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A REPORT ON ADDITIONAL GEOPHYSICAL SURVEYS OVER THE WHITE SPUR GRID (EL 9/66) NEAR QUEENSTOWN, TASMANIA

ON BEHALF OF

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

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ON BEHALF OF

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

BY

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SYDNEY, N.S.W.

JUNE, 1978

TAS-054B

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NOTE : No Plate 1

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INTRODUCTION

At the request of Mr. K. Reid, Chief Geologist for the Mount Lyell Mining & Railway Company Ltd., Scintrex Pty. Ltd. performed additional gradient array detailed surveys and a dipole-dipole survey over two critical sections of the White Spur grid. These surveys were carried out on 10 production days between 12th April and 1st May, 1978, and were conducted by crewleaders Mr. R. Bennett and Mr. R. Sims assisted by two field assistants.

Additional total magnetic field surveys were carried out over the eastern half of the White Spur grid on five double operator days between 16th and 21st February, 1978. These surveys were carried out under Scintrex Party Leader Mr. R. Sims.

The data from the original surveys carried out on the White Spur grid are presented and described in Scintrex Report TAS-035C dated April, 1977.

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GEOPHYSICAL CONSULTANTS AND CONTRACTORS

SUMMARY

A series of short lines placed between the reconnaissance lines of the White Spur grid in two areas of interest, has resulted in a superior definition of the chargeability anomalies located, and the major rock type changes in the detailed areas.

The completion of the total magnetic field survey over the eastern section of the grid confirmed a grid north-south strike to the underlying volcanics, as opposed to a grid north-north-west/south-south-east strike west of the major rock type change boundary defined in the reconnaissance survey.

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A - THE DETAILED E.I.P. SURVEYS

GENERAL DISCUSSION

Two sections of the grid were surveyed in detail with intermediate lines emplaced between the original survey lines. In the west, sections between lines 33N and 43N were surveyed for about 500 metres west of the major physical property boundary, while in the east, intermediate lines were placed between lines 37N and 42N.

The data profiles are displayed at the horizontal scale of 1 inch = 200 feet (1:2400). The vertical scales employed are: Chargeability, 1 inch = 10 millivolts/volt; Decay form ΔM, 1 inch = 2 millivolts/volt; Normalised decay form, ΔMn, 1 inch = 5%; Resistivity, 5 inch log cycle and expressed in ohm-metres. The contour interpretations are shown at a scale of 1:6000.

The detailed survey was carried out using an IPR-8 read on a two second programme and three slices under the decay curve (M_1, M_3, M_5). This data is presented in *millivolts/volt* on the data profiles, but in order to make meaningful comparison with the original data, it has been converted to *milliseconds* on the contour presentations.

Some comments on the method and meaning of the chargeability data, and the derived parameters ΔM and ΔMn are given below.

Very briefly, fine grained mineralisation absorbs the charge *rapidly* and once the passage of the energising current is stopped, the stored charge is *rapidly* discharged. If the mineralisation is *effectively* coarse grained (i.e. either coarse grained as such, or agglomerates of finer grain), the charging and consequent discharging will be much *slower*. Only with MIP is the actual decay *within* the source monitored, therefore major differences in decay form can be observed. However, in EIP these differences in decay form can also be observed when the body is "shallow". However, with MIP, the origin of the decay is *INTERNAL*, while with EIP it is *EXTERNAL*, and the latter is subject to change by the environment.

While the above comments refer to "mineralisation" they are also true of chargeability background. The background in rocks is usually determined by mafic mineral content, while the decay form appears often to be dependent on the rock grain size.

Both for "mineralisation" and "background" the mechanism is similar. Diagram 1 shows how this is accomplished using the IPR-8 time domain receiver. In sketch (A) EP represents the energising pulse, while the rapid decay form is due to fine grained material discharge, and the slow decay form is due to coarse grained mineralisation. You will note from the diagram that the rapid decay form has a greater amplitude to start with. This is due to the fact that as the IP effect depends on the total surface area of the sulphides presented, the disseminated material per sulphide volume present will give a greater IP effect.

The three decay slices are shown in the diagram as M_1, M_3 and M_5.

