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COMMENTS ON
GRADIENT ARRAY ELECTRICAL INDUCED POLARIZATION
AND TOTAL MAGNETIC FIELD SURVEYS
CARRIED OUT OVER THE MT. BLACK GRID
NEAR ROSEBERY, TASMANIA
ON BEHALF OF
ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

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NEAR ROSEBERY, TASMANIA
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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

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TAS-065

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GEOPHYSICAL CONSULTANTS AND CONTRACTORS

SUMMARY

A gradient array reconnaissance survey over the 34 kilometres of the Mt. Black grid has defined a number of 'single line' anomalies on the 1 kilometre spaced traverses which are worthy of further investigation by additional short lines placed either side of the areas of primary interest.

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INTRODUCTION

At the request of Mr. G. Dunbar, Chief Geologist for West Coast Mines division of Electrolytic Zinc Company of Australasia Limited, Scintrex Pty. Ltd. performed a gradient array electrical induced polarization reconnaissance survey over some 34 line kilometres of grid in the Mt. Black area, near Rosebery Tasmania.

The EIP work was carried out on 4 single and 5 double operator days between 30th November and 18th December, 1978, and 9 single and 3 double operator days between 11th and 26th January, 1979. The earlier part of the survey was marred by a fire in the motor generator/alternator section while enroute to the first set-up. The damage caused by this fire was far more difficult to rectify than first appeared likely. The latter part of the survey was affected by severe magnetic storm acitivity, which also delayed the magnetic field survey. The latter was carried out by three operators on line and a base station, and took some six production days between 28th January and 2nd February, 1979.

The party leader was Mr. B. Ekstron who was variously assisted by Mr. O. Saeck, Mr. P. List, Mr. T. Von Strokirch,B.Sc., Mr. K. Aprhorpe B.Sc., Mr. K. Hannan,B.Sc. and Mr. D. Webb,B.Sc.

On site geological direction was undertaken by Senior Geologist, Mr. R. Williams.

EQUIPMENT

The equipment consisted of a Scintrex 10/15 kilowatt time domain induced polarization transmitter powered by a trailer mounted Volkswagen industrial generator. The resultant primary (resistivity) and secondary (induced polarization) electrical fields were observed using a Scintrex IPR-8 analog time domain induced polarization receiver, and later in the programme a more sensitive but compatible digitial IPR-10.

The energisation was a two second on, two second off, reverse and repeat, while the data was acquired with a two second, three slice programme on the receiver.

METHOD

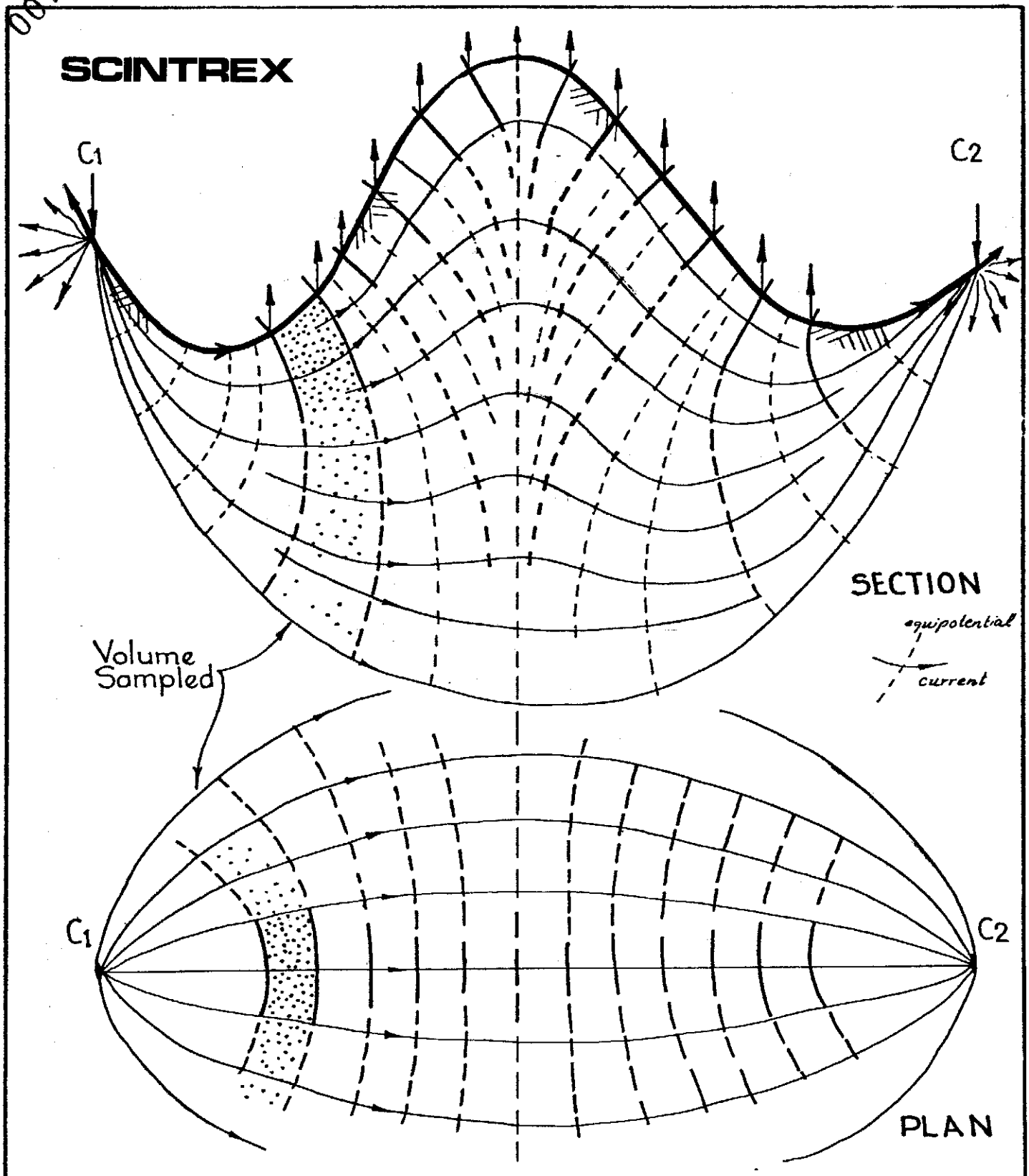
The method chosen as the most cost effective was gradient array which has excellent depth penetration due to the *large* current dipoles employed, and excellent resolution due to the *small* potential dipole employed. In the present case they were 6500 metres and 20 metres respectively.

In order to appreciate the volume from which the observed data originates, some brief comments are made on the method. The characteristic of the gradient array is that the current poles are distant from the potential dipole. Figure 1 displays the salient features of the primary current flow and primary equipotential field generated during energisation, and, in exaggerated form, shows the influence of terrain on the current paths. From this diagram it can be seen that the *apparent resistivity* is a summation of the volume of material normal to local slope beneath the surface and at right angles to it.

The apparent resistivity will be *biased by* the influence of each current electrode, but the *relative* values of *adjacent* readings can be considered *reliable*. As each electrode is approached, the readings become *increasingly biased by* that electrode.

Each in-line (i.e. along strike) gradient block will show a similar anomaly form, however, end-on gradient blocks (i.e. adjacent) *may* show material differences as the overlapping potential dipole will not necessarily be sampling the same volume of material. This is increasingly true as the current pole is approached. Figure 2a illustrates this situation diagrammatically.

Distortion can also occur at the extremeties of the array as shown in Figure 2b. This is due to the angle of the primary energising current to the reading potential. If there is a *conductive* unit at, near, or at right angles, to the line, the current will run at



Diagrammatic Representation of Primary Current and Potential Field in Steep Topography.

FIGURE 1.

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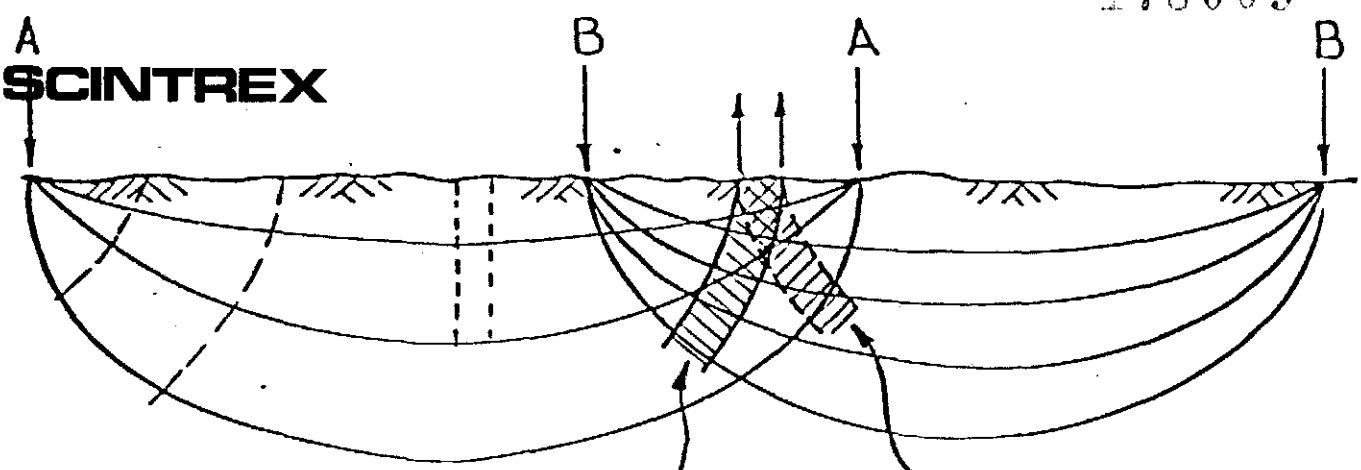
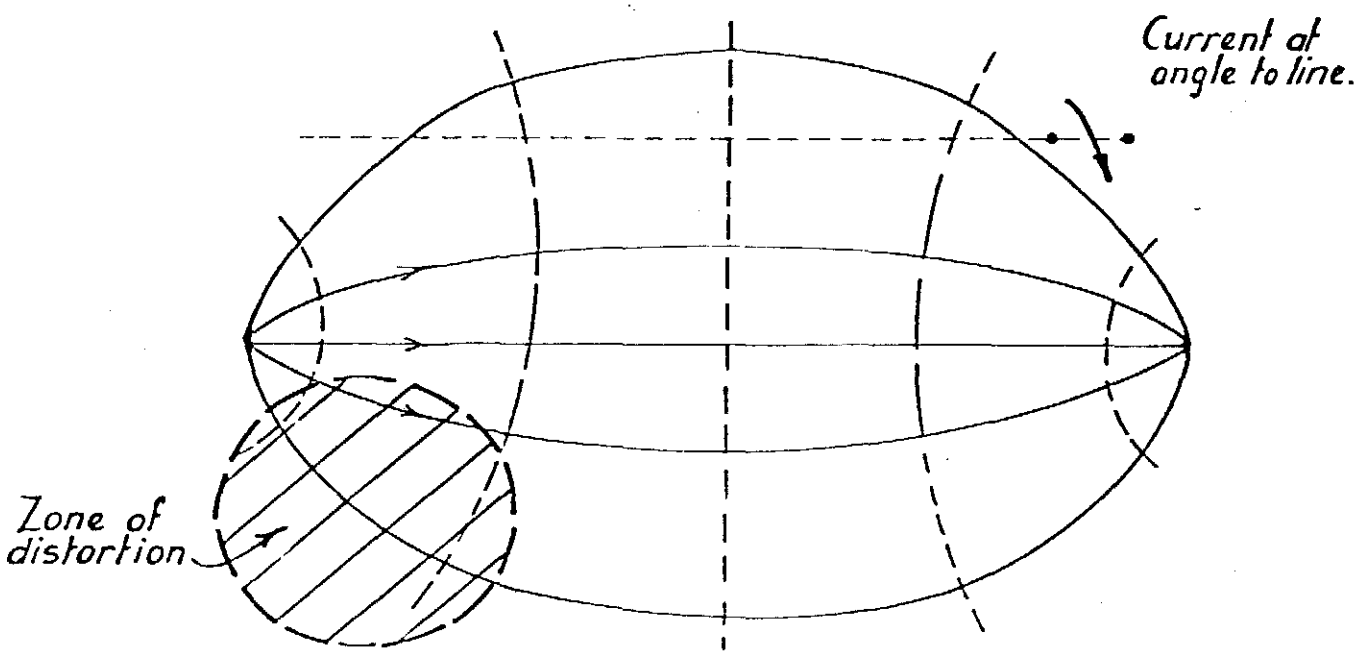


SECTION

2(a) Explanation of difference in ρ_a measurements for "end-on" arrays.



2(b) Explanation of exaggeration at edges of array.

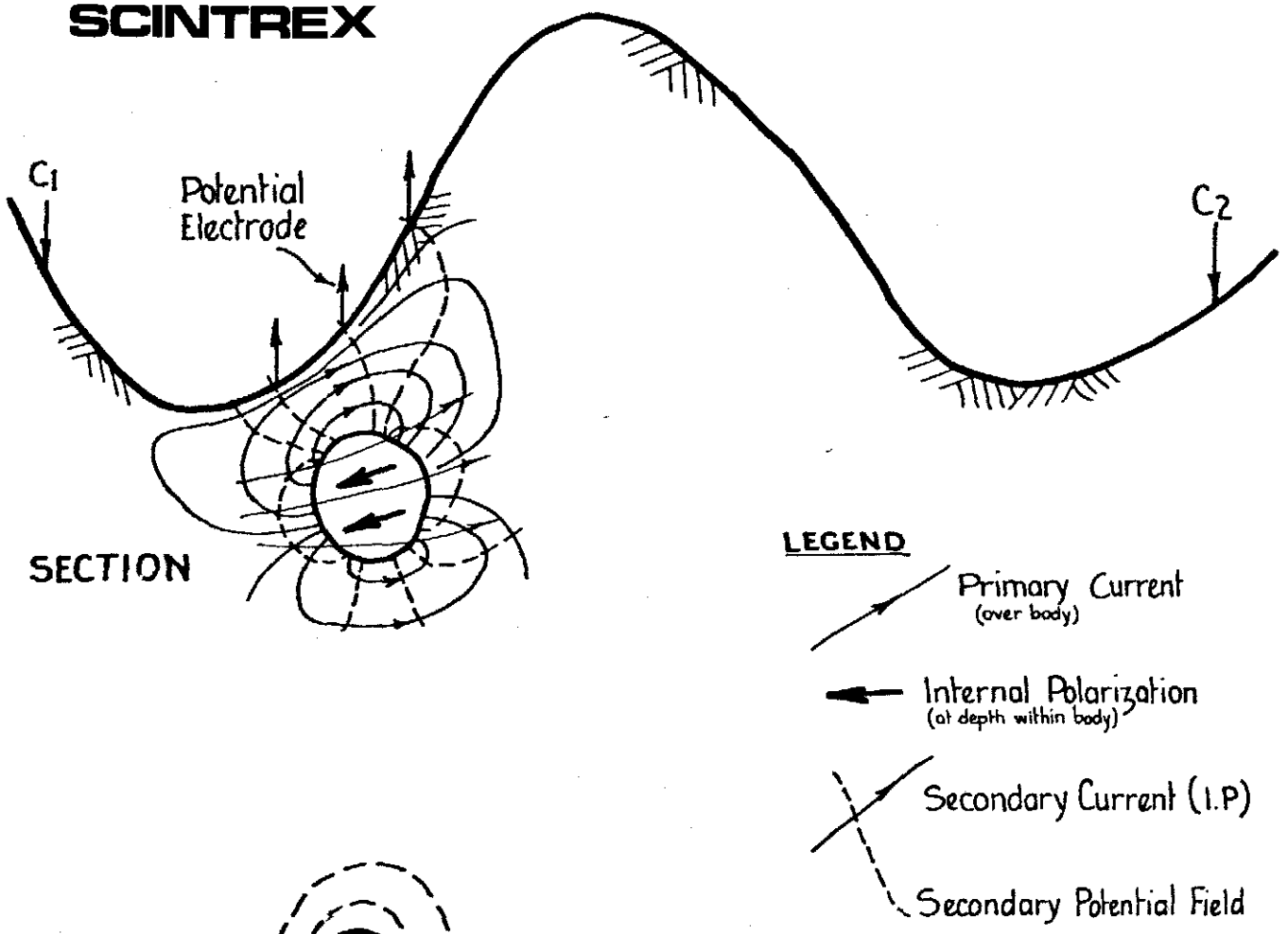
right angles to the line, and thus the equipotentials will be parallel to the reading dipole. Therefore readings in the "zone of distortion" should be regarded with caution.

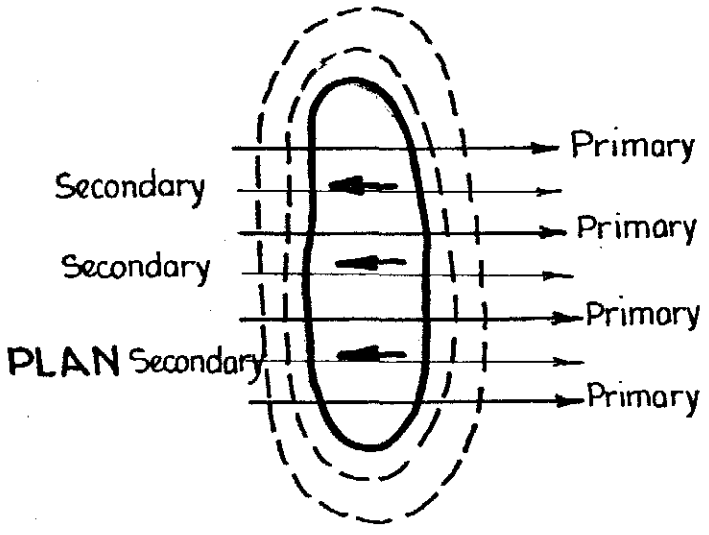
Note particularly that the *source volume* is *normal to local slope* and not vertically beneath the potential dipoles.

Note also that the volume of material *closest* to the potential electrodes will influence the data most. It is difficult to easily quantify the complex relationship between the volume of material sampled and its distance from the potential dipole.

Figure 3 displays the secondary current pattern generated from the decay of induced polarization effect *within* a chargeable sulphide source, together with the equipotential field generated by that decay. Note that due to the necessarily curved nature of the current flow outside the body, the on-surface manifestation is *wider than* the *source width*. Note also that the volume sampled in the primary potential field (apparent resistivity ρa) is not necessarily the same volume as is the secondary potential field (apparent chargeability Ma). This is of course true for *any* array.

From the *form* of the profile over any resistive or chargeable unit, a maximum depth to source estimate can be made. The depth can, however, be less than the maximum depth estimated, as this calculation assumes a 'narrow' source. Also, the depth to source cannot be estimated better than the potential dipole employed (20 metres)





Diagrammatic representation of secondary current (I.P. effect) and secondary potential field in steep terrain.

FIGURE 3.

within a depth equal to that dipole. In this case therefore, bodies shallower than 20 metres will appear to have maximum depths of 20 metres.

Both the apparent chargeability and apparent resistivity are plotted midway between the potential electrodes.

Decay Form: The decay form was observed in three slices, M_1, M_2 and M_3, which are combinations of slices $M_1 + M_2$, $M_3 + M_4$ and $M_5 + M_6$ shown in Figure 4.

With the IPR-8/10 some six slices under the decay curve can be analysed. Some additional explanation is necessary in respect of this data. Each of the six slices is *normalised* to take account of the 'normal' decay form. This is done within the IPR-8/10 itself. Thus, if the decay form *is* normal, all six slices will be equal, i.e. $M_1 = M_2 = M_3 = M_4 = M_5 = M_6$. For abnormally slow decay forms, $M_1 < M_2 < M_3 < M_4 < M_5 < M_6$, and for abnormally fast decay forms, $M_1 > M_2 > M_3 > M_4 > M_5 > M_6$. This is diagrammatically shown in Figure 4. It follows that ΔM will be *POSITIVE* for slow decay rates and *NEGATIVE* for fast decay rates.

The geological meaning of decay rates is as follows: The decay rate is determined predominantly by the grain size of the causative mineralisation. Slow decay rates are caused by 'large' effective grain size, while fast decays are due to fine grain size mineral assemblages and/or inefficient sources. While the grain size is

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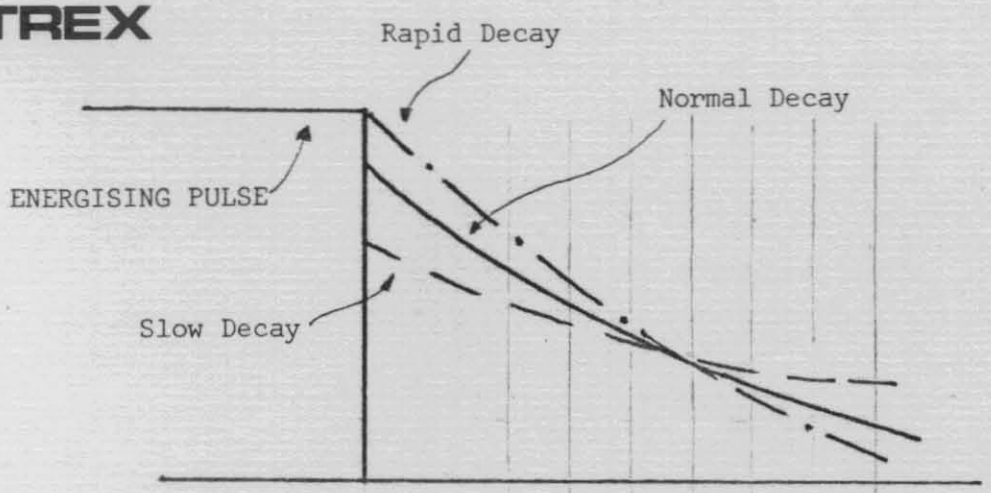
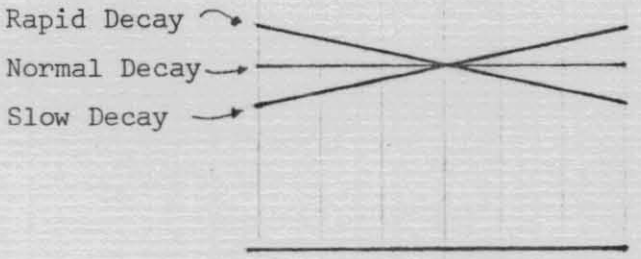


I(a) Actual Decay



I(b) Decay as read in IPR-8
after normalisation

Decay Slice M_1 M_2 M_3 M_4 M_5 M_6

FIGURE 4

Actual (a) and normalised (b) decay form as read and processed by Scintrex IPR-8

not the sole determinant, in our experience it is the dominant one.

At Mt. Black where M_1, M_3 and M_5 were recorded, only M_3 has been plotted. In areas of low signal and/or high noise, only a single slice (summing M_1 to M_6) was recorded to increase the signal to noise ratio. The former are plotted with a (•), while the latter are shown thus (Δ)

DATA PRESENTATION

The data profiles have been plotted at a scale of 1:2500. The vertical scales for resistivity and chargeability are 10 centimetres = 1 logarithmic cycle and 1 centimetre = 2 millivolts/volt respectively. The gradient of the self potential was recorded and plotted at a scale of 1 centimetre = 10 millivolts while the total magnetic field is presented at 1 centimetre = 50 gamma.

Plate 1 is a contour interpretation of the chargeability, Plate 2 is a contour interpretation of the resistivity data and Plate 3 is a contour interpretation of the total magnetic field data. The scale of all three plates is 1:5000.

DISCUSSION OF RESULTS

Each of the lines is separately discussed, and anomalies on each individual lines are not correlated with adjacent lines, as the distance between lines of 1 kilometre is too far for this to be meaningful.

The chargeability anomalies located are graded in terms of primary, secondary and tertiary interest based on their amplitude, and on form. Those that are associated with lower than background resistivities being considered of greater interest than those of high resistivity.

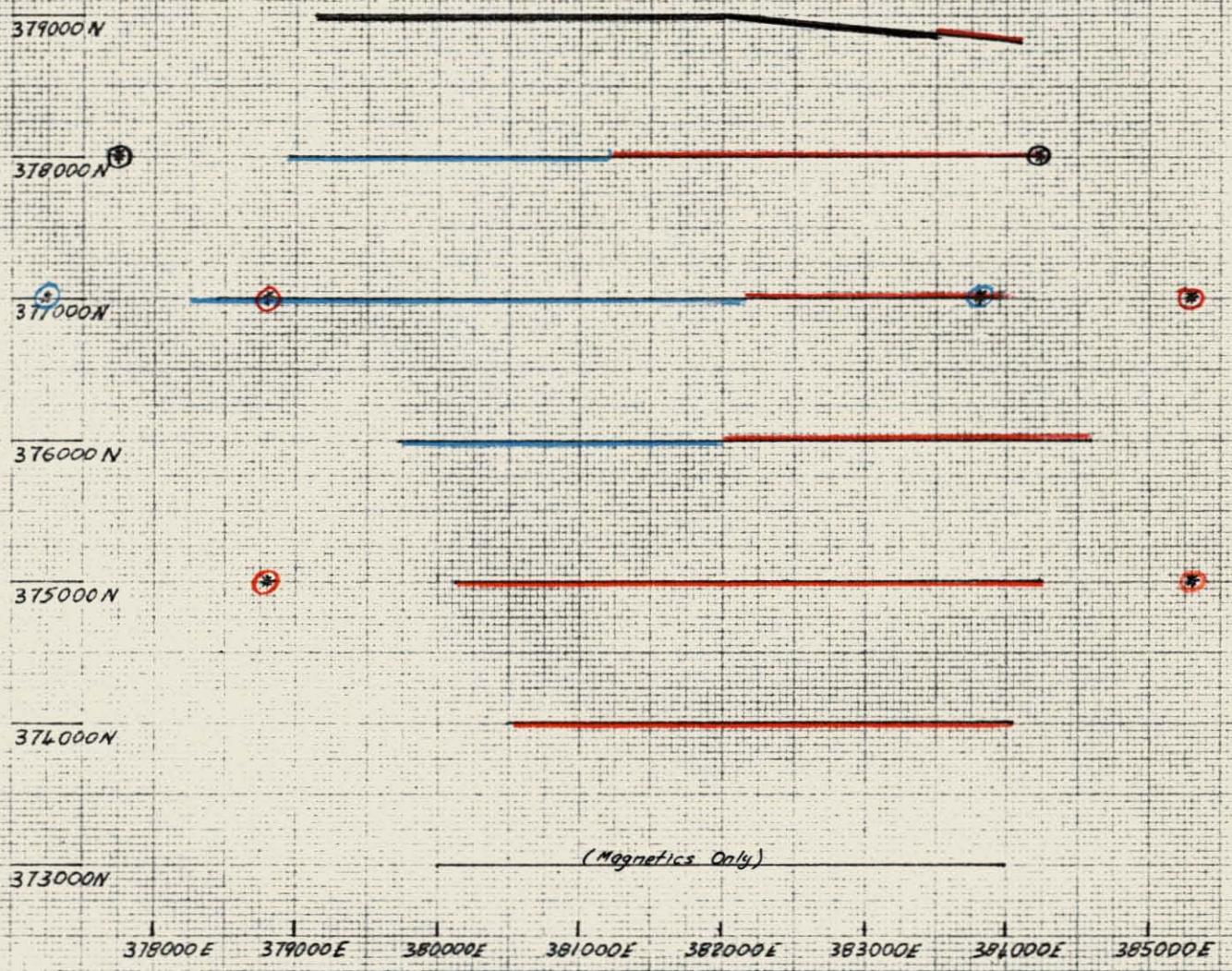
A diagrammatic location plan is shown in Figure 5 at the scale of 1:50,000.

LINE 379000N

379050E - 38000E

The background chargeability over this section is about 22 millivolts/volt while the apparent resistivity ranged between 1000 ohm-metres and 10,000 ohm-metres but background can be considered to be about 2000 to 5000 ohm-metres.

Significant above background induced polarization responses were located between 379150E and the end of the line at 379050E. At this latter station the chargeability is about twice background, with a lesser maximum of 10 millivolts/volt above background at 379112E. The resistivity background remains a high 2500 ohm-metres indicating a disseminated source. The form of the response does not allow an accurate depth estimate, however a guesstimate is about 25 to 35 metres for both maxima. The priority of this zone is *SECONDARY*.



* ELECTRODE POSITIONS

SCALE 1: 50,000 (metres)

5 cm

FIGURE 5

Two relatively minor responses of 8 and 6 millivolts/volt were defined at 379212E and 379260E. Disseminated sources are present at 50 metres and 40 metres within resistive material. Both are of *TERTIARY* interest.

A sharp 8 millivolts/volt above background response was recorded at 379440E. The high resistivity of 4000 ohm-metres indicates a resistive, disseminated host, the maximum depth of which is 30 metres. The response is of *TERTIARY* interest only.

380000E - 384050E

Over this section the background chargeability decreases gradually and slowly from about 18 millivolts/volt to 10 millivolts/volt (adjusted), while the apparent resistivity increases over that observed to the west, to a level varying around 10,000 ohm-metres (adjusted). Superimposed on this background are two significant maxima and a number of lesser maxima which are worthy of comment.

At 380035E (±35 metres) a broad high of 6 millivolts/volt above the 20 millivolts/volt local background is accompanied by slightly reduced apparent reissitivities of 4000 ohm-metres. This low amplitude, broad response probably represents a compositional change and thus is of *MINOR* interest only.

Assuming the background to be at about 16 millivolts/volt, a series of increased induced polarization readings were recorded between about 380150E to 380325E with individual maxima at 380190E, 380237E

and 380270E, all of 31 millivolts/volt. A lesser shoulder at 380310E may infer a separate source. The high resistivity of 5000 ohm-metres to 6000 ohm-metres clearly infers a disseminated or electrically discontinuous source, while the maximum depth inferred is about 75 metres. However, the latter is no doubt excessive, as the source is *broad* and probably not sharply enclosed in the background host rocks. This response is of *PRIMARY* interest.

