A REPORT ON GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION AND TOTAL MAGNETIC FIELD SURVEYS OVER THE BASIN LAKE GRID NEAR QUEENSTOWN, WEST COAST TASMANIA

ON BEHALF OF

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

000

329002

PRIVATE AND CONFIDENTIAL

A REPORT ON GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION AND TOTAL MAGNETIC FIELD SURVEYS OVER THE BASIN LAKE GRID NEAR QUEENSTOWN, WEST COAST TASMANIA

ON BEHALF OF

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BY

A.W. HOWLAND-ROSE

MSc,DIC,AMAusIMM,FGS.

GEOPHYSICIST

SYDNEY, N.S.W.

OCTOBER - DECEMBER, 1974

TAS - 025B

001

329003

CONTENTS

002

329004

SCINTREX PTY. LTD.

Formerly

SEIGEL ASSOCIATES AUSTRALASIA PTY. LTD.

GEOPHYSICAL CONSULTANTS AND CONTRACTORS

SUMMARY

A gradient array electrical induced polarization survey carried out over the Basin Lake grid, revealed a series of substantial induced polarization anomalies contained within zones having a twice normal background response. These anomalies were not associated with any significant magnetic response, nor does the resistivity data show them to be conductive. The interpreted sources are denser segregations of sulphides (or graphite) surrounded by a relatively disseminated halo of sulphides. These geophysical characteristics are considered similar to those observed over typical "Mt. Lyell Type" mineralisation.

1031 WELLINGTON STREET, WEST PERTH, W.A. 6005
TELEPHONE 21 6934. TELEGRAMS "SCINTREX" PERTH

6 TRAMORE PLACE, KILLARNEY HEIGHTS, N.S.W. 2087
TELEPHONE 451 5367. TELEGRAMS "SCINTREX" SYDNEY

A REPORT ON
GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION
AND TOTAL MAGNETIC FIELD SURVEYS
OVER THE BASIN LAKE GRID
NEAR QUEENSTOWN, WEST COAST TASMANIA
ON BEHALF OF
THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

INTRODUCTION

At the request of Mr. K. Reid, Chief Geologist for the Mount Lyell Mining and Railway Company Ltd., Scintrex Pty. Ltd. conducted a 26 line mile reconnaissance gradient array electrical induced polarization survey over the Basin Lake grid.

This survey was under the immediate direction of Scintrex Senior Crew Leader, Mr. B. Ekstrom, with Scintrex field geophysicist Mr. G.J. Elliott B.App.Sc(Geophys) providing on site geophysical direction. Auxiliary Scintrex operator Mr. L. Jones also assisted on this project. The survey was conducted on 17½ production days between 9th November and 10th December, 1974. Details are shown in Appendix 'P'.

Geological direction of the surveys was undertaken by Mr. K. Wells, Senior Exploration Geologist for the Mount Lyell Mining and Railway Company Ltd., while the project was under the overall geophysical supervision of Mr. A.W. Howland-Rose.

Although Appendices on methods and instrumentation have been omitted, an abbreviated desçription of the gradient array reconnaissance technique as applied in this survey is included in the text.

Gradient Array Electrical Induced Polarization Method

More comprehensive descriptions of the above method are contained in previous survey reports on the Mt. Lyell area. What follows is a brief summary of the major factors.

In the case of the gradient array, positional information is excellent, but depth estimates rely on profile shape and then only give a "maximum depth". An additional inhibiting factor of course is resolution of the potential dipole used. In this survey the minimum potential dipole employed was 100 feet, thus it is not possible to resolve the depth better than "within 50 feet". Thus many of the 50 feet determinations may in fact either outcrop, or lie within a few feet of surface. The plotted position of the data represents a summation of the characteristics of the material immediately below that point between the potential dipoles.

Similarly the width of bodies is not easy to determine for narrow zones having a width less than half the dipole spacing used. Thus, estimated maximum widths are educated guesses at best. However, the wider zones are resolved more accurately.

The attitude of a chargeable zone can only really be gauged with any precision in the centre of the gradient array and providing the body has strongly contrasting resistivity and chargeability characteristics to the enclosing rock units.

All field measurements were taken between slope distances along lines. This will, in steep areas, produce errors in the calculated apparent resistivity data, however, these errors will be arithmetic, and as significant changes in resistivity are logarithmic, this source of error is not significant. In assessing the position of the source in areas of extreme terrain, it does not lie vertically below the plotted position of the anomaly, but normal to the "local slope". All positions in the text refer to source positions normal to the local slope.

Each current dipole block should be considered separately. As would be expected, the continuity along strike is generally good, especially in the chargeability data. However, "end on" current dipole blocks cannot be expected to give identical data due to the different base levels of the current dipoles and, in zones close to the current poles, the data will not sample identical volumes on the overlap between current dipoles. This phenomenon will result in more extreme divergence of data as the current dipole is approached. However, these factors are entirely predictable.

DISCUSSION OF RESULTS

The data profiles are displayed on Plate 1 at a horizontal scale of 1 inch = 200 feet and vertical scales of 1 inch = 10 milliseconds, 1 log cycle = 2 inches for the apparent resistivity which is expressed in ohm-metres and 1 inch = 200 gammas. The L/M ratio remains within the range 0.8 $\pm$ 0.1 and therefore has not been plotted.

Contour interpretations are presented of chargeability, apparent resistivity and total magnetic field on a horizontal scale of 1 inch = 500 feet on Plates 2, 3 and 4 respectively.

The nine current dipoles employed to energise the grid area are as follows:

Electrodes	Lines Surveyed	Dipole
5050E & 950W on line 15S	00, 06S, 12S, 18S 24S, 30S	6000'
3050E & 9050E on line 15S	00, 03N, 03S, 06S 12S, 18S, 24S, 30S	6000'
4050E & 10050E on line 15S	00, 06S, 12S, 18S 24S, 30S	6000'
950W & 5050E on line 45S	30S, 36S, 42S, 48S 54S, 60S	6000'
3050E & 9050E on line 45S	30S, 36S, 42S, 48S 54S, 60S	6000'
5050E & 10050E on line 45S	30S, 36S, 42S, 48S	5000'

Electrodes	Lines Surveyed	Dipole
950W & 5050E on line 81S	66S, 72S, 78S, 84S 90S, 95S	6000'
3050E &9050E on line 81S	66S, 72S, 78S, 84S 90S, 96S.	6000'
950W & 9050E on line 81S	96S,	10000'

The potential dipole used on all gradient blocks was 100 feet with readings at 100 feet intervals, and where necessary, at 50 feet intervals. On Plates 2 and 3 each block has been contoured separately. The western and central sections of line 30S were run twice, once from the current dipoles to the north and once from the current dipoles to the south. This was done to study how significant the differences in the observations from each current dipole are, with a view to establishing if the lines between each adjacent block should be repeated. Comments on this study are made in the text.

The normal induced polarization background in the area is about 12 milliseconds $\pm$ 2 milliseconds. On some lines that level is raised due to the current electrode being emplaced in a chargeable zone, such as occurs on the western ends of the centre gradient block on lines 00 to 30S inclusive.

The apparent resistivity varies from 1000 ohm-metres to 15,000 ohm-metres, but the background can be considered to be between 3000 and 5000 ohm-metres. The overlaps on "end-on" gradient blocks, and the adjacently run line (30S), give excellent correlation, and as would be expected, considerably less divergence on overlap than does the apparent chargeability.

Each line is discussed individually below.

Line 00: A broad zone of twice background chargeability was recorded between about 2200E and 3600E, coincident with a depressed apparent resistivity level of about 50% of that to the immediate east and west. However, the absolute values of between 2000 and 3000 ohm-metres do not infer material conduction. Within this twice background zone, two anomalies at 2550E and 3150E of 20 and 25 milliseconds above normal background were observed. The maximum depths to source are assessed to be 200 feet, while the width of the source is assessed to be less than 100 feet. The broad high between 2200E and 3100E on line 06S is the southerly continuation of the above zone. This anomaly is open to the north.

Within a more resistive unit defined between 5650E and 6000E, a twice background induced polarization anomaly was defined between 5850E and 6000E. The width of the source is assessed to be about 150 feet and the depth about 100 feet. The response has no correlative to the south and is considered of tertiary interest only.

