

692001



MITRE GEOPHYSICS PTY LTD

MINERAL EXPLORATION AND ENGINEERING CONSULTANTS

BUGGS LANE

ELLIOTT

TASMANIA 7325

PHONE 004-363143

A REPORT ON THE DIGHEM

SURVEY OVER THE NATONE AREA

FOR

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

West Coast Mines

BY

DR. J.R. BISHOP

EZ/MG81/12

OCTOBER, 1981

02.4797

CONTENTS

<u>CONTENTS</u>	i
<u>FIGURES</u>	i
<u>SUMMARY</u>	ii
<u>AIM AND INTRODUCTION</u>	1
<u>RESULTS</u>	4
<u>CONCLUSIONS AND RECOMMENDATIONS</u>	17
<u>REFERENCES</u>	19
<u>APPENDIX</u>	20

FIGURES

- Figure 1. Dighem E.M. anomalies (1:10,000)
- Figure 2. Colebrook Hill smoothed dip VLF contours and Dighem anomalies (1:5,000).



SUMMARY

A Dighem survey of 316 line km was flown over the Natone area in February, 1981. Many excellent responses were obtained over the highly conductive Colebrook Hill area, and some large anomalies but with lower conductances, were located outside the E.L. boundary. Apart from these, anomalies with poor responses and with mostly low grades were scattered throughout the rest of the survey. The intense magnetic responses associated with Colebrook Hill were also absent from the rest of the area (except over the serpentinites) and most anomalies had no associated magnetic responses.

This report is concerned only with those anomalies lying outside the area covered by the Colebrook Hill VLF survey, but inside, or close to, the E.L. boundary. Within this area, sixteen anomaly alignments (termed 'zones' in this report) were defined, (labelled A to P); plus forty three individual anomalies (numbered 1 to 43). Of this latter number, thirty seven were 'possible' anomalies, the lowest grade defined by Dighem.

Anomalous zones over sediments which are, or may be, host to the mineralisation, and are close to Colebrook Hill, are considered the best anomalies; i.e. zones C, D, E and B (B is the 'best' zone, but may be outside the lease). Two isolated anomalies south, and on strike, of Colebrook Hill are only 'possible' grade, but which, if genuine, may indicate deeper mineralisation (9 and 10). A possible anomaly also occurs over old workings (no. 26 near 5,366,500mN) and this, with nearby on-strike anomaly no. 25, is also considered prospective. Otherwise, anomalous zones over sediments are considered to be better targets than zones over glacials (both of these sets of zones should at least be locatable on the ground) which in turn are rated more highly than isolated anomalies (mostly 'possible') over sediments. The anomalies are listed below in decreasing order of priority: those between semi-colons have equal rating.

C; D; E; B; 9; 10; 26; 25; 11; M, O, P; N; A; F; G, H; I, J, K, L; 18; 30, 31; 1, 2, 22, 23, 24, 29, 38; 21, 27, 28, 36, 39, 41; 14, 33, 34, 35; 20; 3, 4, 5, 6, 7, 8, 12, 13, 15, 16, 17, 19; 32, 37, 40; 42, 43.



VLF has proved to be most successful over the Colebrook Hill mineralisation and should be tried for follow up of the above anomalies (even though the Colebrook Hill style of mineralisation apparently doesn't occur elsewhere on the lease). It is a quick and easy method, requiring one person to operate it. However, over conductive regions such as glacial moraine, spurious anomalies may be recorded: these areas should be surveyed with a different method, such as Max-Min.



AIM AND INTRODUCTION

A Dighem survey of 316 line km was flown over the Natone area: the nominal line spacing was 200m. The survey was undertaken from the 11th to 22nd February, 1981: the interpretation report and final plans were received 1st June, 1981 (preliminary computer profiles at 1:20,000 were received some weeks prior to this).

The Dighem EM system is a helicopter borne technique using a towed 'bird' which contains two sets of transmitting and receiving coils: one pair of vertical coils with a common axis (co-axial) and a pair of horizontal, co-planar coils. The transmitted frequencies are sufficiently far apart to be recorded separately, but are close enough to assume both coils operate at 900 Hz, for mathematical treatment of the responses. The two coil orientations allow Dighem to differentiate different types of conductors, in particular, conductive overburden from bedrock conductors.

The survey data is computer processed and, as well as giving the usual in- and out-of-phase data for both coil orientations, altimeter and magnetometer profiles, the profiles also show apparent resistivity and depth (for a conductive earth); conductance (for a vertical dyke), as well as various anomaly enhancement channels (some of which are experimental and are unexplained). Also shown are ambient noise levels for both coil orientations. Further description is given in the Dighem report (Dvorak and Vergos, 1981) and in Fraser (1979).

The output from the Dighem survey consists of the original analogue records, computer processed profiles and four maps. One map shows the EM anomalies with a grade symbol and two series of dots. The grade is based on the conductance of a (assumed) vertical dyke as the cause of the anomaly. One series of dots shows the size of response, the other the interpreted depth. A second map is a contour plan of resistivity (a conductive earth beneath a resistive layer is assumed). A third map is a contour plan of the magnetics, and the fourth map is a plan of enhanced magnetics. The processing for the last map removes broad anomalies and amplifies the response of narrow ones; thus it accentuates near surface magnetic bodies. The resistivity and both magnetics maps show the EM grade symbol but not the other information.