A second response of *PRIMARY* interest was recorded at 380670E±25 metres from either a broad (say 40 metres wide) source *or* two individual sources within this zone. The chargeability rises some 10 millivolts/volt above the local 20 millivolts/volt background, while the apparent resistivity at 900 ohm-metres is depressed below background. The depression is at a minimum over the eastern section of the chargeability maximum, and as this coincides with a negative SP value of 30 millivolts below background, some interconnection, albeit small, is inferred to be present. Much smaller chargeability maxima of 4 millivolts/volt at 380580E and 8 millivolts/volt at 380730E may be related.

A sharp SP minimum of 50 millivolts below background at 380790E which coincides with a 6 millivolts/volt increase in chargeability and an *increase* in resistivity by 2.5 fold to 20,000 ohm-metres, is interpreted as being due to a minor conductive anomaly over a minor electrically continuous zone of minor extent within a resistive host, probably associated with disseminated sulphides (or graphite).

The remainder of the induced polarization responses recorded are considered minor, and due to compositional differences within the underlying rocks.

LINE 378000N

The line appears to have a general correlation in background to line 379000N in that the background chargeabilities west of about 380800E are at about the 22 to 24 millivolts/volt level, while to the east of that they fall to about 16 millivolts/volt. However, unlike line 379000N, they again rise very gradually to about 22 millivolts/volt at 383600E (±) after which they again fall to 16 millivolts/volt towards 384200E. These changes undoubtedly represent gross compositional changes in the underlying rocks. The apparent resistivities remained between 1000 ohm-metres and 10,000 ohm-metres, with the most resistive rocks being between about 379850E and 381175E and between 382125E and 382650E.

The anomalies worthy of comment are individually discussed below.

At 379730E a sharp single station maximum of 8 millivolts/volt above background was recorded from rocks whose resistivities were recorded as 3000 ohm-metres. The source is interpreted as disseminated sulphides at a maximum depth of about 25 metres.

At 380690E a 28 millivolts/volt maximum was recorded coincident with a fall of 50% or so in the background resistivity to 5000 ohm-metres. The maximum depth to the source, which is less resistive

than the enclosing rocks, is estimated at 50 metres, and the inferred dip is to the east. This response is of *SECONDARY* geophysical interest.

A series of sharp 8 to 10 millivolts/volt maxima above the lower than usual 14 to 16 millivolts/volt background were recorded at 380990E, 381050E and 381110E, all associated with *increases* in apparent resistivity to 10,000 ohm-metres to 7000 ohm-metres above the 4000± ohm-metres background. The maximum depths to source of these three maxima are 50 metres, 25 metres and 35 metres respectively. These sources are disseminated and lie within a resistive host, and are thus of *SECONDARY* to *TERTIARY* interest only.

Two related maxima of *SECONDARY/TERTIARY* and *TERTIARY* interest were defined at 381950E and 381990E from disseminated sources estimated to lie at maximum depths of 50 and 30 metres respectively. These sources are in resistivities considerably less than those further west, and are therefore not similar to them.

A response of *SECONDARY* interest at 382050E again from a disseminated source, this time at a maximum depth of 30 metres, is considered of secondary interest. It is narrow and sharply enclosed into the host rocks.

A series of maxima of 6 to 8 millivolts/volt were recorded between 383250E and 383500E, all within locally lower resistivities of 700 to 1000 ohm-metres. These maxima of 26, 29, 29 and 31 millivolt-volt over the 20 to 22 millivolts/volt background show no individual

resistivity minima and were defined at 383275E, 383370E, 383430E and 383490E, so probably represent segregations of sulphides or graphite within a broader chargeable unit. The maximum depths to source are 50 to 60 metres.

The only anomaly of *PRIMARY* interest was located at 383770E ±25 metres where an 8 to 10 millivolts/volt above background response was recorded over changes in resistivity from 600 ohm-metres at 383730E to 4000 ohm-metres east of 383850E. The source lies then on a transition between two different rocks types, and can be interpreted as not influencing the resistivity of that change. The maximum depth to source is estimated at about 50 to 60 metres, while the asymmetry infers a west dip. The source itself is either 'broad' (30 to 40 metres) or is composed of two or more individual sources within these limits. This zone is recommended for careful follow-up.

LINE 37700N

This line shows a number of distinct level changes. The description of the significant anomalies is by each distinct background section in this case.

378200E - 378900E

The background chargeability over this section is a high 24 to 28 millivolts/volt, while the resistivity varies between about 600 and 2500 ohm-metres.

Within this zone the most significant response was a series of 30 to

36 millivolts/volt maxima between 378500E and 378950E. The resistivity reaches a low of 600 ohm-metres at 378600E, and between 378730E to 378870E within this zone. This broad horizon is of formational origin and may represent graphite and/or sulphides within a less resistive background. Within this zone maximum depths to the sources are 75 metres at 378550E, 30 metres at 378730E. The main individual segregations of chargeable material were noted at 378550E, 378675E, 378730E, 378850E and 378900E.

378980E - 379800E

This section sees a gradual increase in background resistivity from 1000 ohm-metres± in the west to 5000 ohm-metres in the east, while the background chargeability remains at about 24 millivolts/volt (±) over the entire section.

An 8 millivolts/volt above background chargeability response centred at 379025E is accompanied by slightly increased resistivity of 2500 ohm-metres. The maximum depth to the disseminated chargeable and resistive host is about 40 metres. The response is of *SECONDARY* interest at best.

At 379150E a 12 millivolts/volt above background response was recorded, but unfortunately the next two readings to the east were unobtainable. The resistivity over this section was about 650 ohm-metres and showed no change over the anomaly. The source then must be disseminated sulphides or graphite, which does not influence the resistivity of the host.

A sharp 10 millivolts/volt above background response at 379350E is considered to be due to disseminated chargeable material at a maximum depth of 30 metres. This response is of *TERTIARY* interest only.

Two related responses of 10 millivolts/volt and 12 millivolts/volt centred at 379490E and 379550E (± 25 metres) were recorded. The latter is a broad zone which may either be a broader source (say 30 metres) *or* multiple sources *between* these limits. This response is of *SECONDARY* to *PRIMARY* interest.

379800E - 380500E

Between these limits the background resistivity remains at about 5000 ohm-metres while the background chargeability remains at 24 to 22 millivolts/volt.

Within this zone relatively minor 6 to 8 millivolts/volt rises in chargeability above the background at 380000E, 380275E and 380450E are considered of *TERTIARY* interest. The latter two are accompanied by slight depressions in the otherwise resistive backgrounds. The sources in all three cases are disseminated in nature.

380500E - 382000E

This sector is characterised by background resistivity increasing from 2000 to 3000 ohm-metres in the west to 5000 (±) ohm-metres in the east, while the background chargeability falls progressively from

20 millivolts/volt in the west to 12 millivolts/volt in the east. A gradual decrease in chargeable material and an increase in resistivit- *infers* increasingly acidic rocks (whether sedimentary or volcanogenic) from west to east. Also, this section is characterised by no induced polarization responses of any note.

382000E - 383900E

Only two induced polarization maxima are worthy of note over the whole section.

The first is a 6 to 7 millivolts/volt above background response at 382100E which unlike any other responses discussed to this point, is accompanied by a very material decrease in resistivity from 10,000 ohm-metres to the immediate east and west, to 1300 ohm-metres. The source therefore, while still resistive as such, is very much less so than the enclosing rocks, which may indicate some inter-connection between the sulphide and/or graphite source.

The second response of note is a most extraordinary one of 32 millivolts/volt at 382550E. The response is on the boundary between 20 millivolts/volt background to the west and 17 millivolts/volt background to the east. The resistivity data however shows no such dramatic change, inferring that the change in background is due wholly to chargeable content. The maximum depth to this interesting zone which is of *SECONDARY* to *PERHAPS PRIMARY* interest, is estimated at 50 metres.

LINE 376000N

This line, surveyed from 379730E to 384600E, defined some three areas of primary geophysical interest. In addition, there are some material changes in background resistivity which must reflect rock type changes. Of significance is generally similar changes in background chargeability were noted to that observed 1 kilometres to the north. The large interline spacing however, precludes a *precise* correlation, which is best observed on the *coloured* contour presentation. Each of the significant anomalies, and major electrical property changes, is briefly discussed below.

379730E - 380950E

Over this section the background resistivity decreases from 5000 (±) ohm-metres in the west, to about 1000 ohm-metres (±) in the east, while the background chargeability decreases from 22 millivolts/volt to 15 millivolts/volt in sympathy. Over this sector there are few significant induced polarization responses. These are as follows:-

At 380675E a 6 millivolts/volt above background response was recorded from a host which is seen to be 1500 ohm-metres as against 5000 ohm-metres to the west, and 3000 ohm-metres to the east. The maximum depth to source which is less resistive than the enclosing rocks, is about 40 metres. The anomaly is of *TERTIARY* interest on grounds of amplitude, but *SECONDARY* based on form. An east dip to the source appears likely.

Between 380850E and 380890E a 6 millivolts/volt above background response was recorded associated with a resistivity change from 1500 ohm-metres to 2500 ohm-metres across the source. The source is considered to be disseminated, and at a maximum depth of 40 metres and *may* dip to the east. The geophysical interest is considered as *TERTIARY*.

380950E - 381900E

Over this section the resistivity rises to 4000 ohm-metres at 381400E (+) and then remains at about this level to 381900E (+). The chargeability remains at about 14 millivolts/volt over the entire section. Two significant series of induced polarization responses of *PRIMARY* interest occur within this section.

A series of related, sharp, narrow increases in chargeability background of about 12 millivolts/volt, of 27, 30 21 and 23 millivolts/volt at 381090E, 381150E, 381170E and 381230E were recorded. While the resistivities over these responses are lower than most observed on this line at 1500 ohm-metres, the source is nevertheless considered to be disseminated in origin. The maximum depth to individual sources is about 40 metres, while the geophysical interest of the four maxima as a whole is considered *PRIMARY*.

A second zone of *PRIMARY* geophysical interest was located between 381350E to 381500E with above background induced polarization anomalies of 10, 14 and 18 millivolts/volt at 381370E, 381412E and 381470E. The high 3000 ohm-metres (+) resistivities which accompany these

maxima clearly infer the sources to be disseminated in nature.

381900E - 383000E

Between 381950E to 382150E, and between 382400E to 382650E, the background rises from 2000 ohm-metres to 10,000(±) ohm-metres. In the section between, resistivities of 2500 ohm-metres are accompanied by higher chargeabilities. The background on this section is about 12 millivolts/volt. The significant responses above this background are discussed below.

At 382480E an 8 millivolts/volt above background response was recorded from rocks which show 6000 ohm-metres background resistivities The disseminated source has a maximum depth of 40 metres and the asymmetry of the response suggests a west dip.

Within resistivities of 3000 to 4000 ohm-metres between 382600E and 382900E, which are lower than the 5000 ohm-metres resistivities recorded to the east and west, a series of induced polarization maxima which jointly are of *SECONDARY* interest, was recorded. These maxima, at 382650E, 382710E, 382825E and 382875E indicate disseminated sources at depths of 60, 20, 30 metres and an unquantifiable depth respectively.

383000E - 383600E

This section of the line is characterised by low background chargeability of 16 millivolts/volt (±) with resistivity varying about the

3000 ohm-metres mark. Also characteristic of this section is the lack of significant changes in the induced polarization background.

383600E - 384600E

Over this long section the background resistivity remains at about the 1000 ohm-metres level (similar to the unit seen on the line to the north), while the chargeability varies little from the 20 millivolts/volt level. There are only two significant chargeability events which are as follows:-

The first was recorded at between 384090E and 384200E where chargeability responses to 30 millivolts/volt from the 20 millivolts/volt background was observed. The form of the anomaly suggests an east dip. The accompanying resistivities of 500 ohm-metres (±) between 384070E and 384110E indicate a host significantly less resistive than the enclosing rocks. The maximum depth to source is about 75 metres. Should the dip be as inferred, the footwall would be considerably more resistive than the hanging wall, but is inferred to be chargeable also.

The most easterly response recorded was at 384530E where an 8 millivolts/volt anomaly (above background) was recorded from a source estimated to be 35 metres below surface. The source is seen to be more resistive than the rocks which enclose it and is judged to be of *SECONDARY* interest at best.

LINE 375000N

Each of the significant induced polarization responses, and each of the major changes in background are discussed in detail below.

380130E - 381250E

The resistivity background decreases gradually from about 5000 ohm-metres (±) in the west to about 1000 ohm-metres in the east. The chargeability background also decreases in sympathy from 26 millivolts/volt (±) in the west to 18 millivolts/volt(±) in the east. Only minor variations to 6 millivolts/volt were noted from this background.

381250E - 381600E

Higher resistivity of 4000 to 5000 ohm-metres was noted between these limits. The background resistivity over this section is about 16 millivolts/volt. Only small variations of 4 millivolts/volt at 381440E and 6 millivolts/volt at 381590E were recorded. Both of these are of *MINOR* importance.

381600E - 381900E

The resistivity background is about 2000 ohm-metres, while the background chargeability falls from 16 millivolts/volt in the west to 12 millivolts/volt in the east. Again there are no significant maxima within this zone.

381900E - 383750E

The resistivity background over this section remains at about 2000 ohm-metres while the chargeability background remains at about 12 millivolts/volt. Several anomalies of *SECONDARY* interest were recorded as follows:-

At 381990E a significant 10 millivolts/volt above background induced polarization response was recorded. The associated resistivity of 3500 ohm-metres is less than that to the immediate east and west, which infers that the source, while disseminated, is nevertheless slightly less resistive than the enclosing rocks. The form of the profile suggests an east dip to the source, and a maximum depth to source of 40 metres.

A 9 millivolts/volt response at 382675E associated with a very slight fall in the otherwise high 2000 ohm-metres resistivities was recorded. The disseminated source lies at a maximum depth of about 35 metres, and is of *TERTIARY* interest only.

Other minor responses at 382870E and 383050E are also of minor interest.

383750E - 384230E

The resistivity background progressively decreases eastward from 1000 ohm-metres in the west to 100 ohm-metres in the east, while the chargeability increases from a background of 20 millivolts/volt to a higher 36 millivolts/volt. This phenomenon is considered to be due

a gradual change in rock properties towards the east. As the energising electrode lies on this line, this increase in chargeability and decrease in resistivity cannot be due to any geometric effect. No such phenomenon was observed on line 376000N, however, east of 383700E on line 374000N a dramatic increase in chargeability was recorded, which obviously correlates with this zone. East of 383900E the resistivity falls to 400 ohm-metres (±), and this also indicates that this feature is representative of the underlying rocks.

It is recommended that the *whole zone* be looked at as being of *PRIMARY* interest as the higher chargeability together with the lower resistivity are the characteristics which from a geophysical point of veiw are of greatest interest. The actual source is nowhere actually conductive as such, so the chargeable material, graphite or sulphides, is either *weakly* interconnected, lies within a less resistive host, or varying combinations of both. The significant maxima were recorded at 384025E, 384070E, 384112E and 384170E where chargeabilities of 38 millivolts/volt plus were recorded together with locally high values of 700 and 600 ohm-metres resistivities for the two most westerly and relatively low 150 and 100 ohm-metres for the two most easterly responses. The maximum depth to source is difficult to assess but is considered to be about 50, 25, 25 and 25 metres respectively from west to east.

LINE 374000N

380500E - 382325E

The resistivity background over this long sector shows very little

variation from the 2000 to 4000 ohm-metres range, while the chargeability background shows a gradual decline from about 20 millivolts/volt in the west to 10 millivolts/volt in the east. The variations in chargeability against this background were, for the most part, minor.

The most significant are as follows:-

Between 380520E and 380670E a broad zone of higher chargeability was noted. The 4 to 6 millivolts/volt above background responses were recorded from 2000 to 4000 ohm-metres resistivities. The assessed sources have a maximum depth of the order of 40 metres in the eastern and western margins.

Small maxima of 4 millivolts/volt at 380990E and a larger 8 millivolts/volt at 381070E arise from sources at maximum depths of 50 metres and 30 metres respectively. 50% to 60% falls in apparent resistivity to about 2000 ohm-metres were recorded.

An anomaly of 20 millivolts/volt against background of about 12 millivolts/volt was recorded at 381625E. The 2500 ohm-metres resistivities infer a disseminated source, while the form of the profile suggests a source width of greater than 20 metres, and a maximum depth of the order of 40 metres.

A 17 millivolts/volt response as against a very low 4 millivolts/volt background at 381850E accompanied by a 70% fall in apparent resistivit

to 1400 ohm-metres was recorded. The source which is less resistive than the enclosing rocks, is estimated to lie at a maximum depth of about 45 metres. This response is of *SECONDARY* interest at best.

382325E - 383700E

The western margin of this sector is marked by a major rock type change at about 382300E, with resistivities to 1000 ohm-metres to the immediate west and 10,000 ohm-metres to the immediate east. To the east of 383700E the resistivity falls unevenly and gradually to 1000 ohm-metres, while the chargeability climbs unevenly but gradually from a low 10 millivolts/volt to about 20 millivolts/volt. There are four major deviations from this background, these are:-

Sharp, 6 millivolts/volt responses were noted at 382650E, 383010E and 383070E, all from within higher 4000 ohm-metres (+) resistivities. The maximum depth to these sources which are considered of *SECONDARY* interest are about 25 to 30 metres.

A significant broad response of 8 millivolts/volt above background recorded centred at 383412E, is associated with a more substantial sharp 50% fall in apparent resistivity to 1700 ohm-metres at 383400E. This displacement, together with the form of the chargeability anomaly suggests the source has an east dip, and a maximum depth of about 60 metres. The response is of *SECONDARY* interest.

383700E - 384075E

Over this section the background resistivity falls from 1000 ohm-metres

in the west to 400 ohm-metres in the east, while the chargeability background shows a rise from the 24 millivolts/volt level to a 32 millivolts/volt level in the east. This sector correlates well with a similar section on the eastern end of line 375000N. Within this dramatically rising chargeability background, a number of distinct maxima were located as described below. The source is considered to be chargeable material, still essentially disseminated, within less resistive rocks. Graphite or pyritic shales would yield such a picture. Overall the priority is considered to be *PRIMARY*.

The major response in this zone was 37 millivolts/volt against background of 24 millivolts/volt accompanied by a broad increase in resistivity to 1700 ohm-metres at 383870E. The maximum depth to source is estimated at 60 metres. The priority is considered *PRIMARY/SECONDARY*.

A second substantial response at 383950E of 34 millivolts/volt as against the 24 millivolts/volt background is accompanied by 600 ohm-metres resistivities. The maximum depth to source is about 40 metres. The priority is *PRIMARY/SECONDARY*.

A very sharp 41 millivolts/volt response at 384010E is accompanied by a minor local depression in resistivity to 350 ohm-metres. Of significance is a sharp depression in the SP profile of 40 to 50 millivolts at 384030E. This suggests a narrow electrically conductive zone of limited extent associated with the chargeable source. The latter has an estimated depth of 30 metres.

CONCLUSIONS

1 - The broad strike directions indicated via all three physical properties of total magnetic field, resistivity and chargeability, are similar, as seen by the major changes in all three properties. However, as was expected from the inception of the programme, *precise* correlation between lines was not seen.

2 - No truly conductive sources were located on the reconnaissance survey. All chargeability responses had associated resistivities which would infer either a disseminated source, or if 'massive' electrically discontinuous.

As the line spacing is large, it is recommended that not only should the *larger* responses having *lower* than background chargeabilities be investigated, but also those which show a series of highs, e.g. 381170E ± and 381412E on line 376000N, as these may well represent 'fishtail' sulphide ending of a lode system.

3 - All significant induced polarization responses are summarised below. The geophysical priority is assessed partly on amplitude and partly on form.

LINE 379000N

379050E	42/22	2000 ohm-metres	secondary	30 metres (±5)
379112E	33/22	2500 ohm-metres	secondary	30 metres (±5)

379212E	30/22	2200 ohm-metres	tertiary	50 metres
379260E	28/24	2700 ohm-metres	tertiary	40 metres
379440E	32/24	4000 ohm-metres	tertiary	30 metres
380035E	26/20	4000 ohm-metres	tertiary	?
380190E	31/16	5000 ohm-metres		
380237E	31/16	5000 ohm-metres	primary	70 metres (?)
380310E	31/16	5000 ohm-metres		
380670E (±25 metres)	29/20	9000 ohm-metres	primary	50 metres

LINE 378000N

379730E	33/24	3000 ohm-metres	secondary	25 metres
380690E	28/22	5000 ohm-metres	secondary	50 metres
380990E	22/14	11,000 ohm-metres	secondary/ tertiary	50 metres
381050E	22/14	10,000 ohm-metres	secondary/ tertiary	25 metres
381110E	24/14	7000 ohm-metres	secondary/ tertiary	35 metres
381950E	24/16	2500 ohm-metres	secondary/ tertiary	50 metres
381990E	21/16	1000 ohm-metres	tertiary	30 metres
382050E	26/16	1000 ohm-metres	secondary	30 metres
383275E	26/20	1050 ohm-metres	tertiary	50 metres
383370E	29/22	800 ohm-metres	secondary	60 metres
383430E	29/22	700 ohm-metres	secondary	?
383490E	31/22	1000 ohm-metres	secondary	50 metres
383770E (±25 metres)	30/22-18	600(?) ohm-metres	primary	50/60 metres

LINE 377000N

378500E to 378950E	to 37/28	to 600 ohm-metres	tertiary	30 to 75 metres
379025E	34/26	2500 ohm-metres	secondary	40 metres
379150E	36/24	600 ohm-metres	secondary	?
379350E	32/24	2000 ohm-metres	tertiary	30 metres
379490E	32/24	4000 ohm-metres	tertiary	30 metres
379550E (±25 metres	36/24	4500 ohm-metres	secondary/ primary	50 metres
380000E	28/22	5000 ohm-metres	tertiary	60 metres
380275E	30/22	5000 ohm-metres	tertiary	60 metres
380450E	30/22	3500 ohm-metres	tertiary	70 metres
382100E	19/12	1300 ohm-metres	secondary	35 metres
382550E	32/20-12	4000 ohm-metres	secondary/ primary	50 metres

LINE 376000N

380675E	22/16	1500 ohm-metres	tertiary	40 metres
380870E	21/25	2000± ohm-metres	tertiary	40 metres
381090E	27/16	1500 ohm-metres		
[		]		
381150E	30/12	1500 ohm-metres		
[		]		
381170E	21/12	1500 ohm-metres	primary	40 metres
[		]		
381230E	23/12	3000 ohm-metres		
381370E	24/14	3000 ohm-metres		40 metres
[		]		
381412E	28/14	3000 ohm-metres	primary	50 metres (?)
[		]		
381470E	32/14	3000 ohm-metres		60 metres
382480E	20/12	6000 ohm-metres	tertiary/ secondary	40 metres
382650E	25/18	4000 ohm-metres	secondary	60 metres
[				

382710E	32/14	3000 ohm-metres	secondary/ primary	20 metres
382825E	24/16	2500 ohm-metres	secondary	30 metres
382875E	24/16	2000 ohm-metres	secondary	?
384130E(±)	30/20	500 ohm-metres	primary	75 metres
384530E	31/22	1200 ohm-metres	secondary	35 metres

LINE 375000N

381990E	22/12	3500 ohm-metres	secondary/ primary	40 metres
382675E	20/12	2100 ohm-metres	tertiary	35 metres
383750E - 384230E in detail		500-1000 ohm-metres	primary	
384025E	38/28	700 ohm-metres (high)	primary	50 metres
384070E	38/28	600 ohm-metres (high)	primary	25 metres
384112E	42/28	150 ohm-metres (low)	primary	25 metres
384170E	38/28	100 ohm-metres (low)	primary	25 metres (?)

LINE 374000N

380520E-380670E	26/20	2000 to 4000 ohm-metres	tertiary	40 metres
380990E	24/20	2000 ohm-metres	tertiary	50 metres
381070E	23/16	2500 ohm-metres	tertiary/ secondary	30 metres
381625E	20/12	2500 ohm-metres	tertiary/ secondary	40 metres
381850E	17/4(?)	1400 ohm-metres	secondary	45 metres

382650E	18/11	4500 ohm-metres	secondary	30 metres
383010E	23/16	4000 ohm-metres	secondary	30 metres
383070E	23/16	4000 ohm-metres	secondary	30 metres
383412E	26/18	1700 ohm-metres	secondary	60 metres
383800E to 384050E in detail			primary	
383870E	37/24	1700 ohm-metres (high)	primary/ secondary	60 metres
383950E	34/24	600 ohm-metres	primary/ secondary	40 metres
384012E	41/24	350 ohm-metres (low)	primary/ secondary	30 metres

4 - From a *geophysical standpoint* those responses which should receive follow-up attention are as listed below.

Line 379000N 380237E (±)

Line 378000N 383770E (±)

Line 376000N 381170E (±)

Line 376000N 381412E (±)

Line 376000N 382800E (±)

Line 375000N 383750E-384230E

Line 374000N 383800E-384050E

Of course geological and geochemical input may drastically alter the priority.

5 - It is recommended that the follow-up should consist of a series of short lines, of say 300 to 400 metres, parallel to the

reconnaissance line, and distanced 100, 200 and 500 metres from it, and on either side of it. It is recommended that the gradient array EIP technique be continued on these lines using the same electrode positions as for the reconnaissance survey. (It is understood that the main sections of the current lines, particularly those in inaccessible areas, are in place, in anticipation of this).

The reasons why this approach is favoured is (i) a shorter line length is required than for dipole-dipole, thus for a given budget a greater number of cross lines can be surveyed, an approach the Author favours, (ii) coverage should be rapid, (iii) contouring of the closer spaced lines should allow a better idea of the detailed distribution and limits of chargeable material, and perhaps of structure also.

6 - It is also suggested that a short spaced (say 20 or 40 metres) dipole-dipole survey be run over the best response in each group to ascertain among other things, the *minimum depth* to the top of the source. (The gradient array gives excellent *maximum depth* information.)

7 - Comments have not been made on the magnetic field data as generally there is little correlation between individual chargeability events and the magnetics (with some notable exceptions such as the zone of primary interest on line 376000N at 381400E $\pm$). Magnetite is nowwhere considered to be the sole or major cause of the induced polarization noted.

8 - The decay forms observed generally did not vary materially from normal. Those over anomalies were normal to very slightly slower than normal, while those in low background areas were generally slightly faster than normal.

Respectfully submitted on behalf of:

SCINTREX PTY. LTD.