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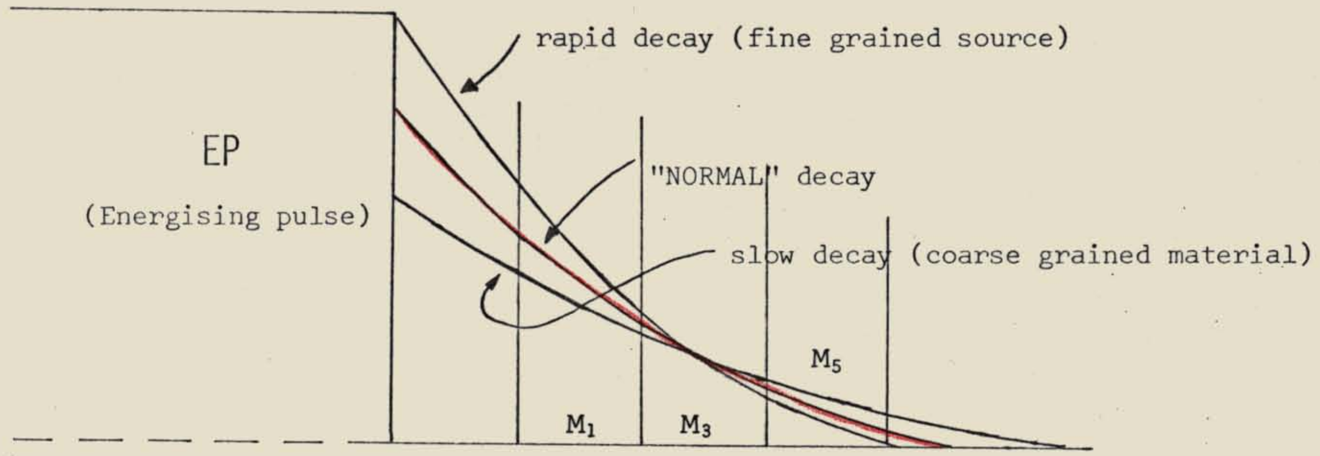
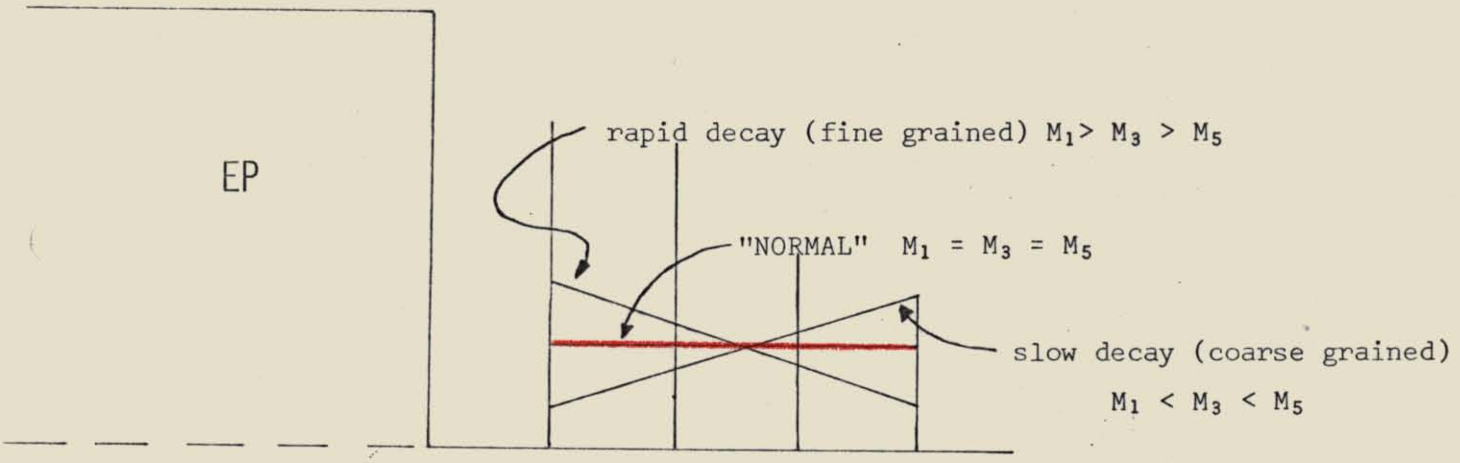


(A) DECAY AS OBSERVED BY IPR-8 MIP RECEIVER PRIOR TO PROCESSING



(B) DECAY AS OBSERVED BY IPR-8 MIP RECEIVER AFTER NORMALISATION FOR A "NORMAL" DECAY FORM

DIAGRAM 1

The red decay form included in diagram 1A is the "normal" or "average" decay form usually observed over normal rocks. The IPR-8 processes the data by dividing this normal decay into each of the slices M_1, M_3 and M_5. This is done so that any deviation from "normal" is readily apparent. Diagram 1B displays the result of this processing of data. The rapid decay form (e.g. fine grained disseminated) will result in $M_1 > M_3 > M_5$, while the slow decay form (e.g. coarse grained massive, but not necessarily electrically continuous) will result in $M_1 < M_3 < M_5$.