Dighem have defined six grades for a possible conductor, these are:-

<u>Dighem grade</u>	<u>Conductance (σt) range</u>	
6	100 ≥ 100	≥ 100
5	50 - 99	
4	20 - 49	
3	10 - 19	
2	5 - 9	
1	≤ 4	
X	Possible	

The following quote is on all Dighem EM maps.

"Dighem anomalies are divided into six grades of conductivity - thickness product. This product in mhos is the reciprocal of resistance in ohms. The mho is a measure of conductance, and is a geologic parameter. Most swamps yield Grade 1 anomalies but highly conducting clays can give Grade 2 anomalies. The multi-coil anomaly shapes often allow surface conductors to be recognised, and these are indicated by the letter S on this map. The remaining Grade 1 and 2 anomalies could be weak bedrock conductors. The higher grades indicate increasingly higher conductances. Examples: The ore bodies of the Mogusi River camp yield Grade 4 anomalies, while Mattabi and Whistle give Grade 5. Graphite and sulphides can span all grades but, in this survey area, field work may show that the different grades indicate different types of conductors."

Dighem identifies the anomalies on the computer profiles, lettered A, B, C, etc., from west to east on any one flight line; grade X responses are lettered separately, also starting from A. Anomalies thought to be spurious (e.g. spherics, instrumental noise, etc.) are not plotted on the plans, and thus not all letters appear along one flight line, and there may be repetition if there are both 'proper' and 'possible' anomalies. To further confuse, the labelling of anomalies has been done sheet by sheet; therefore where a flight line crosses a sheet, the anomalies start again from A. (Computer profiles showing complete flight lines on one profile have been ordered, presumably these will have a continuous labelling.)

*include
labelling of Mifne anomalies*



In this report, the anomalies have been replotted onto the Natone Area geology sheet (at 1:10,000). An open circle has been used with the Dighem grade printed inside. Possible anomalies are shown as X (after Dighem). Alignments of anomalies (called zones) have been outlined and are labelled alphabetically from A. Isolated anomalies have been numbered from 1 (see Figure 1). The Appendix lists the Mitre and Dighem labelling of those anomalies discussed in this report.

This representation of the anomalies does not indicate size of the response i.e. how well it was detected, and therefore the EM channel amplitudes are also listed in the Appendix with the quantitative interpretation data (all from the Appendix in the Dighem Report).

Dighem was provided with base sheets showing topography at a contour interval of 10m at a scale of 1:10,000. (The area flown covers (part of) six maps, E.Z. sheets 7, 9, 11, 28, 30, 32.) The flight film strip was plotted onto photo mosaics each night (by Doug Morrison of Southlands Geophysical Services). The flight navigation system used for the survey was rather unusual in that each frame did not have its own fiducial number; the numbers were changed either manually by the navigator or after a set time. When plotting fiducials, the position was extrapolated back to the first frame with that number. Replotting of some of the flight lines on to a later series of photographs changed the location of some anomalies by as much as 300m.

A comparison of the Dighem anomalies over Colebrook Hill with the VLF (smoothed dip) contours over that area suggests that the survey accuracy is to within about 120m, however isolated anomalies may be much worse.

The Dighem results within the area covered by the VLF survey (Bishop, 1980) are not discussed here, nor are those anomalies falling well outside the lease boundaries. This report evaluates all other anomalies and possible anomalies and gives an order of priority for determining their location on the ground.



RESULTS

Dighem anomalies outside of the area covered by the Colebrook Hill VLF survey, but within or close to the lease boundaries are briefly assessed here; that is the anomaly responses, locations and associations with other anomalies are examined to determine whether the anomaly is genuine (i.e. whether it has been caused by a geologic conductor), and if so, the likelihood of mineralisation being the cause.

The results outside of the Colebrook Hill area and within the lease boundaries are disappointing: definite anomalies have low grades or are only possible anomalies (grade X). The target mineralisation for this survey was for cassiterite associated with sulphides: at Colebrook Hill this is pyrrhotite, which has been shown to be an excellent conductor as well as highly magnetic. So far at Colebrook Hill, there has been little or no tin with the pyrrhotite (or elsewhere in the drill core), although there are old tin prospects in the area as well as tin geochemical anomalies. (But the old workings on Colebrook Hill were for copper.) Presumably elsewhere on the lease tin may be associated with other (disseminated) sulphides which are not magnetic. And there is the possibility that better grades and tonnages of the Colebrook Hill type copper (or other base metal) may occur. Detailed summaries of the area's geology and mineralisation are given in Mill, et al, 1980.

Possible anomalies have no quantitative information and low grade anomalies are unlikely to be caused by (economic amounts of) massive mineralisation, thus there are few positive predictions. In any one geological environment, mineralisation often has a certain signature and thus the very conductive (and mineralised) area of the Colebrook Hill VLF survey appears to be almost entirely restricted to the area covered by that survey. The poorer responses elsewhere may be better understood after detailed investigation of one of them.

The zones and individual anomalies are lettered and numbered respectively from north to south and are so described below. The number of anomalies of any one grade is indicated in brackets after the grade.