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

GEOPHYSICIST

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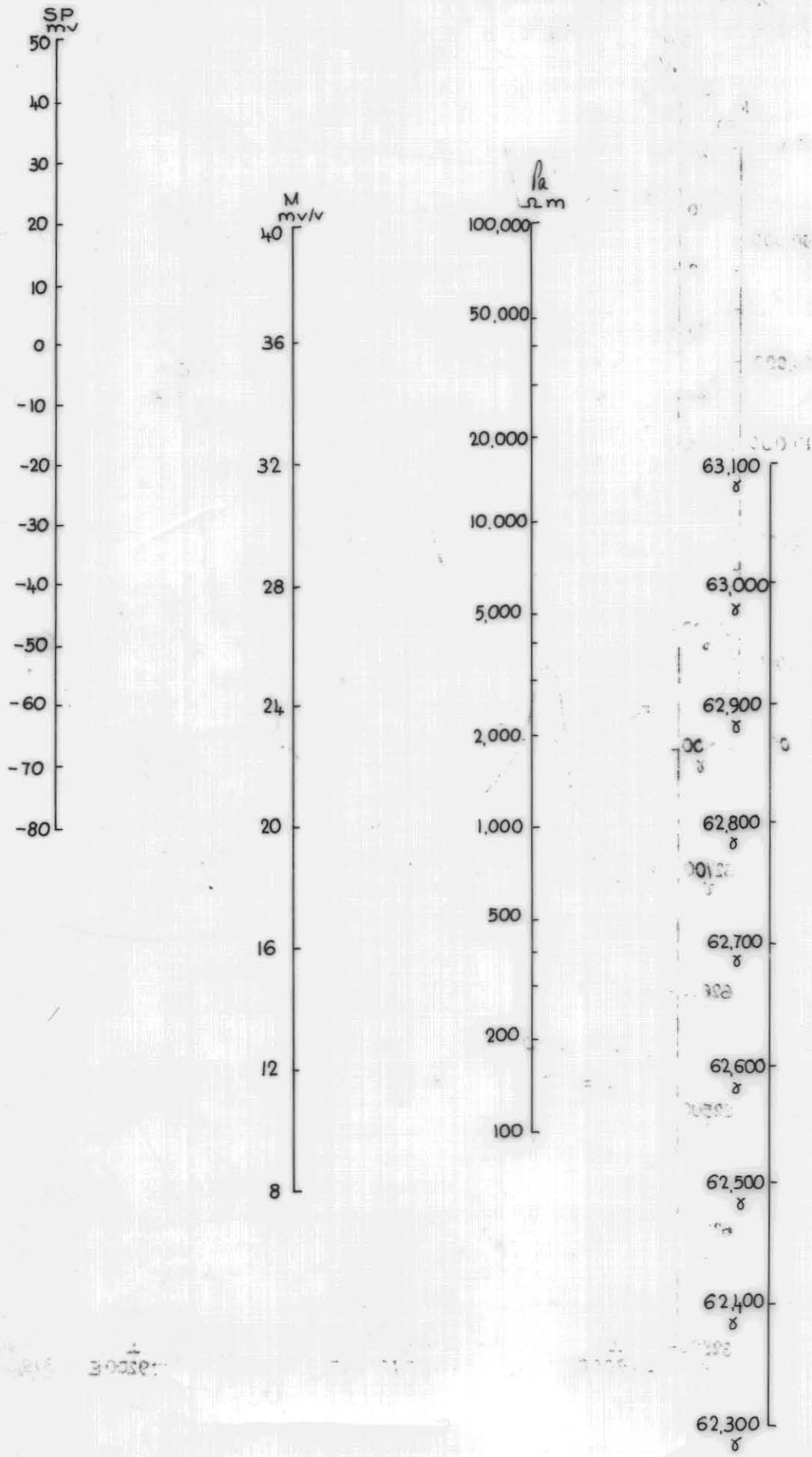
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LINE 373000N

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MAGNETICS

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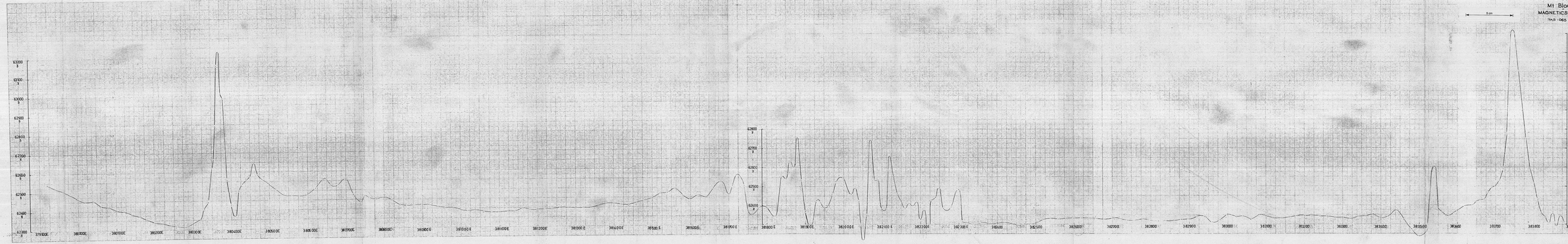

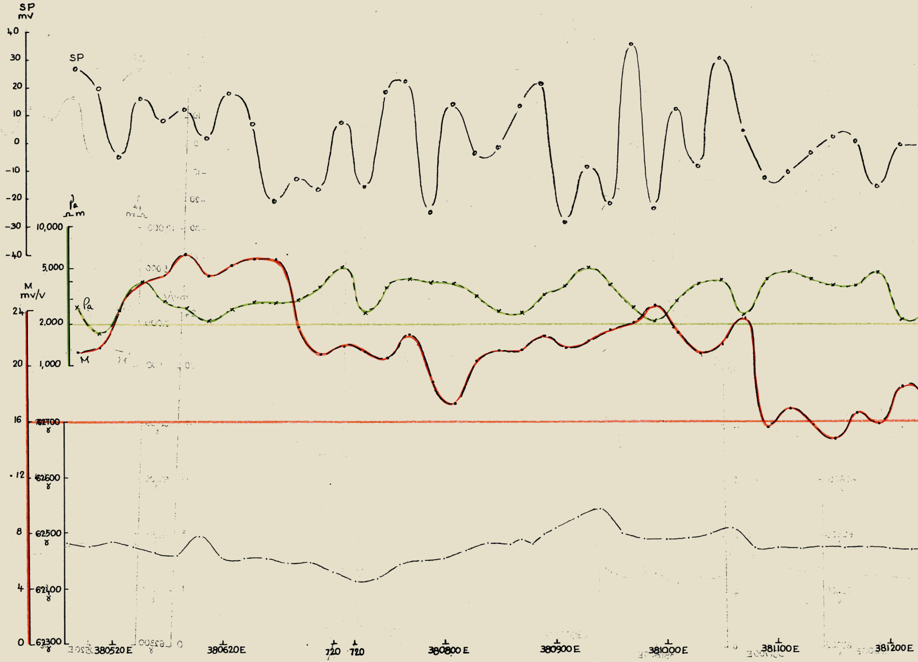

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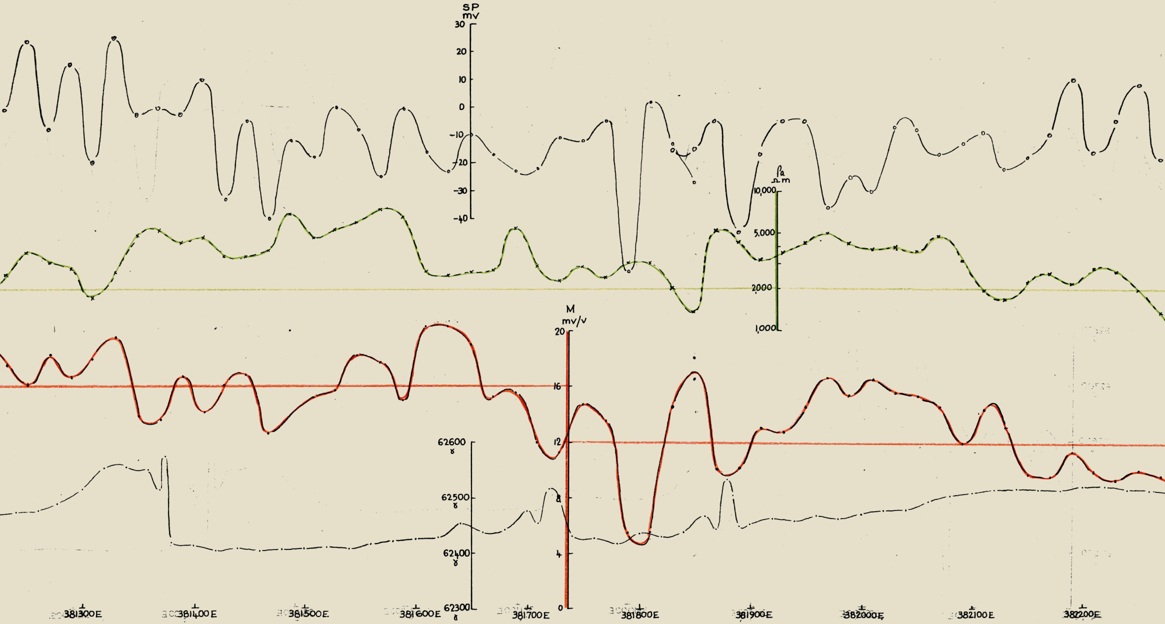

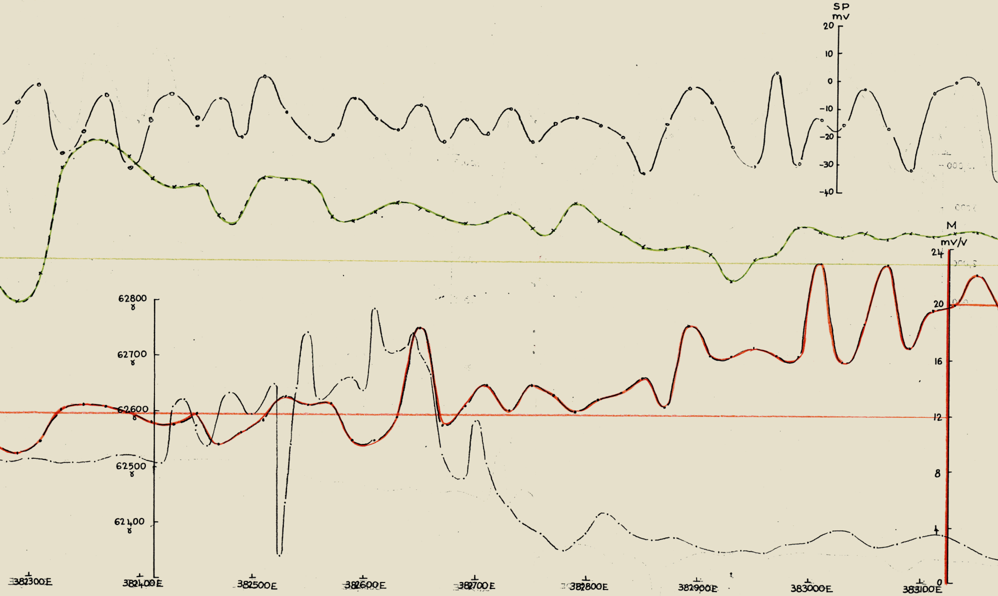

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LINE 374000 N

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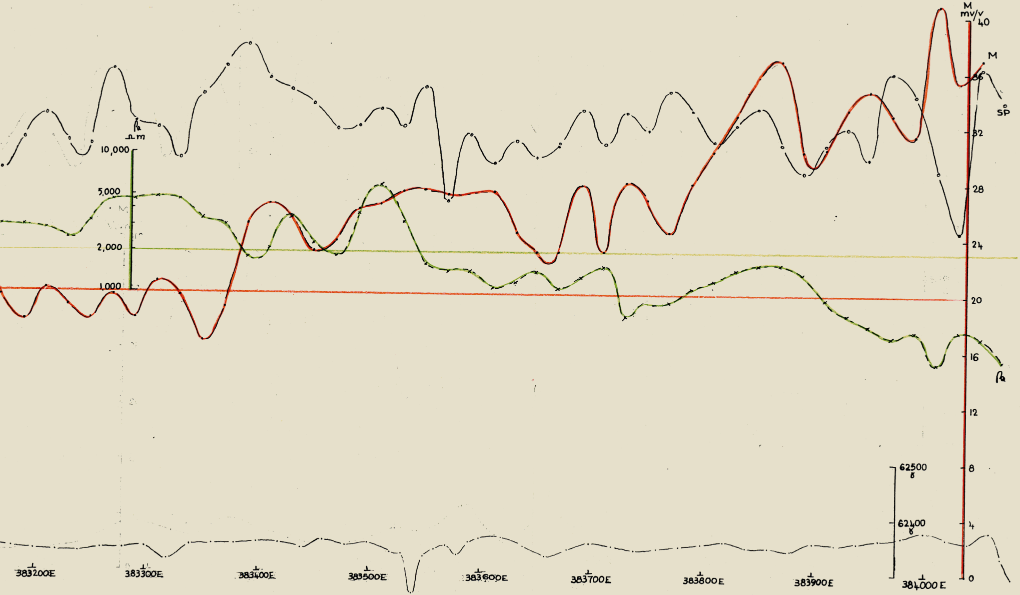

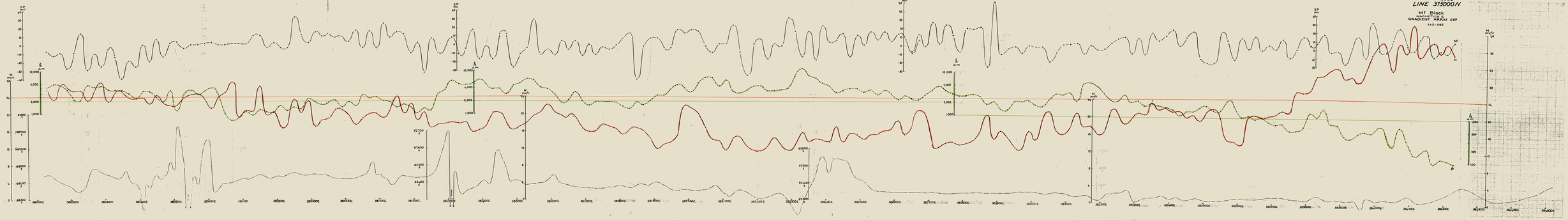
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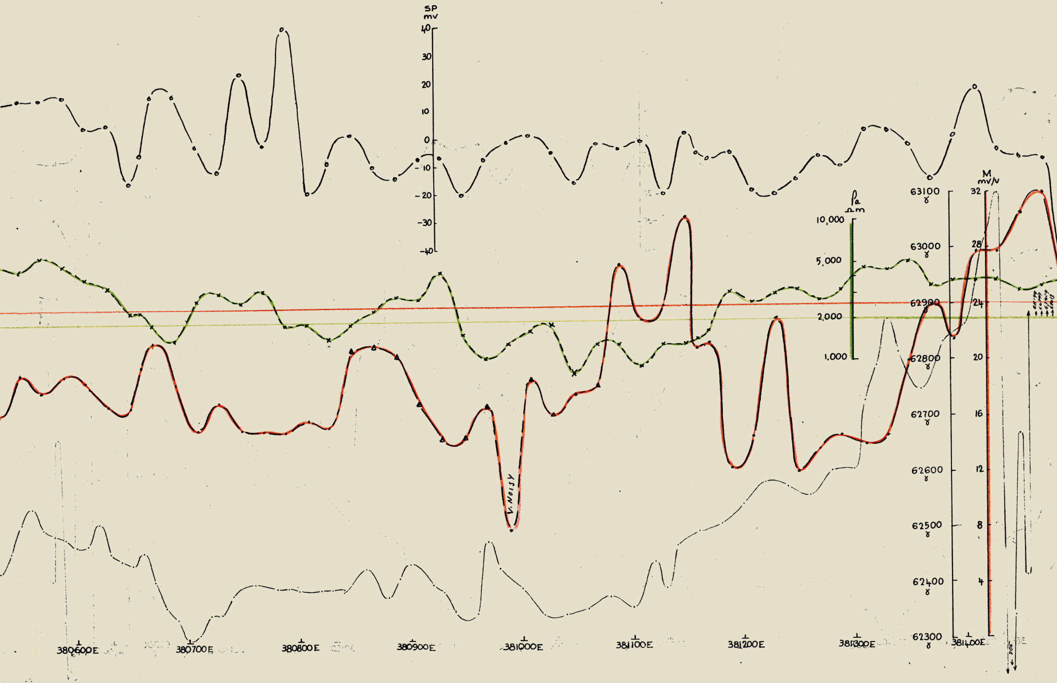

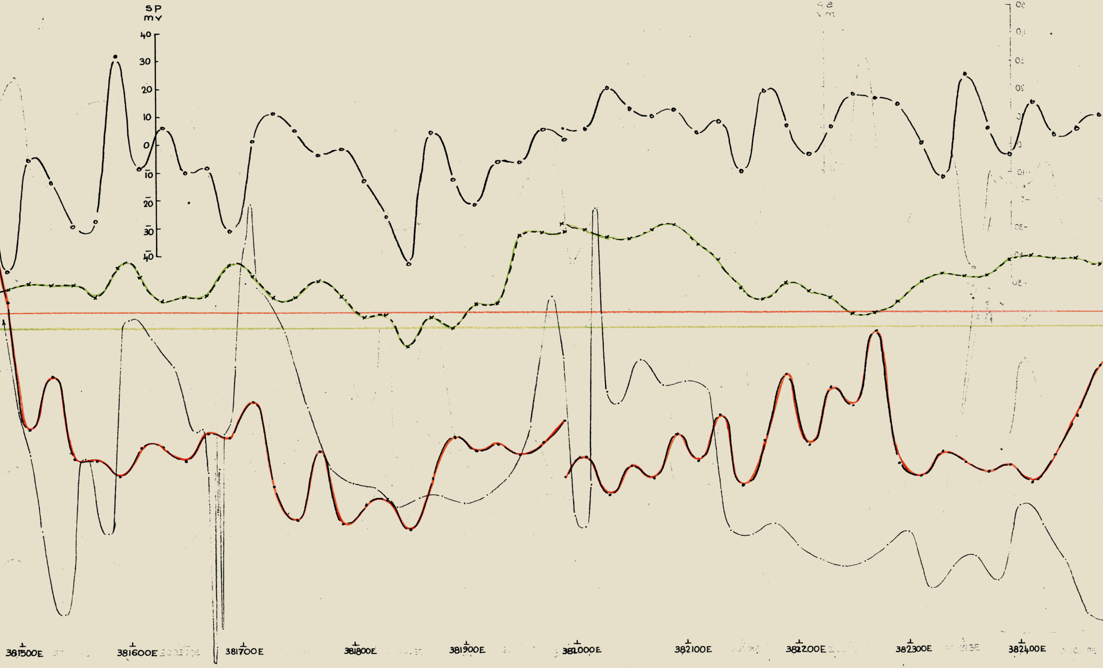

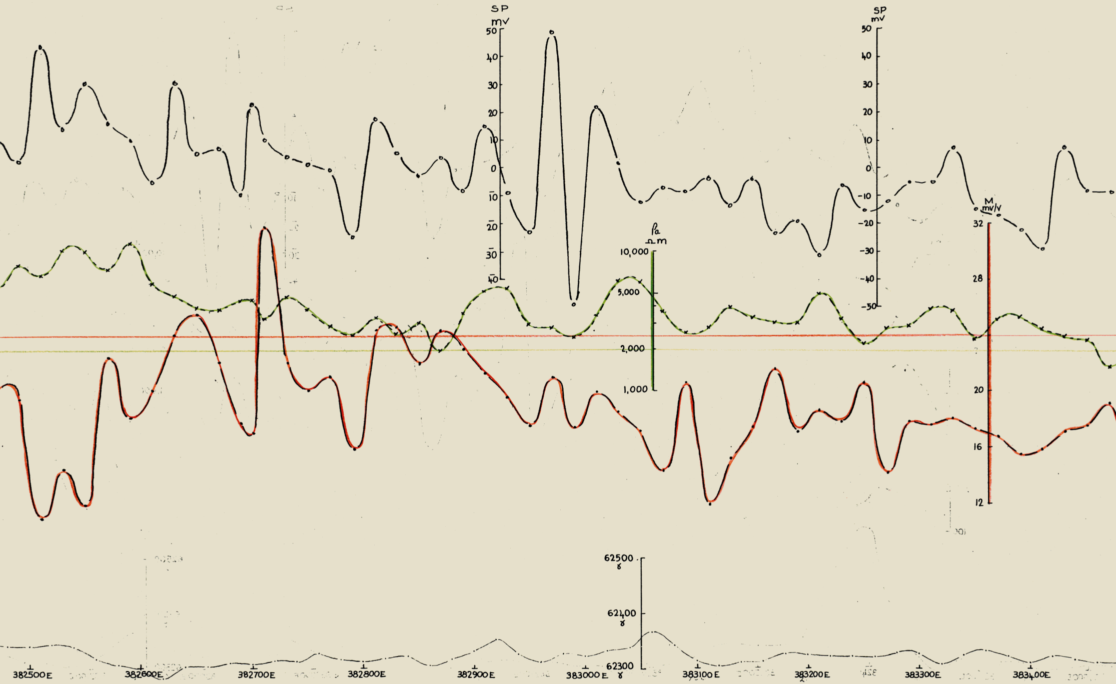

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LINE 376000 N

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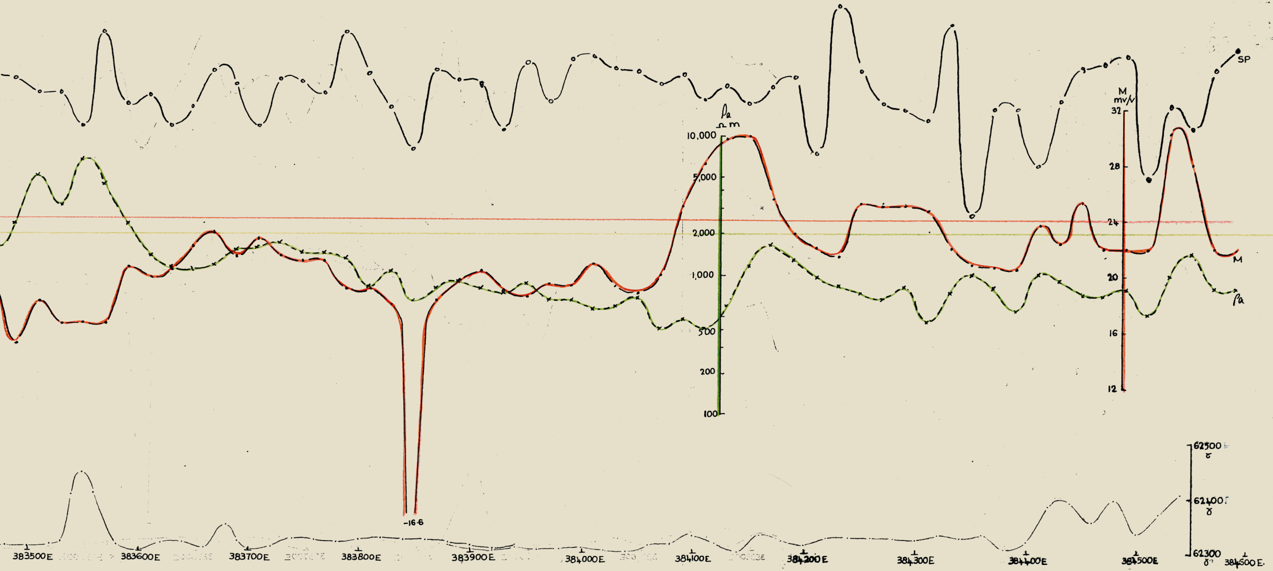

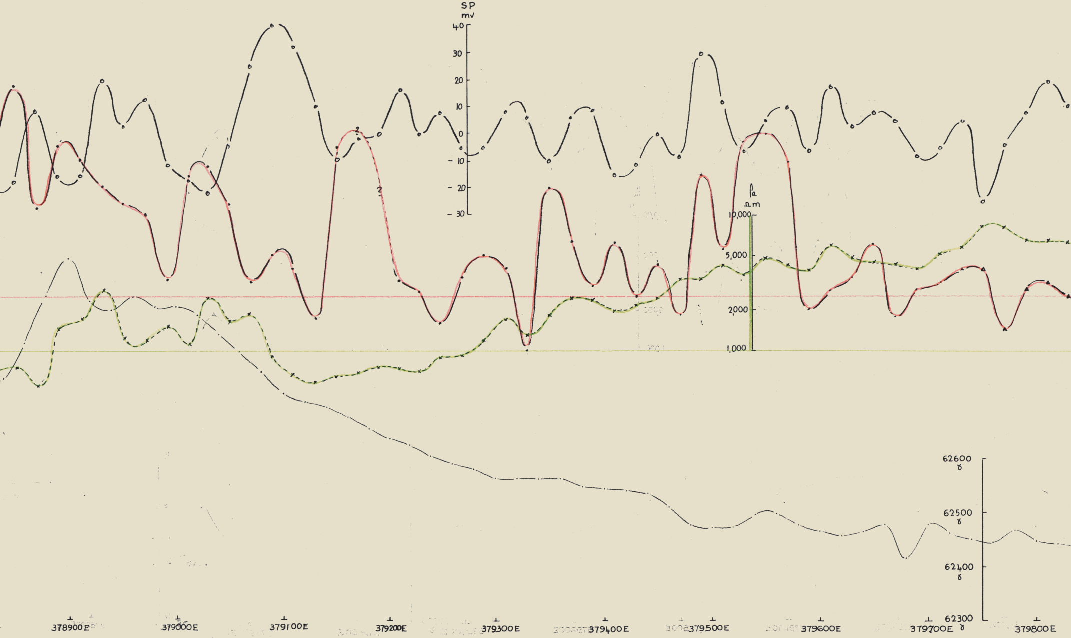

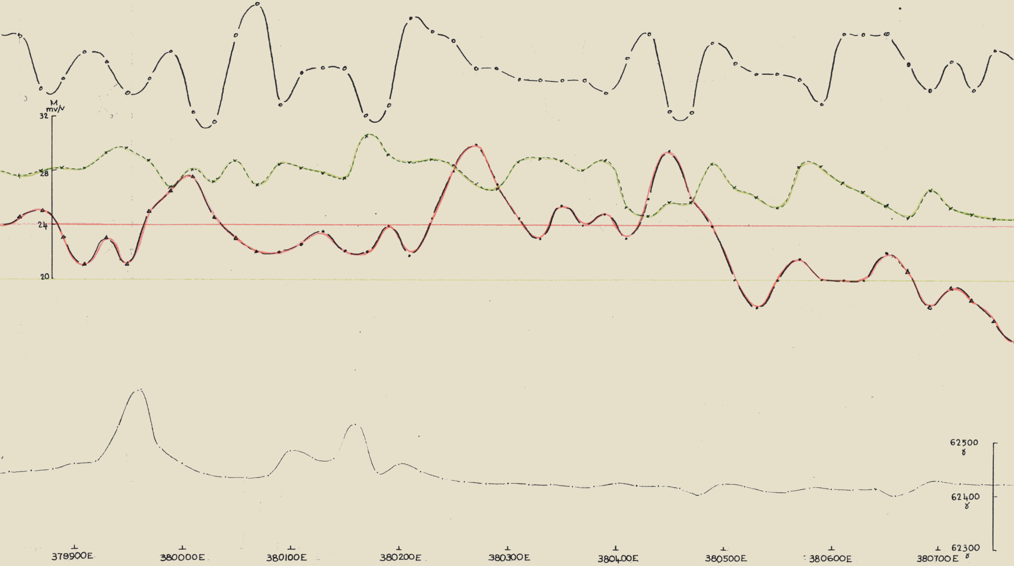

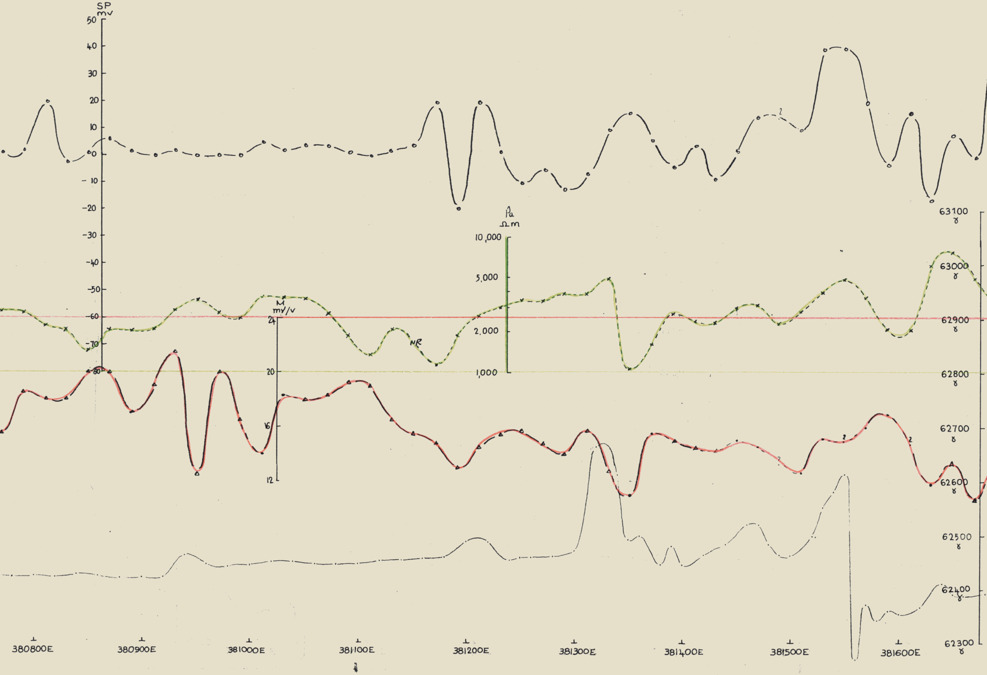

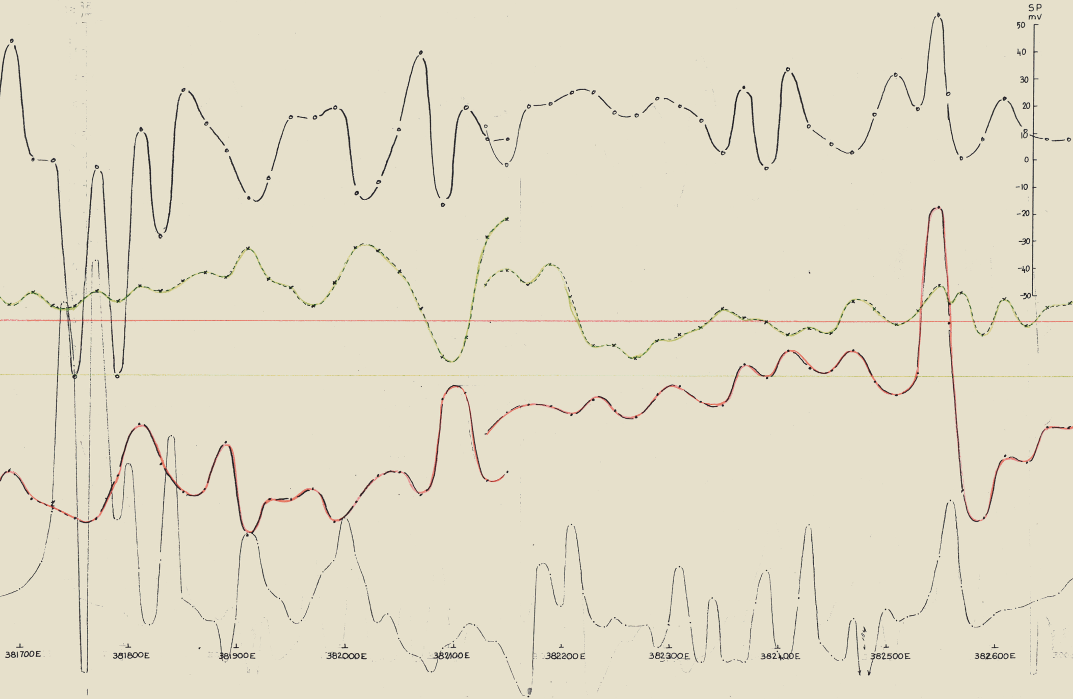

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LINE 377000 N

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MAGNETICS &
GRADIENT ARRAY EIP