A highly significant response was defined centred at 7350E. At this point a 30 millisecond anomaly above background was recorded from a source whose maximum depth is assessed to be about 100 feet and whose maximum width is interpreted as being about 150 feet. Over the highest chargeability values, a very slight decrease in apparent resistivity was noted. However, the absolute level of 3000 ohm-metres clearly infers the source to be non-conductive in nature. A gradual rise in apparent chargeability was noted from background to the anomaly for about 100 feet on either side of the anomaly. Over the same distance the apparent resistivity rises threefold. The sulphide source therefore is contained within a disseminated sulphide halo, contained in a resistive rock unit.

An examination of the data profiles for the overlap between 3700E and 3900E shows a 10 millisecond divergence in background. This phenomenon is entirely predictable. It comes about because the most westerly electrode on the eastern gradient block lies within a chargeable body, while the most eastern electrode on the westerly block lies within an area of normal chargeability background.

Lines 03N and 03S: Short lines were surveyed some 300 feet north and south of the above described anomaly. On the most northerly line, 03N, an anomaly of very similar form was defined at 7400E, with a second suggested at 7600E, which may be the "end effect" of a more substantial anomaly to the north. The width of the source is suggested as 50 to 75 feet while the maximum depth is not greater than 300 feet. This substantial and significant anomaly lies open to the north.

To the south on line 03S, the anomaly form is quite different and clearly the anomaly centred at 7350E/00 does not cross this line. However, background effects remain high on this line and also on the line to the south, the form of which suggests a grid south-south-west to south-west twist to the strike between these lines. A second source, inferred to be very narrow, was defined at 7100E at a depth of about 100 feet or so. The resistivity is slightly depressed (30%) over the maximum induced polarization values, inferring very weak interconnection between chargeable grains.

Line 06S: Within a broad zone between 2100E and 3000E of about twice background chargeability, a distinct peak was defined at 2250E coincident with a 60% fall in apparent resistivity to about 1500 ohm-metres. The depth to source of the narrow (less than 50 feet) response is considered to be less than 100 feet, but the contacts with the enclosing resistive disseminated sulphide carrying host rocks is not sharp. The actual high may be related to 2550E/00, or most likely represents a weakly conductive lens of greater sulphide content within a broad zone of dissemination.

There are no other distinctive induced polarization anomalies on this line, although a number of broad zones of about 50% above background were noted at 050E, 4800E, 7150E and 8650E.

Line 12S: A broad twice background response similar in characteristics to the previous line was resolved between 2350E and 3600E. On the western margin a distinctive peak from a source assessed to have a width less than 100 feet was defined at 2450E. The maximum depth to source is assessed at 100 feet. The form is similar to the anomaly at 2250E/06S, however, the response lies on a sharp 85% decrease in apparent resistivity inferring the source to be in close proximity of a contact between two rock units of markedly different electrical properties.

Interestingly enough, on the other side of this significant reduction in apparent resistivity which takes place between 2425E and 1900E, at 1800E a second chargeability response was recorded whose source width and depth are both about 150 feet.

No other significant anomalies were recorded, however, higher than average background values were recorded between 7400E and 6200E, and minor peaks at 1250E and between 800E and 1000E.

Line 18S: The broad zone of twice background observed on the western sections of most lines is much increased in length on this line from 1600E to about 3500E. Unlike lines to the north, the apparent resistivity shows a reduction over the zone of greatest chargeability. As the average reduction in apparent resistivity is about 50% - 70% to about 1500 ohm-metres, the sulphide (or graphite) source material shows no meaningful conduction and therefore must be of a disseminated nature.

The most significant response within this zone was defined at 1725E coincident with markedly reduced resistivity. The anomaly form suggests a very sharp contact with the enclosing rock types on the western contact but not on the eastern side which grades into background. It is not possible to gauge the depth to source except at about 1700E where the source has a maximum depth of about 160 feet. Other peak responses within this zone were recorded between 2150E and 2350E and at 3300E. It is not possible to assess depth to source between 1900E and 3400E. Should this information be required, either electrical soundings parallel to strike or pole-dipole at three spacings over sections of particular interest should be carried out.

A series of above background responses mark the northern extremity of an extensive chargeability anomaly characteristic of a broad disseminated halo. In detail, an 8 to 10 millisecond response between 5800E and 7350E is considered of minor interest, while distinct anomalies at 6575E and between 7000E and 7300E are considered of greater interest. Over the entire section the apparent resistivities remain a high 1000 to 5000 ohm-metres, clearly inferring a disseminated, non-electrically continuous sulphide or graphite source.

The anomaly of 10 milliseconds above background centred at 6575E is interpreted as coming from a source whose width is about 50 feet and whose maximum depth is not greater than 100 feet.

The major 20 millisecond above background response seen between 6750E and 7250E has two distinct peaks at 7000E and 7160E. It is not possible to be sure if these anomalies represent <u>one OR two</u> sources, however, they are significant and the maximum depth estimated on the western edge is about 100 feet to source and on the eastern edge about 200 feet. There is no significant conduction associated with either source.

A broad gradual increase in recorded chargeability noted between 8000E to 9000E reaches a maximum at 8450E and is considered a variation in background only, and therefore of minor significance.

<u>Line 24S</u>: Although the recorded chargeabilities between 1200E and 3000E remain between 50% to 75% above background they are

markedly less than those seen on line 18S, indicating the end of this zone. The resistivities do, however, remain somewhat lower than background. However, between 3200E and 3750E chargeabilities rise to over 2½ times background, and at 3650E a distinct and significant response of 45 milliseconds was recorded. This anomaly is interpreted as having a source whose width is significantly less than the potential dipole used, namely, 50 - 100 feet, and a maximum depth of about 100 to 150 feet. Although weak conduction is inferrred by a reduction in resistivity from 4000 ohm-metres to 1500 ohm-metres, the source is nevertheless electrically discontinuous and mostly disseminated in nature.

On first appearances the overlap between the two "end on" gradient blocks between 3850E and 4150E is contradictory. However, the proximity of the western electrode of the eastern block to chargeable material at 3050E/15S completely explains the divergence in the two profiles.

A second zone of high chargeability was logged between 6200E and 7300E. This correlates well with the anomalies observed at about the same co-ordinates on the line to the north. Within this zone the anomaly between 7000E and 7300E represents the <u>southern</u> extremity of one zone, while the anomaly logged between 6200E and 6900E represents the northern extremity of a 2500 feet long anomaly which can be traced to the south.

In common with all other anomalies discussed above, no material conduction within the chargeable zone infers a disseminated sulphide source.

Line 30S: This line was surveyed from current dipoles 1500 feet to the north and 1500 feet to the south to study the significance of divergences between set-ups. On the whole, both the resistivity and chargeability profiles are very similar. As would be expected, the apparent resistivities are almost identical save for slight level changes.

The most westerly anomaly located was logged at 250E and was about 10 milliseconds above background. The depth to source is difficult to assess as the chargeable source is not sharply defined. However, a maximum of 150 feet is estimated. The chargeable source shows no conductive contrast with the enclosing rocks and therefore disseminated sulphides are the suggested source. The correlatives on lines 24S and 36S are 350E and 200E respectively. The importance is assumed to be secondary or tertiary.

A number of significant anomalies were recorded between 3000E and 4000E which can be correlated to responses noted on adjacent lines. At 3060E a 15 to 20 millisecond anomaly was defined from a source which shows no contrast with the enclosing material.

The assumed depth to this disseminated sulphide (or graphite) source is about 120 feet while the width is considered to be of the order of 100 feet or less. This anomaly is considered of primary interest.

Two anomalies whose sources are interpreted to be about 100 feet in width and whose depths are assessed to be about 100 to 150 feet, were defined centred at 3550E and 3800E. The latter lies immediately to the west of a resistive rock unit, as does the anomaly of primary interest defined at 3650E/24S to which this is the correlative. These anomalies are considered of secondary to primary interest.