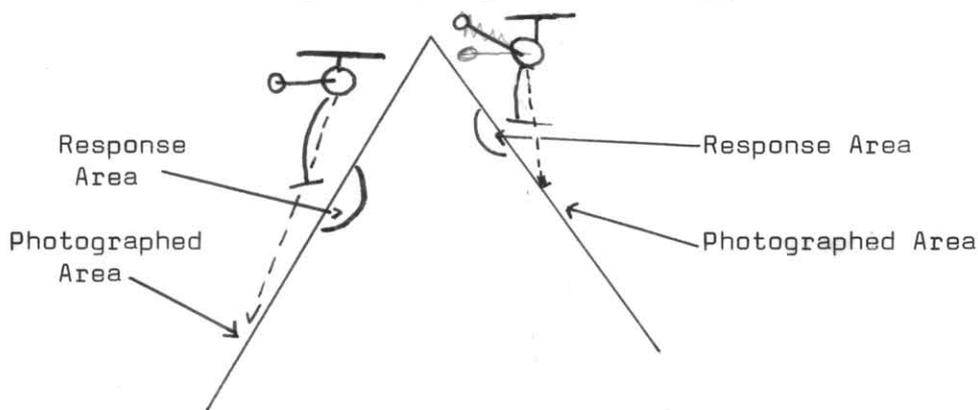


- ZONE A: 2 responses, grades 1(2). 'A1' is between the banks of the Pieman River. 'A2' may be due to a cultural (line) source, although this has not been interpreted by Dighem. Not considered very prospective.
- 1, 2, 3, 4: Grades X(4). These four separate possible anomalies are all within the banks of the Pieman River and are not considered prospective.
- ZONE B: 9 responses, grades 6(3), 5, 4, 3, 2, X(2). This zone is outside of the lease's western boundary, but is close enough to be considered. It is a zone of high conductances although responses are not high. The VLF survey covered this area and most of Zone 'B' does not coincide with a VLF anomaly. Thus, since it can be fairly assumed that the VLF and Dighem surveys have responded to the same source (and this, being steeply dipping, would mean little difference in response location), the true position of the Dighem anomalies is either to the east or west. (That is, either inside the lease boundary or further away.) There is a good VLF response to the east of 'B', between the lease boundary and the western contact between the sediments and the serpentinites: the southern end of Zone 'B' is coincident with this VLF anomaly. If this anomaly is the true position of 'B', the excellent conductance would most probably not be due to the sediments/serpentinites contact, and mineralisation seems a likely cause. Alternatively, Zone 'B's' true position is further away from the lease (a VLF anomaly is to the west of Zone 'B' at its northern end, see Figure 2).
- ZONE CH: Anomalies in this zone are in the area covered by the VLF survey. A comparison of the VLF and Dighem results is shown in Figure 2. To project the Dighem anomalies to the best fitting VLF anomalies (not necessarily the nearest), anomalies must be moved, on both sides, towards the crest of the Hill. Why this may be so, is illustrated below. Errors in position (i.e. discrepancies between VLF and Dighem



anomalies) are up to 100m, not necessarily in areas of steepest topography.

A few areas of the VLF survey had a line spacing of 200m. Dighem anomalies in these areas should be confirmed by surveying the following intermediate lines: 5,371,300N; 5,371,500N; 5,371,210N. Also, 5,371,700N needs to be extended to the west to investigate three grade 1 anomalies.



ZONE C:

5 responses, grades 6, 4, 3, X(2). This zone is on the NE edge of the VLF survey: 'C4' and 'C5' are coincident with a VLF anomaly and the zone points towards another, on line 5,372,600N. The strike of this and other nearby zones suggest that the VLF contouring here is in error and that the NE-SW trending anomaly does not extend past line 5,371,900N.

The high grade of conductance and associated (but not coincident) magnetics suggest that Zone 'C' has a similar source to the main Colebrook Hill anomalies. The lower amplitudes (<10 ppm) imply a smaller volume of mineralisation (i.e. lower σt products) and, at the southern end, to deeper mineralisation (nearly 75m).

ZONE D:

3 responses, grades 2, X(2). Dvorak and Vergos (1981) suggest that zones 'C', 'D' and 'E' may all be part of the one (?intermittant) zone: certainly there is a good alignment. Zone 'D' is still within the magnetically active area surrounding Colebrook Hill and the poor conductances indicate smaller amounts of sulphides.

ZONE E:

5 responses, grades 4(2), 3(3). Dighem has only tentatively included E4 and E5 into the zone, but the conductance and depths of these anomalies are comparable to those of 'E1', 'E2' and 'E3' and the strike is similar to some of the Colebrook Hill trends. There are some good responses (e.g. 'E3') and 'E5' has a coincident magnetic anomaly. However, all five anomalies are within a magnetically anomalous zone (see Sheet 2, enhanced magnetics, Dighem report).

This zone is interesting since it appears to be 'attached' to the Colebrook Hill mineralisation, but has lower conductances, suggesting a lower concentration or different style of mineralisation: the good responses suggest a significant amount of mineralisation. A conductive lithological unit is also quite possible: the southern end of zone 'E' lies between DDH's NP 106 (350m to the south) and NP 107 (200m to the north), (?mineralised) black shales were intersected in these holes. However the trend of zone 'E' is at a definite angle to the indicated geologic strike.

ZONE F:

17 responses, grades 3, 2(6), 1, X(9). This zone extends for over 1km and is at an angle of about 20° to zones 'C' and 'D'. Conductances are low, as are the amplitudes (generally <5 ppm). Although on the edge of the contours defining the Colebrook Hill magnetically active area, this zone is probably not connected with that mineralisation and is more likely due to a lithological unit (black shales or disseminated pyrite). 'F9 - F17' are coincident with a creek, if follow-up confirms that this is the true position then the creek may be the cause (particularly if rich in dissolved salts from old workings on Colebrook Hill), however the grade 3 of 'F16' is probably too high for a creek (against this, the amplitudes of 'F16' are nearly in the noise level).