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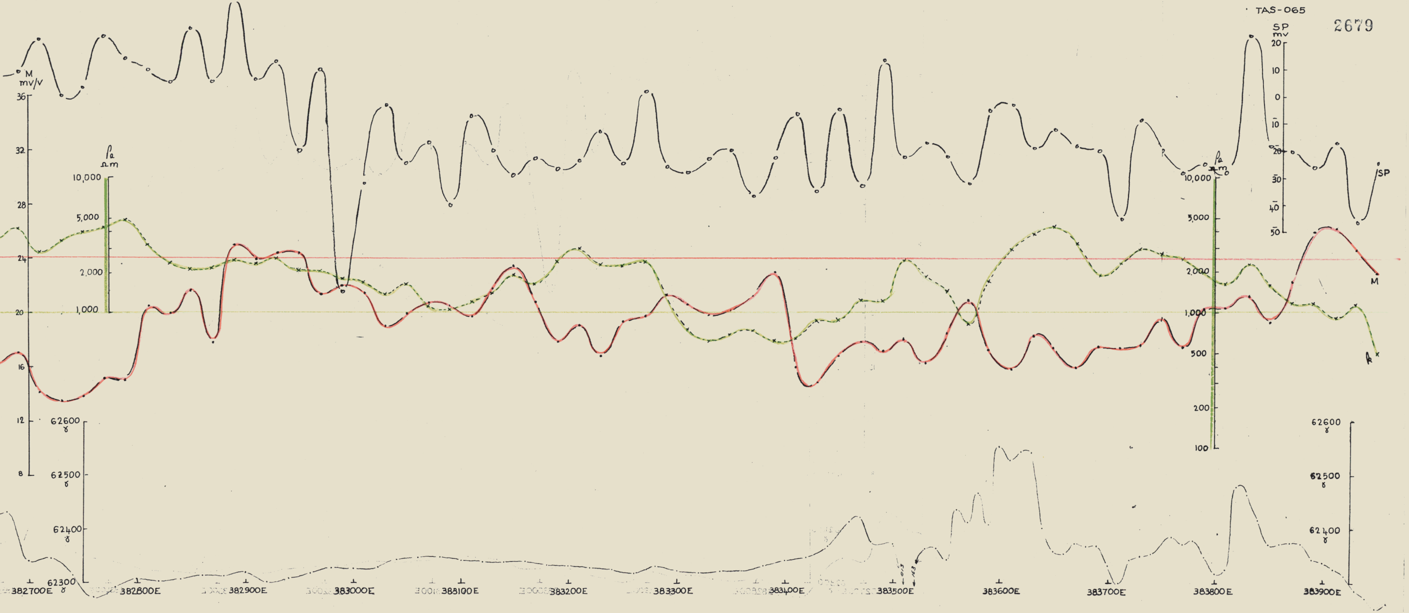

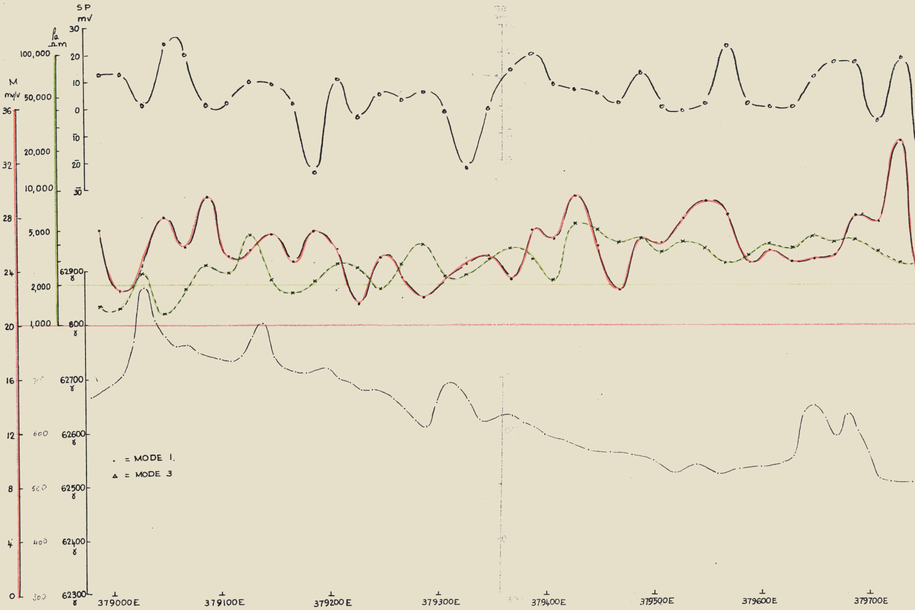

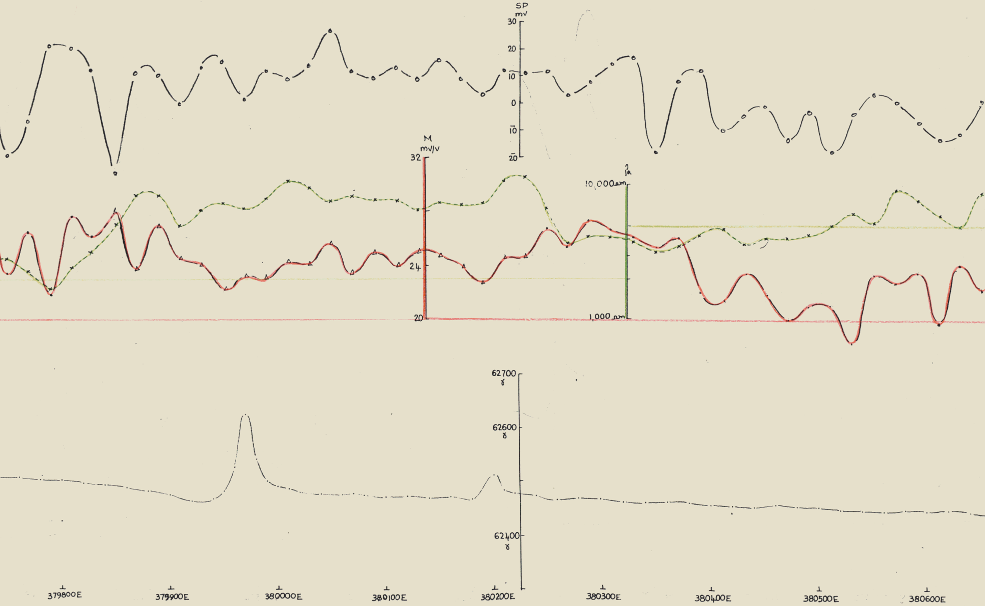

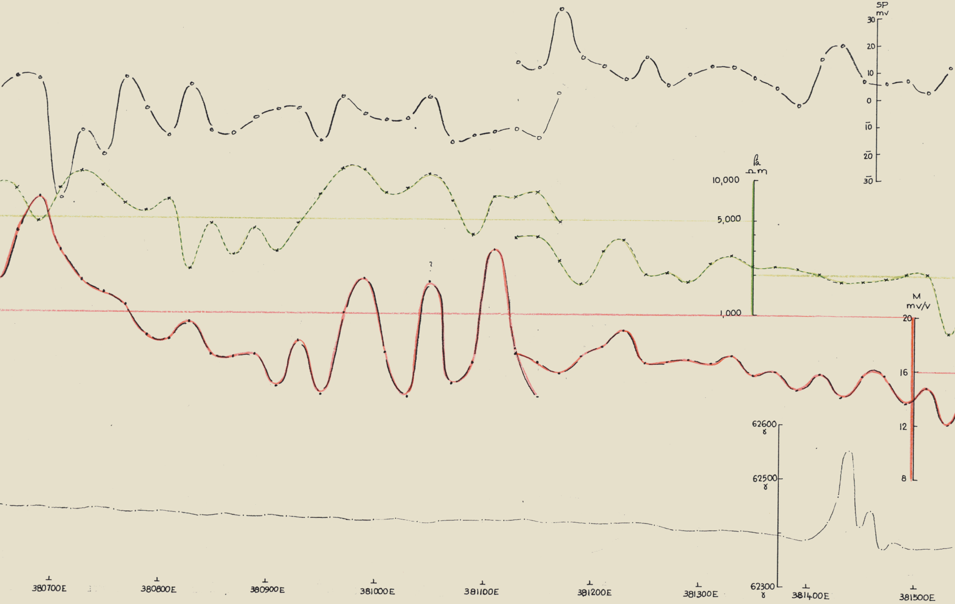

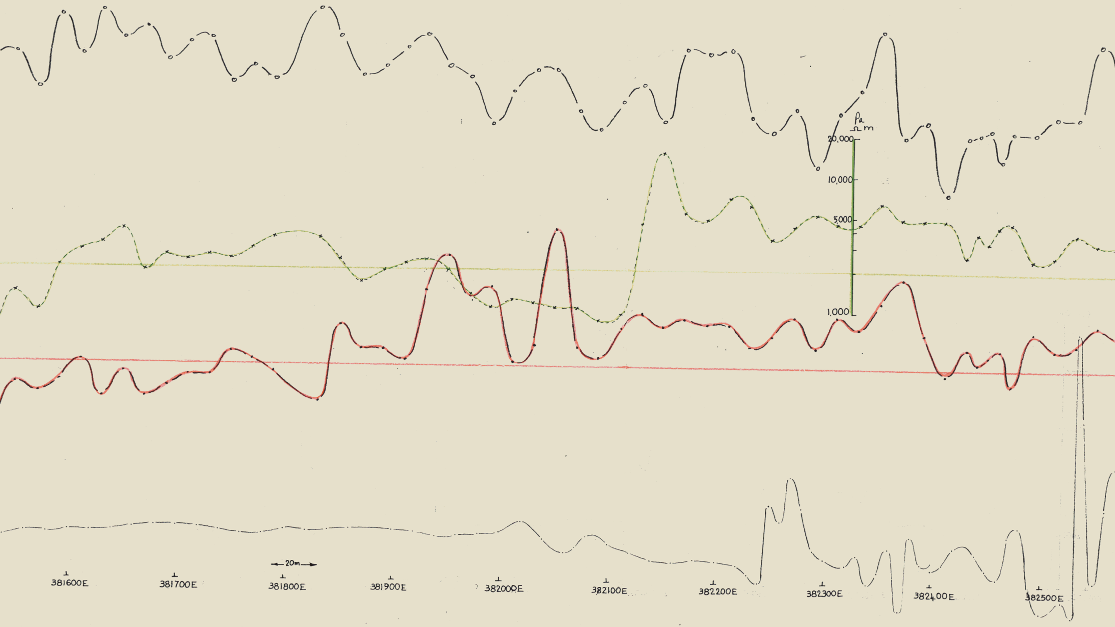

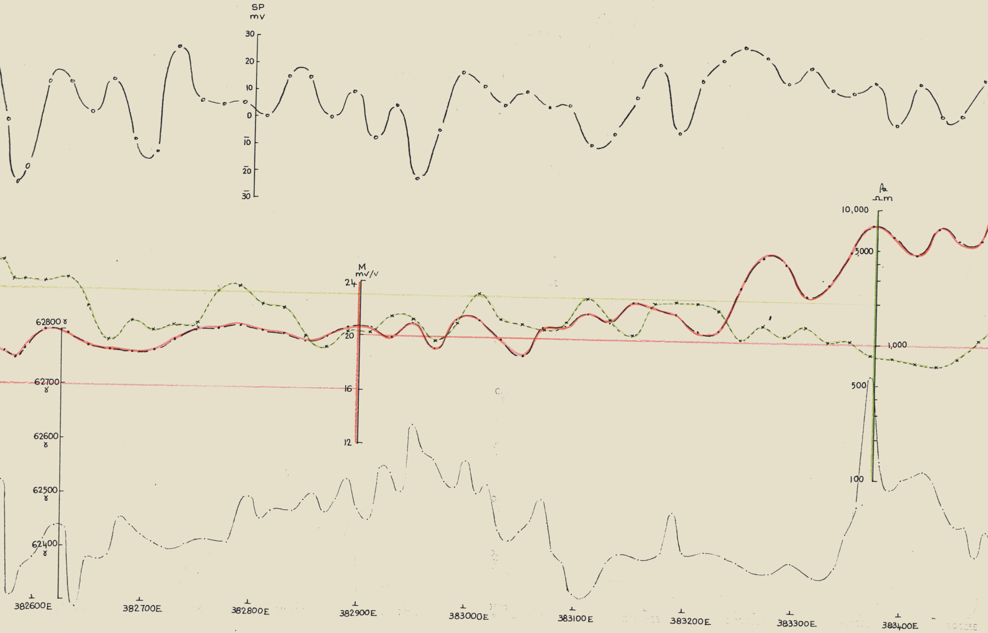

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LINE 378000N

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MAGNETICS &
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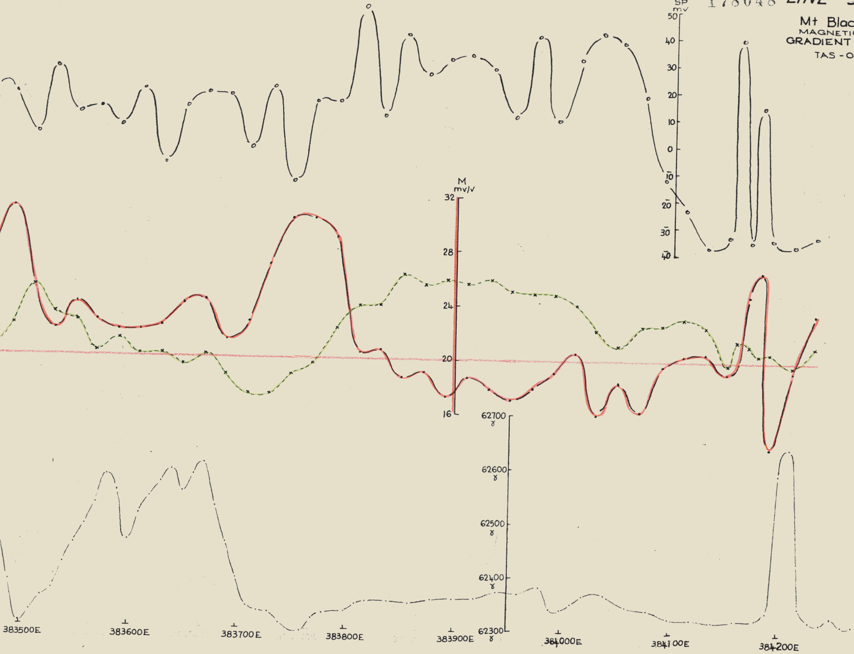

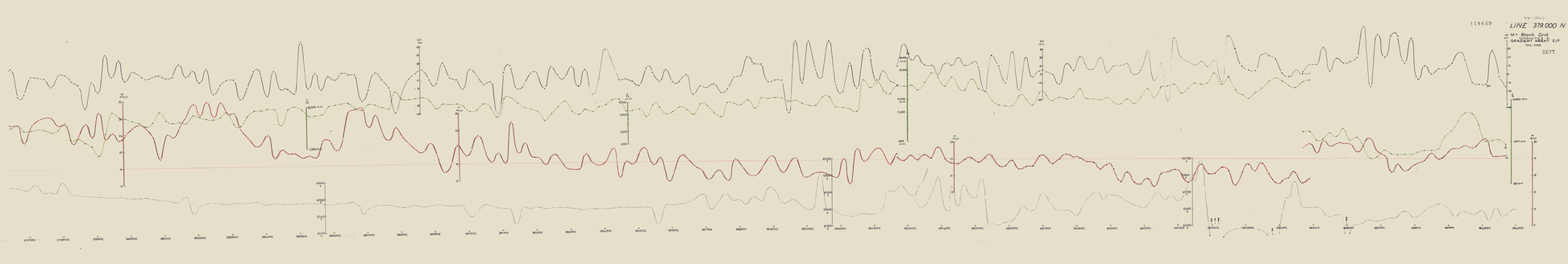
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5 Area identification number

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KEUFFEL & ESSER CO. MADE IN U.S.A.

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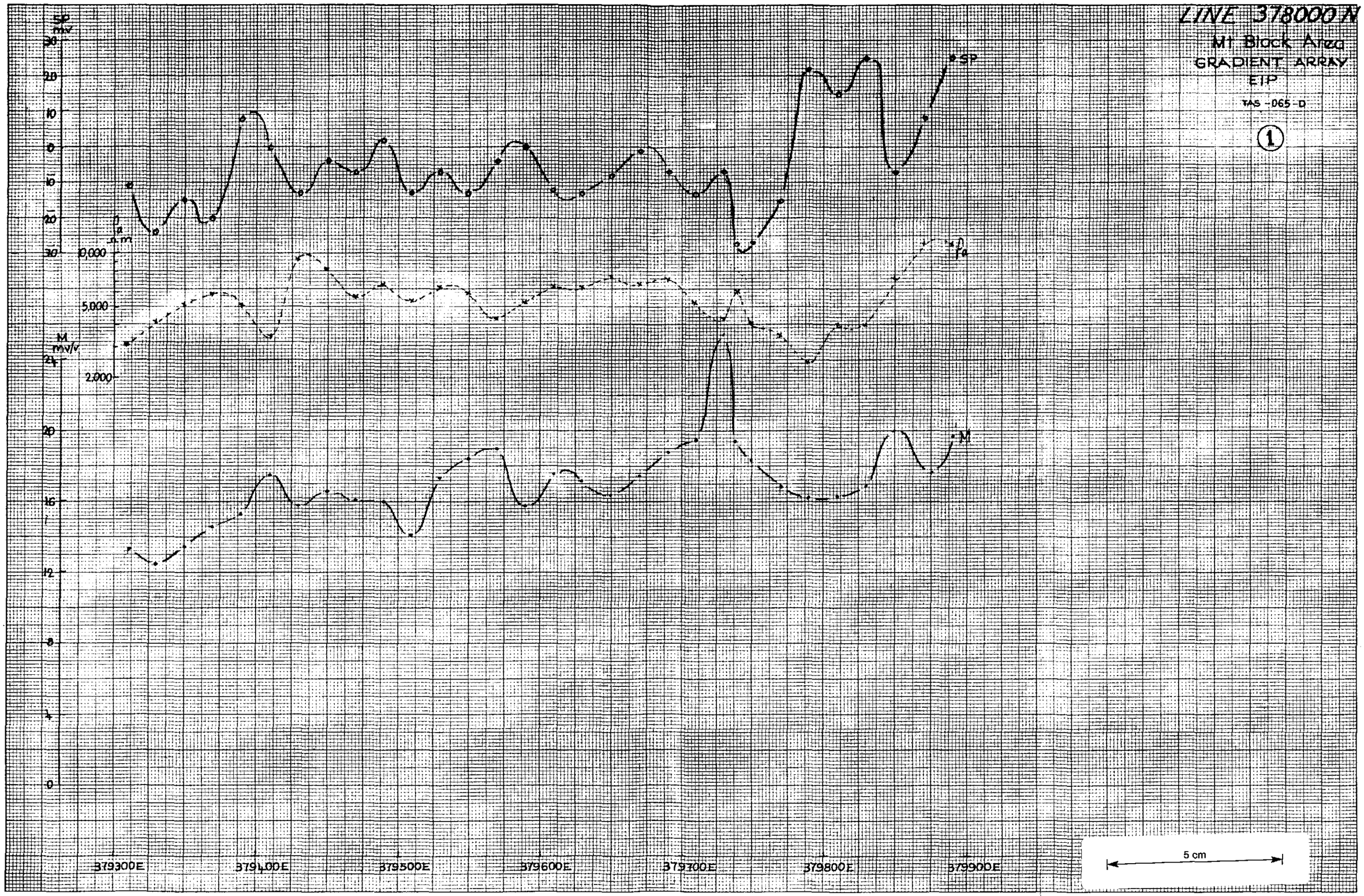

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0

SP

ρ_a

M

379310E
379400E
379500E
379600E
379700E
379800E
379900E

5 cm

47 1516

K+E 10 X 10 TO THE CENTIMETER • 25 X 38 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

79-1342

178054

LINE 377300 N

Mt Black Area

GRADIENT ARRAY IP

TAS-065D

(2)

SP

ρ_a

M

5 cm

TG-1342

047

178055

LINE 377100 N

Mr Block Area

GRADIENT ARRAY EIP

TAS-065D

(2)

SP
mV
20
10
0
10
20
30
50

ρa
ohm-m
10,000
5,000
2,000
1,000

M
mV/V
20
16
12
8
4
0

SP

ρa

M

5 cm

379300E 379400E 379500E 379600E 379700E

79-1342

048

178056

LINE 377000 N

Mt Block Area

GRADIENT ARRAY E.I.P.

TAS-065-D

(2)

SP mv

10

0

10

ρ_a ohm-m

20

15,000

10,000

30

5,000

3,000

M mv/v

24

20

16

12

8

4

0

SP

ρ_a

M

5 cm

379300E

379400E

379500E

379600E

379700E

79-1342

049

79-1342

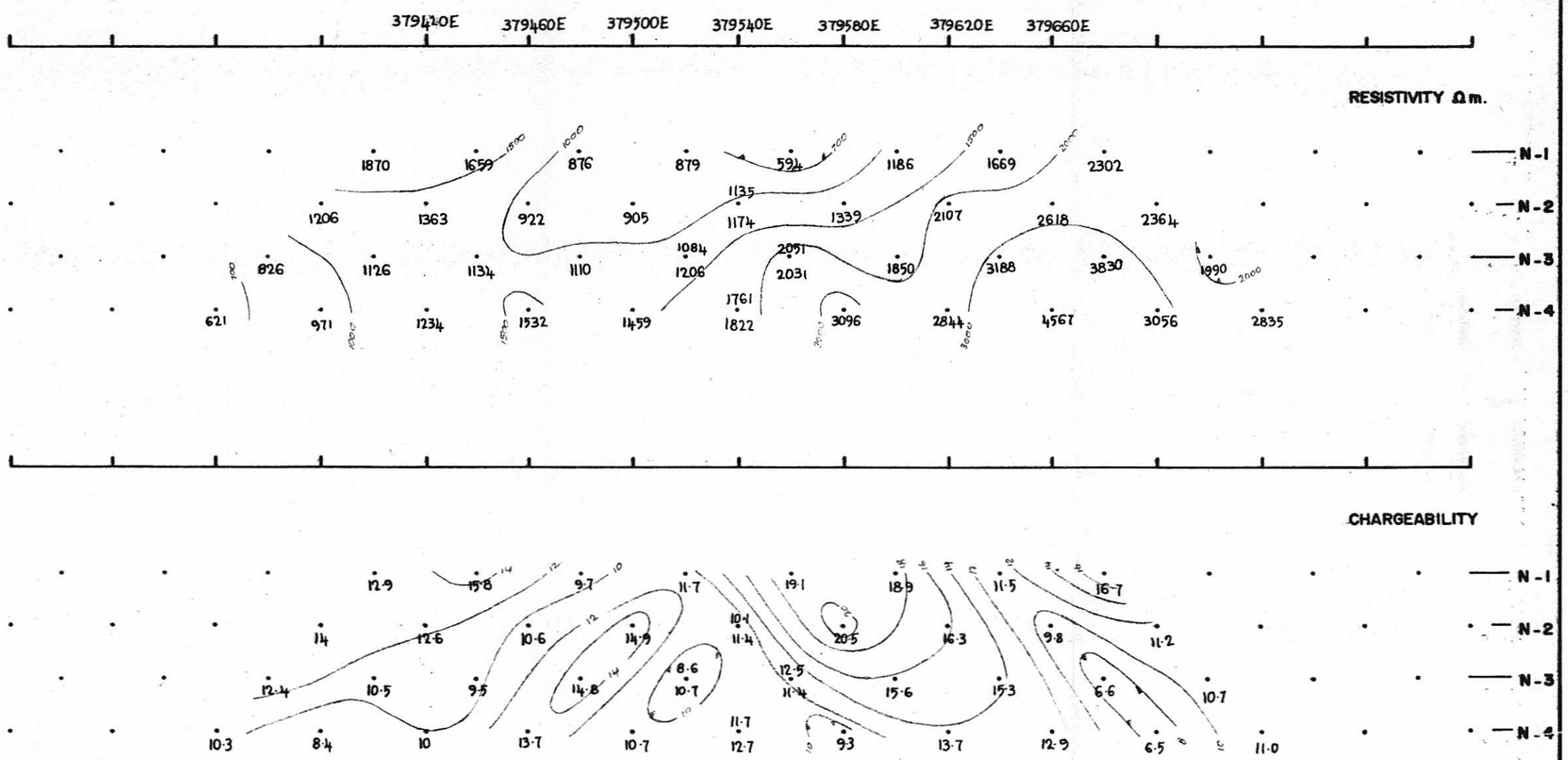
178057

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 23·5·79	LINE No. 5,377,000 N
PLOTTED BY DJTW	PROSPECT MT BLACK (2)
PULSE 2 sec / Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40 m	



5 cm

050

LINE 376900 N

Mt Black Area

GRADIENT ARRAY E-P

TAS-065-D

(2)

178058

SP
mv
20
10
0
10
20
30

ρa
Ωm
20,000
10,000
5,000
2,000
1,000

M
mv/v
24
16
12
8
4
0

SP

ρa

M

5 cm

379300E
379400E
379500E
379600E
379700E

79-1342,

051

47 1516

K&E 10 X 10 TO THE CENTIMETER 25 X 38 CM. KEUFFEL & ESSER CO. MADE IN U.S.A.

LINE 377900 N

Mt Black Area

GRADIENT ARRAY EIP

TAS-065-D

③

SP mv

30 20 10 0 10 20

ρ_a ohm-m

20,000 10,000 5,000 2,000

M mv/v

20 16 12 8 4 0

SP

ρ_a

M

5 cm

380500E 380600E 380700E 380800E 380900E 381000E 381100E 381200E 381300E

79-1342

052

LINE 378000 N

Mt Black Area

GRADIENT ARRAY

EIP

TAS-065-D

③

SP mV

40 30 20 10 0 -10 -20

ρ_a Ω-m

20,000 10,000 5,000 1000

SP

ρ_a

M mV/V

20 16 12 8 4 0

M

380500E 380600E 380700E 380800E 380900E 381000E 381100E 381200E

5 cm

178060

47 1516

K·E 10 X 10 TO THE CENTIMETER 25 X 38 CM. KEUFFEL & ESSER CO. MADE IN U.S.A.

279-1347

053

LINE 378100 N

Mt Black Area

GRADIENT ARRAY

EIP

TAS-065-D

(3)

SP

mv

20

0

20

ρ_a

ohm m

40,000

10,000

5,000

2,000

1,000

M

mv/V

20

16

12

8

4

0

SP

ρ_a

M

CREEK

← 1SEC. TIMING →

5 cm

380500E

380600E

380700E

380800E

380900E

381000E

381100E

381200E

178061

79-13442

47 1516

K&E 10 X 10 TO THE CENTIMETER • 25 X 38 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.

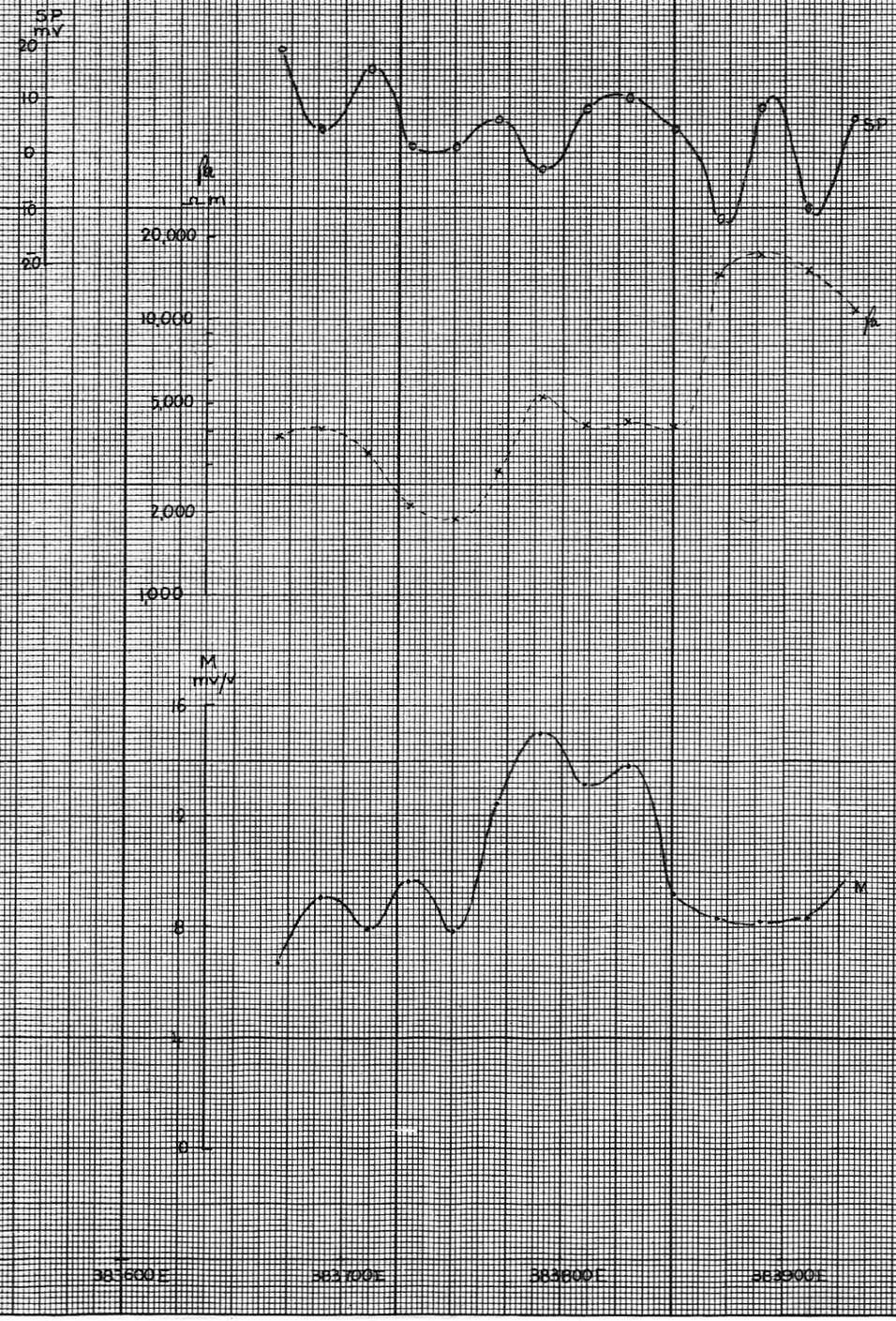
LINE 378300 N

Mt Black Area

GRADIENT ARRAY IP

TAS-065D

(4)



5 cm

79-1342.