The broad zone defined between 6200E and 6700E on line 24S is divided into two major and one minor maxima on this line. The most significant was defined at 6100E. The source width and depth is assessed at about 100 feet and 140 feet respectively. The anomaly appears to be coincident with a sharp change in resistivity from 8000 ohm-metres at 5900E to 500 ohm-metres at 6250E. The apparent chargeability over the low remains about twice background, therefore some interconnection between sulphides is suggested. At 6550E a significant anomaly of about 20 milliseconds was defined from a source interpreted to be 150 feet in width and whose maximum depth is considered not greater than 200 feet. The significance of this response of higher chargeability values within more resistive rock either side of relatively conductive material suggests a disseminated halo surrounding sulphides with some conduction. Eventhough the absolute value of chargeability over the resistivity low is less, the sulphide content, if of coarse grain size, can be greater. The zone between 6000E and 6650E deserves careful ground follow-up.

Line 36S: Between 100E to 3600E the recorded apparent chargeabilities range between 1½ to 2 times background with peaks at 1575E, 2025E, 2900E and 3500E. The significance of this zone is difficult to assess other than a variation within a high background. The contour interpretation shows the line to be just north of a major induced polarization zone in the west, and just south of it in the centre. However, between 5950E and 6600E a number of significant anomalies clearly have correlatives on lines 36S and 42S.

The maximum response of 42 milliseconds was recorded at about 6150E and is pretty well coincident with the apparent resistivity low of about 1000 ohm-metres. This resistivity low is quite clearly the correlative of that seen at 6250E on line 30S. The weakly conductive "core" of this response is assessed to be about 150 feet in width. Chargeability remains high to 5900E as resistivity rises to over 10,000 ohm-metres, as it does to the east where resistivity rises to over 4000 ohm-metres. Even in the lowest resistivities, a disseminated source is inferred by the 1000 ohm-metres apparent resistivities, however, the conductivity in the centre of this anomaly is ten times greater than on the flank. A broad disseminated halo surrounds this major response with additional local signatures at 6350E and 6500E.

There are no other significant anomalies on this line.

Line 42S: From about 400E to 2400E chargeabilities of 50% to 100% above background were observed but no substantial anomalies were recorded from within that zone.

A distinctive anomaly between 5900E and 6600E of about 10 to 12 milliseconds has a very sharp contact between the source material and the enclosing rock types. The maximum depth to source at the western and eastern extremeties is assessed to be 100 feet and 150 feet respectively. The depth to source can only be judged between about 6000E and 6500E by the use of electrical soundings parallel to strike. This zone represents the most southerly extension of the significant response seen on line 36S between 5900E and 6600E.

A distinctive triangular shaped anomaly was defined centred at 7130E. Both the depth and width are difficult to assess as the source does not form a sharp contact with the enclosing material, but rather a gradual one. The coincident 50%

reduction in apparent resistivity to 1000 ohm-metres shows only the very weakest conduction within the chargeable zone. A very broad weak 3 to 5 millisecond anomaly on line 36S between 7000E and 7300E associated with a marked decrease in resistivity, is the northern correlative of this response. The anomaly is considered of primary importance on line 42S and on line 48S at 7000E.

Line 48S: Background induced polarization values between 200E and 2200E remain about twice normal. Superimposed on this background is a significant response of 35 milliseconds between 650E and 1000E. There are two peaks, one at about 775E and at 1000E, but the 100 feet potential dipole does not permit resolution of the two zones. Both zones lie within relatively low resistivity, inferring weak conduction. This zone probably relates to an over twice background anomaly between 400E and 1200E on line 42S, particularly as a low resistivity zone was noted between 600E and 1000E.

A minor response between 1650E and 1750E is considered of tertiary interest only on this line, but along strike to the south the source gives rise to an anomaly of primary interest centred at 1850E on line 54S. However, on line 48S the maximum width and depth are perhaps of the order of 100 feet and an increase in resistivity clearly demonstrates the source to be more resistive than the enclosing host rocks. On line 54S the source is, however, slightly more conductive than the enclosing material.

Between 5900E and 6500E the recorded chargeability varies from 50% to 100% above background and represents the most southerly expression of the major responses seen on lines 24S to 42S between about 5900E and 6650E. The depth to source is not possible to assess except by moving source methods.

An angular anomaly identical in magnitude and form to that located on line 42S at 7130E was defined at 7000E on this line. The apparent resistivity also shows a decline of almost identical form and magnitude. This anomaly can also be traced south to line 54S at 7000E. The body is interpreted as not having sharp boundaries with the enclosing host rocks, therefore the depth to source is certainly less than the interpreted 200 feet and the "width" will therefore be greater than 150 feet interpreted from the profile form.

Line 54S: A broad anomaly centred at 370E having a width of about 100 to 150 feet and a definite contact with the enclosing rocks is associated with very weak conduction. This response is clearly related to a similar but less definite response on the previously described line, 48S, between 250E and 500E. To the south, a shoulder at 400E on line 60S probably represents the correlative.

A significant anomaly of primary interest was defined between 740E and 920E. The 20 millisecond anomaly is associated with a 60% depression in the apparent resistivity to about 4000 ohm-metres. The interpreted source is of the order of 100 feet in width at a maximum depth of about 150 feet and is centred at 825E. The asymmetry of the profile form suggests a steep to moderate east dip. This anomaly is related to the response of primary interest at 775E on line 48S, but is not seen to the south. A depression in the L/M ratio over this anomaly infers a coarse grain size to the source which the apparent resistivity infers to be disseminated.

A second, even more significant anomaly of some 30 milliseconds above background was defined centred at 1200E. The interpreted width is of the order of 100 feet while the maximum depth is probably of the same order. The asymmetry of the profile form suggests an east dip to the source which the 3000 ohm-metres apparent resistivity infers to be disseminated. Again a distinct depression in the L/M ratio suggests a disseminated source. There is no clear correlation either to the north or the south.

Yet a third substantial anomaly of primary interest occurs on this line. This anomaly is centred at 1825E. The source width is difficult to estimate as the eastern margin of the source is not sharp and/or the body dips east. The minimum suggested width is however of the order of 150 feet. Although there is a depression in the apparent resistivity, the absolute level remains a high 3000 ohm-metres and therefore the source is considered to be disseminated sulphides. The correlative on line 48S is possibly the minor response at about 1700E.

With the exception of a minor response noted between 4100E and 4900E, there are no significant induced polarization anomalies before 7000E. At this point an anomaly of secondary interest was defined from a source at a suggested depth of about 150 feet from a source width of about 100 feet. Asymmetry of the profile form suggests an east dip while a very slight depression in the apparent resistivity profile infers the host to be slightly more conductive than the enclosing rock types. The northern correlative is 7000E, while the anomaly is not visible to the south on line 60S.

Line 60S: Although apparent chargeability values of about twice normal background were recorded between 300E and 2200E over the southern strike extension of the three significant anomalies recorded on the previously described lines, no truly significant anomalies were defined. However, two minor responses of about 8 to 10 milliseconds above the 20 millisecond background were observed from sources interpreted as being less than 50 feet in width and at maximum depths less than 100 feet.

A zone of high resistivity between 3500E and 3900E is clearly correlated to a similar zone between 3900E and 4400E on line

54S and between 3300E and 4000E on line 66S.

Line 66S: Twice background anomalies between 400E and 700E and between 1100E and 1500E are related to the twice background readings recorded on lines to the north. It is not possible to judge their significance other than in terms of on strike disseminated haloes for the major anomalies seen on line 54S and to the north. The maximum depths are difficult to judge, but are considered not to be greater than 150 to 200 feet, and may be considerably less than this because the margins of the sulphide (graphite) source is not sharp.

There are no further significant anomalies on this line.

Line 72S: Two about twice background induced polarization zones between about 400E and 850E and between 1200E and 1400E correlate to almost identical responses recorded to the north. The maximum depth to source is about 200 feet at about 1200E and 850E, but cannot be gauged elsewhere.

A significant 20 millisecond anomaly of primary interest was defined centred at about 5600E. The maximum depth to source is considered to be not greater than 200 feet while the width of the body is of the order of 100 feet. As usual the relatively minor depression in the resistivity to about 2500 ohm-metres infers only weak conduction within the host.

A very minor anomaly of 3 to 4 milliseconds at 5950E on line 66S may represent an "end effect" or minor on-line response for this zone, while on line 78S the anomaly at 5450E is clearly the correlative.

There are no other significant induced polarization anomalies.