ZONE G:

3 responses, grades 1(2), X. This zone is of low conductances, but the grade 1 anomalies have definite responses (see Appendix). There is a small magnetic anomaly centred on 'G2', which extends to 'G1'. The magnetics and short strike



length suggest that this is not a black shale or other lithological unit, but the weak grades and lower responses suggest, in comparison with Colebrook Hill, a much poorer (in concentration and volume) mineralisation.

ZONE H:

4 responses, grades 2(2), X(2). Anomaly 'H1' has a response nearly in the noise level, but 'H3' is clearly defined. Like zone 'F' the southern part of this zone (in particular 'H3') is coincident with a creek. Zone 'H' is not associated with any magnetic response and is over glacials. From the Appendix it can be seen that in the interpretations of 'H1' and 'H3', the values (of conductance and depth) are much closer for a horizontal sheet than for a vertical dyke. Nevertheless the zone should be located on the ground, preferably by a system such as the Max-Min method which allows some quantitative interpretation.

ZONE I:

2 responses, grade 1(2). Like zone 'H', the interpretation of these two anomalies better fits a horizontal sheet (i.e. a conductive zone within the glacials) than a vertical dyke. But the zone is close to zone 'E' and may be easily followed up as part of the survey over that more promising zone.

5:

Grade X. An isolated possible anomaly over glacials. This, like other possible anomalies, is recommended for follow-up, mostly because of a lack of obvious excellent conductors. Also experience elsewhere in Tasmania has shown that significant (disseminated) mineralisation may not be detected by Dighem. Apart from being a possible source of the anomaly, the glacials could also serve to reduce a genuine prospective anomaly.

6:

Grade X. Like 5, this is also an isolated possible anomaly over glacials. Like other similar anomalies in the vicinity, follow-up can be done relatively easily by using or extending existing grids. That is, an initial attempt can be made to



locate these unpromising anomalies without a great cost in time or money. Further exploration could await the evaluation of the whole first-pass (ground phase) exploration program.

- 7-8: Grade X(2). These two possible anomalies are over glacials but the line between them is parallel or sub-parallel to the probable strike direction; however, a flight line with no response passes between them. With anomaly 6, these two anomalies may be investigated by extending, for short distances, existing grid lines.
- 9: Grade X. This (?) isolated possible anomaly has an associated magnetic response and is on strike (about 300m) to the south of the Colebrook Hill mineralisation. The 'isolation' is questioned since the next flight line to the south also has an on-strike possible anomaly ('10'). Although only a grade X, anomaly '9' is considered prospective.
- 10: Grade X. This possible anomaly does not have the magnetic association of '9', but is similarly on strike. And like '9' it is considered prospective and may be followed up by using existing grid lines.
- 11: Grade X(S?). A possible anomaly, possibly due to a surficial conductor, is one of the least prospective targets. The indicated position of anomaly '11' is the (western) contact between the serpentinites and the sediments, a quite likely source for a poor EM anomaly. Nevertheless, this should be verified. In the anomalies favour is the proximity of the old 'Athenic' and 'Olympic' tin workings to the east.
- 12: Grade X. This possible anomaly is on the edge of the glacials and is considered an unpromising anomaly. As with other possible anomalies, a ground EM survey can determine if the anomaly is genuine and, depending on the method used, allow a better interpretation as to the likely source.
- 13: Grade X. This possible anomaly is over the glacials.



The position is approximately 125m north of DDH NP 106 and although this hole is likely to only provide information about rocks west of '13', it will give at least local information about the thickness of the glacials.

- 14: Grade X(S). This possible anomaly with a probable surficial cause has been plotted just outside the lease boundary. It is, however on a cut grid line and can be readily verified.
- 15: Grade X(S). This possible anomaly with a probable surficial cause is located on the edge of the glacials. Its location can be included with the follow up of anomalies 16, 17 and 18.
- 16-17: Grade X(2). Both possible anomalies are located over glacials. The anomalies are on adjacent flight lines, approximately 160m apart and are aligned close to the (presumed) strike direction. Follow up may be included with 15 and 18.
- 18: Grade 3. This anomaly has a coplanar coil response in the noise level and hence the conductance calculation (i.e. the grade 3) is probably not reliable. The coaxial response is small but definite. The anomaly is over sediments and, for a vertical dyke, has an interpreted depth of 46m. But like the conductance, this figure is suspect. As mentioned above, follow up may be combined with anomalies 15, 16 and 17.
- 19: Grade X. This possible anomaly is located about 200m west of the Hercules ropeway, over glacials. It is an isolated anomaly and, being in dense/medium bush, follow up may be difficult. This anomaly has a low priority which would change if interesting results were obtained from any of the anomalies '15' to '18', some 300 to 500m to the south.

ZONE J:

2 responses, grade 1(2). The response for J1 strongly suggests a spheric (natural EM emission) cause; the Dighem interpreters apparently agreed with this, but later decided it was a genuine anomaly (see computer profiles). A similar cause is possible for J2, where there is a considerable amount of noise in both noise monitoring channels.