054

178062

055

128063

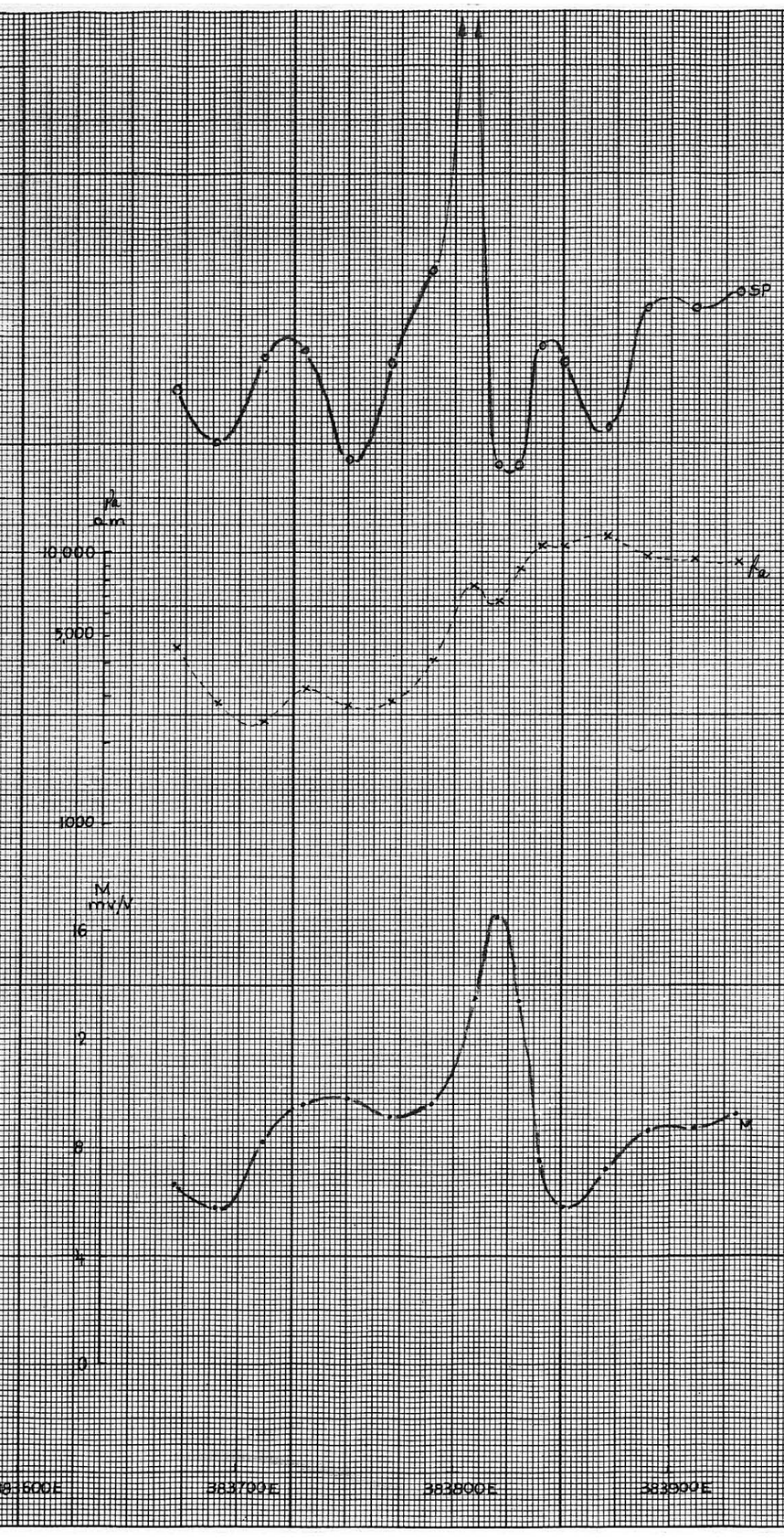
LINE 378100 N

Mt Block Area

GRADIENT ARRAY E1P

TAS-0.65-D

(4)



5 cm

79-1342-

056

LINE 378000 N

Mt Black Area

GRADIENT ARRAY E.I.P.

TAS-065 D

4

178064

SP
mV
30
20
10
0

ρ_a
Ωm
20,000
10,000
5,000
2,000
1,000

M
mv/V
6
4
2
0

SP

ρ_a

M

3836000E
3837000E
3838000E
3839000E
3840000E

5 cm

79-1342

057

79-1342

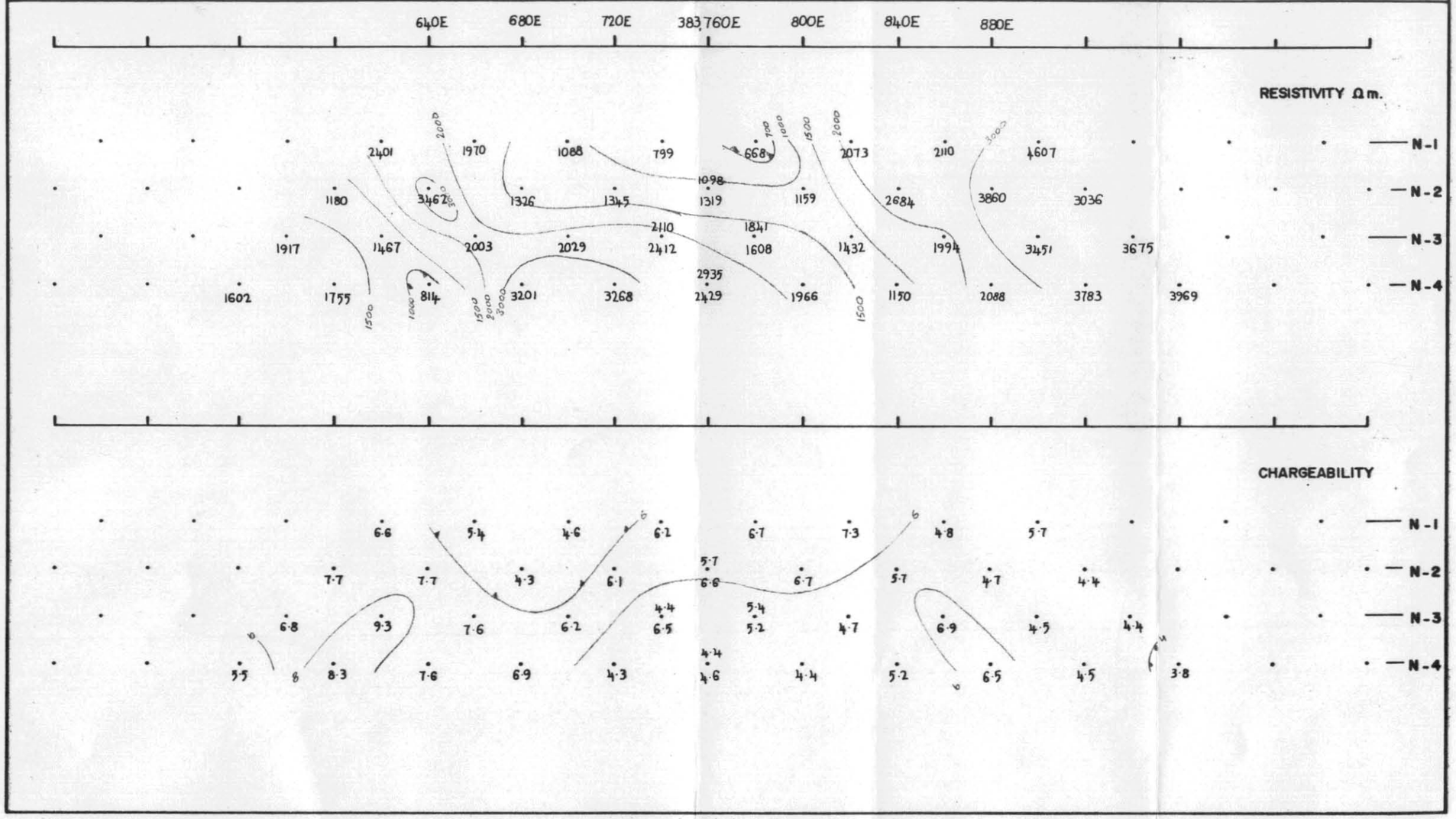
178065

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 3·6·79		LINE No. 5.378.000 N
PLOTTED BY DJTW		PROSPECT MT. SALE (4)
PULSE 2 sec	Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40m		



5 cm

053

LINE 371900N

MT Black Area

GRADIENT ARRAY I.P.

TAS-065D

(4)

SP mV

20

10

0

-10

-20

SP

ρ_a Ω.m

20000

10000

5000

2000

R

M mV/V

16

12

8

4

0

M

5 cm

383600E

383700E

383800E

383900E

7198600mN

79-342

059

LINE 377700N

Mt Black Area

GRADIENT ARRAY E1P

TAS-065-D

(4)

79 - 13482

060

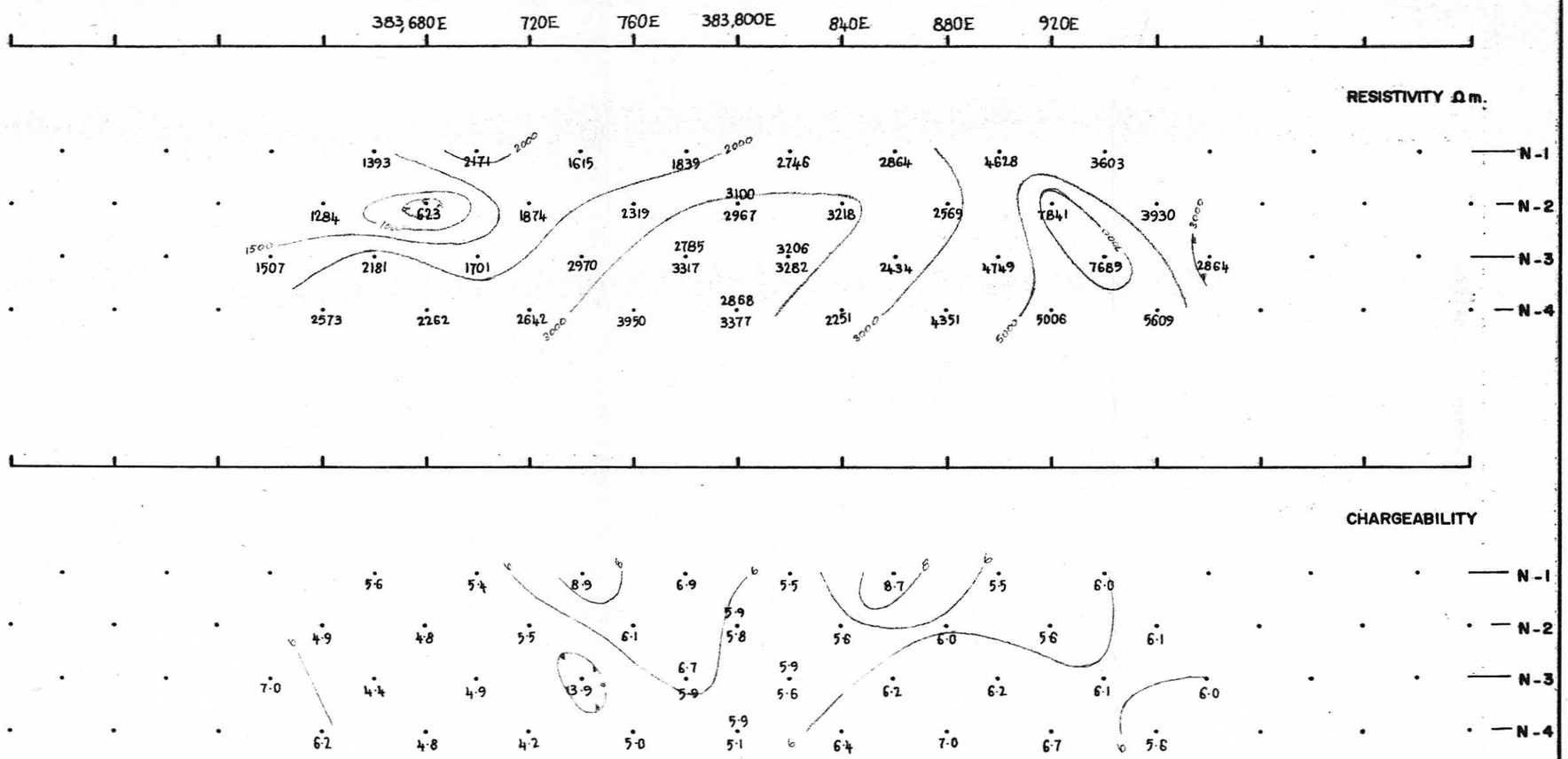
79-1342 178068

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 2-6-79	LINE No. 5,377,500 N
PLOTTED BY D.J.T.W.	PROSPECT MT. SALE (4)
PULSE 2 Sec. / Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40 m	



5 cm

LINE 376500 N

Mt Block Area

GRADIENT ARRAY

EIP

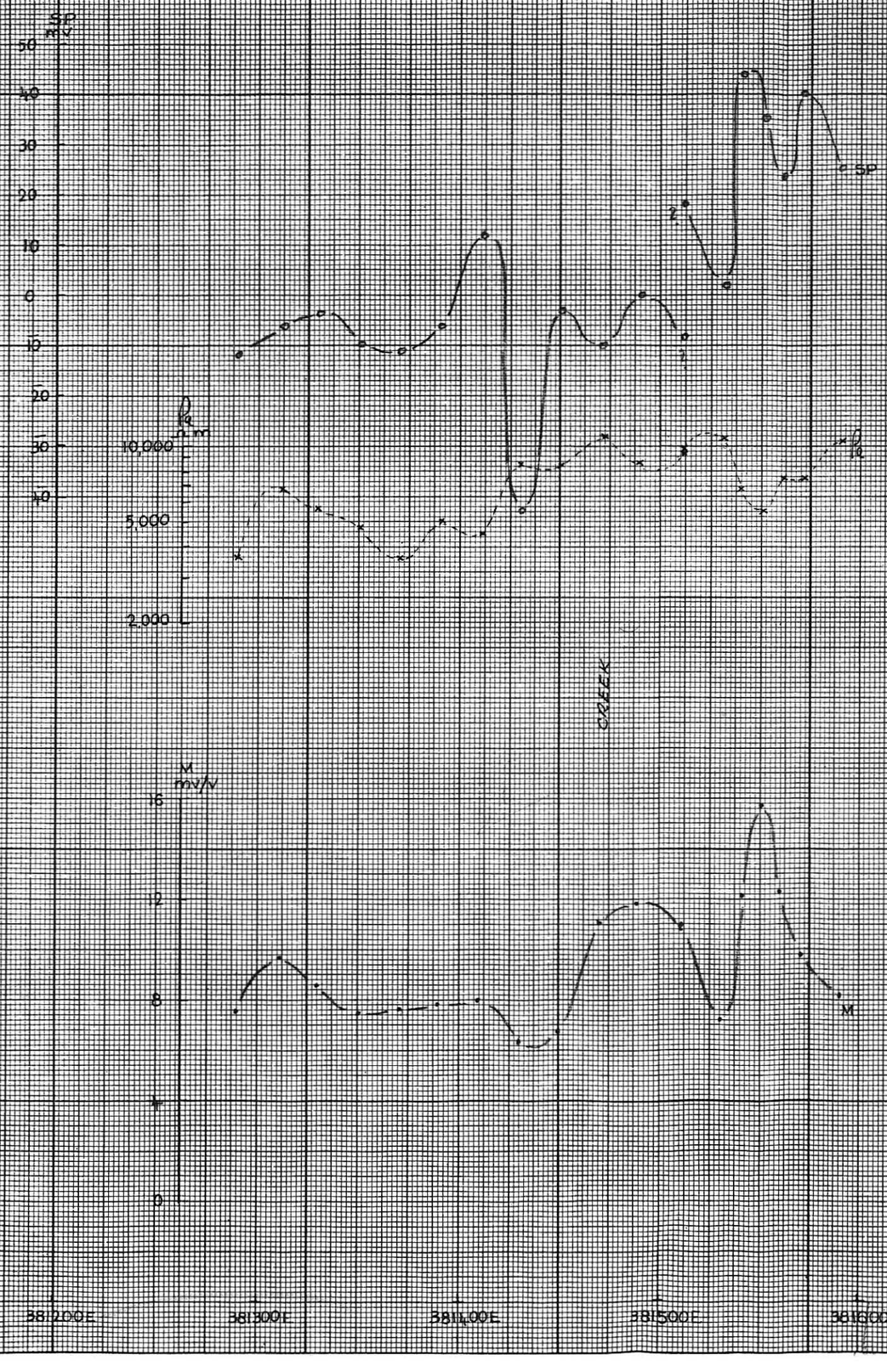
TAS-062-D

(5)

061

178069

79-1342



5 cm

LINE 376300 N
Mt Block Area
GRADIENT ARRAY
E.I.P.
TAS-065-D
(5)

062

12807

SP
mV
40
30
20
10
0
10

SP

ρ_a
Ω m
10,000
5,000
2,000
1,000

ρ_a

M
mV/V
16
12
8
4
0

M

5 cm

381300E
381400E
381500E
381600E

79-1342

063

LINE 376/00N

Mt Black Area

GRADIENT ARRAY

EIP

TAS-065-D

(5)

1:50:1

SP mV

30 20 10 0 10 20 30 40

ρ_a Ω-m

10,000 5,000 2,000 1,000

M mV/V

16 12 8 4 0

SP

ρ_a

M

5 cm

380800E 380900E 381000E 381100E 381200E 381300E 381400E 381500E 381600E

79-1342.

064

LINE 376000 N

Mt Black Area

GRADIENT ARRAY

E.I.P.

TAS-065-D

(5)

18072

SP

mV

60
50
40
30
20
10
0
10
20

ρ_a

Ωm

10,000
5,000
2,000
1,000

M

mV/V

24
20
16
12
8
4
0

ρ_a

M

5 cm

3808000E
3809000E
3810000E
3811000E
3812000E
3813000E
3814000E
3815000E
3816000E

Y 78-1342

065

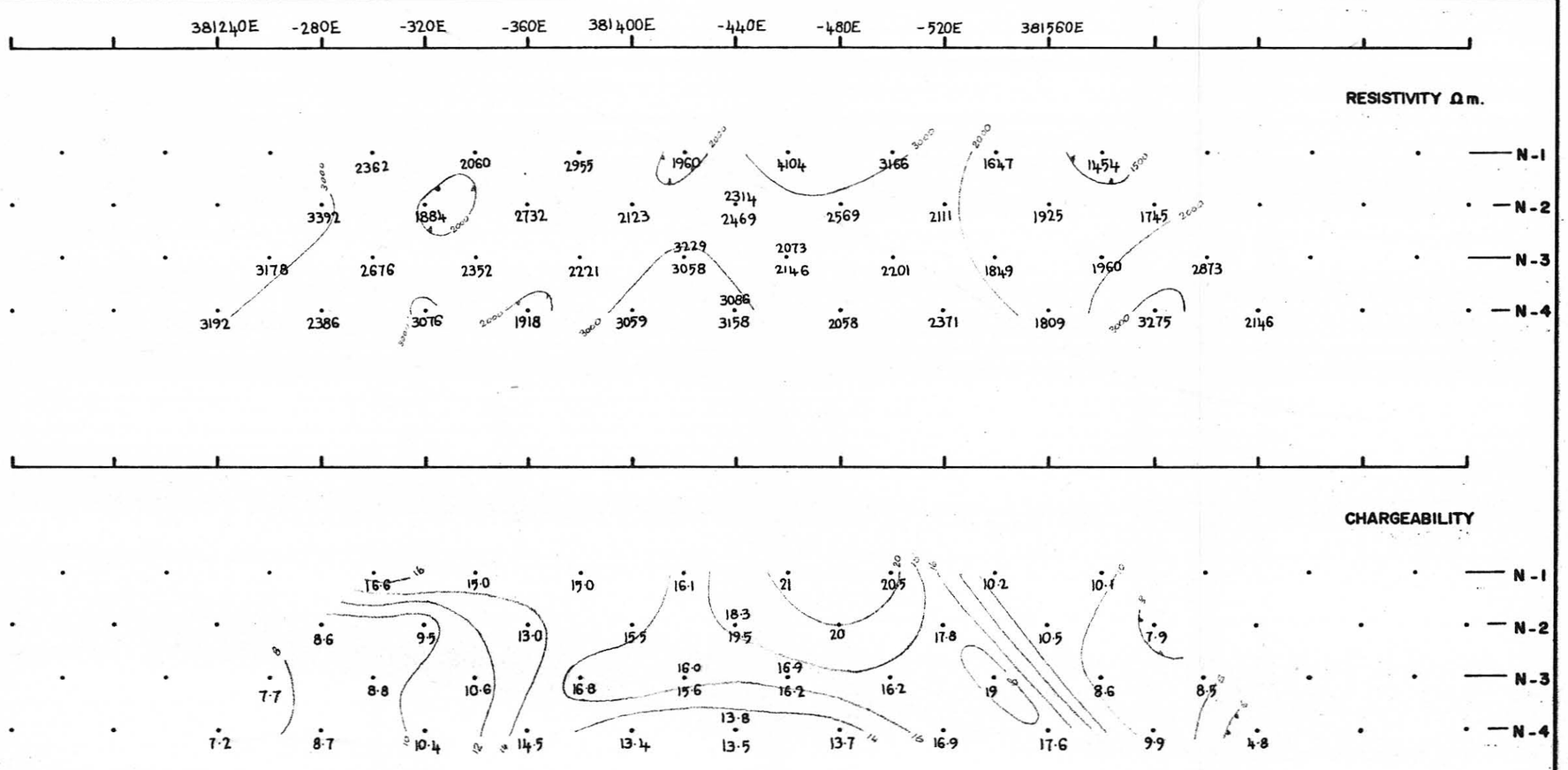
79-1342 - 178073

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 21-5-79		LINE No. 5376000 N
PLOTTED BY DJTW		PROSPECT MT. BLACK (5)
PULSE 2 Sec	Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40 m		



5 cm

LINE 375900 N
Mt Black Area
GRADIENT ARRAY
E.I.P.
TAS-065-D
(5)

990

SP
mv
20
10
0
10
20
30
40

ρa
Ω.m
20,000
10,000
5,000
2,000
1,000

M
mV/V
20
16
12
8
4
0

? 74
? 106
? 78
? 69
SP
ρa
M

5 cm

380900E
381000E
381100E
381200E
381300E
381400E
381500E
381600E

A78174

79-1342

LINE 375700 N

Mt Block Area

GRADIENT ARRAY

EIP

TAS-065-D

(5)

1780'S

79-1342

290

SP mv

0

10

20

30

40

ρ_a ohm-m

20,000

10,000

5,000

2,000

M mv/v

20

16

12

8

4

0

SP

ρ_a

M

5 cm

380600E 380900E 381000E 381100E 381200E 381300E 381400E 381500E 381600E

LINE 375500 N

Mt Black Area

GRADIENT ARRAY

E.I.P.

TAS-065-D

(5)

79-1342

17807G

SP mV

40 30 20 10 0 -10 -20

Pa Ω-m

20,000 10,000 5000 2,000

M mV/V

20 16 12 8 4 0

SP

Pa

CREEK

CREEK

5 cm

380700E 380800E 380900E 381000E 381100E 381200E 381300E 381400E 381500E

069

79-1342

178077

SCINTREX PTY. LTD.

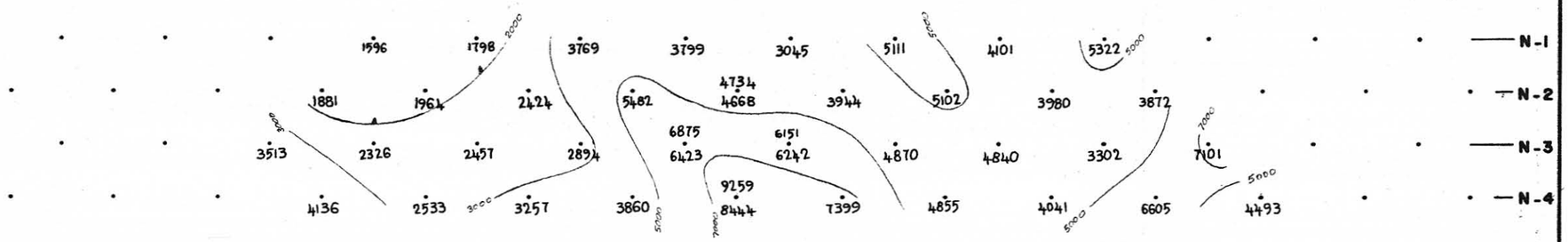
INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

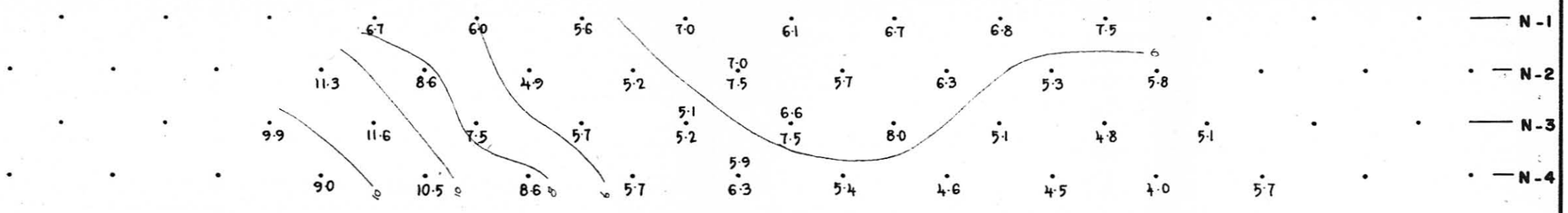
DATE 29·5·79	LINE No. 5,377,700 N
PLOTTED BY D J T W	PROSPECT MT. SALE (6)
PULSE 2 sec / Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40 m	

382360E -400E 382440E -480E -520E 382560E -600E -640E 382680E -720E

RESISTIVITY Ω m.



CHARGEABILITY



5 cm

79-1342

178078

SCINTREX PTY. LTD.

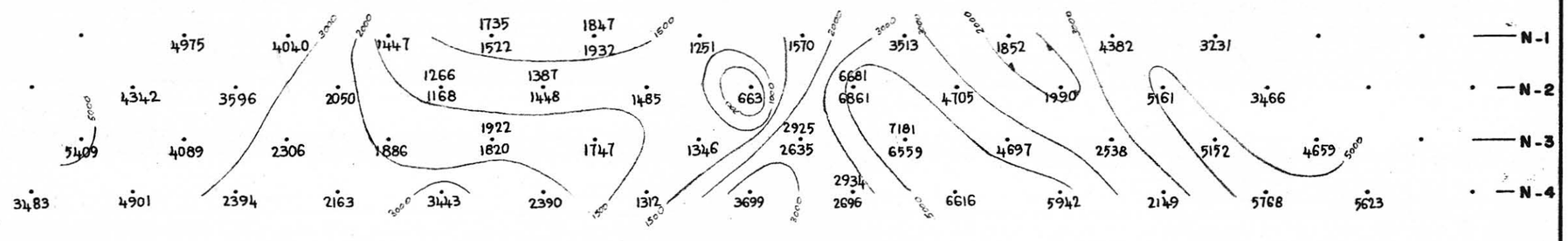
INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

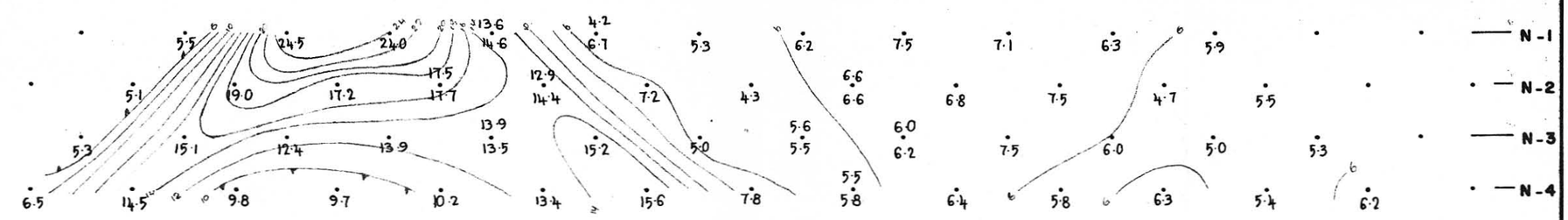
DATE 28-5-79 / 31-5-79	LINE No. 5377,500 N
PLOTTED BY DJTW	PROSPECT MT. SALE (6)
PULSE 2 sec / Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40m	

382240E -280E -320E 382360E -400E -440E 382480E -520E 560E 382600E -640E -680E 382720E

RESISTIVITY Ωm.



