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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Mines

EXPLORATION LICENCE 52/80 - SMITHTON

Final Report on Exploration Activity

8th November, 1981 to 8th November, 1982.

Geology Dept.
Report No. 156

I.R. McDonald,
October, 1982.

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1. INTRODUCTION

This report is a final report on E.L. 52/80 prior to relinquishment. It also covers the previously unreported exploration work carried out by E.Z. during the period from 8th November, 1981 to 8th November, 1982.

A description of the Licence area and details of previous exploration work are contained in E.Z. Report No. 140 - "Report for Six Months ended 8th November, 1981".

2. EXPLORATION UNDERTAKEN

A photogeological study of the area was undertaken by Robertson Research (Aust.) Pty. Ltd. This involved some ground traversing to check lithological details. An interpretation of the aeromagnetic survey flown by Geoex (see Report No. 140) was completed by Mitre Geophysics Pty. Ltd.

3. RESULTS RECEIVED

3.1. Geology

The report on the photogeological study of the area by Robertson Research is presented in Appendix 1. Essentially the study failed to find any indications of buried granite intrusion which may have indicated some potential for Sn-W mineralisation.

3.2. Geophysics

The interpretive report on the Smithton aeromagnetic survey by Mitre Geophysics is presented in Appendix 2. The report basically concludes that the anomalies present do not appear to have sufficient amplitude to be responses from pyrrhotite bodies and that most can be best explained as Tertiary Basalts or Cambrian spilites.

4. CONCLUSIONS

Exploration was undertaken in E.L. 52/80 essentially because the Smithton Dolomite represented a favourable host rock for skarn or pyrrhotite replacement style Sn mineralisation. The photogeological study and the aeromagnetic survey failed to find any evidence for buried granite which could act as a mineralisation source. The magnetic anomalies can all be explained by non-mineralisation features. The west-north-west trending magnetics in the north of the Licence are believed to be due to fossil sand dune trends. The large area of high magnetics in the south-east corner is due to Cambrian spilites. Other spot anomalies are readily attributable to Tertiary olivene basalts.

It is therefore concluded that the area has little potential for economic Sn-W mineralisation and that further expenditure on the Licence is not warranted.

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APPENDIX 1.

A Photogeological Study of E.L. 52/80.

by Robertson Research Aust. Pty. Ltd.

1. INTRODUCTION

E.Z. commissioned this photointerpretation of the Smithton region by letter dated 10 December 1982 and the project area covers E.L. 52/80.

C. M. Thomas, Senior Minerals Geologist of Robertson Research Australia Pty Limited undertook the interpretation and briefly visited the area on January 21/22, 1982, accompanied by Dr N. Rutherford and R. Morland.

E.Z. provided the 1:50,000 scale basemaps for the photo-compilation and a copy of the aeromagnetic survey of the E. L.

The objective of exploration in the area of E.L. 52/80 is vein tin mineralisation of the Renison-Cleveland type. The area was selected presumably on the basis of known tin mineralisation at Balfour on the southern margin of the Smithton Basin, and the presence in the E.L. of Precambrian carbonates in an inferred anticlinal structure which if intruded by granites of the stanniferous Devonian suite would provide prospective targets.

2. GEOLOGY

2.1. 1:250,000 SCALE MAPPING

E.L. 52/80 lies within the Burnie 1:250,000 scale geological map sheet and according to this map the E.L. covers Precambrian dolomite flanked by Cambrian volcanics along the eastern boundary and overlain to the west by Cambrian flysch sediments. The presence of Tertiary basalts is also recorded.

The area is very poorly exposed with only occasional outcrops along the creeks and at the aptly named Stony Point on the coast.

2.2. PHOTO-INTERPRETATION

1:50,000 scale black and white Government photographs of the region were provided by E.Z. for the study. The major features of the interpretation were:-

a) Major Stratigraphic Units

The Cambrian flysch covering the western half of the E.L. forms densly forrested hilly country. It appears to be a thick westerly dipping sequence with no indication of marker horizons except for a lower unit of more quartziticsandstones and possibly carbonates located in the south west which are well defined by geomorphology and vegetation pattern. The quartziticnature of this unit was indicated by the grey pebbly soils of the unit noted in a road traverse; same slightly vughy quartz sandstone pebbles could indicate that there are carbonates in this sequence. The typical flysch facies siltstones and sandstones provide yellow-brown clayey soils.

Cambrian volcanics are exposed in road cuttings along a low (?fault) escarpment forming the eastern boundary of the area; there are also some outcrops of flysch south of the volcanics. Dips along this eastern boundary are 35 to 45^{o} and probably parallel the dips in the west.

The central valley comprising the greater part of E.L. 52/80 has been mapped as Precambrian dolomite, it is characterised on the photographs by a weak NE-trending lineament (?jointing) paralleling the major regional fracture trend. Good exposures of white to grey crystalline limestone with minor siliceous veining were observed in Duck River in the southern part of the E.L., the dip appeared to be low ($\sim 5^{o}$) to the south east. The dolomite would appear to have a uniform photo 'signature' throughout the southern half of the E.L. south of the Bass Highway. North of the Highway thin Quaternary sediments, notably sand dunes cover the valley and mask the photogeology. It is not inconceivable that this carbonate unit is part of the Cambrian volcano-sedimentary sequence given its apparent location between dominant older volcanics in the east and younger sediments (with basal quartzite sandstone unit) in the west.