'J' is close to a terminal moraine where one might expect a thick sequence of glacials, however the anomalies have not been interpreted by Dighem as probably (or possibly) having a surficial cause. For a vertical dyke, the interpreted depths are less than 6m, but for a horizontal sheet are nearly 100m. The former interpretation seems unlikely (well within the glacials), the latter is perhaps too deep to be within the glacials (?). But again, low response levels mean inaccurate estimates.

The zone is to the south of, and close to, the road running along the top of the terminal moraine, hence follow up should not be difficult.

ZONE K:

2 responses, grade 1(2). The responses of both K1 and K2 suggest conductive overburden: a weak response in one of the difference channels may have persuaded Dighem not to have labelled this 'surficial'. As the Dighem report comments, the recognition of bedrock conductors is difficult in conductive ground, which is the condition here. The interpreted depth assuming a vertical dyke is zero for both anomalies: for a conductive earth, it is 1m and 20m respectively. Thus 'K' is not considered highly prospective, however it is adjacent to a track and follow up probably would not be difficult.

20:

Grade 1(S?). This anomaly has a strong out-of-phase response and a surficial source within the glacials seems most likely. Like 'K', the depth to a vertical dyke is zero (suggesting that this is an unsuitable model): it is also



zero for a conductive earth (more likely), but is 31m for a conductive horizontal sheet. Together with 'K' and several other anomalies over the glacials, although probably not prospective, the relative ease of access means that they can be followed up without too large an expenditure of time and money.

ZONE L:

2 responses, grades 2, 1. L1 is a definite response with better conductance than many of the anomalies described above, but it is still over conductive ground and a grade 2 anomaly may still be readily caused by 'geologic noise'. 'L' is within the glacially covered area and is close to the bottom of the Hercules haulage. It is also close to anomaly '22' (a grade 'X' anomaly) and follow up could investigate both anomalies.

21:

Grade X(S). This possible anomaly, probably has a superficial cause and it is plotted just outside of the lease boundary on the southern most line of the old Colebrook Hill grid (no longer accessible). As with all other isolated grade X anomalies, in the absence of any other information (e.g. over old mine site), there is little that can be said other than: a very small response was recorded near here which may be due to a conductor in the ground. If genuine, this may be a strong conductor at depth, or a weaker conductor near the surface.

22-23:

Grade X(2). These two possible anomalies have not been joined by Dighem, but they are on adjacent lines and are sub-parallel to zone 'L' to the north. The responses are over sediments and hence are given a higher priority than those over glacials.

24:

Grade X. This is an isolated possible anomaly over sediments at the top of a slope on the northern side of the Ring River. It is remote and follow up priority may depend on factors other than geophysics. I suggest that it be left



until similar anomalies, of which there are several, have been evaluated. From experience of these, responses such as '24' can be better evaluated.

ZONE M:

3 responses, grades 2, 1, X. Both 'M2' and 'M3' have very small responses ('M1' is the 'X' anomaly), and M2 the better conductor, has the smaller response values, i.e. no great confidence can be placed on the quantitative interpretation. However the profiles indicate a genuine anomaly (that is, unlike isolated possible anomalies, a follow up survey can be planned with reasonable confidence that the anomaly exists).

As with the other anomalous zones away from Colebrook Hill, the low conductance values do not generate much enthusiasm, however they may be caused by disseminated mineralisation. And as mentioned previously, often conductors (mineralisation and spurious sources such as black shales) in a particular area will have a certain 'signature', and thus more confident predictions may be possible half way through a follow up project, than at the beginning.

ZONE N:

3 responses, grades 1(2), X. Zone 'N' is more a superposition, than an alignment of anomalies. Thus the response is almost certainly genuine, despite the very small responses and low grades. Presumably a superposition of anomalies should have a much smaller 'probable location radius' than the 100m established at Colebrook Hill. Since 'N' is about 75m outside of the lease, these anomalies have a low priority.

25:

Grade X. This possible anomaly is of greater interest than many other similar anomalies defined in this survey, because of its proximity to '26', a possible anomaly that is apparently associated with old workings. '25' is about 240m along (local) strike to the north of '26'.



- 26: Grade X. This possible anomaly appears to be associated with some old workings and thus, although the surrounding ground is apparently conductive and a surficial cause is quite likely, '26' has the highest priority of the isolated possible anomalies.
- 27-28: Grade XS? (2). If genuine, '27' and '28' may be caused by a surface conductor. The two anomalies are situated across strike about 170m apart, in the conductive zone mentioned under '26'.
- The cause of this conductive zone may be of interest; for example, perhaps it outlines an area of more intense alteration (?). In which case anomalies such as '27' and '28' might acquire a new interest. See resistivity plan, Sheet 3.
- 29: Grade X. An isolated possible anomaly, SW of '27' and '28' and outside of the conductive zone. Access would appear to be difficult. It would assume a greater interest if '25' or '26' to the north or '32' to the south were shown to be caused by mineralisation.
- 30: Grade 1(S). This anomaly has a large coincident response in the coaxial noise monitoring channel and is possibly spurious, but the character of the EM channel responses suggests a genuine signal. The anomaly is located directly over one of the old open pits south of the Hercules Mine and presumably this is the cause. Nevertheless a follow up survey is warranted if the local geology and mineralisation are not completely known.
- 31: Grade 1(S?). This anomaly has no in-phase response in either channel, the out-of-phase responses are small and local. An extremely poor conductor seems likely. The anomaly is coincident with a track running south from the Hercules Mine, thus the location may be readily checked.