CHARGEABILITY



5 cm

071

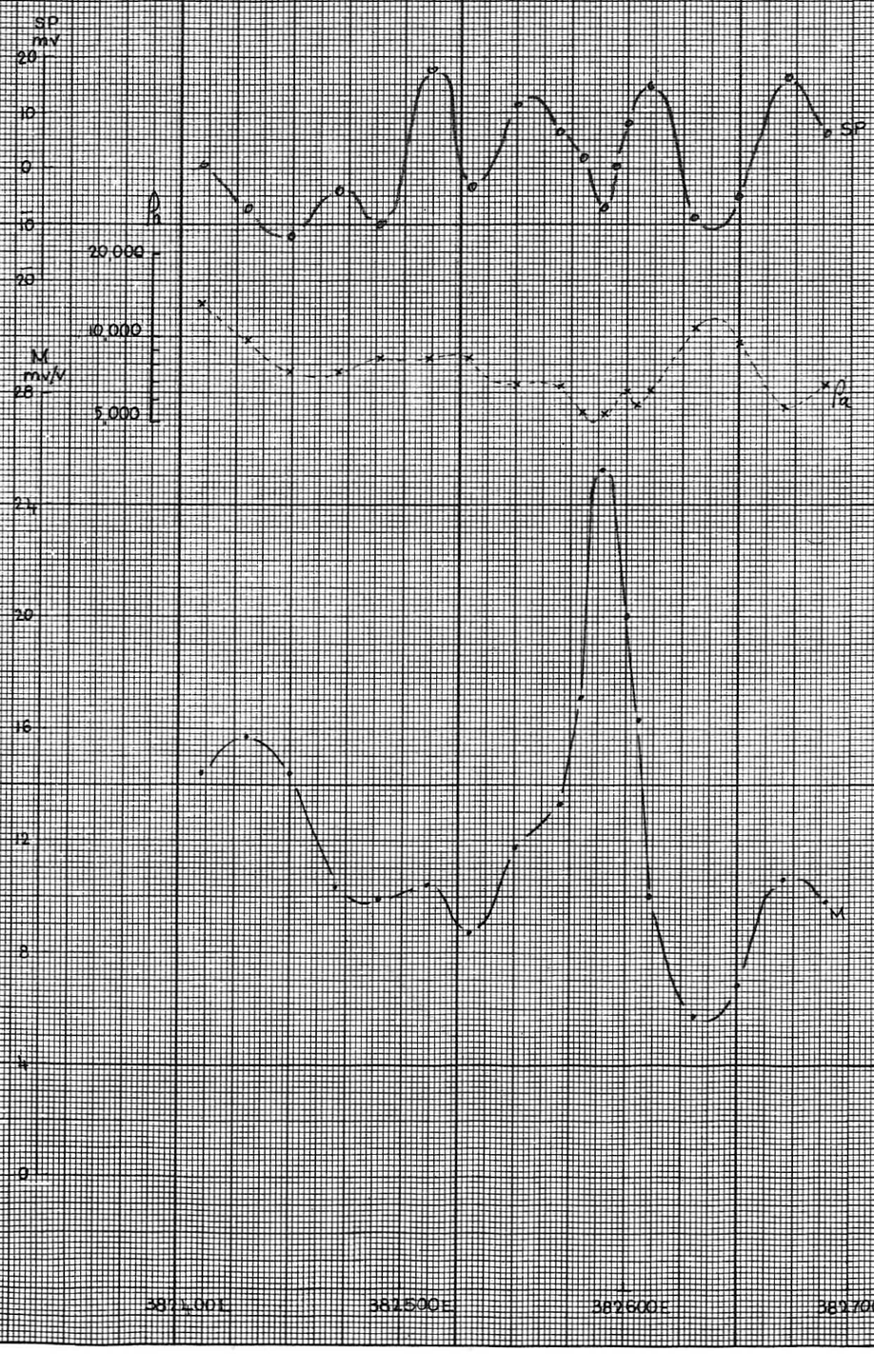
LINE 377300N

Mt Black Area

GRADIENT ARRAY EIP

TAS-065-D

(6)



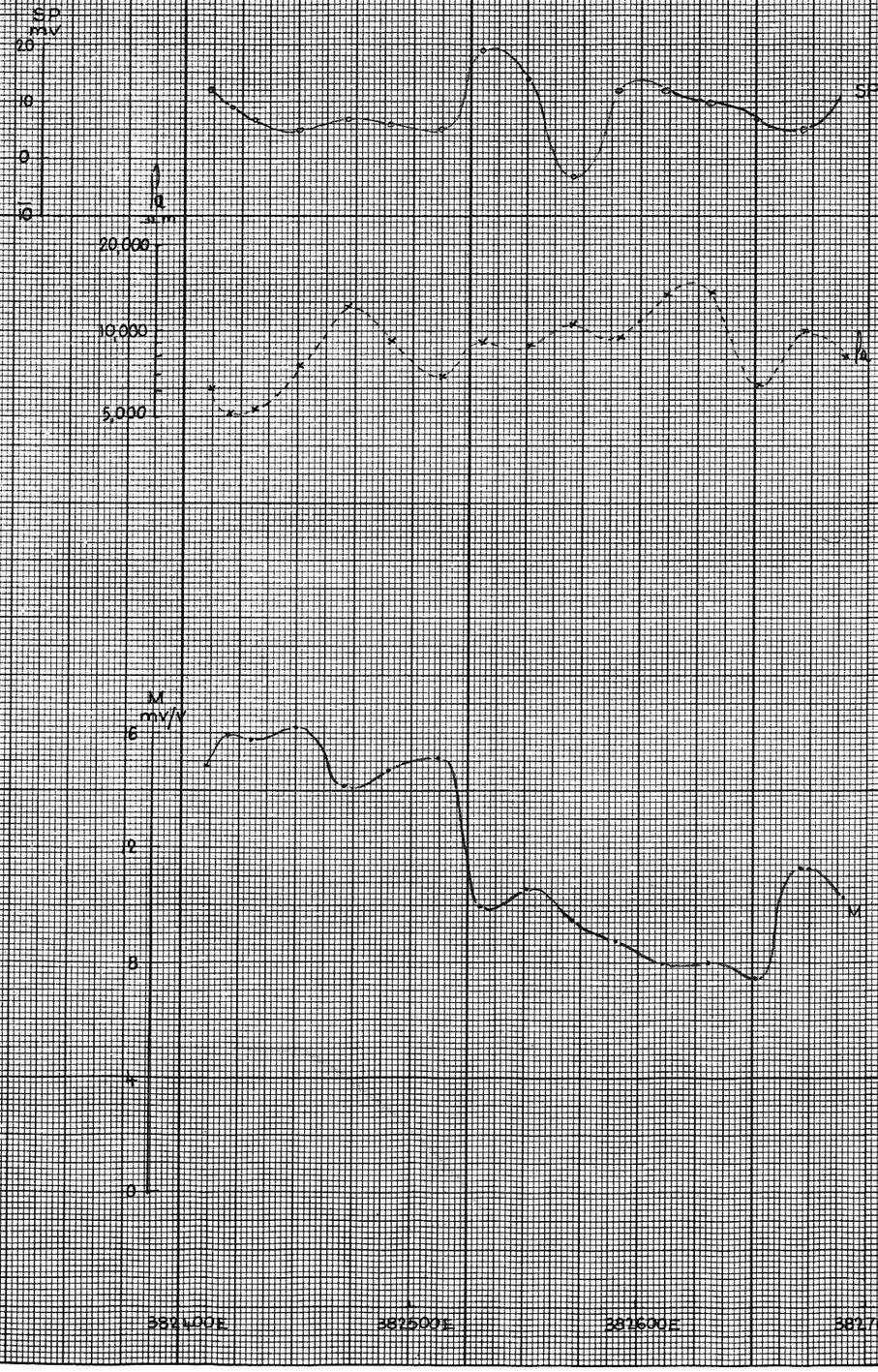
17807 9

79-1342

LINE 377100N
Mt Black Area
GRADIENT ARRAY IP
TAS-065 D
(6)

178080

79-1342



073

LINE 371000 N

Mt Black Area

GRADIENT ARRAY EIP

TAS-065-D

(6)

178081

79-1342

SP

mV

40

30

20

10

0

10

ρ_a

ohm.

20,000

10,000

4,000

M

mV/V

28

24

20

16

12

8

4

0

SP

ρ_a

M

5 cm

382400E

382500E

382600E

382700E

074

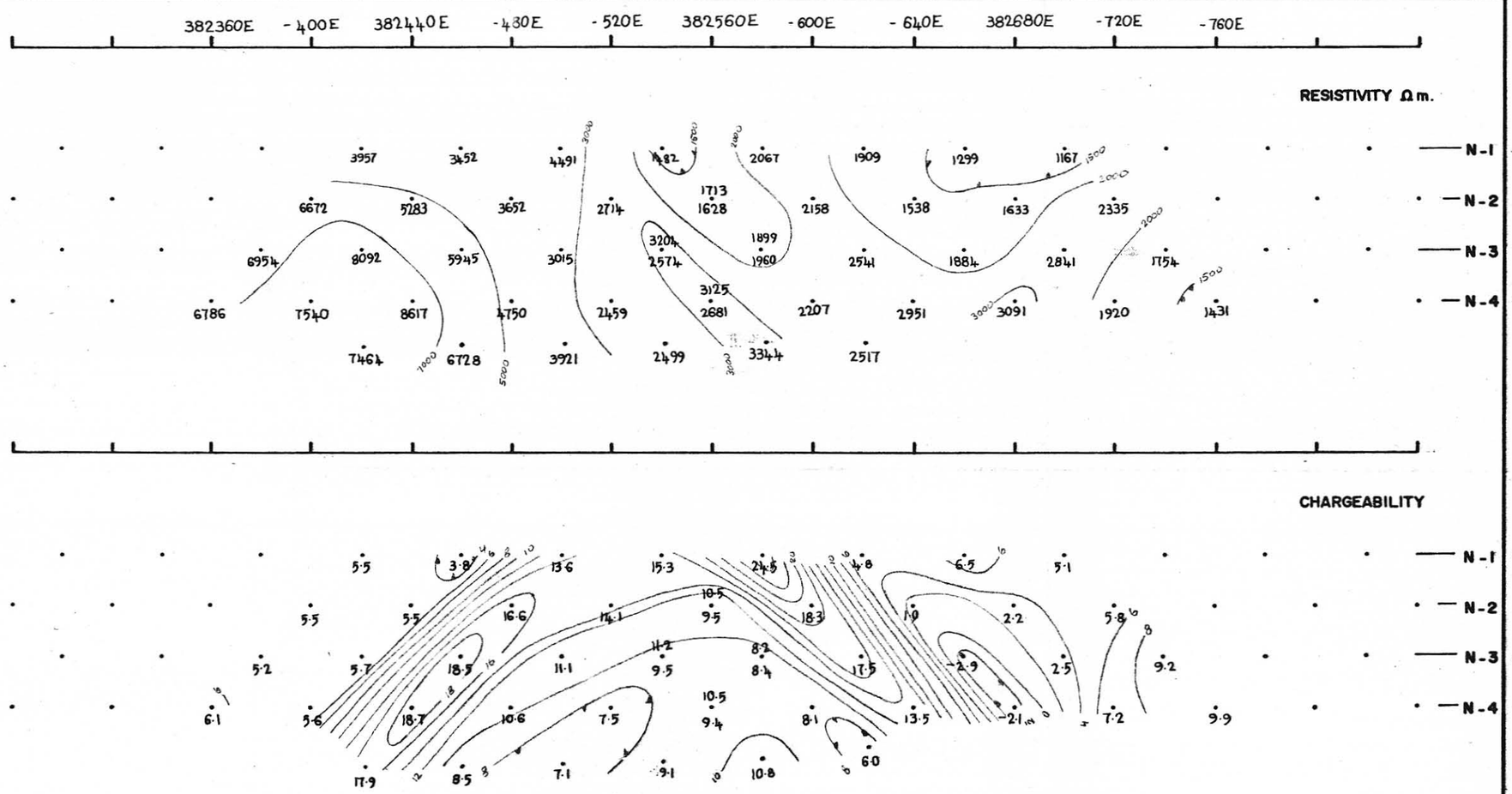
79-1342 178082

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

DIPOLE - DIPOLE ARRAY

DATE 25-5-1979	LINE No. 5,377,000 N
PLOTTED BY D.J.T.W	PROSPECT MT. SALE (6)
PULSE 2 Sec / Rx.	JOB No. TAS-065-D
DIPOLE SPACING 40 m	



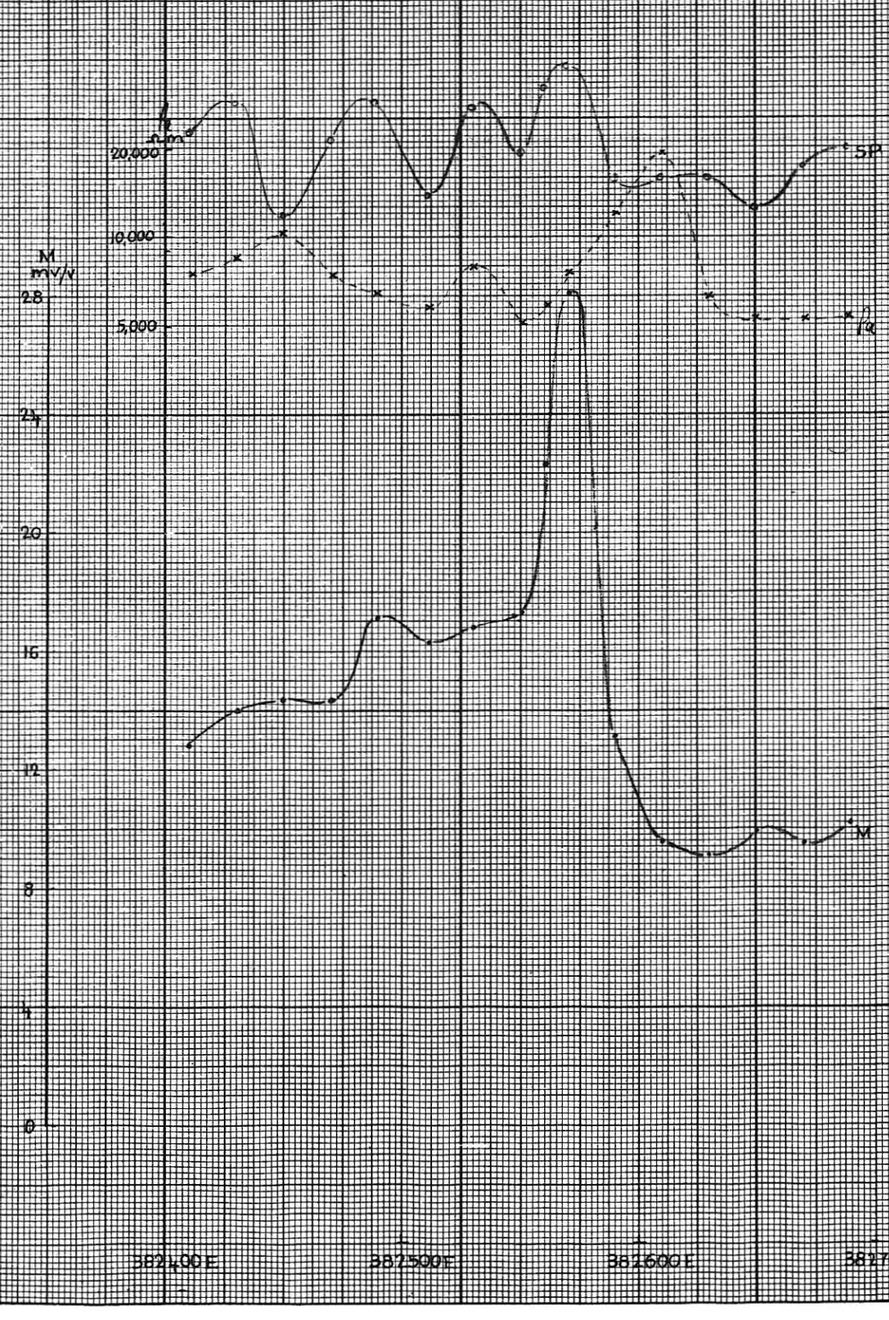
5 cm

LINE 376900 N
Mt Block Area
GRADIENT ARRAY
EIP
TAS-065-D
(6)

075

178083

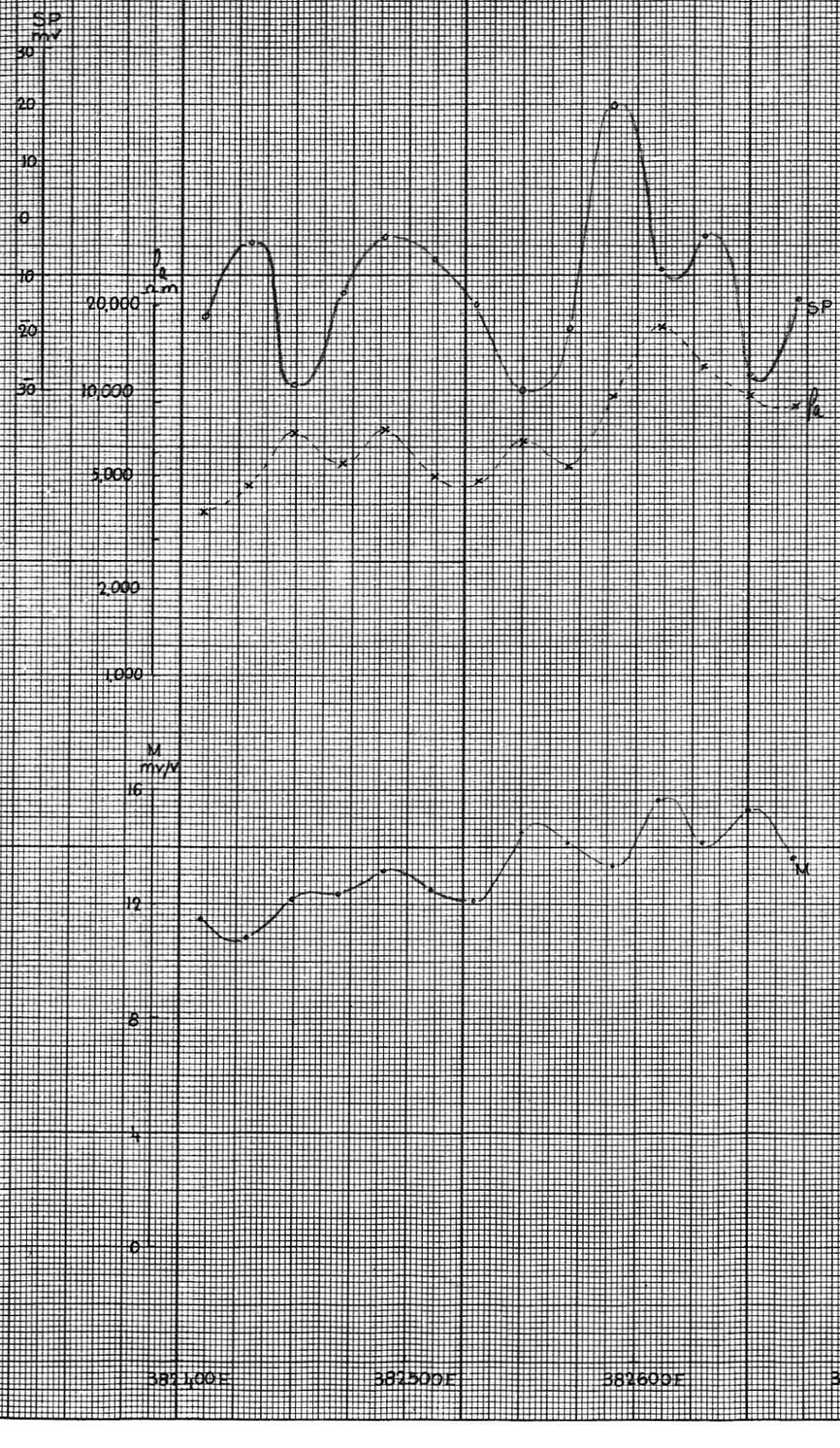
79-1347

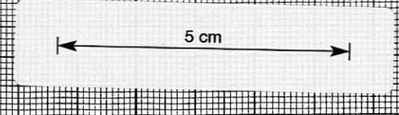


5 cm

076
178084

LINE 376700 N
Mt Black Area
GRADIENT ARRAY EIP
TAS-065-D
(6)





79-1342

077
178085

LINE 376300 N

Mt Black Area

GRADIENT ARRAY E.I.P

TAS-065-D

(7)

SP
mv
50
40
30
20
10
0
10
20
30

Ra
ohm-m
20,000
10,000
5,000
2,000

CREEK

SP

Rα

M
mv/v
16
12
8
4
0

M

5 cm

382300E
382400E
382500E
382600E
382700E
382800E
382900E

79-1342

LINE 376100N

Mt Black Area

GRADIENT ARRAY

E.I.P.

JAS-065-D

(7)

078

178086

79-1342

SP
mv
30
20
10
0
10
20
30

ρ_a
Ω.m
10,000
5,000
2,000

M
mv/V
20
16
12
8
4
0

SP

ρ_a

M

5 cm

382300E
382400E
382500E
382600E
382700E
382800E
382900E

LINE 376000 N

Mt Black Area

GRADIENT ARRAY

ETP

TAS-065-D

(7)

SP mv

20
10
0
10
20
30
40

20,000
10,000
5,000
2,000
1,000

M mv/V

20
16
12
8
4
0

3821300E
3821400E
3821500E
3821600E
3821700E
3821800E
3821900E

5 cm

1780871

079

79-1342

LINE 375900 N

Mt Black Area

GRADIENT ARRAY

E I P

TAS-065-D

(7)

030

178088

79-1342

ρ_a ohm-m

40
30
20
10
0
10
20
30

20,000
10,000
5,000
2,000

SP

M mv/v

16
12
8
4
0

M

5 cm

382300E
382400E
382500E
382600E
382700E
382800E
382900E

LINE 375700 N
Mt Block Area
GRADIENT ARRAY
E - P
TAS-065-D
(7)

178089

79-1342

SP
mV
30
20
10
0
10
20
30

Ohm-m
20,000
10,000
5000
2,000

SP

COMPLEX

IP
mV/V
16
12
8
4
0

IP

5 cm

3812 00E
3812 400E
3812 800E
3813 200E
3813 600E
3814 000E
3814 400E

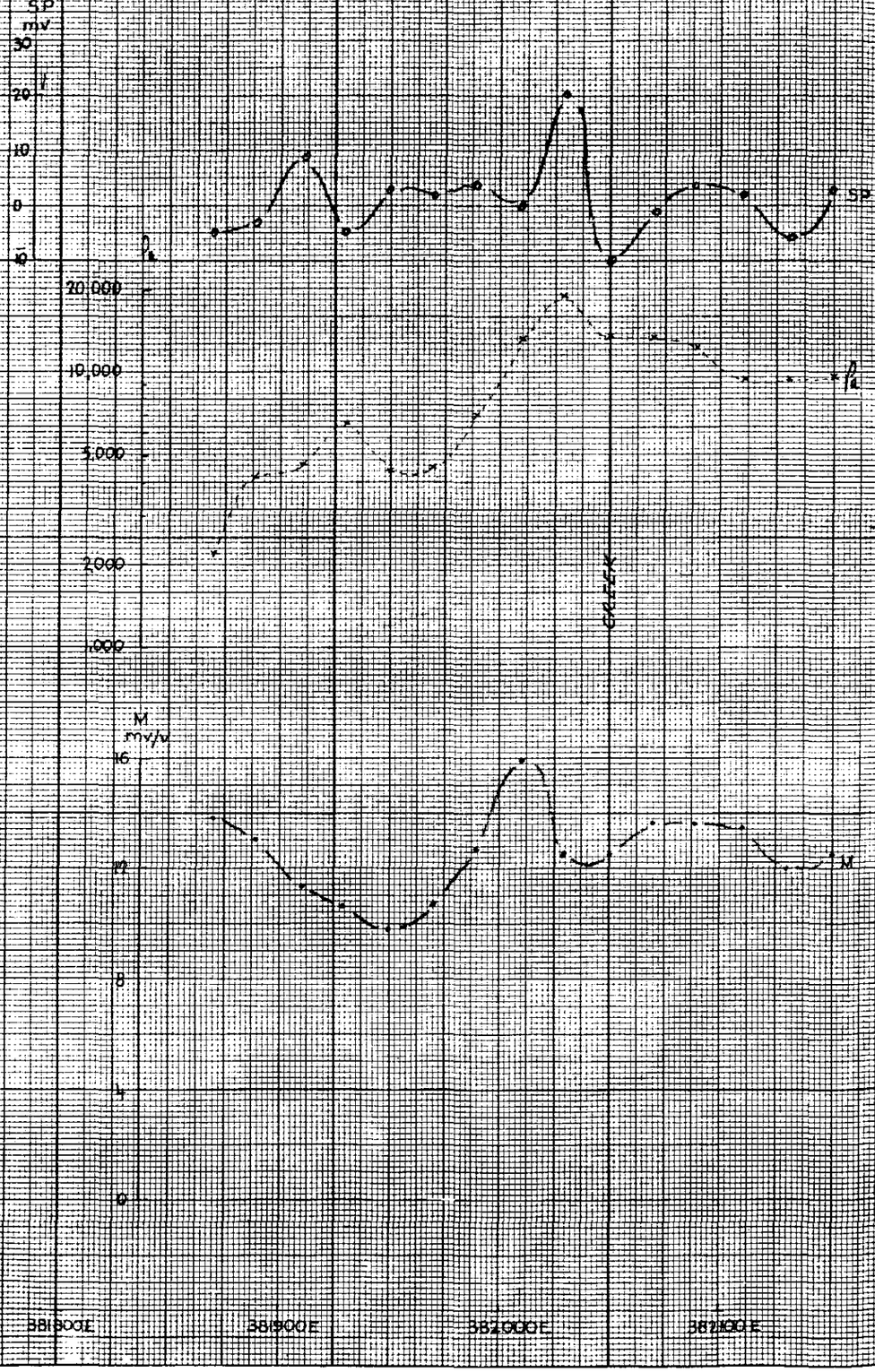
LINE 375100 N

MI Block Area

GRADIENT ARRAY IP

TAS-065-0

(8)



5 cm

280

060827

TG-1342

LINE 375000N

Mt Block Area

GRADIENT ARRAY EIP

TAS-065-D

(8)

083

178091

79-1342

SP mv

20

10

0

10

20

SP

R
Ω.m

20,000

10,000

5,000

3,000

M
mV/V

20

16

12

8

4

0

M

5 cm

381500E

382000E

382500E

LINE 374900 N

Mt Black Area

GRADIENT ARRAY IP

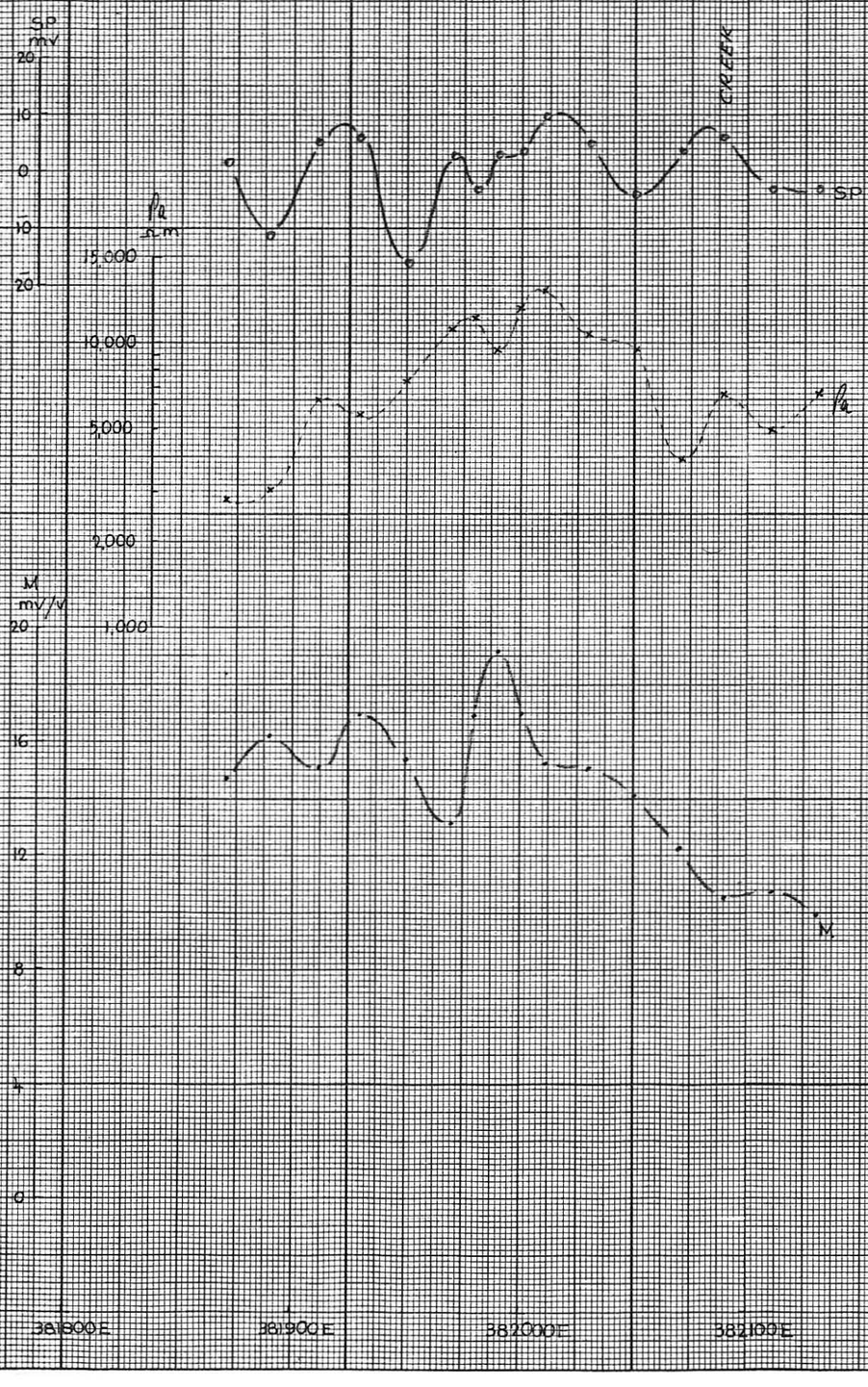
TAS-065-D

(8)

084

79-1342

17809



5 cm

085

79-134

178093

LINE 5378700 N

Longdons

GRADIENT ARRAY EIP

TAS-065-D

9

SP

30 20 10 0 10̄ 20̄ 30̄

ρ_a ohm m

20000

10000

5,000

M mv/v

20 16 12 8 4 0

5 cm

380000 E 380100 E 380200 E 380300 E 380400 E 380500 E 380600 E 380700 E 380800 E 380900 E

086

79-1342 178094

LINE 5378800N

Langdons

GRADIENT ARRAY IP

TAS-065-0

9

SP

20

10

0

10

SP

ρ Ωm

20,000

10,000

5000

1

M

80

16

12

8

4

0

5 cm

380 000E

380 100E

380 200E

380 300E

380 400E

380 500E

380 600E

380 700E

380 800E

380 900E

K&E 10 X 10 TO THE CENTIMETRE

46 1510

087

79-1342

LINE 5378900 N

Langdons

GRADIENT ARRAY EIP

TAS-065-D

(9)

178095

3°N

SP

20
10
0
-10
-20
-30
-40

ρ Ωm
20000
10,000
5000
2,000

M mV/V
24
20
16
12
8
4
0

SP

Pa

M

5 cm

380000E 380100E 380200E 380300E 380400E 380500E 380600E 380700E 380800E 380900E

088

79-1342 178096

SCINTREX PTY. LTD.