Quaternary sand dunes are prominent features throughout the norther part of the area but also extend inland with aeolian and beach dunes located along the valleys at the base of the hills. Major beach dune systems have aeromagnetic signatures due to heavy minerals.

b) Tertiary Volcanics

The scattered outcrops of basic volcanics attributed to the Tertiary on the 1:250,000 geological sheet and the ubiquitous presence of isolated areas of red volcanic soils is indicative of the widespread presence of volcanics as flows, and perhaps sills and dykes. The photointerpretation suggests that along the Montague River valley there is a NNE-trending zone of volcanic centres, indicated by circular features, extending to south of Stony Point where basalt has been mapped. The low Brittons Swamp area, encircled by hills would appear to be, also, a volcanic related feature with a rectalinear shape orientated N-S and at the southern end merging with a NW-trending magnetic lineament. This latter magnetic zone contains the highest magnetic anomaly covered by the E.L., careful study of the photography indicates very weak discontinuous parallel lineaments in the vicinity of the zone. However the Tertiary basalts do not form outstanding photogeological features.

c) Structure

The major structural features would appear to NE-trending faults, notably along the line of the Bass Highway south west of Smithton, and south of Montague. This fracture direction is common in the Cambrian sediments and Precambrian carbonate terrain.

The escarpment extending south from Smithton is probably a younger Tertiary fault line.

There is no evidence of doming or anticlinal folding which could reflect subsurface granite intrusives.

3. CONCLUSIONS

The photogeology of the area indicates:

(i) The absence of granitic intrusives prospective for tin mineralisation.

(ii) Linear magnetic anomalies in the northern half of the area reflect an ESE-trending coastal dune system.

(iii) Magnetic anomalies elsewhere in the E.L., particularly a NW zone in the southwest corner reflect Tertiary hypabyssal intrusions.

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APPENDIX 2.

Interpretation of the Smithton Aeromagnetic Survey.

by Mitre Geophysics Pty. Ltd.

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MITRE GEOPHYSICS PTY LTD
MINERAL EXPLORATION AND ENGINEERING CONSULTANTS
BUGGS LANE ELLIOTT TASMANIA 7325 PHONE 004-363143

A SUMMARY REPORT ON THE SMITHTON

AEROMAGNETIC SURVEY, E.L. 52/80

(SMITHTON)

FOR

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Mines

BY

DR. J.R. BISHOP

EZ/MG81/14

NOVEMBER, 1981.

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ABSTRACT

E.L. 52/80 (Smithton) was pegged by E.Z. with tin as the main exploration target. A detailed acromagnetic survey (200m line spacing, 100m sensor altitude) was flown to locate any massive sulphide (plus cassiterite) replacement bodies or skarn deposits. However the survey produced no magnetic anomalies that are comparable with responses over the known primary tin deposits in north-western Tasmania.

The survey defined a central low with a north-south striking series of highs on the eastern side (referred to in the report as the eastern ridge) and a WNW-ESE striking series of highs on the northern side (referred to in the report as the northern ridge). South of the low is a broad weak high. Superimposed on these features are a number of smaller anomalies, the shapes of which indicate more local and shallower sources. With one exception, the amplitudes of these anomalies are less than 100 γ. Seventeen of these anomalies have been chosen for closer inspection plus one of the highs constituting the eastern ridge.

Of the seventeen anomalies, only one has been interpreted with any certainty (Sm11), however seven other anomalies have a similar amplitude and character (category 4, see below). Sm11 is coincident with a Tertiary basalt outlier, but there is no basalt indicated at any of the seven similar anomalies and the one other outlier indicated on the lease has no associated magnetic response: thus the interpretation is by no means certain. Other anomalies may also be grouped together, as probably having similar sources: there are two linear anomalies plus another (not labelled) hidden within a steep gradient, and there are three negative anomalies. These latter indicate that remanence may be important; opposing remanent magnetism may be present (and unrecognised) in some of the other anomalies, reducing their amplitudes.

From such a limited survey, an interpretation of the regional features is most uncertain and earlier surveys covering larger areas should be examined, but this has not been done for this summary report. For the tin deposits sought, a granite source is needed; it is noted in the report that granites in north-west Tasmania are usually non-magnetic, and that the central low in this survey is not inconsistant with a buried granite. But other data, such as gravity or seismics, are needed before such an interpretation could be made. The eastern ridge may be due to buried spilites. The northern ridge which appears to define a fault

across the eastern ridge, may also be due to a lithological unit, or possibly to buried basalts in the north west corner (basalt outcrops at Montagu, 2km to the west) and to Spilites in the north-east corner (spilites outcrop at Smithton, 2km to the east). The group of linear anomalies referred to above (category 1, below), parallel or subparallel the northern ridge.

No detailed interpretation has been made of the eighteen anomalies defined in this report, but a simple method of depth interpretation (assuming the source to be a point pole, dipole, line of poles or lines of dipoles) has been used to provide a relative order and the magnitude of depths to the sources. A more detailed interpretation giving better depth estimates and possible dimensions, etc., of the body can be provided, however it is recommended that any such work be delayed until more geological data is available to use as constraints and guides in the geophysical modelling.

None of the eighteen anomalies are obvious targets for follow up surveys but in any thorough exploration program all anomalies for which there is no obvious explanation, should be investigated. The list below gives the eighteen anomalies in order of priority for follow up.

1. 6,7.
2. 2, 3, 12, 13, 16.
3. 5, 18.
4. 1 (off shore), 4, 8, 9, 10, 15, 17.
5. 11.
6. 14.