This data is presented as ΔM ($|M_5| - |M_1|$), which displays the difference in amplitude of the first and last slice. However, due to the often large variation in the amplitudes of the chargeability (M_3) itself, it is also presented as ΔMn, the *normalised decay form* in percent.

$$\Delta Mn\% = \frac{\Delta M}{M_3} \times 100 = \frac{M_5 - M_1}{M_3} \times 100$$

ΔMn, when positive, infers a "coarser than normal" grain size, and when negative, a "finer than normal" grain size. The amplitude (in percent) variation from normal will give some indication of the departure of the decay from normal.

DETAILED DISCUSSION OF THE DATA

EASTERN SECTOR - LINE 37.5N to 41.5N

The induced polarization responses mapped in the detailed survey invariably occur within significantly lower resistivities of 1000 ±50% ohm-metres from 4000+ ohm-metres to the immediate east and west. The chargeabilities are at best 50% above the local 20 millivolts/volt background, and invariably have slower than normal decay forms. A line by line description follows:

LINE 37.5N .... A maximum 10 millivolts/volt above background response was recorded at 5450E within a resistivity minimum of less than 1000 ohm-metres. Over the anomaly, the decay form ΔMn is about 2% to 3% slower than normal. The maximum depth to source is about 200 feet.

LINE 36N .... The chargeability between 4800E and 5500E rises to 75% above the 20 millivolts/volt background. Two distinct maxima were observed at 5050E and 5350E, the maximum depths of which are about 200 feet. The resistivity reaches a relatively low 700 ohm-metres *between* these two maxima at 5250E. The decay parameter ΔMn, infers a coarse grain size on the western flank of the western anomaly (5050E) and the eastern flank of the eastern anomaly at 5350E. It is not certain which (if either) of these anomalies relates to the source inferred at 5450E on line 37.5N.

The data observed on the present survey is similar to that acquired on the original survey when the array change and mode of chargeabilities is taken into account.

LINE 38.5N .... On this line, twice background anomalies were located between 4950E and 5575E and centred at 5050E and 5450E. The significant anomalies of 44 and 41 millivolts/volt were accompanied by 9% and 6% slower than normal decay forms (ΔMn), which infer a coarser grain size to the source at these points. The westerly source is "narrow" while the easterly source may be wider than the 100 feet dipole used (or a multiple source). Maximum depths to source in both cases are about 150 to 200 feet.

LINE 39N .... East of 4650E the chargeabilities rise 50% to 75% above the 18 millivolts/volt background to the west. Two distinct maxima of 32 millivolts/volt and 37 millivolts/volt were recorded centred at 4850E and 5100E. Both are accompanied by apparent resistivity lows of 1500 ohm-metres (as against 3000+ ohm-metres to the immediate east and west), and slower than normal decay forms of ΔMn = +6% and +5% respectively. The source is interpreted to be disseminated chargeable material of coarser grain size than normal, within a host less resistive than the enclosing rock units. The maximum depth to source is less than 150 feet. A 100 feet dipole-dipole survey between 4500E and 4700E was surveyed, which also infers the depth to source to be about 150 feet. The near surface shales which are considered to be the source are not the *whole* source, although the dipole-dipole n = 1 shows higher than background chargeabilities between 4850E and 5300E which infers *some* contribution. The *bulk* of the source however, appears to be about 150 feet.

LINE 39.5N .... A distinct increase in chargeability from a background of 10 millivolts/volt or less to 30 millivolts/volt plus, was recorded between 4550E and 5150E. This zone coincides with a significant broad depression in the local 5000 ohm-metres resistivities of 50%. Three distinct maxima of 28 millivolts/volt, 35 millivolts/volt and 36 millivolts/volt were recorded at 4650E, 4850E and 5050E respectively. The maximum depth to source is estimated to be 150 ±50 feet in each case. All sources show slower than normal decay forms ΔMn being about +4% to 5%, and all show *some* depression in the apparent resistivity. However, the absolute values are between 1500 ohm-metres and 2800 ohm-metres.