INDUCED POLARIZATION AND RESISTIVITY SURVEY

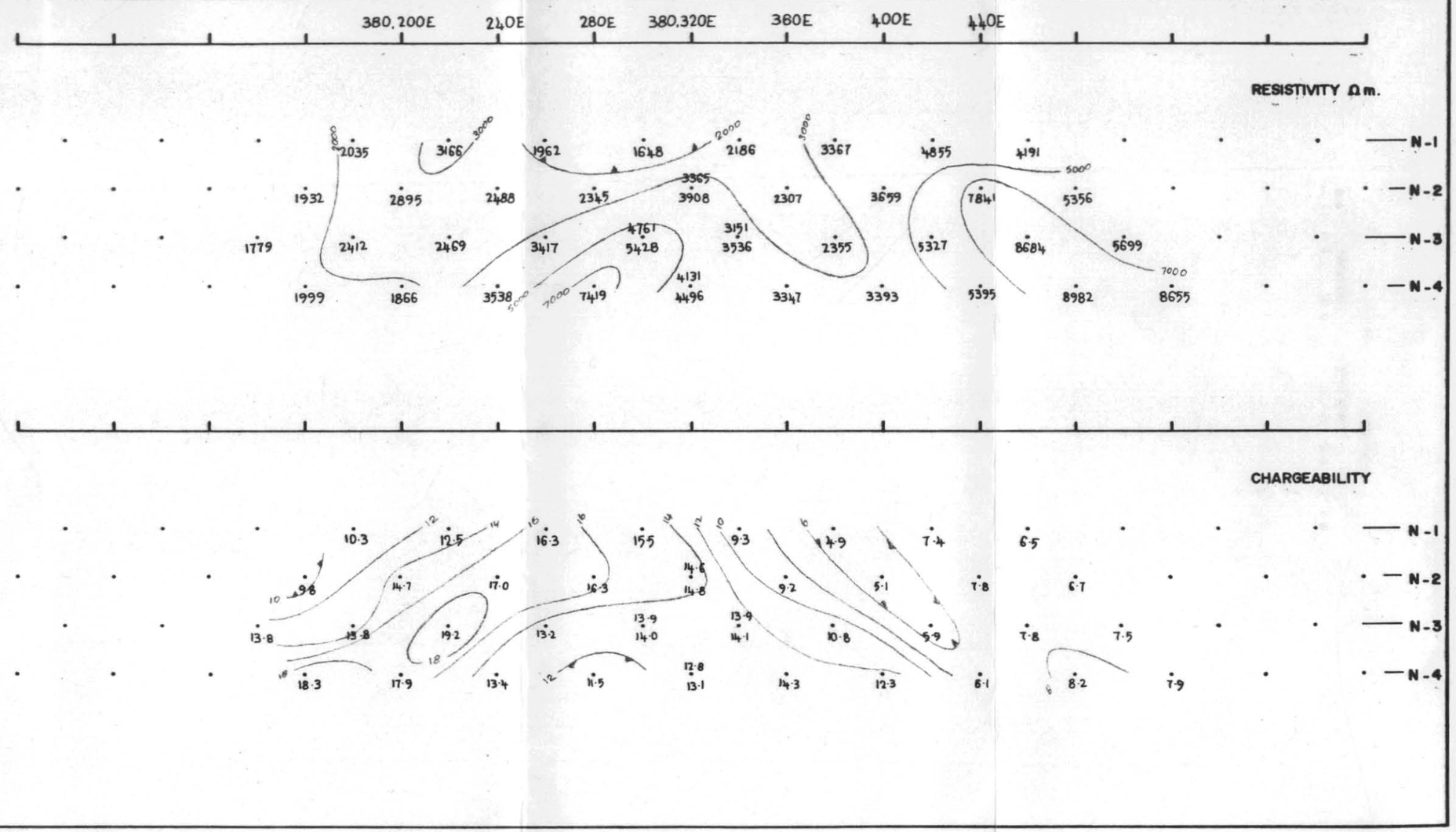
DIPOLE - DIPOLE ARRAY

DATE	6·6·79
PLOTTED BY	D.J.T.W
PULSE	2 sec
Rx.	
DIPOLE SPACING	40 m

LINE No. 5 378900 N

PROSPECT LANGDONS (9)

JOB No. TAS-065-D



5 cm

089

72-1342

178097

LINE 5379000 N

Longdons

GRADIENT ARRAY EIP

TAS-065-ID

9

SP

30
20
10
0
-10

ρ_a Ωm

20,000
10,000
5000
3000

ρ_a

M

mV/V

20
16
12
8
4
0

M

5 cm

380,000 E | 380,100 E | 380,200 E | 380,300 E | 380,400 E | 380,500 E | 380,600 E | 380,700 E | 380,800 E | 380,900 E

KEUFFEL & ESSER CO. MADE IN U.S.A.
10 X 10 TO THE CENTIMETER

79-1342 178098

LINE 5379100N

Langdons

GRADIENT ARRAY EIP

TAS-065-D

(9)

SP

91

40 30 20 0 −10 −20 −30

20,000 10,000 5000 2,000

M mv/V

20 16 12 8 4 0

5 cm

380,000E 380,100E 380,200E 380,300E 380,400E 380,500E 380,600E 380,700E 380,800E 380,900E

KEUFFEL & ESSER CO. MADE IN U.S.A.

72-79-1342 178099

091

K+E 10 X 10 TO THE CENTIMETER 46 1320
KEUFFEL & ESSER CO. MADE IN U.S.A.

LINE 5379200N

Langdons

GRADIENT ARRAY EIP

TAS-060-D

(9)

SP

20
10
0
-10
-20

ρ_a Ωm

10,000
5,000
2,000
1000

M mv/v

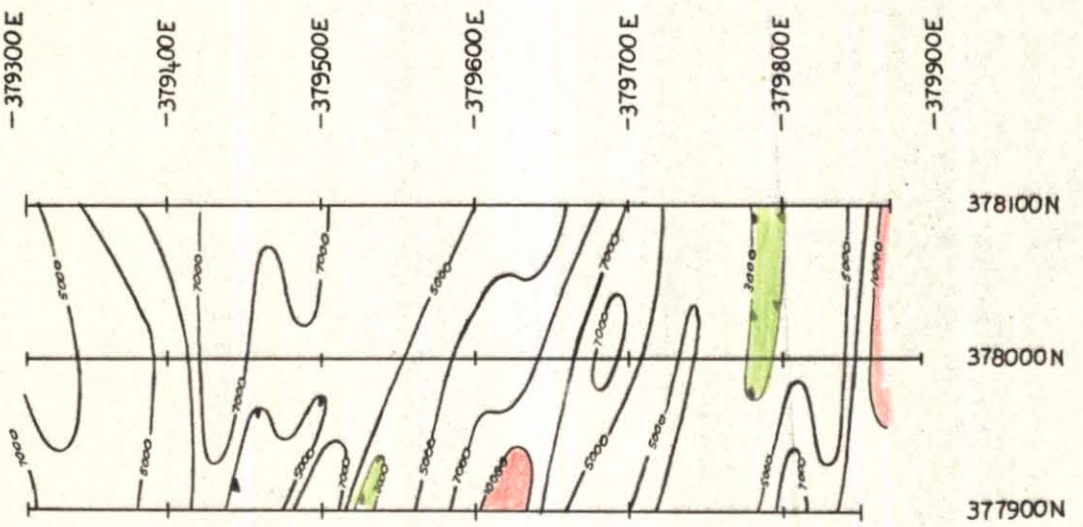
16
12
8
4
0

5 cm

380000E 380,100E 380,200E 380,300E 380,400E 380,500E 380,600E 380,700E

092

178100



(1)

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

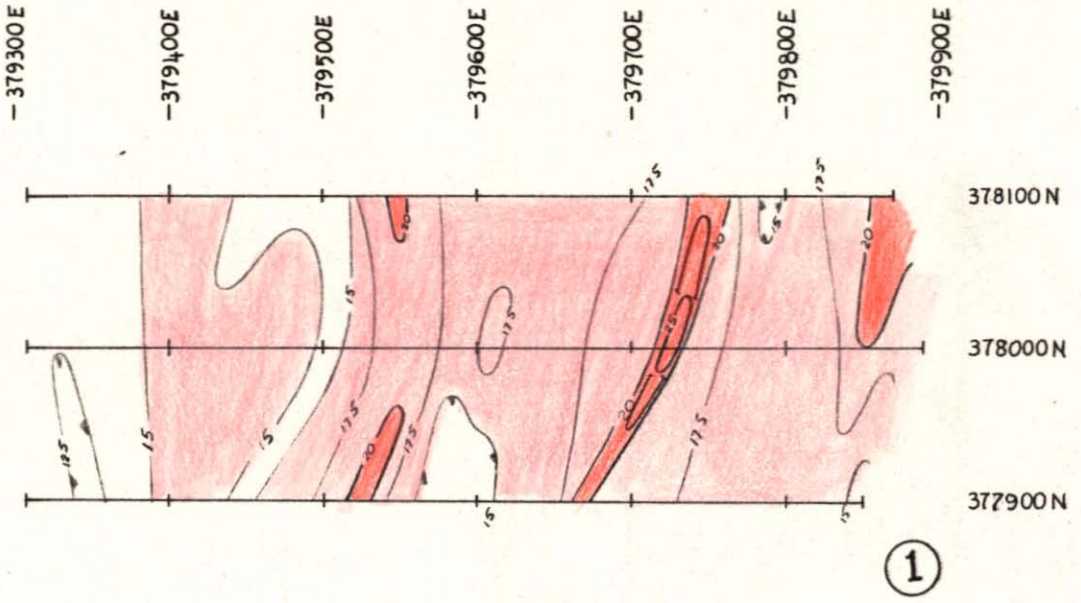
Job Nº TAS-065-D

79-1342

5 cm

093

178101



ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

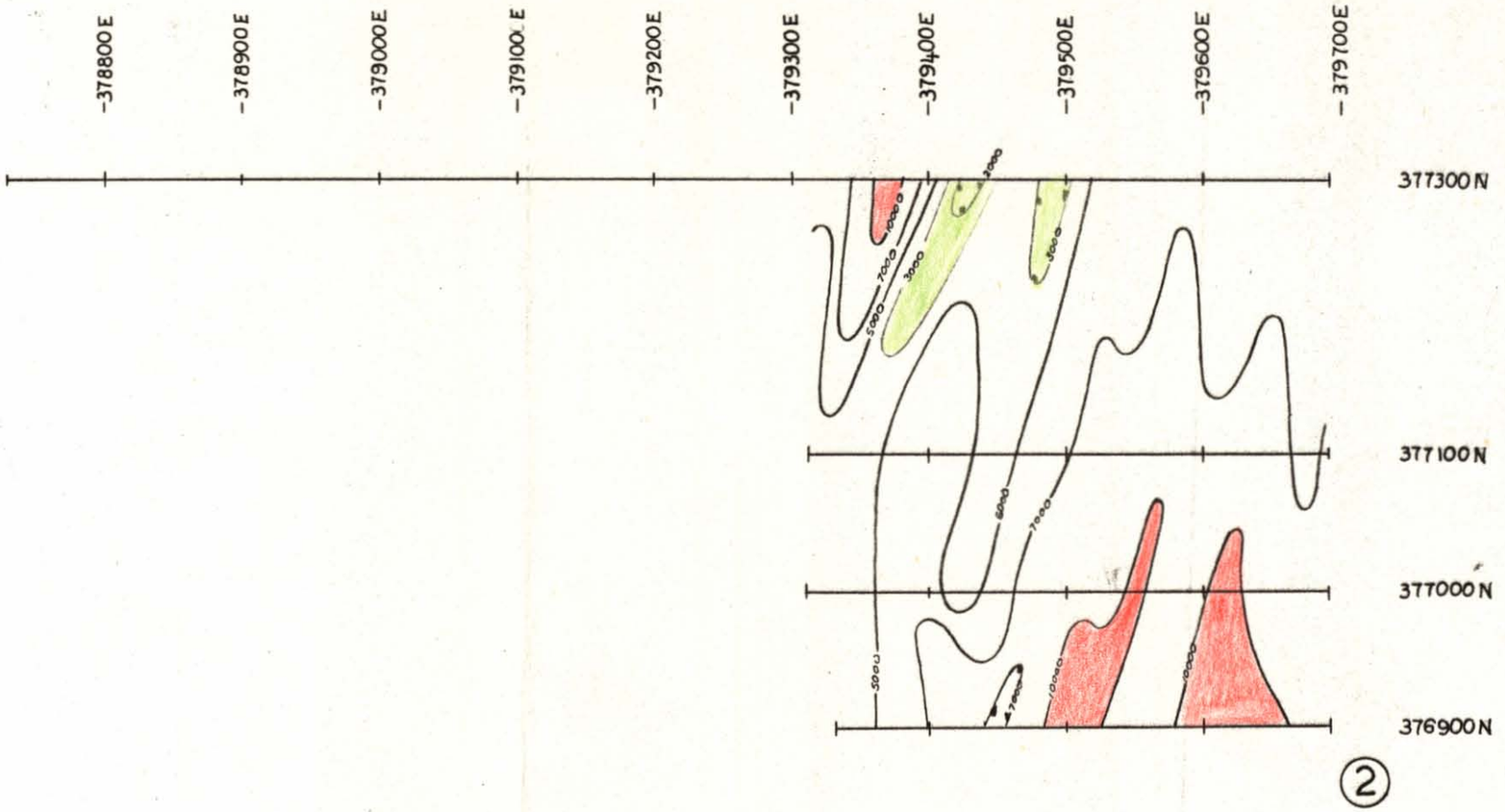
Job Nº TAS-065-D

79-1342

5 cm

094

178102



ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

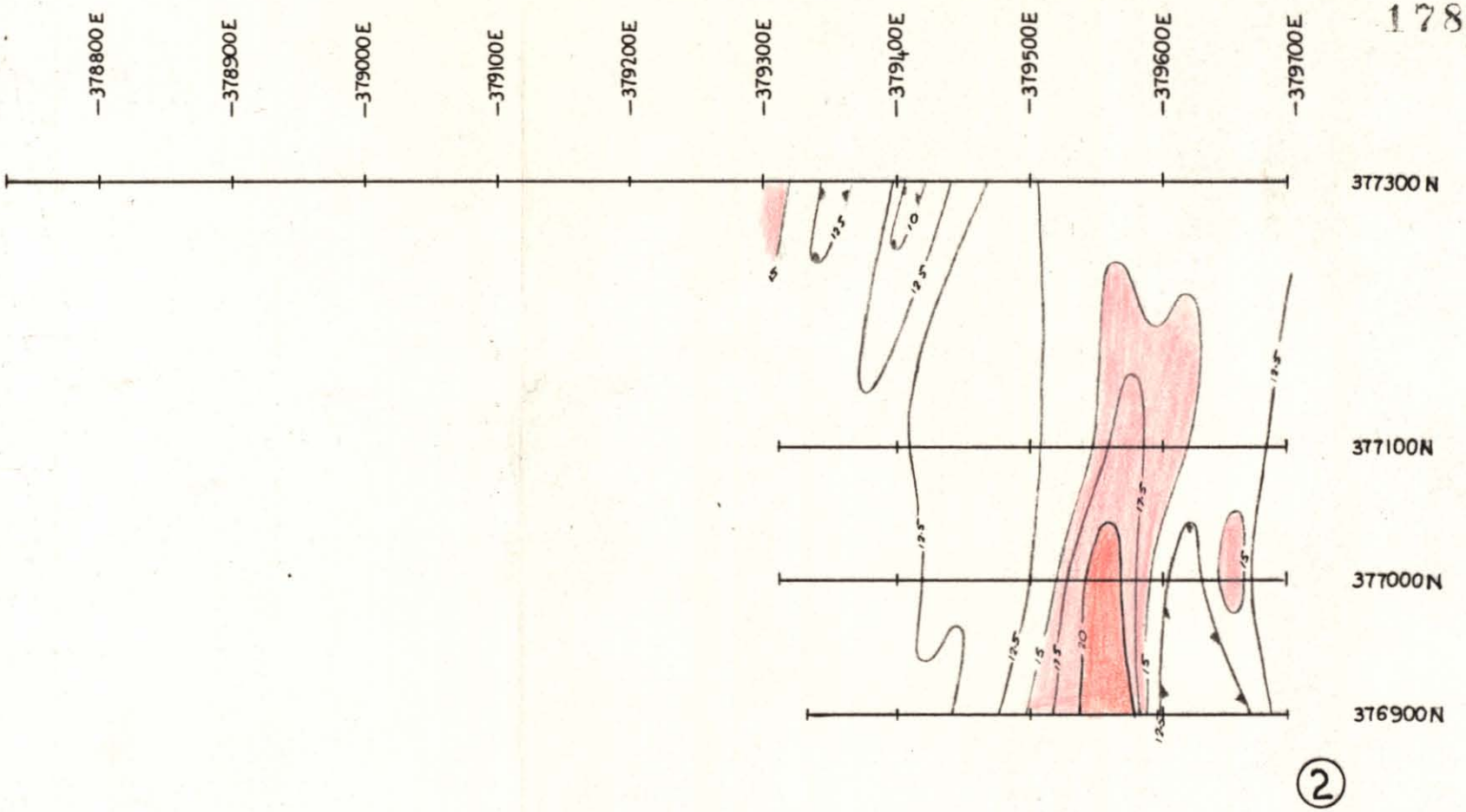
Job Nº TAS-065-D

79-1342

5 cm

095

178103



(2)

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

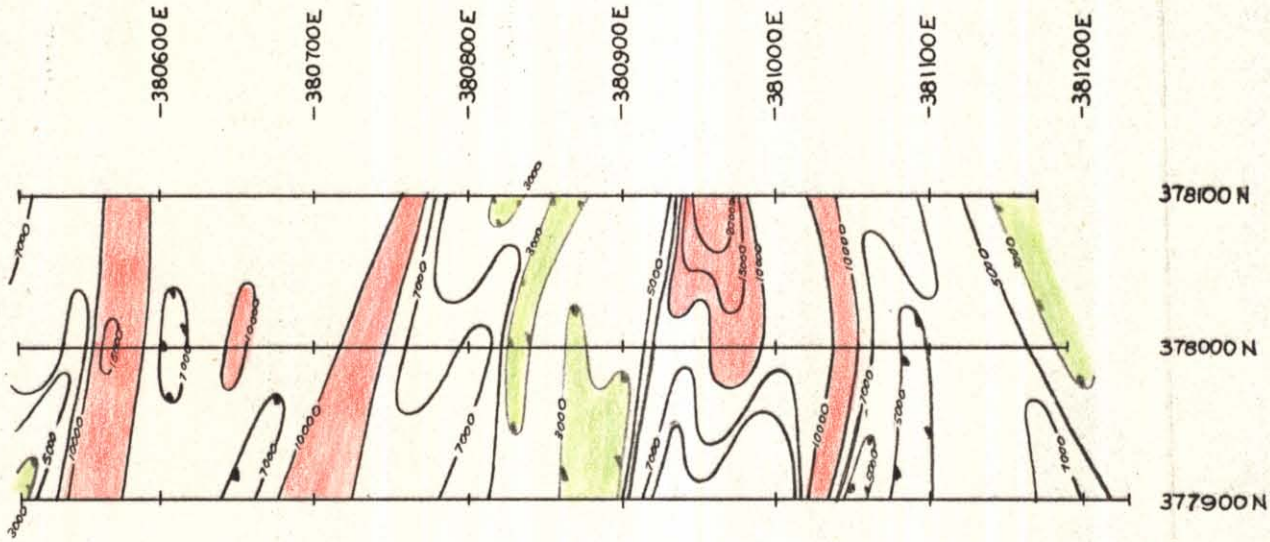
Job Nº TAS-065-D

79-1342.

5 cm

096

178104



③

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1:5000 m

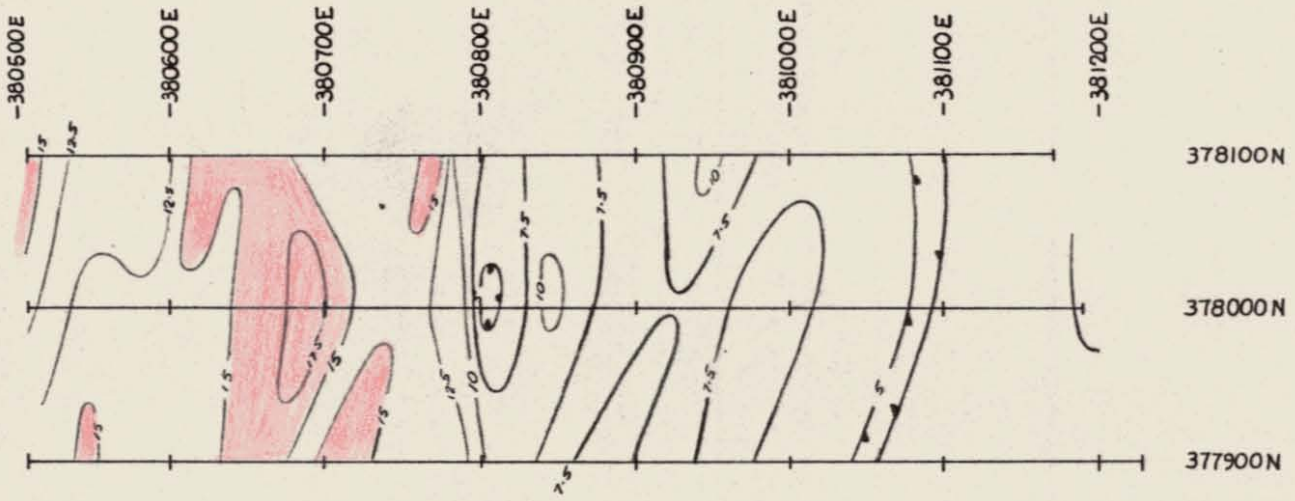
Job Nº TAS-065-D

79-1342.

5 cm

097

178105



③

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

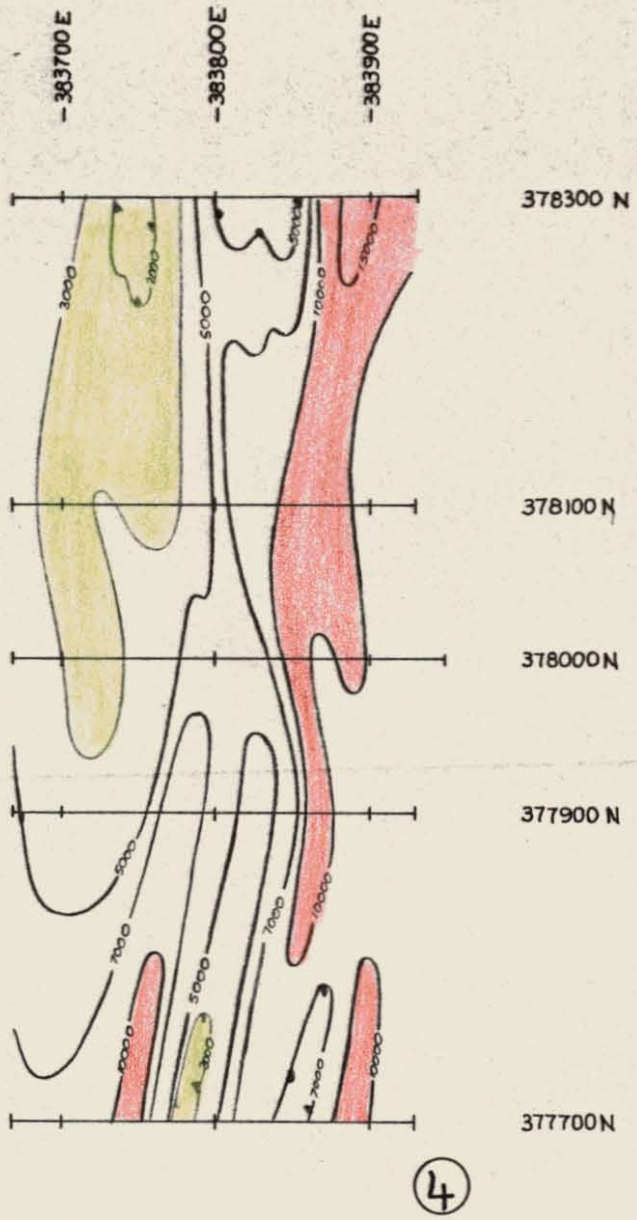
Job Nº TAS-065-D

79-1342

5 cm

098

178106



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ELECTROLYTIC ZINC CO. OF ASIA LTD.

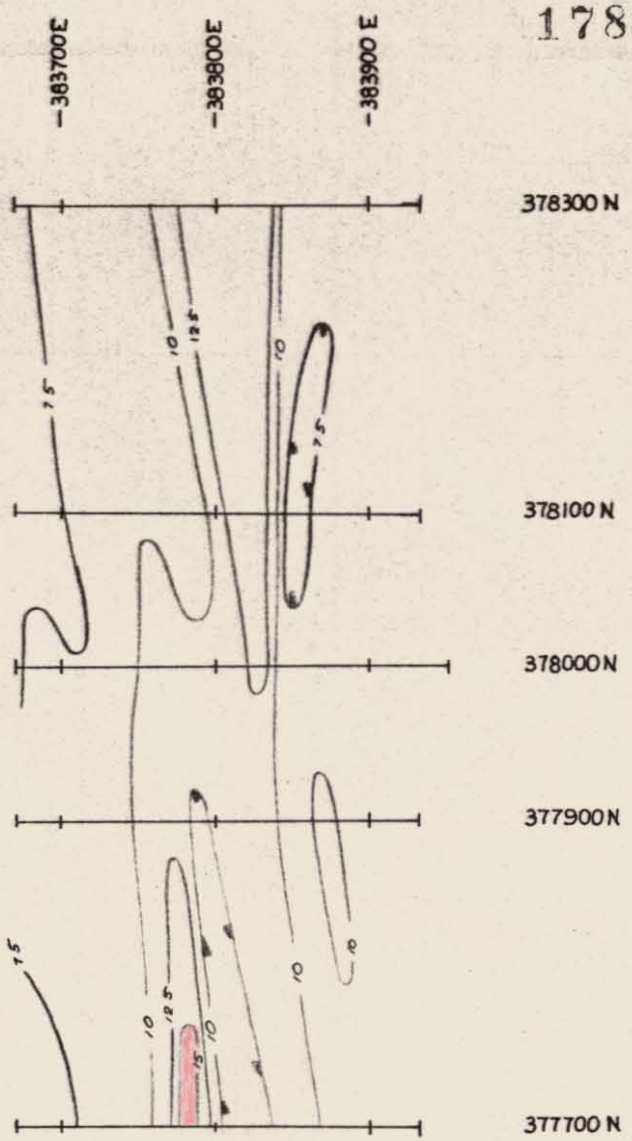
MT BLACK

EIP DETAIL

RESISTIVITY CONTOUR PLAN

099

178107



(4)

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

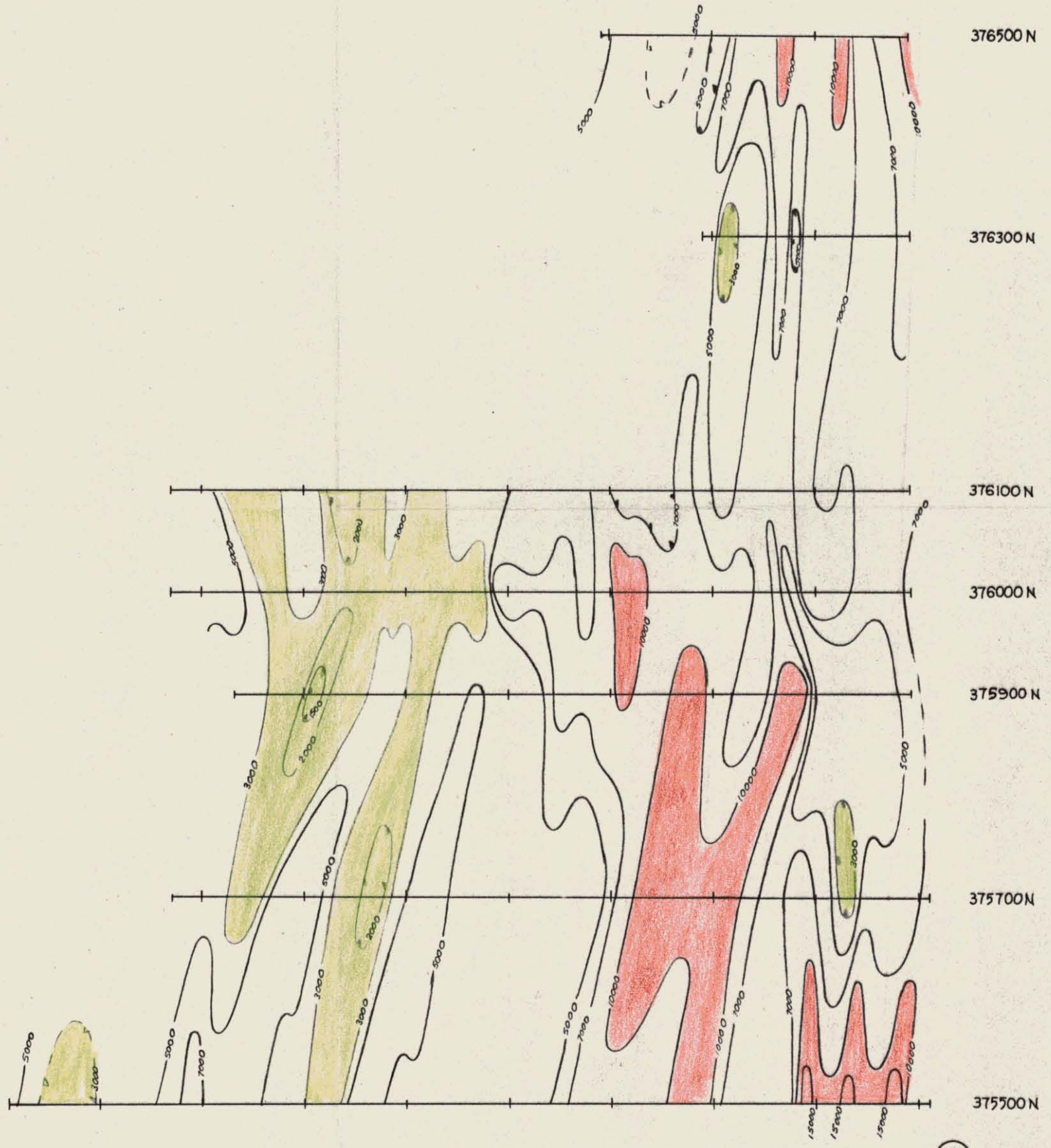
CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