AIM AND INTRODUCTION

The primary target in E.L. 52/80 is for tin, and if present, it might occur as one of the three types of tin mineralisation recognised in north-west Tasmania (Taylor, 1979).

"1) Isolated sulphide cassiterite orebodies which occur as replacements of dolomitic sediments related to underlying granitoid cupolas. e.g. Renison Bell, Cleveland, Mt. Bischoff.

2) Minor quartz-tourmaline fissure veins in the Heemskirk granite, which relate to sulphide rich zinc veins with a zonal pattern in the surrounding sediments.

3) Banded magnetite-fluorite 'wrigglite' style present in northern region associated with granitoid cusp with quartz cassiterite veins. Tin bearing magnetite skarns are also present in the regions, e.g. Mt. Lindsay."

An aeromagnetic survey would be expected to help define types (1) and (3) but would be of little use for (2), except that north-west Tasmanian granites are commonly magnetically 'quiet' and hence a magnetic survey might help define the extent of a granite (see below). A detailed aeromagnetic survey was flown over E.L. 52/80 in January, 1981.

The geology of the E.L. (see Figure 1) consists of a Cambrian greywacke-turbidite sequence on the west side of the lease, with the eastern side covered by Quaternary alluvium. Pre-Cambrian dolomite occurs under the alluvium in the centre of the lease as well as in creeks on the eastern boundary. Mostly outside the eastern boundary, occur a sequence of north-south striking basic - intermediate volcanics; these intrude into the south east corner of the lease. Two Tertiary basalt outliers occur over the Cambrian Sediments, near the centre of the western lease boundary.

The ground was previously held by Aberfoyle and their work plus the work of other lease holders has been summarised by Young (1979). Young's report concerns a larger lease which had the same eastern boundary as E.L. 52/80:

Aberfoyle's target and that of some of the earlier companies had been for tin in heavy sands at Ann Bay on the west coast. Nickleton Mining investigated a 'gossan' about 4km west of the north west corner of E.L. 52/80 and drilled one hole on their Montagu River Grid. Young (1979) noted that the reported sequence of rocks at Montagu River, "Cambrian spilites, siltstones and mudstones and Pre-Cambrian dolomites is similar to the stratigraphy at Cleveland and Renison" but this hole was apparently not assayed for tin.

Since a Renison style of mineralisation was perhaps the prime target on E.L. 52/80 it may be instructive to show the response of a very simple model of this style of ore-body. The simplest response will be from an equidimensional ore-body and a sphere can be used as a model. Whilst the form of the anomaly may change for bodies of other shapes, the amplitude should not vary greatly. The model assumes a ten million tonne ore-body where 50% of the carbonates have been replaced by pyrrhotite (plus cassiterite). (At Renison the replacement is up to 75%.) The literature quotes a wide variety of magnetic susceptibilities for pyrrhotite but Renison is very magnetic and a value around 0.01 cgs has been assumed; therefore the model ore-body has a susceptibility of .005 cgs units. The density of pyrrhotite is 4.55 gm/c.c. and that of the carbonates is assumed to be 2.65; therefore the ore-body has a density of 3.6 gm/c.c.. These parameters give the ore-body a diameter of 174m. Let the top of the ore-body be 63m from the surface, then the depth to centre from an aeroplane 100m above the ground is 250m. The maximum response is around 2,000γ. Figure 2 shows the response as a contour plan at a scale of 1:10,000 (the scale of the original Geoex plans) and at 1:50,000 the scale used in this report. It can be seen from Figure 3 that there is no anomaly of this magnitude on E.L. 52/80. However, as stated above, pyrrhotite has a very variable magnetic susceptibility and smaller anomalies can occur over the same sized ore-bodies. Also, the body may be deeper, smaller, have a more elusive shape, etc..

It is the aim of this report to identify the anomalies resulting from the survey, make some simple estimates of depths to the sources of the anomalies and (where possible) make some comment about these sources.

RESULTS

Geoex Pty. Ltd. flew an aeromagnetic (fixed wing) survey over E.L. 52/80 in January, 1981. The flight line spacing was nominally 200m with a magnetometer altitude of 100m. The data was presented as contour maps at 1:10,000 with a 5γ contour interval and as line profiles also at 1:10,000. The contour maps have been reduced to 1:50,000 and redrafted onto one sheet (Figure 3). Radiometric spectrometer data was also recorded (potassium, uranium, thorium and total count channels); this data was not processed, but can be examined on the analog records.

The broad features of the Smithton aeromagnetic map are a central low extending beyond the western boundary of the lease, which is flanked to the north and east by 'ridges' of magnetic highs: to the south of the low is a broad, weak high. In the south west corner, strong and variable responses reflect the outcropping spilites. There are numerous low amplitude anomalies both within the low and on or near the ridges.

The ridge defining the northern boundary of the magnetic low described above strikes approximately WNW-ESE: this is almost at right angles to the general strike of the country. As seen in Figure 3, the ridge appears to be a lithological unit, although there are other possibilities (e.g. that the north western high is due to covered basalt which outcrops at Montagu, whilst the eastern high is due to covered spilites which outcrop at Smithton). The aeromagnetic data over E.L. 4/71 may assist in the interpretation. (see below).

For the type of target sought, a granite is considered to be prerequisite. There is no known granite near the E.L., although Cox (pers.comm) has suggested possible (buried) granites several kilometres to the west and south-east of Smithton based on the regional state gravity data. The broad magnetic low in E.L. 52/80 is not inconsistant with the usually non-magnetic response of north western Tasmanian granites, but there is insufficient information to effectively interpret the low, and nor is there a coincident gravity low to enhance this interpretation. It would assist the interpretation if the extent of the low were known; this might be shown in the aeromagnetic survey for Nickleton Mining flown over the whole of E.L. 4/71 (quoted by Young, 1979 on Plate 6B).