- 32: Grade 3 (L?). This anomaly has very small EM amplitudes and is offset from a large response in the coplanar noise channel. There is no power line in the vicinity and the channel is either picking up natural pulses, or the instrumentation is noisy. There is a strong possibility that it is a false anomaly.
- 33: Grade X(S). This possible anomaly is located just outside of the lease boundary. There are definite anomalies several 100's of metres both to the east and west of it. An X(S?) grade anomaly ('34') is 270m on strike to the south, but an intervening line shows no response where it intersects the line between '33' and '34'. Low priority.
- 34: Grade X(S?). On strike with '33', but an intermediate line has no response. Follow up of the zone '0' described below could include this anomaly by virtue of its proximity rather than any geophysical merit it might have.
- 35: Grade X(S). This possible anomaly is located between zone '0' and '34' and, like '34', could be incorporated into a follow up survey over zone '0'. By itself, it is of little interest (but nevertheless has a higher priority than do isolated anomalies over glacials).
- ZONE 0: 4 responses, grades 2, 1(3). All four anomalies have very definite responses from a genuine conductor, and all four have been interpreted as showing an easterly dip. The interpretation for a (near) vertical dyke is quite consistent between 01, 02 and 04 (conductance 3 to 4, depth 10 - 12.5m, 03 has a conductance of 5, and a depth of 25m). The zone is at an angle to the apparent geologic strike and, in the absence of any higher-conductance zones, has a high priority.
- ZONE P: 2 responses, grades 1, X. 'P' is south of '0' and parallel to it, but is offset some 50m (a small fault?). The conductances are lower than those of '0' but P2 is still a



definite response. Its rating may depend to some extent on '0', but it would still need to be investigated if '0' was not prospective.

- 36: Grade 1(S?). This is a weak and indefinite response adjacent to zone 'P': it would be included in any investigation of 'P'.
- 37: Grade X(L?). This possible anomaly is associated with a large response in a noise channel. A power line is not shown on the base map and seems unlikely in the area (on one of the northern lines of the Dobson's Creek Grid), but it is likely that it is a false anomaly.
- 38: Grade X. An isolated possible anomaly on the western edge of the conglomerate on Moore's Pimple. This anomaly, if genuine, may lie in more prospective rocks to the west, although the Colebrook Hill experience suggests that on the side of steep hills, the true position is closer to the top; in which case, it lies within or beneath (?)unprospective conglomerate.
- 39: Grade X(S?). This anomaly is situated on the Dobson's Creek Grid, close to a track. It is on the edge of a small magnetic anomaly. Follow up would depend on what (if any) geophysics has been carried out on the adjacent grid lines.
- 40: Grade X(L?). There is no power line in the vicinity (?) and an erroneous signal seems likely.
- 41: Grade X(S?). This possible anomaly is just outside of the eastern lease boundary and is within a conductive surface area (which includes '40'). A possible surface cause in an area with surface conductance makes it a poor target.
- 42-43: Grades X(S). These possible anomalies with probable surficial causes are located over dolerite talus on the east side of Mt. Dundas. Not prospective.



CONCLUSIONS AND RECOMMENDATIONS

Apart from zone 'CH', which is the area covered by the ground VLF survey there are no high grade anomalies with good responses. Also, no other anomalies have the strong magnetic responses associated with the Colebrook Hill area and most other anomalies have no associated magnetic response at all. Thus the likelihood of significant quantities of pyrrhotite (hopefully with economic quantities of cassiterite) within say 50-100m of the surface is poor.

This report evaluated anomalies outside of the Colebrook Hill area and inside or near to the lease boundaries. Sixteen areas of anomaly alignments (called zones) were labelled (A to P) and these varied in length from less than 50m to over 1km. Of the isolated anomalies, those definitely caused by cultural effects (e.g. power lines) were not considered, and a total of 43 were evaluated. Of these, 37 were only 'possible' anomalies, the lowest grade defined by Dighem. There is very little to distinguish possible anomalies, except perhaps the rock types over which they occur. Thus 'X' anomalies over old workings are more prospective than those over sediments, than those over glacials. However since the possible response may be due to a good conductor at the limit of penetration of the system, all except two possible anomalies have been recommended for eventual follow up. The exceptions are two grade X(S) anomalies over dolerite talus on the side of Mt. Dundas.

Anomalous zones have the top priority and those close to Colebrook Hill seem to be the most prospective, i.e. 'C', 'D' and 'E'. I think zone 'F' may be due to black shales (as is possibly the southern end of 'E'). Zone 'B' is the best response but its true position is possibly even further outside the lease boundary. Possible anomalies '9' & '10' are on strike to the south of Colebrook Hill and may represent deeper mineralisation.

Away from Colebrook Hill, possible anomaly '26' is over, or adjacent to, old workings and thus is considered prospective and, by association so is anomaly '25', 250m along strike to the north. Zones M, O and P are definite conductors in the sediments within the lease, but they have very poor conductances. But as was mentioned in the report, significant volumes of dissem-



inated mineralisation (in other surveys) have been missed by Dighem or have been given an 'X' grading. A conductor needs to have a true resistivity of less than about 10 ohm-m in order to be detectable (Fraser, pers. commun.).