79-1342

100

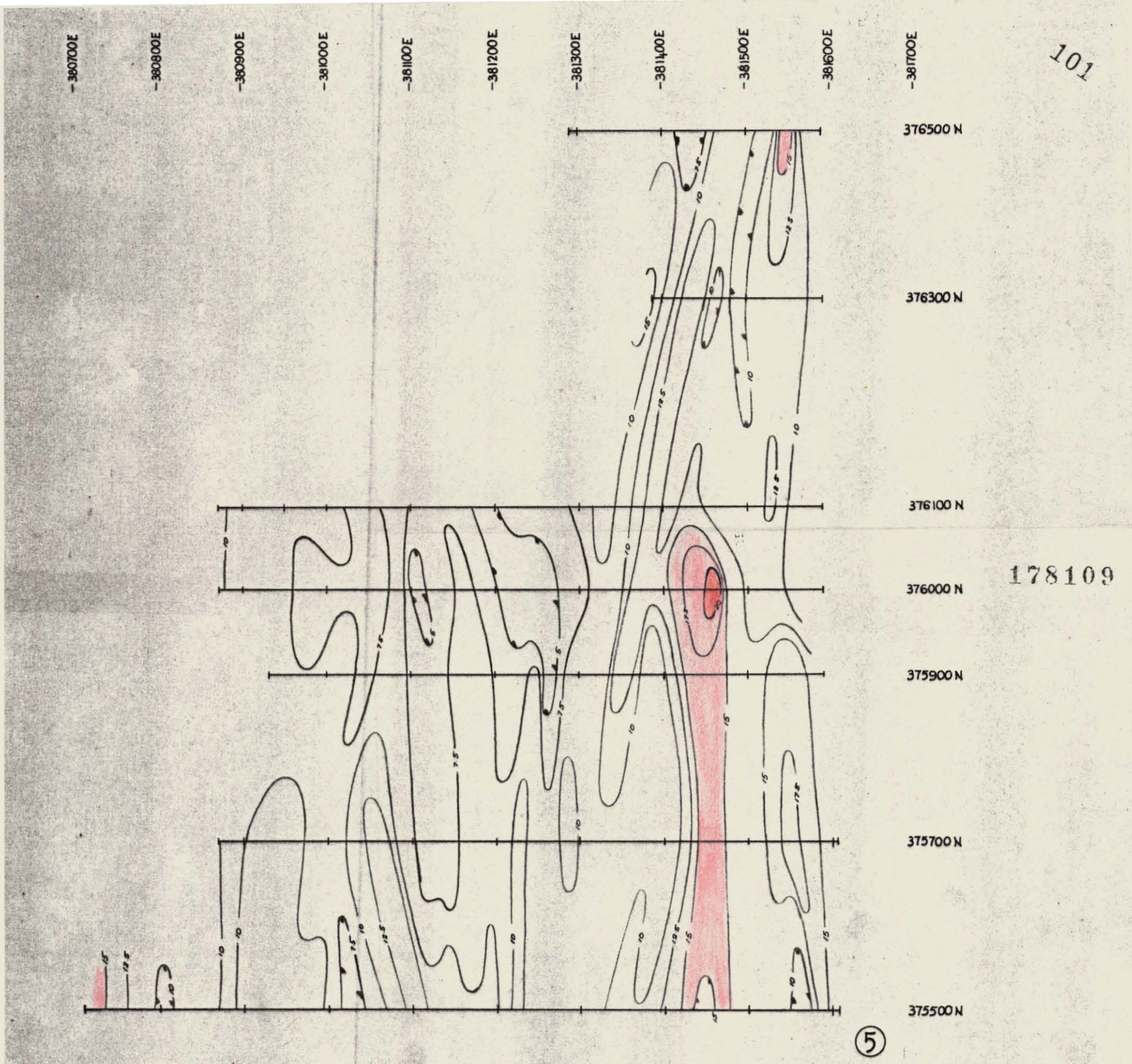


5

ELECTROLYTIC ZINC CO. OF ASIA LTD.
MT. BLACK
E.I.P. DETAIL
RESISTIVITY CONTOUR PLAN
SURVEYED & COMPILED
by SCINTREX
79-1342
APRIL-MAY 1979
SCALE 1: 5000 m
Job Nº TAS-065-D

178108

5 cm



178109

⑤

ELECTROLYTIC ZINC CO. OF A.SIA LTD.

MT BLACK

EIP DETAIL
CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX

APRIL- MAY 1979

SCALE 1:5000 m

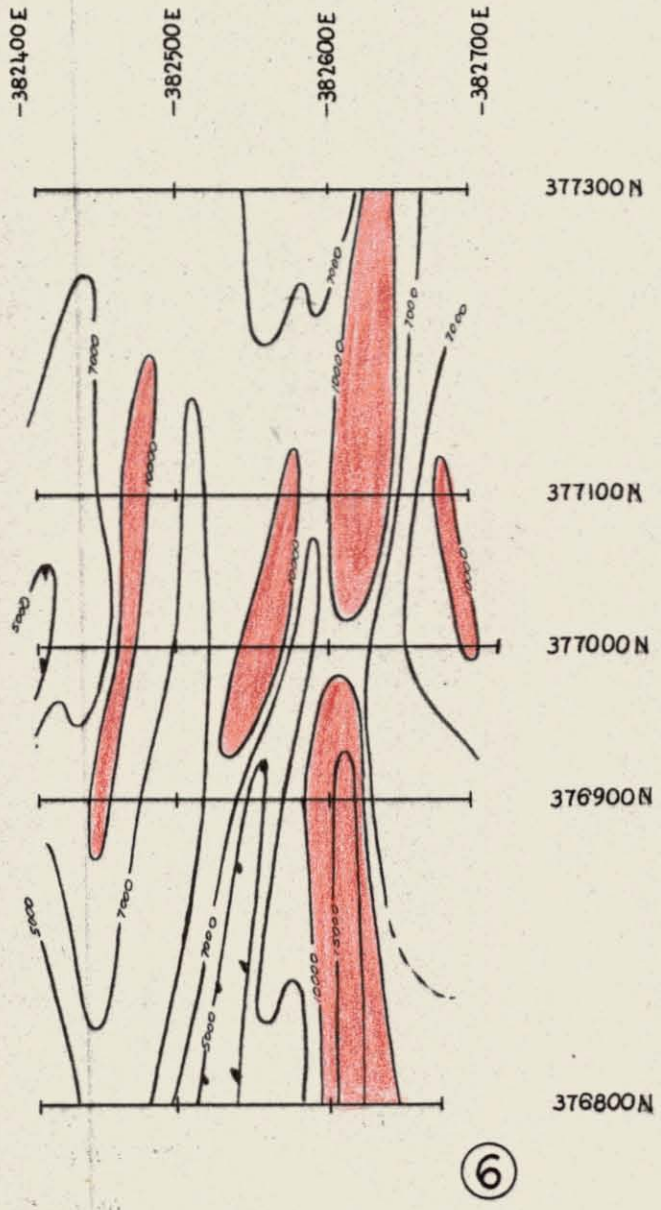
Job Nº TAS-065-D

79-1342

5 cm

102

178110



6

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

RESISTIVITY CONTOUR PLAN

79-1342.

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

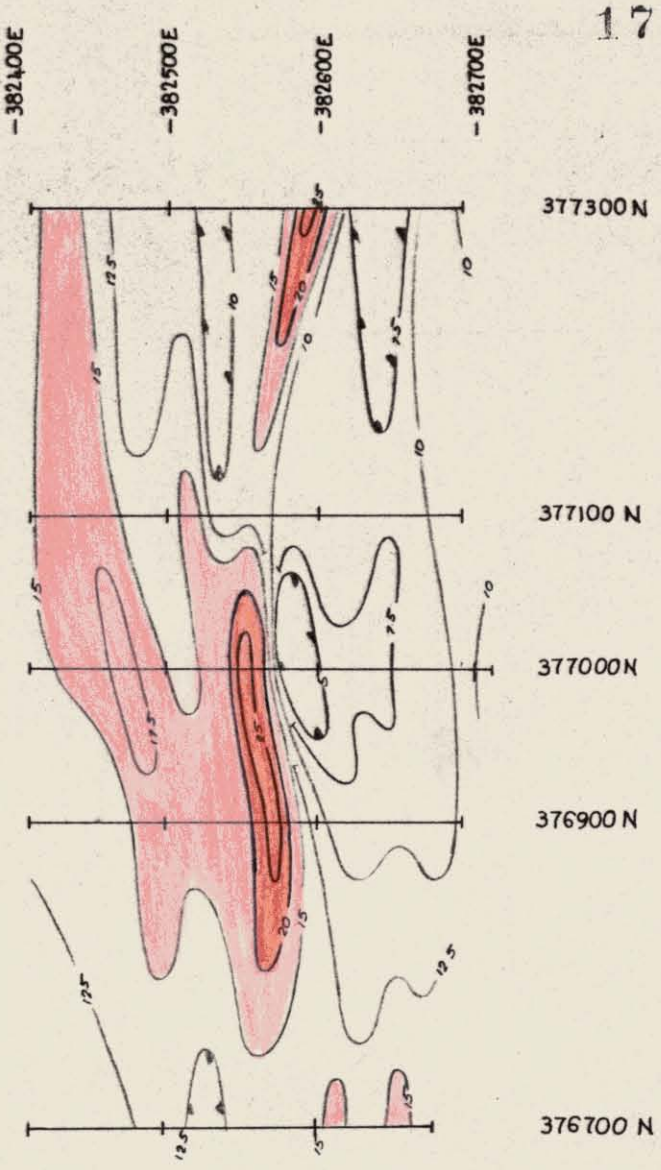
SCALE 1: 5000 m

Job Nº TAS-065-D

5 cm

103

178111



6

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

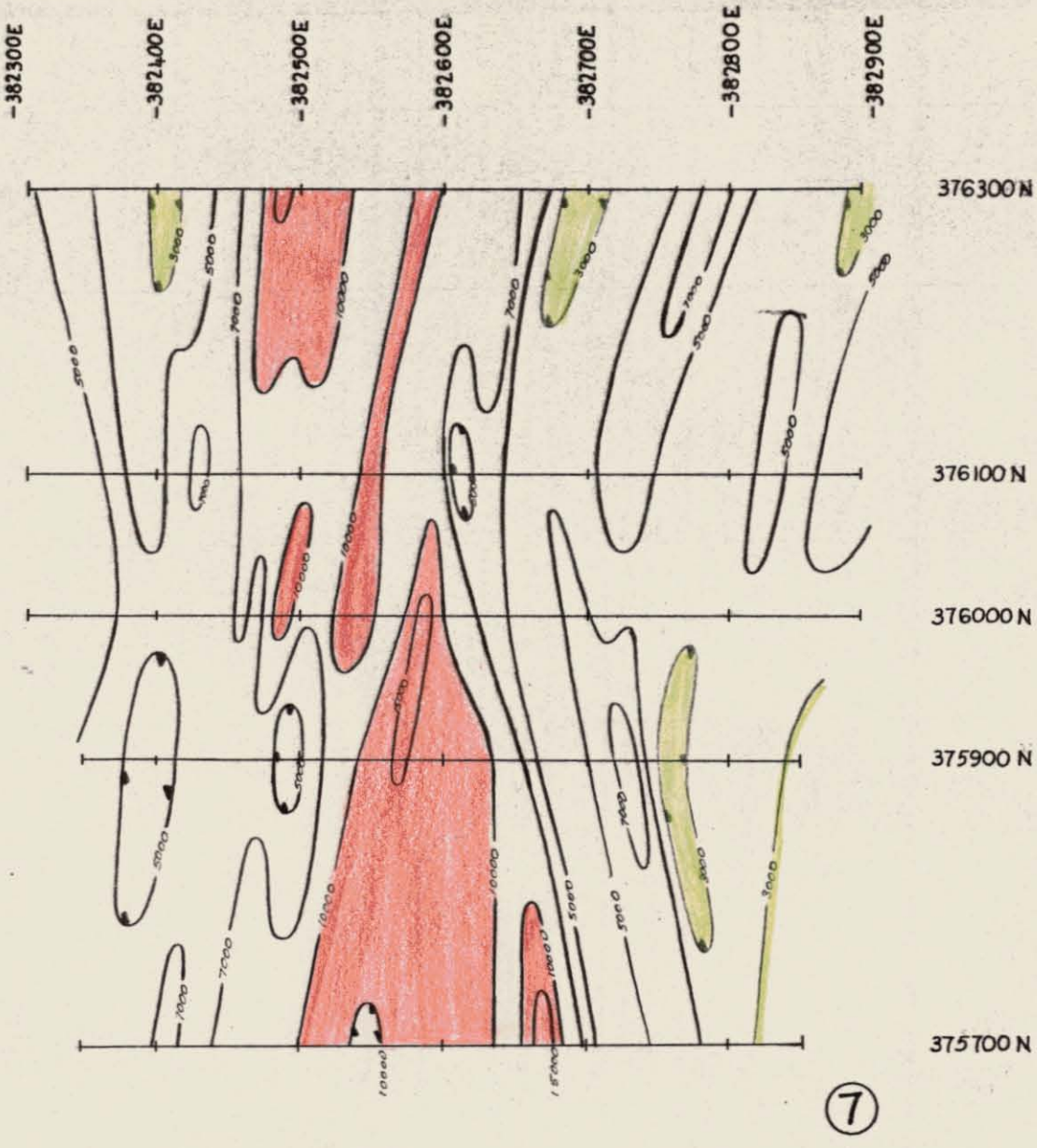
Job Nº TAS-065-D

79-1342

5 cm

104

178112



ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

79-1342.

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

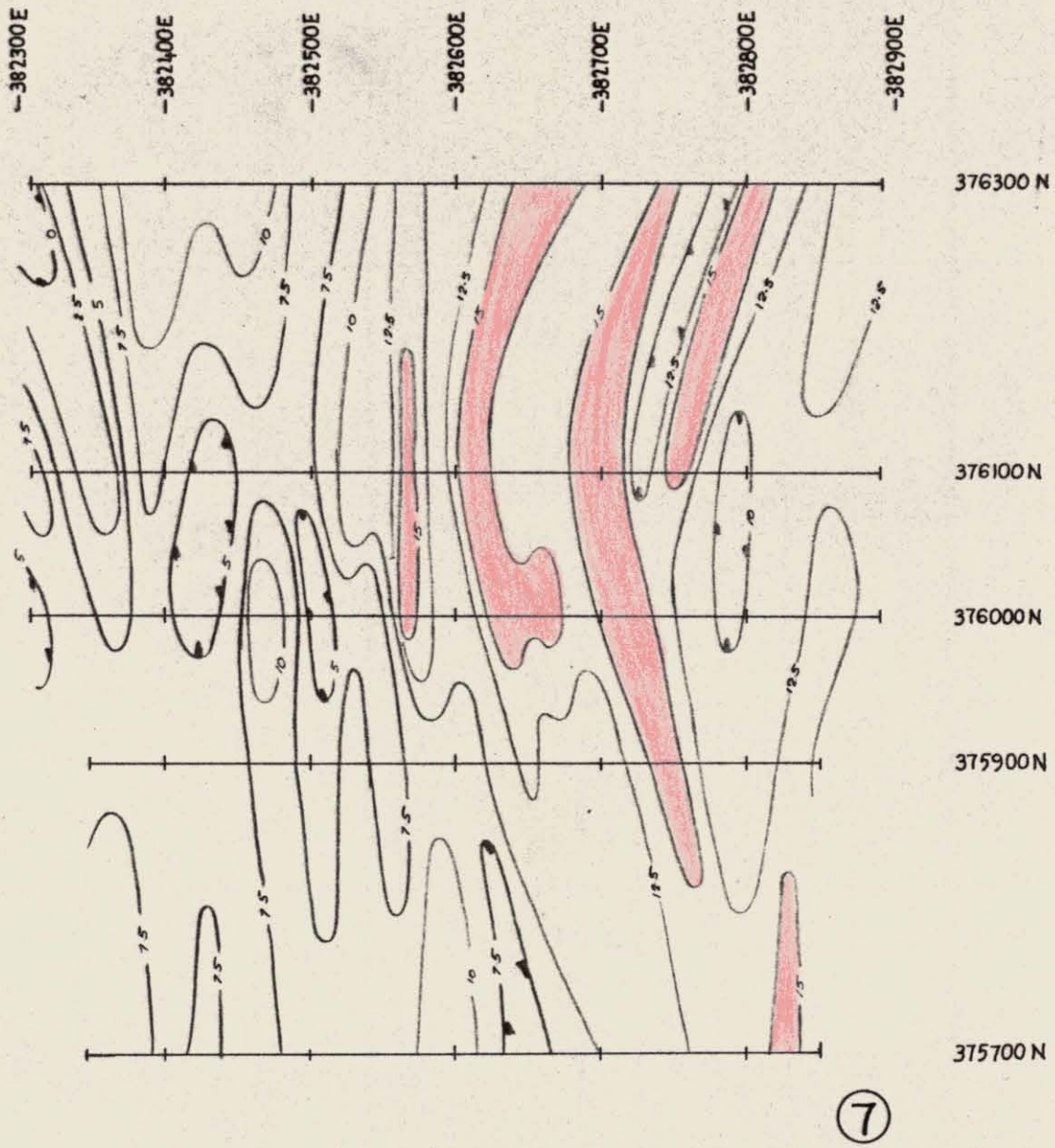
SCALE 1: 5000 m

Job Nº TAS-065-D

5 cm

105

178113



79-1342.

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

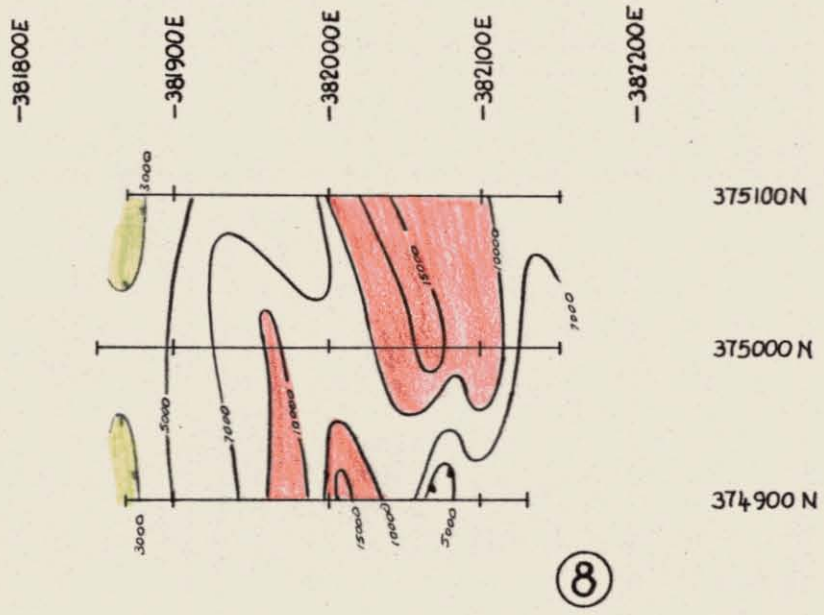
SCALE 1: 5000 m

Job N° TAS-065-D

5 cm

106

178114



ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

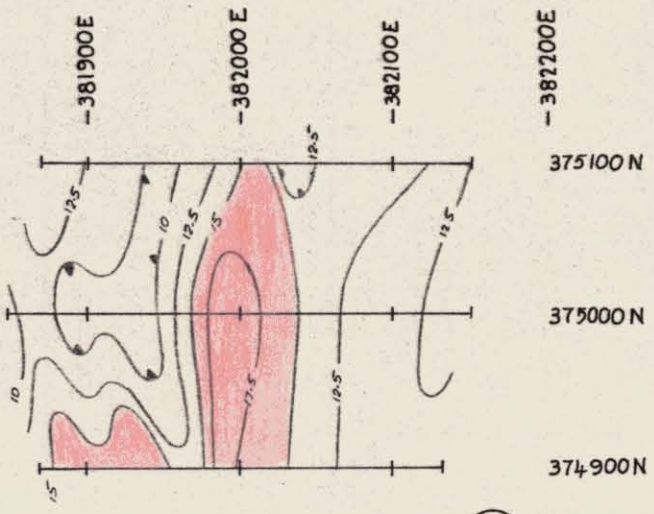
Job Nº TAS-065-D

79-1342

5 cm

107

178115



(8)

ELECTROLYTIC ZINC CO OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

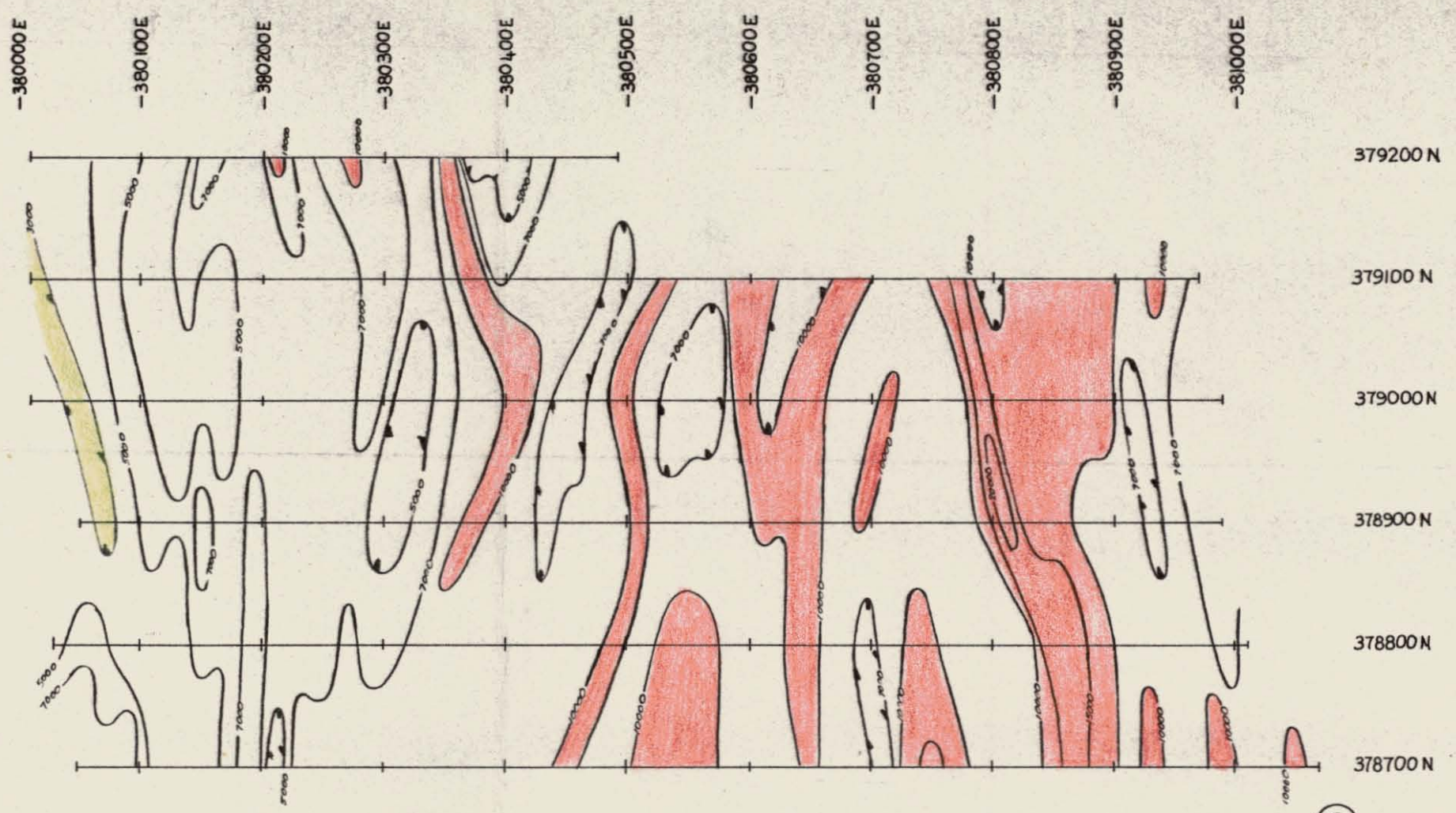
Job No. TAS-065-D

79-1342

5 cm

109

178116



9

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

E.I.P. DETAIL

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX 79-13H2

APRIL-MAY 1979

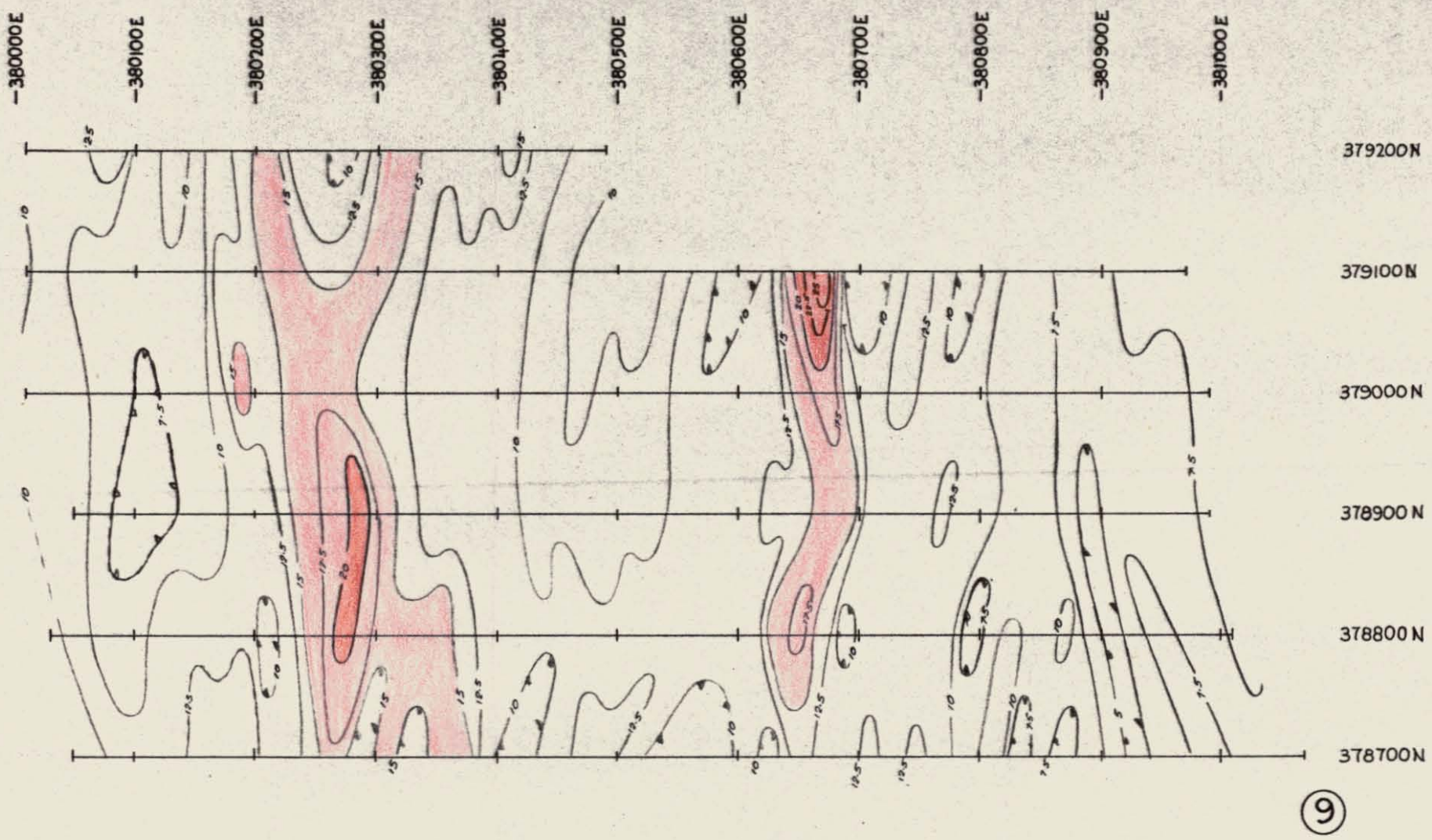
SCALE 1: 5000 m

Job No. TAS-065-D

5 cm

108

178117



(9)

ELECTROLYTIC ZINC CO. OF ASIA LTD.

MT. BLACK

EIP DETAIL

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED

by SCINTREX

APRIL-MAY 1979

SCALE 1: 5000 m

Job N° TAS-065-D

79-1342

5 cm