Eighteen anomalies have been picked from the survey for depth determination. Anomalies that have not been chosen are either too weak to be of interest or form part of a complex (e.g. the north-west and south-east corners) and cannot be separately analysed. Depths have been calculated using the method of Smellie, 1967 (elementary approximations in aeromagnetic interpretation) and these provide 'ball-park' figures. The values quoted below are below surface, assuming a flight height of 100m (when examining any anomaly in detail, the analog record should be examined to verify the anomaly and to check the altitude). No order of accuracy is given, but as an example an anomaly (no. 11) probably due to outcropping basalt gave a depth (below surface) of 100m for a point source and 55m assuming a line source. Thus there are large differences depending on the model chosen as well as on other assumptions (e.g. the assumption of a point source for an outcropping slab of basalt). Similar, but hidden errors may occur in the other anomalies but the interpretation does serve to classify the anomalies into 'shallow', 'intermediate' and 'deep' sources. An outline of Smellie's method is given in the Appendix and the parameters taken from the profiles are summarised in Table 1 (amplitudes quoted are approximate only). The anomalies have been labelled numerically (1 to 18) starting from the north. A more detailed interpretation giving better depth approximations and source dimensions can be provided, however with little geological information to constrain the geophysical modelling, a large number of different models will fit the data (an infinite number if no bounds are placed on the model). Also a more detailed interpretation is possibly only warranted following the verification and better definition of the anomaly by ground magnetic surveys. A summary description of the eighteen anomalies is given below: they have been prefixed Sm for Smithton.

Sm1 (20γ) This anomaly is off-shore and has not been interpreted. It is similar in amplitude and shape to several anomalies further south (e.g. 8, 10, 15).

Sm2 (60γ) The magnetic ridge south of Sm2 affects the profile for depth interpretation and though it has the appearance of a point pole, a line source gives the better fit to the model. Depths are 180 and 100m (respectively).

Sm3 (80γ) This anomaly is within the magnetic ridge, but it is isolated and can be approximated as a point pole. Depth estimate is 150m.

Sm4 (30γ) This anomaly is situated within the gradient defining the magnetic low. Depth estimate is probably very unreliable, being affected by the magnetic ridge to the north: a value of 300m was obtained.

Sm5 (-40γ) A sharp low within the northern ridge. This low may be due to the positioning of various (positive) magnetic bodies comprising the ridge, however other (isolated) lows were recorded within the lease (16 and 18). A magnetic low may occur when remanent magnetism is much stronger than the induced field and is in a direction close to opposite that of the present day field. No depth estimates were made.

Sm6b (40γ) 6a-6b defines an elongate zone within the central low, but close to its edge. Thus, given the 'granite' hypothesis, Sm6 is in a favourable location, although like the other anomalies, the amplitude is disappointingly low. The depth estimate for 6b is 120-190m.

Sm7b, 7c (50γ, 30γ) 7a-7c is a linear high within the central low and it strikes approximately WNW-ESE (i.e. it parallels the northern ridge). The linear anomaly covers a distance of 3,000m with two distinct highs (7a and 7b), and a weaker high at the eastern end (7c). Depth estimate for 7b is 120m and for 7c 100-180m. Like Sm6, these anomalies are in a 'favourable' position.

Sm8 (25γ) Sm8 is one of a number of low amplitude, circular anomalies. These are discussed more fully under Sm10.

Sm9 (30γ) Similar to Sm10. Depth estimate is 100m.

Sm10 (20γ) There are a number of low amplitude (20-30γ) circular anomalies within E.L. 52/80; they include anomalies 1, 8, 9, 10, 15 & 17.

They are similar in amplitude and not dissimilar to Sm11, a 25γ bent-elongate anomaly over outcropping basalt (see below). None of this group of circular anomalies is over mapped basalt and the only other occurrence of basalt shown on the geological map, a few kilometres west of Sm11 has no magnetic anomaly associated with it. It is noted that Sm11 is atypical of most anomalies over basalt, but small, weathered occurrences might produce such a response. Nevertheless it seems probable that all the circular anomalies have the same causes and it is possible that these are small outliers of basalt. The depth determinations for this group are 100 to 200m, however 'slabs' of basalt relatively close to the magnetometer would not approximate a point source and large over-estimates would be expected using Smellies' (1967) method.

Sm11 (25γ)

Sm11 corresponds with one of two Tertiary basalt outliers at 'Christmas Hill' near the centre of the lease. There is no magnetic anomaly over the western outlier, but Sm11 corresponds closely in shape to the mapped boundary of the eastern one. The depth estimate for Sm11 is 55-100m, rather high for outcropping basalt, but as explained above, the assumptions used in Smellie's method are probably not appropriate for this type of source. It was also noted above that a broad-looking, 25γ anomaly was not typical of the magnetic responses of basalts, but that an isolated, weathered outcrop might produce such an anomaly. Ground magnetic surveys and geological mapping are needed over both outliers to determine their true responses and extents.

Sm12 (70γ)

This high is part of the eastern ridge referred to at the beginning of this section. The anomaly is influenced on the western side by the gradient defining the central low, but it appears to have an amplitude of about 70γ giving a depth estimate of 300m. A wide source is possible, which would cause the depth to be over estimated. The size of the anomaly makes it one of the more prospective targets, although a buried spilite is probably the more likely cause.