Line 78S: The only significant induced polarization response above background was defined centred at 5470E. Here, a 25 millisecond above background response was accompanied by a 60% fall in apparent resistivity. The depth to source and width is difficult to estimate as the source is suspected not to form a sharp contact with the enclosing material. However, a maximum depth of 200 feet is guesstimated. This anomaly is clearly the correlative of those recorded at 72S/5600E and 84S/5200E. This anomaly is considered of primary importance.

Line 84S: The only signifcant anomaly here is the southerly extension of the above. On this line, although the magnitude is of the same order, the asymmetry of the profile form suggests a west dip. The maximum depth is difficult to gauge but is of the order of 200 feet, while the width of the source may be as narrow as 100 feet, if the source has a suspected dip. This anomaly is not seen to the south, although a broad increase in background from about 8 milliseconds to 15 milliseconds was recorded between 4800E and 5500E, as well as a slight decrease in resistivity centred at 5100E. The strike of this source is about north-north-east as opposed to north south for most of the area.

Lines 90S, 95S and 96S: No significant anomalies

ELECTRICAL SOUNDINGS

Some three electrical soundings were carried out in the area to examine the vertical electrical profile. In the case of the soundings at 60S/6000E and at 96S/3500E, near surface and across strike inhomogeneities precluded a meaningful interpretation of depth. However, within 25 to 30 feet of surface the apparent chargeabilities were about 5 to 7 milliseconds as against twice this on the gradient array data. This infers an alluvial moraine, or oxidation within the first 25 to 30 feet. Also within 10 to 15 feet of surface, significantly lower than normal apparent resistivities of 1000 to 3000 ohm-metres were recorded. This also infers a shallow near surface superficial cover.

The sounding carried out at 18S/500E shows only minor surface perturbations and a more diagnositc interpretation can be made. In this case a surface layer of some 70 feet in thickness having a chargeability of about 45 milliseconds and resistivity of about 600 ohm-metres is underlain by rocks of significantly higher resistivity of over 2000 ohm-metres. As the gradient data shows apparent resistivities of the order of 3000 ohm-metres this is considered a consistent result. The surface layer of low chargeability (4.5 milliseconds) is underlain by material of up to 12 to 14 milliseconds. This also is consistent with the gradient data whose bulk chargeability at this point is 11 milliseconds.

As this data is of marginal interest only, it has not been drafted for presentation in this report.

CONTOUR INTERPRETATION

Plates 2, 3 and 4 display the interpretation of chargeability, resistivity and total magnetic field, respectively. All contour interpretations are presented at the scale of 1 inch = 500 feet.

The Chargeability Contour Plan

As can be readily observed, the background chargeabilities vary about the 10 millisecond level. The contour interval between 20 milliseconds and 30 milliseconds (adjusted for false gradients due to emplacement of electrodes within chargeable horizons), have been coloured pink and above 30 milliseconds, red. This presentation clearly demonstrates a number of distinct zones of twice background chargeability which infer greater pyrite (or graphite) content whose strike extent varies between 2000 and 3000 feet, and whose width varies between about 1000 to 2000 feet. Within these extensive (pyrite?) haloes estimated to carry between ½% to 2% chargeable material, well defined signatures of chargeable material occur whose strike extent varies from less than the line spacing to 1500 feet, and whose width is generally not greater than 100 to 200 feet. The estimated bulk sulphide(or graphite) content of these zones varies between 2% to 4% assuming a grain size distribution normal for the area.

A detailed study of the chargeability data in both profile and contour form strongly suggests two north-north-east trending zones within which these large assumed pyrite horizons occur. With the exception of the most grid south-easterly zone, the strike of these haloes and their enclosed sulphide segregations is generally grid north south. Although the line spacing is relatively large, this strike trend is considered reliable.

The Resistivity Contour Plan

The strike direction of both the more resistive and conductive units of this area are in conformity with the strike observed from the chargeability data, namely north south, except in the far south eastern sector where the strike is grid north-north-east. Over the area the apparent resistivities vary about the 4000 ohm-metre level.

The continuity along strike of resistive and conductive features is excellent and distinct boundaries between units having a contrast over one order of magnitude were recorded. Each of these zones represents the characteristics of the rock unit immediately beneath, and therefore marked changes in electrical characteristics indicate marked changes in rock type also. The strike direction of significant features therefore represents the strike direction of the geologic units beneath.

Generally the lowest apparent resistivity units are observed in the vicinity of, but not precisely coincident with the highest apparent chargeability area. More often than not the resistivity lows extend further along strike than the observed associated chargeability highs. Thus it is inferred that the host rocks for the chargeability source may, at least in part, be intrinsically more conductive than the enclosing rocks. However, the bulk presence of sulphides very obviously decreases the apparent resistivities observed, as the lowest absolute apparent resistivities observed in any pyrite (?) halo invariably occur in close proximity to the highest chargeabilities.

The Magnetic Contour Plan

The strike of the magnetic data is on the whole conformable with those seen on the chargeability and apparent resistivity data. Comparison between the magnetic and resistivity contour maps shows in general that the magnetically more active areas tend to be confined to the more resistive areas. However, all resistive areas do not show distortions in the magnetic field.

Over the entire grid area it is quite apparent that the highest magnetic fields and the zones of greatest potential sulphide content (as gauged by the apparent chargeability data) are mutually exclusive. Thus the magnetite content in this area has no significant chargeability and furthermore, interpreted sulphide zones carry no significant magnetite concentrations. (It should be noted that it requires about ten times the volume of magnetite to produce an equivalent response as an equal quantity of sulphides)

Other than in the assistance of indirectly fixing boundaries between geologic units, the magnetic data is considered to have little economic significance.

COMPOSITE PHYSICAL PROPERTY PLAN

Plate 5 displays the most significant features of each of the three physical property contour maps. The features marked are: resistivity lows, resistivity highs, chargeability highs and zones of greatest magnetic field. The relationship of these features described above, is clearly demonstrated thereon.

CONCLUSIONS AND RECOMMENDATIONS

A - Physical Properties

1. The three physical properties of magnetic intensity, apparent resistivity and apparent chargeability data show a generally conformable pattern.

2. The zones of greatest magnetic field didtortion are invariably relatively more resistive, however, all resistive ridges are not magnetic.

3. Broad zones of anomalous chargeability are of strike length up to 2500 feet and are generally contained within zones of lower apparent resistivity than average. These zones are invariably more extensive than the limits of anomalous chargeability, inferring the rock unit which hosts the chargeable material to itself be relatively conductive. The absolute values of apparent resistivity of 1000 to 4000 ohm-metres infer only the weakest conduction.

4. For the most part, the highest recorded chargeabilities are associated with the lowest apparent resistivities, but the latter vary from 600 ohm-metres to 4000 ohm-metres, inferring minimal conduction only.

5. Nowhere does the total magnetic field maximum occur in association with anomalous induced polarization effects,

clearly demonstrating the contained magnetite not to be chargeable, furthermore the source of zones of induced polarization does not contain significant quantities of magnetite.

6. Strong, relatively narrow induced polarization highs in excess of 2 to 4 times background and of strike lengths of up to thousands of feet are invariably contained within "haloes" of twice background chargeability which extend further across and along strike of the "local" highs. These haloes are considered to consist of disseminated sulphides and/or graphite, with the more restricted local highs being local segregations of sulphides (or graphite). Although somewhat more conductive, the more chargeable core is still either disseminated or if "massive" electrically discontinuous.

7. The L/M ratios are everywhere normal and the chargeability data is nowhere affected by electromagnetic coupling. However, over a number of the more chargeable portions (see text) a depression in the L/M ratio was noted, inferring a coarsening of the average grain size of the source in the nearest to surface portion of the source.

8. The guesstimated sulphide content of the halo is between

½% - 2% and that of the core between 2% - 4% by bulk over the section sampled. However, local variability would be expected.

B - Induced Polarization Anomalies

1. All induced polarization anomalies defined on the present survey are associated with apparent resistivities which, although in most cases infer a relatively conductive source, are invariably high in absolute terms. This, in part, is due to the apparent resistivity being measured, of necessity, across strike - along strike resistivities would no doubt show a significant reduction. Nevertheless a disseminated source is clearly inferred for all sources, although conduction may occur locally over tens or scores feet. If "massive" the source is certainly electrically discontinuous or poddy.