Below are listed the anomalies in order of priority, i.e. priority decreasing down the page and those on the same line having equal rating. Obviously logistics will largely dictate the order in which follow up is carried out. Priorities will also change as follow up progresses. The V.L.F. method should first be tried for follow up: it proved most successful at Colebrook Hill and is quick and easy to use. However over the glacials and on conductive ground, spurious results may occur and another method such as Max-Min should be used (Bishop, 1981).

DIGHEM ANOMALY PRIORITY LIST

(see Figure 1.)

C
D
E
B
9
10
26
25
11
M, O, P
N
A
F
G, H
I, J, K, L
18
30, 31
1, 2, 22, 23, 24, 29, 38
21, 27, 28, 36, 39, 41
14, 33, 34, 35
20
3, 4, 5, 6, 7, 8, 12, 13, 15, 16, 17, 19
32, 37, 40
42, 43

J. Bishop

REFERENCES

- BISHOP, J.R., 1980. Magnetic, VLF, and Self Potential Survey over Colebrook Hill. Mitre Geophysics Report 80/04 for E.Z..
- BISHOP, J.R., 1981. Notes on some EM methods for ground follow up of Dighem anomalies. Mitre Geophysics report no. 81/06 for Mt. Lyell and E.Z..
- DVORAK, Z. & VERGOS, S., 1981. Dighem^{II} survey of the Rosebery Area, Tasmania. Dighem Report no. 326 for E.Z..
- FRASER, D.C., 1979. The multicoil^{II} airborne electromagnetic system. Geophysics Vol. 44 no. 8 p 1367-1394.
- MILL, J.H.A., McDONALD, I.R. & WEEDEN, R.J., 1980. Mt. Black Exploration Licence 1/62, Report no. 134. An E.Z. Company progress report.

APPENDIXQUANTITATIVE DATA FOR DIGHEM ANOMALIES EVALUATED IN THIS REPORT

Anomaly (or zone) Label	Dighem Sheet No.	Responses				Vertical Dyke		Horizontal Sheet		Conductive Earth		
		Coaxial		Coplarar		Mhos Depth (M)	Mhos Depth (M)	Ohm-m	Depth (M)			
		R	I	R	I							
A1	1B	1	5	1	6	7	15	44	2	88	39	55
A2	2E	1	11	5	8	5	14	6	3	93	18	64
1	1XA	2										
2	1XB	2										
3	2XA	2										
4	3XD	2										
B1	3XA	1										
B2	4B	1	5	1	14	0	164	33	8	97	3	77
B3	5A	1	3	0	5	2	44	49	7	130	5	108
B4	6A	1	6	1	13	2	107	19	10	116	2	97
B5	710A	1	11	2	15	3	89	23	8	121	4	100
B6	7A	1	3	1	3	2	102	27	7	134	5	111
B7	8XA	1										
B8	700A	1	5	4	6	4	10	36	1	106	92	59
B9	810A	1	4	5	3	3	5	33	1	102	149	49
C1	5A	2	7	2	6	7	15	34	2	117	41	82
C2	6XA	2										
C3	7C	2	5	0	0	1	125	72	3	158	26	122
C4	700XA	2										
C5	710C	2	4	1	0	0	29	74	2	153	30	116



Anomaly (or zone)	Dighem Label	Sheet No.	Response				Vertical Dyke		Horizont- al Sheet		Conductive Earth	
			Coaxial		Coplanar		Mhos	Depth	Mhos	Depth	Ohm-m	Depth
			R	I	R	I	(M)	(M)	(M)	(M)		(M)
H1	7E	2	3	3	0	0	5	48	1	98	243	41
H2	8XB	2										
H3	1000C	2	5	6	4	7	5	19	1	93	193	39
H4	9XC	2										
I1	12B	2	1	4	0	5	3	34	1	96	128	48
I2	13B	2	3	7	5	8	3	12	2	98	51	59
5	7XB	2										
6	9XB	2										
7	1000XC	2										
8	900XB	2										
9	13XA	2										
10	114XA	2										
11	14XA (S?)	1										
12	14XB	2										
13	16XA	2										
14	19XB (S)	3										
15	18XA (S)	4										
16	18XB (S)	4										
17	19XA	4										
18	19A	4	5	2	1	2	12	46	1	130	103	77
19	21XA	4										
J1	21A	4	1	5	3	6	2	6	1	97	153	44
J2	2100A	4	0	6	4	10	1	5	1	72	253	23
K1	24B	4	5	13	6	21	3	0	1	38	128	1
K2	25A	4	1	6	3	7	2	0	1	64	98	20



NB 1 Part of the topographic detail on this sheet is derived from photo-enlarged 20 chains to the inch plans (Lands Dept), contours in feet

NB 2 This plan has been compiled from the following plans - A0 525-0006, 0013, 0108, 0109, 0110, 0111

NOTES

- 1 Anomalies inside the Colerbrook Hill VLF survey area have not been labelled.
- 2 Anomalies well outside the lease boundaries have not been labelled.
- 3 Anomalies due to cultural effects (L) have not been labelled.