Sm13 (40 γ) Sm13 is a shallower anomaly superimposed on the (deeper) eastern ridge which is defined (in part) by anomalies 12 & 14. An east-west sinistral fault may occur immediately to the north of 13 (throw 1-2km). Depth estimate is 100m.

Sm14 (250 γ) This is the largest anomaly considered, in size and amplitude, however it has the form of a deep-seated intrusive (or buried spilite), rather than an ore-body. Depth estimate is nearly 700m.

Sm15 (25 γ) Within the broad weak high mentioned at the beginning of this Section is Sm15, a small closed anomaly on the western side of the high. It has been grouped with the anomalies discussed in Sm10. Depth estimate is 175m.

Sm16 (-125 γ) A weak NW-SE trough in the south western corner of the lease contains a (relatively) intense low of 125γ. The change in sign of this anomaly does not affect its prospectiveness: the anomalies extent is of the right order of magnitude for an ore-body and it is isolated. No depth estimates were made, but a 'shallow' source is likely.

Sm17 (25 γ) Grouped with the type Sm10 anomalies. Depth estimate 175m.

Sm18 (-35 γ) Sm18 is another negative anomaly possibly on strike with the weak trough containing Sm16. No depth estimate has been made but it is probably deeper than Sm16.

CONCLUSIONS AND RECOMMENDATIONS

The detailed aeromagnetic survey over E.L. 52/80 has defined a number of small amplitude surveys. There is no large amplitude response consistant with a Renison-style ore-body. A prominent feature of the map is a central low and while this is not inconsistant with the response that might occur over a buried granite there is no other evidence to suggest that such is the case.

Certainly the survey results do not reflect the approximately north-south strike of the regional maps. (It was stated in the Introduction that magnetics would not assist in the detection of mineralised viens within a granite however if it has defined a buried granite, then 'cupola detection' (Taylor, 1979, p 254) should be added to the list of target types.)

The amplitudes of the anomalies were all disappointingly low: any skarn or significant pyrrhotite replacement body would be expected to produce anomalies of several hundred to thousands of gammas. To assist in the better understanding of the anomalies listed above, they may be grouped in the following manner:

a) Low amplitude (20-30γ), circular anomalies (already referred to as type Sm10 anomalies), mostly shallow: 1, 8, 9, 10, 15, 17, (4? see below).

b) Circular anomalies of higher amplitude than type Sm10 (60-70 γ), generally in a more mangnetically active area: 2, 3, (12? see below).

c) Linear anomalies trending WNW-ESE, 30-40 γ: 6a-6b, 7a-7c. A third zone not defined above occurs to the north-east of Sm7c. It is located within a large gradient and hence is not evident as a closed high. It is marked on Figure 3 as a dashed line.

d) Large deep-seated anomaly: 14.

e) Negative anomalies: 5, 16, 18.

Anomalies not included above are Sm13 and Sm11. The former has a larger amplitude than type (a) and is unlikely to have the same type of source as that group. It is situated within the eastern ridge but has a shallower source than Sm14 to the south or the deep-seated anomaly below Sm12. Sm11 is the only anomaly for which the cause is apparently known, but for which there are nevertheless problems; an adjacent basalt outcrop has no anomaly and Sm11 is similar in amplitude and character to type Sm10 anomalies which are not over known basalts.

The inclusion of Sm4 into type (a) was questioned since all other type (a) anomalies are in magnetically quiet areas. Sm4 may be a part of the northern ridge.

Sm12 should perhaps be categorised with 13, as highs within the eastern ridge. Sm12 may be caused by a shallower part of this ridge or alternatively be a separate body above the ridge source.

The intense and varied responses in the south-east corner of the lease are due to outcropping spilites. It is probable that the eastern ridge is due to buried spilites possibly faulted off by the northern ridge in the north-east corner. The western end of the northern ridge may be due to buried basalt (which outcrops further to the west). The negative anomalies indicate that remanence is significant for at least some of the sources. Remanence in an opposing direction (as is the case here) may combine with the induced magnetism to severely reduce the magnetic response of a body.

The simple method used for the depth determination was adequate to provide a rough order of magnitude and a relative listing; except for the type Sm10 anomalies which may not fit the assumption of the method. More reliable estimates can be made using more sophisticated methods which will also provide more information about the bodies. However such procedures should be left until the anomalies have been verified and better defined by ground follow up surveys.

If the location of the anomalies is generally good, follow up can be carried out by a series of profiles; each successive profile being at right angles through the highest values of the previous traverse. A grid can then be set up over the peak of the anomaly. It is also recommended that the data from the Nickleton Mining aeromagnetic survey over E.L. 4/71 be obtained, plus any other surveys covering the area, since the broader information may assist in the interpretation of this limited survey.

It may be desirable to pursue the granite suggestion with further geophysics: gravity and/or seismic methods could be used and these should also be able to define the area of shallowest cover.

No anomalies stand out as obvious targets but perhaps Sm7a-7c and Sm6a-6b could be investigated early in the follow up program. An order of priority is given below:

1.	6, 7.
2.	2, 3, 12, 13, 16.
3.	5, 18.
4.	1 (off-shore), 4, 8, 9, 10, 15, 17.
5.	11.
6.	14.

J.R. BISHOP

JRB/amd

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REFERENCES

SMELLIE, D.W., 1967 Elementary approximations in aeromagnetic interpretation. Mining Geophysics, Vol. 2; Society of Exploration Geophysicists.