2. The significant induced polarization anomalies are set down below and graded according to geophysical merit. It would be expected that additional geochemical and/or geological information would require a re-classification of their relative economic interest.

Line	Station	Width	Depth	Grade
00	2550E	100'	200'	Secondary
00	3150E	100'	200'	Secondary
00	5900E	150'	200'	Tertiary

Line	Station	Width	Depth	Grade
00	7350E	50'	100'	Primary
03N	7400E	50'-75'	200'	Primary
03S	7100E	25'-50'?	100'	Secondary
06S	2250E	50'	100'	Secondary
12S	2450E	50'	100'	Primary
12S	1800E	150'	150'	Secondary
18S	1725E	150'(+)	160'	Primary
18S	6575E	50'	100'	Secondary
18S	7000E	140'(?)	100'(-)	Primary
18S	7160E	180'(?)	200'(-)	Primary
24S	3650E	50'-100'	100'-150'	Primary
24S	7050-7250E	200'	?	Secondary
30S	250E	150'(+)	150'	Secondary/Tertiary
30S	3060E	100'(-)	120'	Primary
30S	3550E	100'	100'-150'	Primary/Secondary
30S	3800E	100'	100'-150'	Tertiary/Secondary
30S	6100E	100'	150'	Primary
30S	6550E	150'	200'	Secondary
36S	6150E	100'-150'(+)	100'	Primary
42S	5900-6600E	700'	100', 150'	Primary/Secondary
42S	7130E	?	200'(-)	Primary
48S	775E	150'-200'	200'	Primary
48S	1000E	50'(?)	100'	Secondary
48S	1650-1750E	100'(?)	100'(?)	Tertiary

Line	Station	Width	Depth	Grade
48S	5900-6450E	550'	?	Tertiary
48S	7000E	150'(+)	200'(-)	Primary
54S	370E	150'	150'	Tertiary
54S	825E	100'	150'	Primary
54S	1200E	100'	100'	Primary
54S	1825E	150'	200'(-)	Primary
54S	7000E	150'(?)	150'	Secondary
60S	1550E	50'(-)	100'	Tertiary
60S	850E	50'(-)	100'	Tertiary
72S	5600E	100'(+)	200'	Primary
78S	5470E	150'(?)	200'	Primary
84S	5200E	100'	200'	Primary

C - Recommendations for Further Work

1. The induced polarization anomalies have been defined and classified by physical properties only. It is not possible to judge their relative economic merit in the case of "Mt. Lyell" type deposits, as they generally exhibit the characteristics of high chargeability and reduced, but still high, apparent resistivity. No anomalies of the "Cape Horne" type were defined within the area surveyed.

2. Additional work to ascertain "absolute" depth to source is warranted only where the "maximum depth" estimate is not

adequate. The latter cannot be more accurate than half the dipole (i.e. 50 feet) and then only where the source is well defined and forms a sharp contact with the enclosing material.

3. At this stage no specific drilling recommendations are made, pending the review of the data with respect to the geology.

Respectfully submitted on behalf of:

SCINTREX PTY. LTD.

A.W. HOWLAND-ROSE, MSc,DIC,AMAusIMM,FGS.

GEOPHYSICIST

APPENDIX 'P'

Date	Travel	Production	Standby	Breakdown	Area
28.10.74	1	-	-	-	-
29.10.74	-	1	-	-	Area 'A'
30.10.74	-	1	-	-	Area 'A'
31.10.74	-	-	1	-	Area 'A'
1.11.74	-	1	-	-	Area 'A'
2.11.74	-	1	-	-	Area 'A'
3.11.74	-	1	-	-	Area 'A'
4.11.74	-	1	-	-	Howard's Anomaly
5.11.74	-	1	-	-	Howard's Anomaly
6.11.74	-	1	-	-	Howard's Anomaly
7.11.74	-	1	-	-	Howard's Anomaly
8.11.74	-	1	-	-	Area 'A'
9.11.74	-	½	½	-	Basin Lake
10.11.74	-	-	1	-	
11.11.74	-	1	-	-	Basin Lake
12.11.74	-	½	½	-	Basin Lake
13.11.74	-	¼	3/4	-	Basin Lake

Date	Travel	Production	Standby	Breakdown	Area
14.11.74	-	3/4	¼	-	Basin Lake
15.11.74	-	½	½	-	Basin Lake
16.11.74	-	1	-	-	Basin Lake
17.11.74	-	1	-	-	Basin Lake
18.11.74	-	1	-	-	Basin Lake
19.11.74	-	1	-	-	Basin Lake
20.11.74	-	1	-	-	Howard's Anomaly
21.11.74	-	1	-	-	Howard's Anomaly
22.11.74	-	1	-	-	Howard's Anomaly/Basin Lake
23.11.74	-	1	-	-	Basin Lake
24.11.74	-	1	-	-	Basin Lake
25.11.74	-	1	-	-	Basin Lake
26.11.74	-	1	-	-	Basin Lake
27.11.74	-	1	-	-	Tyndall Detail
28.11.74	-	1	-	-	Tyndall Detail
29.11.74	-	1	-	-	Basin Lake
30.11.74	-	-	1	-	
1.12.74	-	-	1	-	

038

Date	Travel	Production	Standby	Breakdown	Area
2.12.74	-	-	1	-	
3.12.74	-	-	1	-	
4.12.74	-	-	1	-	
5.12.74	-	1	-	-	Basin Lake
6.12.74	-	1	-	-	Basin Lake
7.12.74	-	1	-	-	Basin Lake
8.12.74	-	1	-	-	Basin Lake
9.12.74	-	1	-	-	Basin Lake
10.12.74	-	1	-	-	Basin Lake
11.12.74	-	1	-	-	Basin Lake
12.12.74	-	1	-	-	Madame Howard
13.12.74	-	3/4	¼	-	Madame Howard
14.12.74	-	1	-	-	Madame Howard
15.12.74	-	3/4	¼	-	Madame Howard, Little Owen
16.12.74	-	1	-	-	Madame Howard
17.12.74	-	-	1	-	
18.12.74	1	-	-	-	