LEGEND

- ⊙ Dighem anomaly (showing grade)
- S, S? probable, possible surface conductor
- L line source
- ⊙ M Anomalous zone with Mitre letter
- ⊙ 15 Mitre number for individual anomaly

5 cm

692629

02_4797

A Report on the Dighem Survey over the Natone Area - EL1/1982
 Electrolytic Zinc Company of Australia Limited, Mr Bishop, J.R. EL1/1982

ELECTROLYTIC ZINC CO OF AASIA LTD
 PROJECT: MT BLACK EL 1/62 TAS

NATONE AREA
 GEOLOGY
 DIGHEM INTERPRETATION

SCALE 1:10,000	Survey Mitre Geophysics	Revised
Reference EL/M62/1/2	Date Sept. '81	
Drawn T.G.S.	Checked	FIG. 1

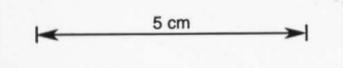
02_4797

A Report on the Dighem Survey over the Natone Area - EL1/1962
Electrolytic Zinc Company of Australasia Limited; Mitr Bishop, J.R. EL1/1962

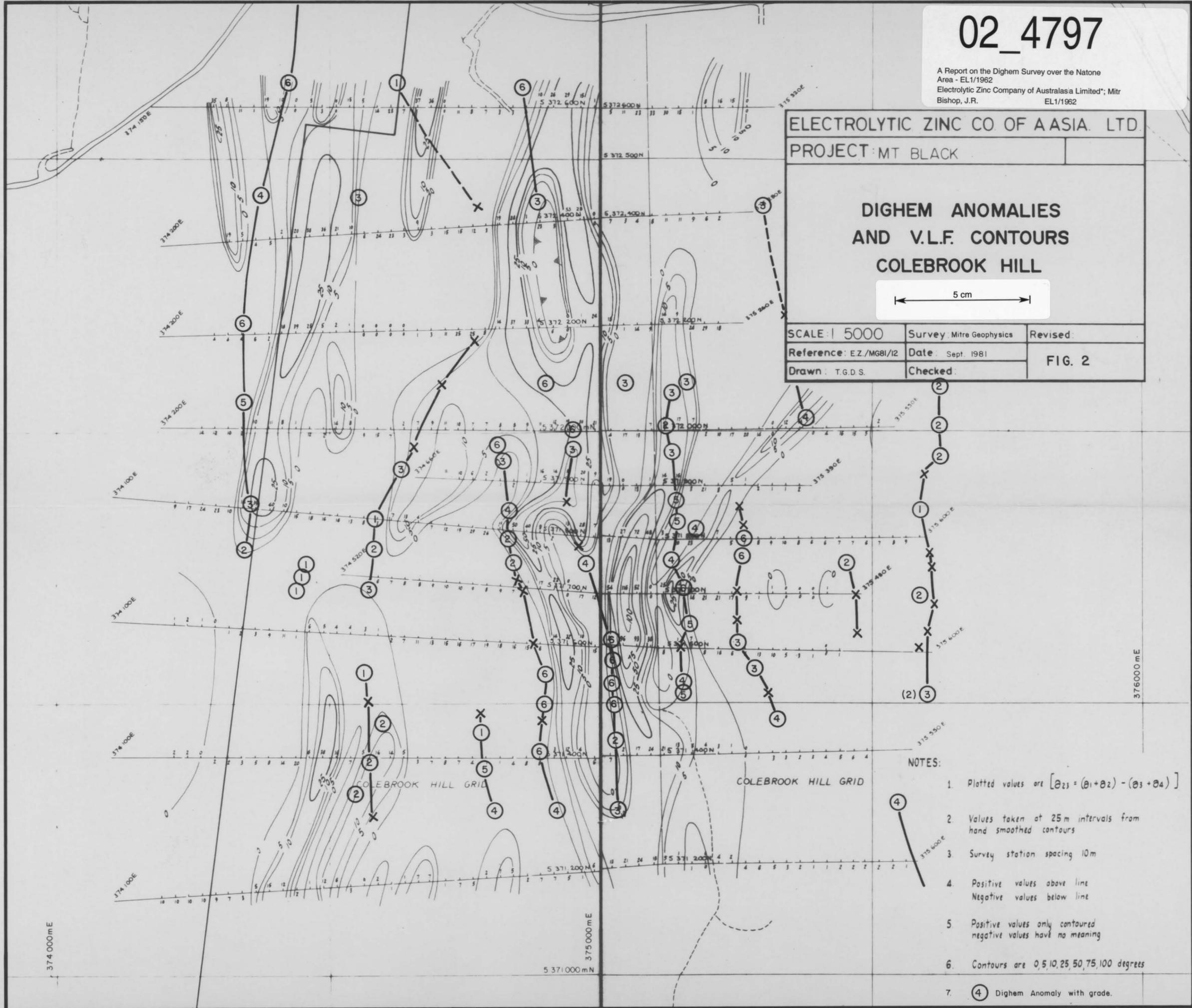
ELECTROLYTIC ZINC CO OF ASIA LTD.

PROJECT: MT BLACK

DIGHEM ANOMALIES AND V.L.F. CONTOURS COLEBROOK HILL



SCALE: 1 5000	Survey: Mitre Geophysics	Revised:
Reference: E.Z./MGBI/12	Date: Sept. 1981	FIG. 2
Drawn: T.G.D.S.	Checked:	



NOTES:

1. Plotted values are $[a_{23} = (a_1 + a_2) - (a_3 + a_4)]$
2. Values taken at 25 m intervals from hand smoothed contours
3. Survey station spacing 10m
4. Positive values above line
Negative values below line
5. Positive values only contoured
negative values have no meaning
6. Contours are 0, 5, 10, 25, 50, 75, 100 degrees
7. (4) Dighem Anomaly with grade.

376000 mE

374 000 mE

375 000 mE
5 371 000 mN