TAYLOR, R.G., 1979 Geology of Tin Deposits. Elsevier, p 543.

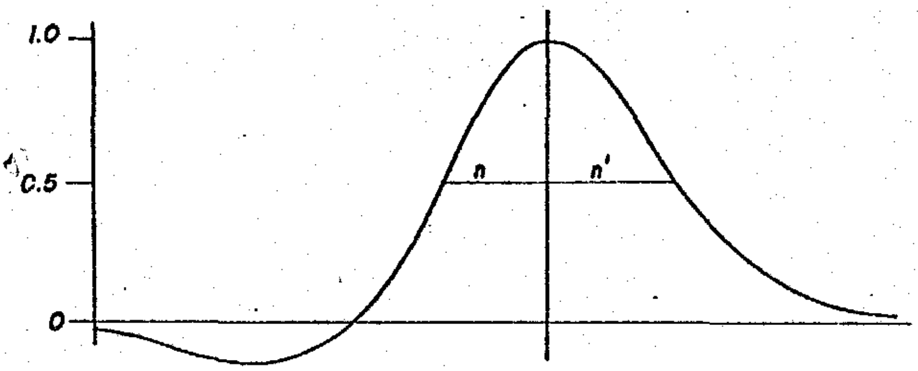
YOUNG, C.H., 1979 Smithton E.L. 18/78 - First and Final Report. (Aberfoyle Exploration Company Report)

APPENDIX

SMELLIE'S METHOD OF DEPTH DETERMINATION

The depths to the tops of the anomaly sources given in this report were calculated using the method described by Smellie (1967). In this method, the source is assumed to be either a point pole, point dipole, line of poles or line of dipoles. A series of nomograms are provided which define a function k, which, when multiplied by the appropriate half width (n), gives the depth.

The half widths are defined in the diagram below:



The following ratios apply for profiles along (magnetic) north-south traverses. (Traverses over point poles or point dipoles can be made north-south and at Smithton, traverses over most line sources were also best taken in a north-south direction.)

Point Pole		Point Dipole		Line of Poles (strike=90° (mag))		Line of Dipoles (strike=90°)	
n:n'	= .83	n:n'	= .81	n:n'	= .74	n:n'	= .77
k	= 1.44	k	= 1.82	k	= .85	k	= 2.3
k'	= 1.2	k'	= 2.24	k'	= 1.15	k'	= 1.76

Then $z = kn$

& $z' = k'n'$

If the data is a close fit to the model, then z and z' should give close to the same depth.

TABLE 1. – ANOMALY DEPTH DESCRIPTIONS

(See Appendix for description of parameters. – All profile directions are magnetic north-south, except where stated otherwise.)

Anomaly	Approx. Amplitude (γ)	n (m)	n' (m)	n:n'	Best fit to n:n' (a)*	Appearance (b)*	Depth below surface (m) (a)	Depth below surface (m) (b)	Approximate Location A.M.G.	Comments
Sm1	20								333,750E 5,482,300N	Off-shore, no interpretation made.
Sm2	60	180	250	.72	Line source	Pt. pole	100	180	336,350E 5,480,550N	Removal of 'regional' reduces depths slightly.
Sm3	80	187	195	.96	Pt. pole	Pt. pole	150		331,700E 5,479,900N	Poor fit of n:n' but good 'shape' to anomaly.
Sm4	30	290	310	.94	Pt. pole	Pt. pole	300		335,300E 5,477,100N	Interference from adjacent responses.
Sm5	-40								339,100E 5,476,800N	No interpretation made.
Sm6b	40	210	230	.91	Pt. pole	Line source	190	120	332,200E 5,477,350N	Interference from adjacent responses.
Sm7b	50	190	265	.71	Line source	Line source	120		331,600E 5,474,400N	
Sm7c	30	200	230	.9	Pt. pole	Line source	180	110	333,100E 5,473,700N	
Sm8	25	210	210	1.	Pt. pole	Pt. pole	175		330,550E 5,471,900N	
Sm9	30	145	160	.9	Pt. pole	Pt. pole (or Pt. dipole)	100	(200)	332,400E 5,472,000N	

* See next page

TABLE 1. - ANOMALY DEPTH DETERMINATION (Cont.)

Anomaly	Approx. Amplitude (γ)	n (m)	n' (m)	n:n'	Best fit to n:n' (a)*	Appearance (b)*	Depth below surface (m) (a)	(b)	Approximate Location A.M.G.	Comments
Sm10	20	170	150	1.13	Pt. pole	Pt. pole		100	332,200E 5,471,000N	Interference from adjacent responses.
Sm11	25	145	160	.91	Pt. pole	Line source	100	55	333,650E 5,470,900N	
Sm12[1]	70	320	320	1.	Pt. pole		300		337,650E 5,470,100N	Possible wide source leading to over estimate:interference.
Sm13[2]	40	170	240	.71	Line source	Line source		100	337,500E 5,467,850N	
Sm14[1]	250	700	500	1.4	Pt. pole		675		338,800E 5,465,650N	Poor fit to n:n'
Sm15	25	190	230	.83	Pt. pole	Pt. pole		175	330,650E 5,465,100N	
Sm16	-125								330,200E 5,463,550N	No interpretation made.
Sm17	25	190	220	.86	Pt. pole	Pt. pole		175	332,300E 5,461,050N	Interference from adjacent responses.
Sm18	-35								332,250E 5,460,400N	No interpetation made.

1 = Profile taken east-west (mag.)