329040

329041

A REPORT ON

GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION

AND TOTAL MAGNETIC FIELD SURVEYS

OVER THE BASIN LAKE GRID

NEAR QUEENSTOWN, WEST COAST TASMANIA

ON BEHALF OF

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

PLATES 1 TO 5

329042

001

3N-18S
84-2231 vol 2

JOB No. : TAS-025 B

SHEET 1 of 3

PLATE 1

329043

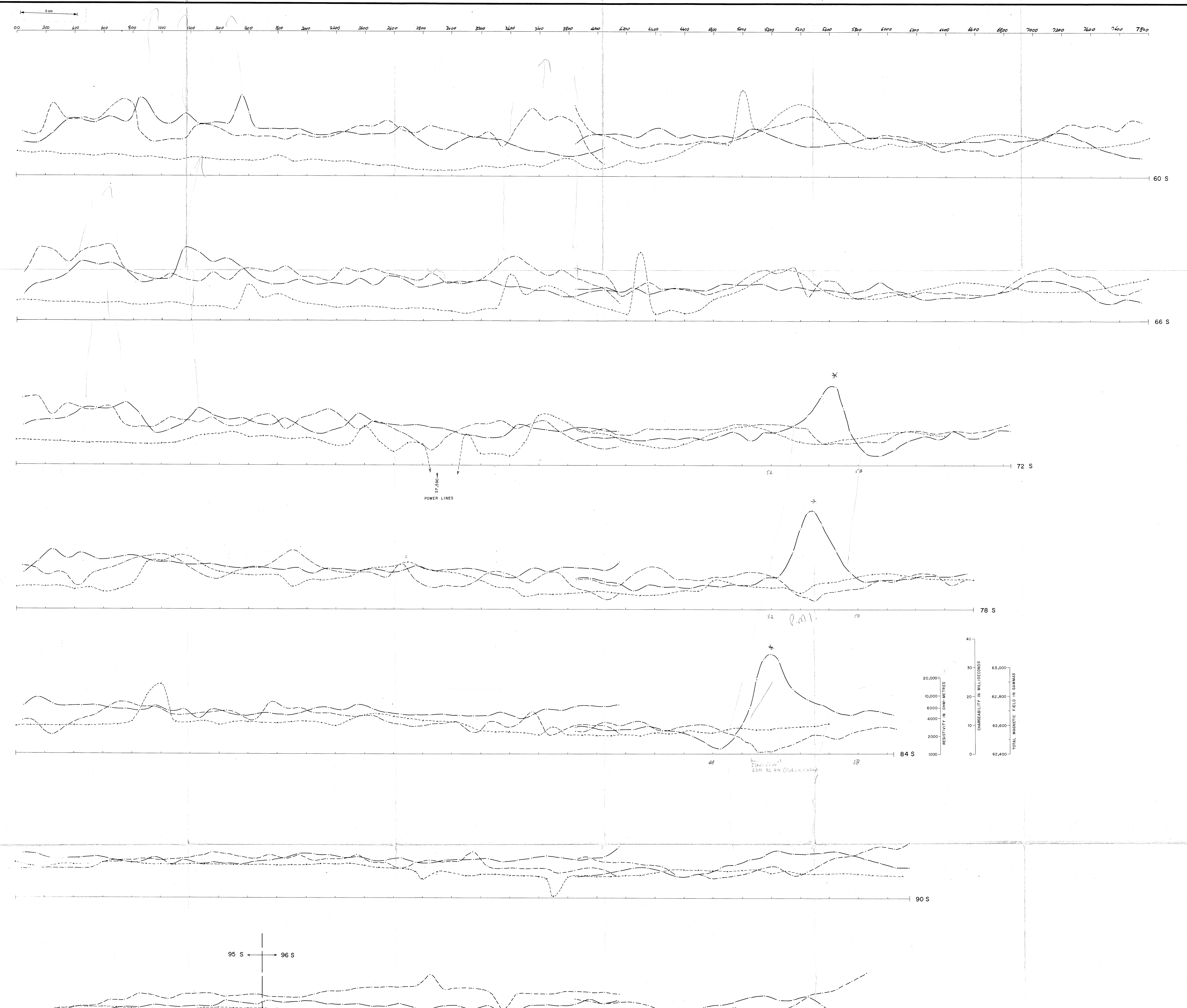
002

JOB No. : TAS-025 B

84-2231 vol 2

SHEET 2 of 3

PLATE 1



LEGEND

Chargeability, 1" = 10 milliseconds
Base level = 0
Symbol = —·—·—

Resistivity, 2" = 1 logarithmic cycle
Base level = 1000 ohm-metres
Symbol = – – – –

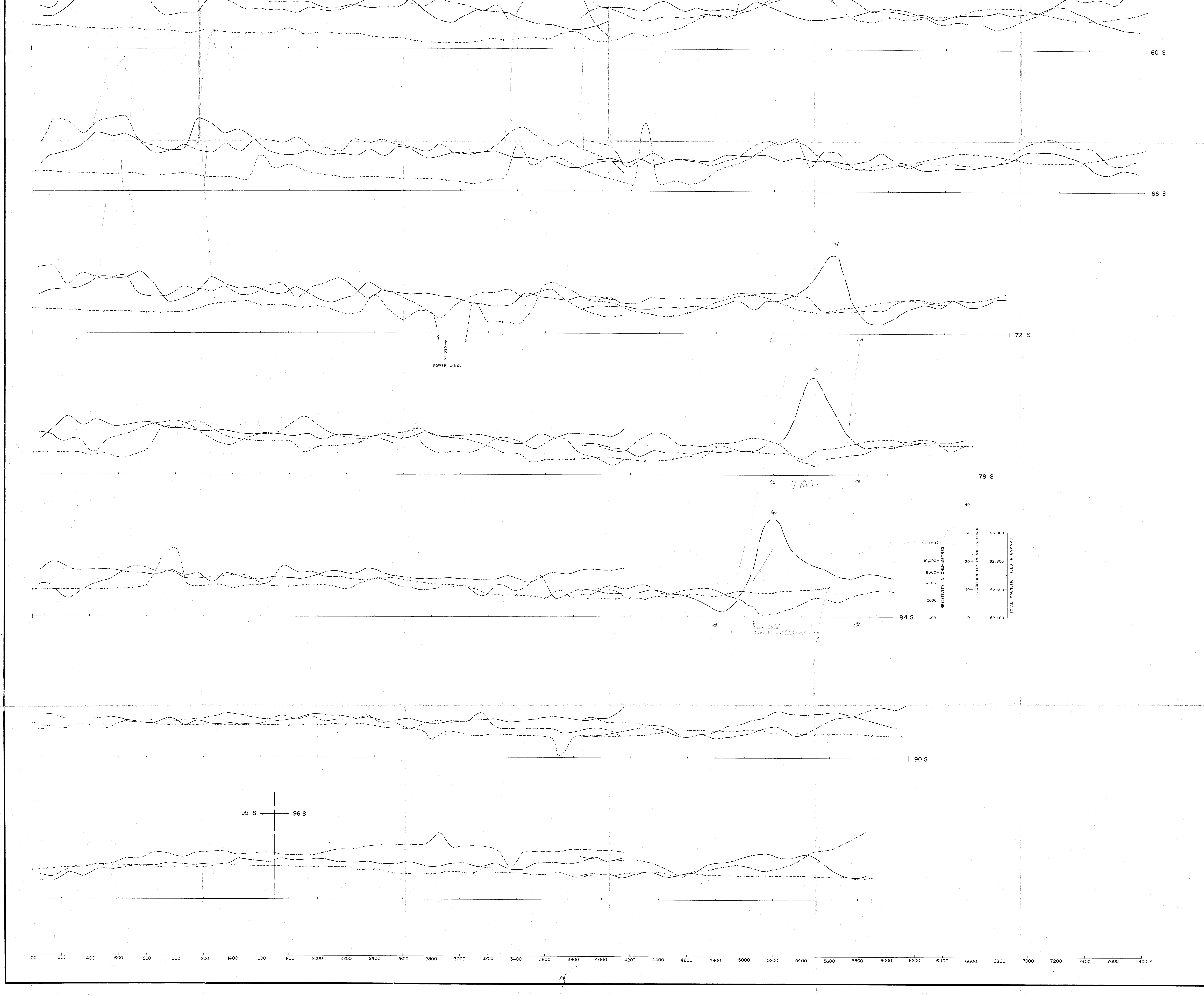
Total magnetic field, 1" = 200 gammas
Base level = 62,400 gammas
Symbol = - - - - - -