2 = Profile taken at 52° (mag.).

* Column (a) shows which of the 4 possibilities (point pole, point dipole, line of poles or line of dipoles) best fits the data using the ratio n:n'. Column (b) gives the best fit by visual inspection.

U29

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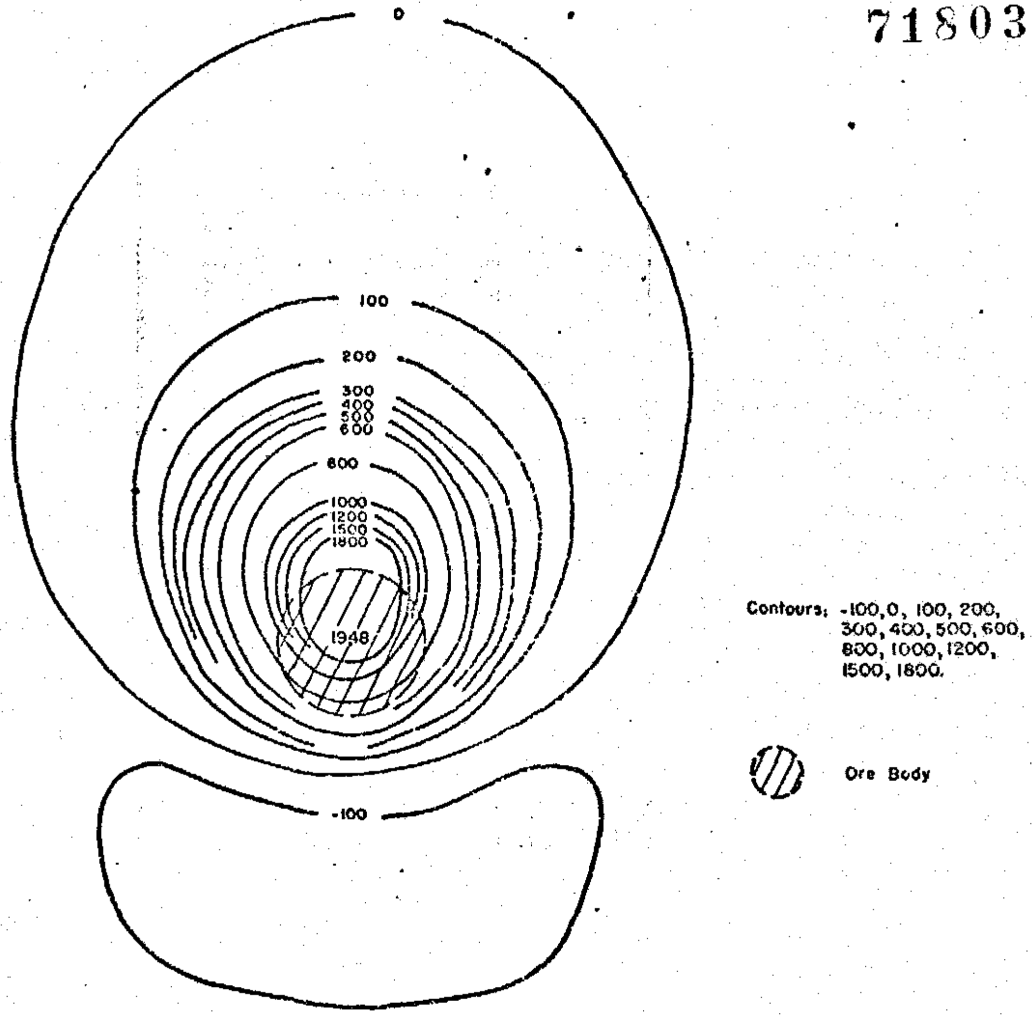
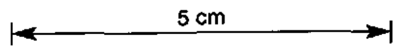
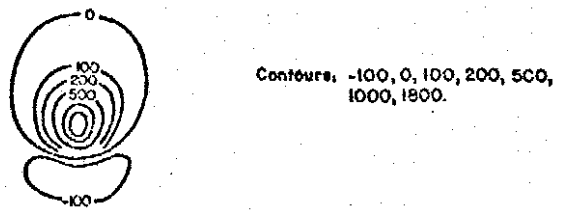


(a) Contour plan at 1:10,000





(b) Contour plan at 1:50,000

THE MODEL: A 10 million tonne spherical ore body with magnetic susceptibility 0·005 c.g.s. units and density 3·6 gm/c.c. Body is buried at a depth of 250m (to the centre of the sphere) below the flight level.

MITRE GEOPHYSICS PTY. LTD.		
Magnetic Response of Spherical Ore-body.		
DRAWN: J.B.	SCALE: As Shown	FIG. 2
TRACED: T.C.D.S.	DATE: Nov 1971	

82-1823.

ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.

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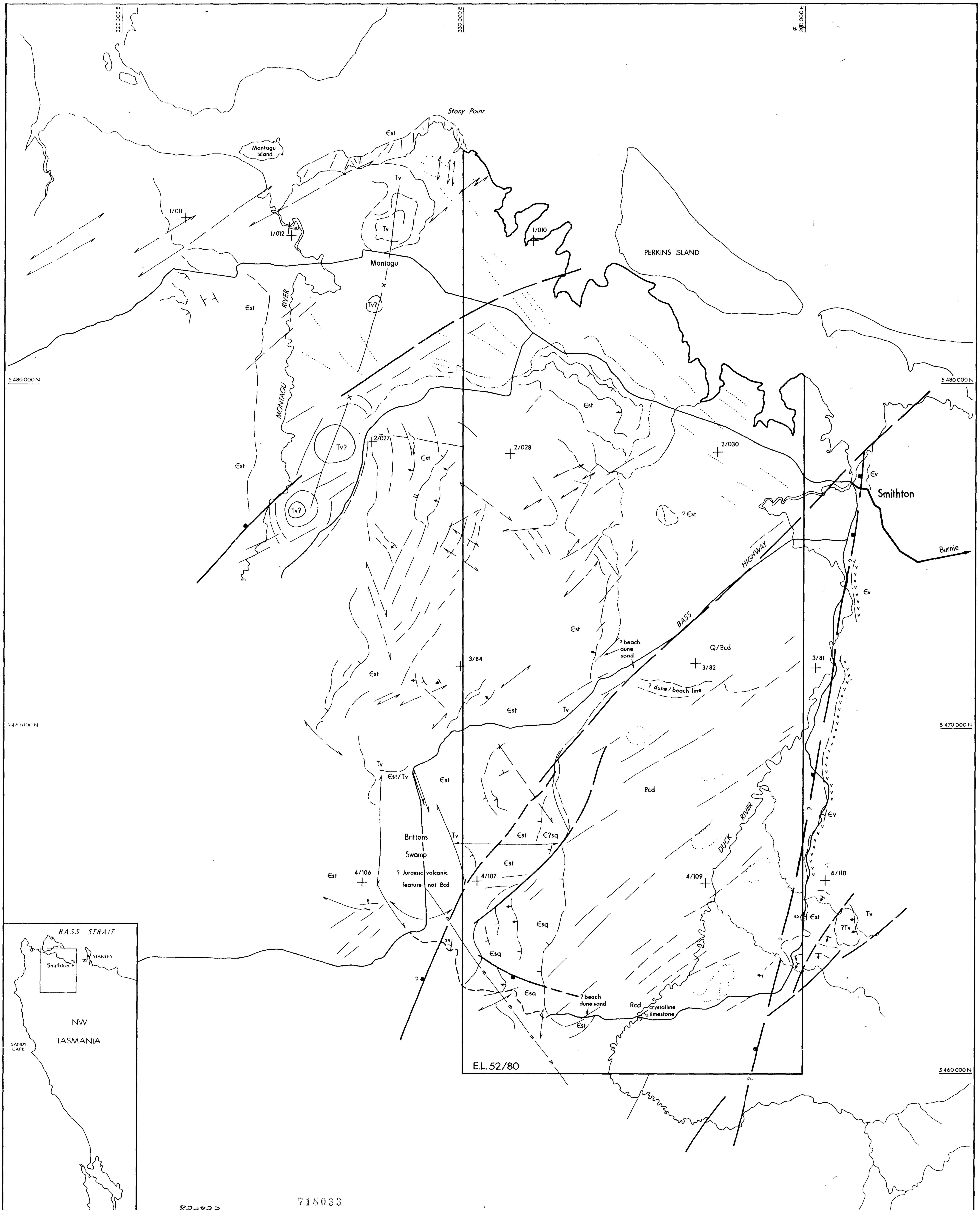
718031

GEOLOGICAL MAP

2473

SCALE: 1:50 000	Survey: Mines Dept.	Revised:
Reference: E.Z./M.G.81/14	Date: NOVEMBER 1981	FIGURE I
Drawn: T.G.D.S.	Checked:	A1 - 515 - 0034

5 490 000 N
5 480 000 N
5 470 000 N
5 460 000 N
320 000 E
330 000 E
340 000 E
LINEAR
2
3
4
5
6a
6b
7a
7b
7c
8
9
10
11
12
13
14
15
16
17
18
BASS STRAIT
STANLEY
SMITHTON
Smithton
MARRAWAH
Sandy Cape
WARATAH
ROSEBERY
ZEEHAN
QUEENSTOWN
STRAHAN
Misery Flat
SOUTHERN OCEAN
LEGEND
50 +
0 to 50
-50 to 0
-100 to -50
-125 to -100
-150 to -125
-175 to -150
-200 to -175
-225 to -200
-250 to -225
to -250
Linear Anomaly
6 Interpreted Anomaly
718032
82-1823
ELECTROLYTIC ZINC CO. OF A'ASIA. LTD.
PROJECT: SMITHTON E.L. 52/80
TAS.
SMITHTON
AEROMAGNETIC SURVEY
Contour Interval 5 gammas
5 cm
2474
Scale 1 50 000
Survey Geoex
Revised
Reference EZ/MG81/14
Date Feb 1981
Drawn TGDS
Checked
FIGURE 3
AI-515-0035



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PHOTOGEOLOGICAL INTERPRETATION

5 cm

Figure 4.

2472

SCALE 1:50 000

AI - 515 - 0037

Prepared by ROBERTSON RESEACH AUSTRALIA Report No 893

LEGEND

Q	Quaternary cover
Tv	Tertiary basalts
CAMBRIAN Ꞓst	Siltstones and sandstones (flysch)
CAMBRIAN Ꞓsq	Quartzitic unit, with possibly some carbonates
CAMBRIAN Ꞓv	Volcanics, mainly basic
Ꞓcd	Crystalline carbonates, could overlie Ꞓv
....	Sand dunes
—·—·—	Beach duneline
	Trace of bedding and dip
	Lineaments, mainly cleavage
	Fault, tick on downthrow side
+ 1/012	Photo centre and number
—×—	Axis of Tertiary volcanics
—m—	Magnetic lineament