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

ELECTRICAL INDUCED POLARIZATION SURVEY
DATA PROFILES
AND TOTAL MAGNETIC FIELD - DATA PROFILES
60S - 96S

5 cm



LEGEND

Chargeability, 1" = 10 milliseconds

Base level = 0

Symbol = ·——— ·———·

Resistivity, 2" = 1 logarithmic cycle

Base level = 1000 ohm-metres

Symbol = ·— — —·— — —·

Total magnetic field, 1" = 200 gammas

Base level = 62,400 gammas

Symbol = --×-----×-----×

THE MOUNT LYELL
MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

ELECTRICAL INDUCED POLARIZATION SURVEY DATA PROFILES AND TOTAL MAGNETIC FIELD - DATA PROFILES

60S - 96S

5 cm

SURVEYED & COMPILED BY :-
SCINTREX PTY. LTD.
OCT. - DEC. 1974

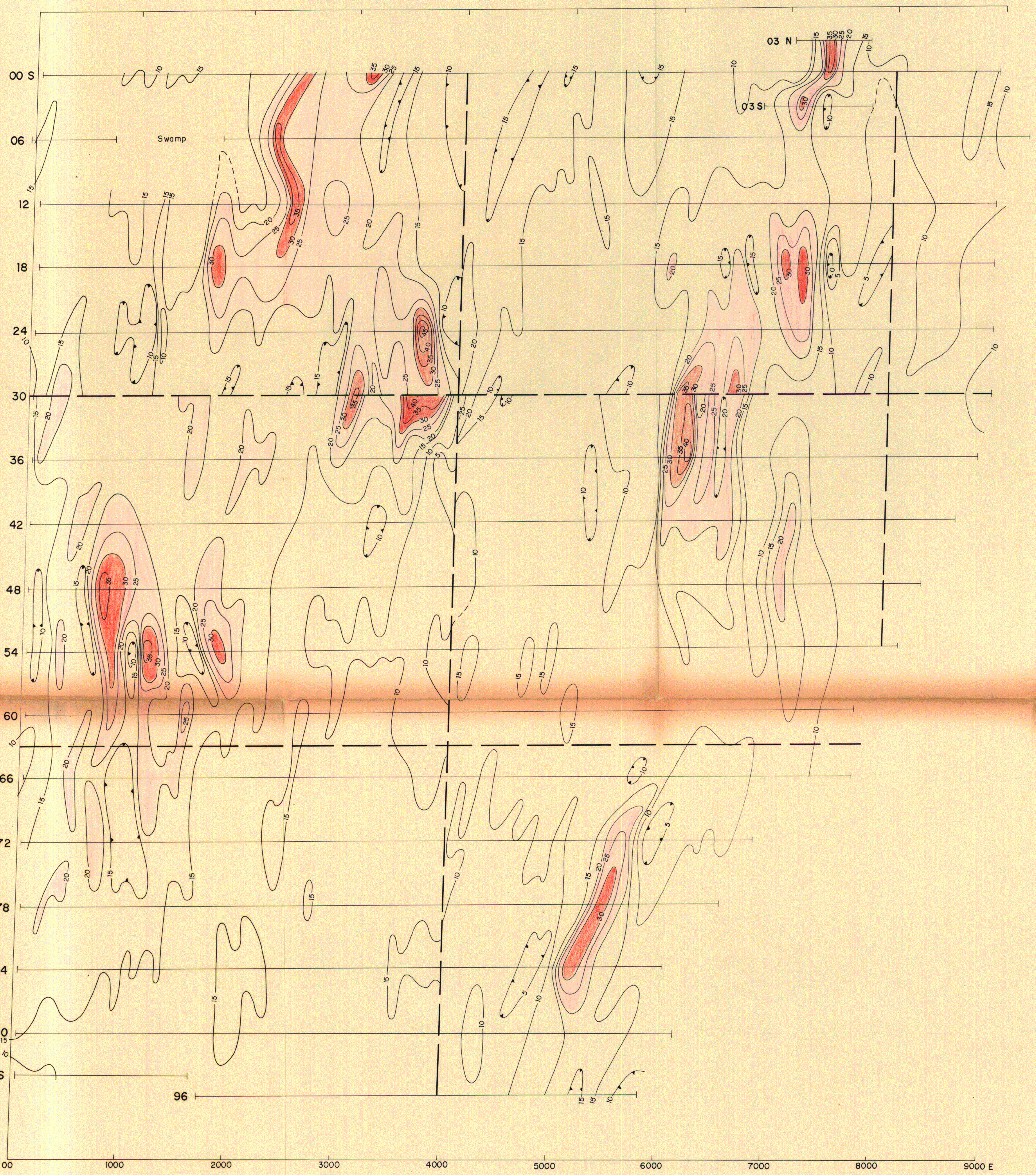
329044

200 0 200 400 600 feet

SCALE - 1:2400

003

JOB No.: TAS-025 B SHEET 3 of 3 84-2231 vol2 PLATE I



THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

CHARGEABILITY CONTOUR MAP

5 cm

SURVEYED & COMPILED BY :-
SCINTREX PTY. LTD.
OCT. - DEC 1974

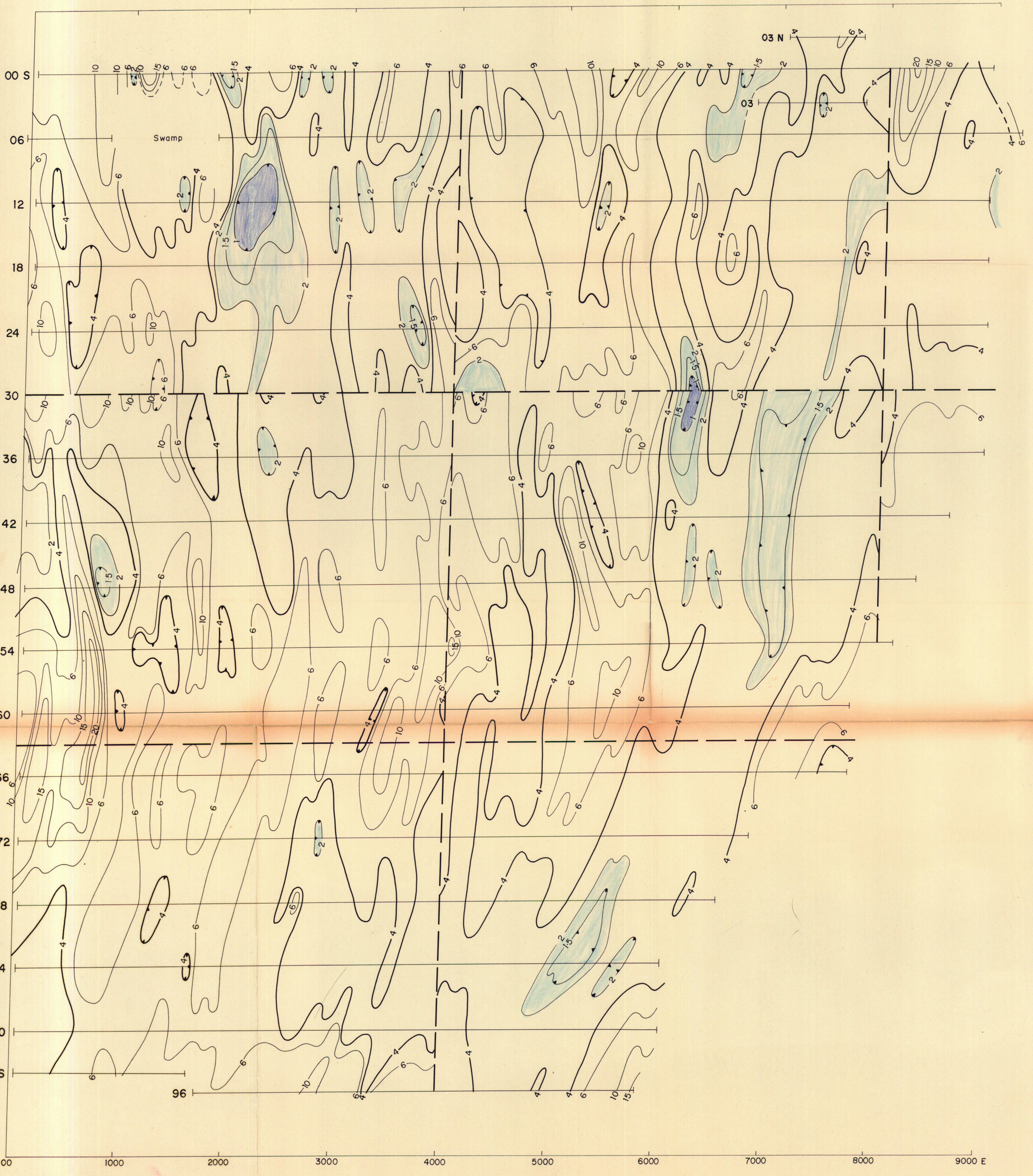
329045

500 - 0 500 1000 1500 feet

SCALE - 1:6000

004

JOB No. : TAS-025 B   SHEET 1 of 1 84-2231 Vol 2 PLATE 2



LEGEND

6 — Contours in 1000's of ohm-metres

— — Gradient block boundary

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

RESISTIVITY CONTOUR MAP

5 cm

SURVEYED & COMPILED BY:-
SCINTREX PTY. LTD.
OCT. – DEC 1974

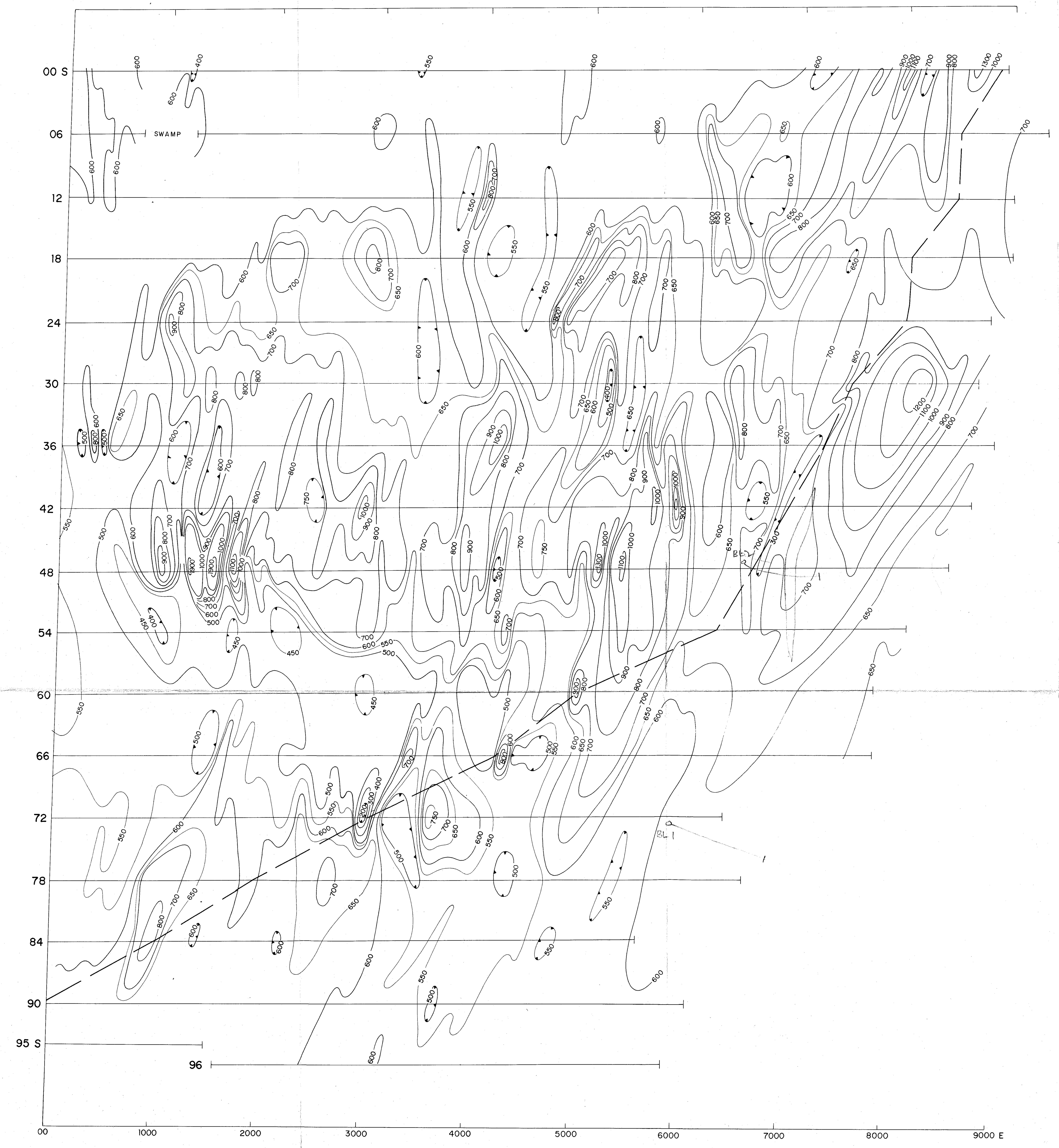
329040

500 0 500 1000 1500 feet

SCALE - 1:6000

005

JOB No. : TAS-025 B SHEET 1 of 1 84-2231 vol 2 PLATE 3



LEGEND

600 — Contours in gammas, add 62,000 gammas to contour value for total field.

— — Power line

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

TOTAL MAGNETIC FIELD CONTOUR MAP

5 cm

COMPILED BY
SCINTREX PTY. LTD.
JAN. – FEB. 1975

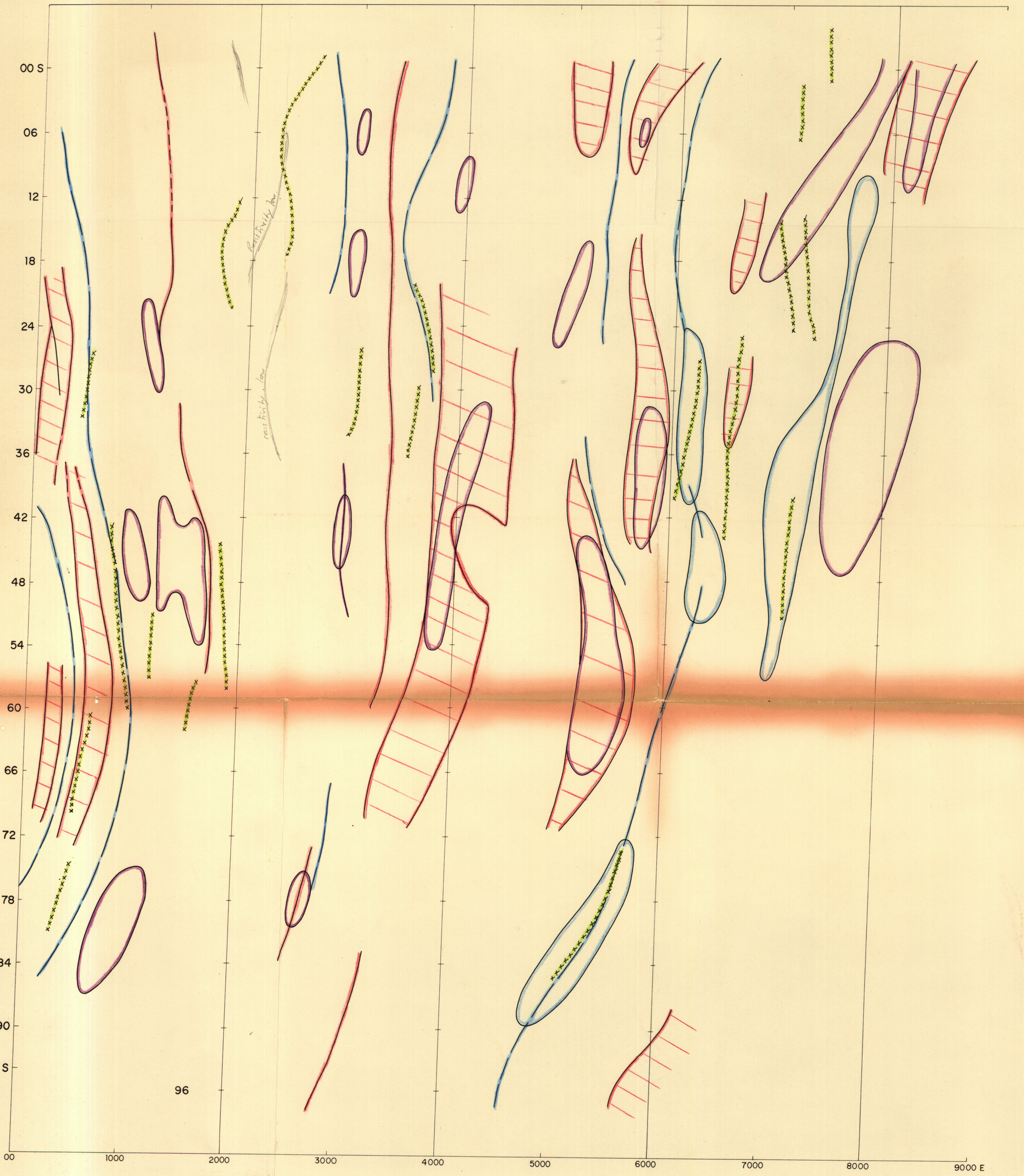
329047

500 0 500 1000 1500 feet

SCALE – 1:6000

006

JOB No.: TAS-025 B SHEET 1 of 1 84-2231 vol 2 PLATE 4



LEGEND

I.P. Ridges

Magnetic highs

Resistivity lows

Resistivity lows

Resistivity highs

THE MOUNT LYELL MINING AND RAILWAY COMPANY LTD.

BASIN LAKE GRID
WEST COAST, TASMANIA

PHYSICAL PROPERTIES MAP

5 cm

SURVEYED & COMPILED BY:-
SCINTREX PTY. LTD.
OCT.- DEC. 1974

329048

500 0 500 1000 1500 feet

SCALE - 1: 6000

007

JOB No. : TAS-025 B SHEET 1 of 1 84-2231 vol 2 PLATE 5