LINE 40N .... A significant chargeability response of up to 20 millivolts/volt above the 10 millivolts/volt (to the west) and 15 millivolts/volt (to the east) background, was recorded between 4650E and 5050E, which infers two distinct maxima at 4750E and 4950E. A relative resistivity low of 4000 ohm-metres was recorded *between* these maxima at 4850E, which represents a 60% depression in the bakcground resistivity. The ΔMn decay form is sharply higher over the anomaly, and peaks at 4850E at 11½%. The interpretation of these anomalies is of a disseminated source coarsening towards 4850E and contained with a host less resistive than the enclosing host rocks. The present survey over this anomaly has resolved the anomaly somewhat more clearly, although both sets of data are similar.

LINE 40.5N .... Two distinct maxima of 18 to 20 millivolts/volt above background were noted at 4450E and 4650E with a distinct resistivity low of 5000 ohm-metres (as against 10,000+ ohm-metres to east and west), between these maxima at 4500E. Both chargeability highs show slow (+5% and +6½%) decay forms, inferring a coarse disseminated source. The maximum depth to source is estimated to be 100 feet in each case.

LINE 41N .... The most prominent induced polarization response was of 17 millivolts/volt above background at 4350E. A slight depression in resistivity to 8500 ohm-metres from about 14,000 ohm-metres, infers a slightly less resistive host. The ΔMn at +8% infers a coarser than average grain size to the mineralisation, while the maximum depth to source is estimated to be less than 100 feet.

A smaller 10 millivolts/volt response at 4150E shows somewhat less slower decay forms (ΔMn) of +5%, a similar reduction in apparent resistivity to 8000 ohm-metres, and a maximum depth of about 100 feet.

A further 9 millivolts/volt above background response at 5000E is accompanied by a substantial drop in apparent resistivity from 20,000 ohm-metres to about 6000 ohm-metres, and a *fast* decay form (ΔMn = -4%). The source is therefore interpreted as finely disseminated material (and/or magnetite) within a rock unit less resistive than the enclosing units. (This anomaly is *not* considered to be associated with any of those discussed above, but is a separate zone, which crosses line 41.5N at about 4850E where it has similar characteristics.

LINE 41.5N .... On this line a relatively minor 20 millivolts/volt (as against 13 to 15 millivolts/volt background), was observed at 4050E, which shows a slow decay form. The disseminated source is therefore coarser than average. A second minor 6 millivolts/volt response showing very fast decay form (ΔMn = -11.2%) was observed at about 4850E within lower (8000 ohm-metres) apparent resistivities. The source is very fine grained sulphide and/or magnetite at a maximum depth of about 100 feet.

CONCLUSIONS

1 - The closer spaced detail has significantly increased the definition of the series of above background chargeabilities as compared with the original survey.

2 - Assuming the data points are precisely positioned, a series of individual chargeable bodies of strike length of 500 metres rather than a continuous zone, is indicated.

3 - The increased chargeabilities observed over the main zone (i.e. other than the north-east anomaly) show slow decay forms (ΔMn) of +5% to +10%, inferring a coarse grained sulphide and/or graphite source, rather than magnetite, the latter characteristically showing normal (ΔMn = 0) to fast (ΔMn negative) decay forms.

4 - The chargeability is invariably associated with a significant fall in apparent resistivity. However, the absolute level of that resistivity infers a disseminated to electrically discontinuou source within a host less resistive than the enclosing rocks.

5 - There is a significant break between lines 39.5N and 40N. To the north resistivities are significantly higher (10,000± ohm-metres) while to the south they are of the order of 4000± ohm-metres. This break is also confirmed in the magnetic data.

6 - The magnetic contour interpretation shows a convincing grid north-south bias as a whole, and over the area of detailed EIP survey this holds also. The total magnetic field survey should be continued over the additional lines to determine whether the *apparent* contoured trends represent the true magnetic picture. The notable break between lines 39.5N and 40N on the EIP is also clearly shown on the magnetic data.

WESTERN SECTOR - LINES 33.5N to 42.5N

The detailed survey has enabled a more realistic contour interpretation of the chargeability data to be made. The orientation and strike of most of the chargeable zones has been modified. Each of the significant responses is reassessed below.

ZONE W13 .... (TAS-035C, Page 23) ..... First located on line 34N at 450W. A significant response was recorded on the intermediate line 33.5N at 1150W. The 64 millivolts/volt (51 milliseconds) chargeability response was associated with a very sharp fall in apparent resistivity to 620 ohm-metres from over 4000 ohm-metres to the immediate east and west. The decay form is slow (ΔMn = +5%), while the profile form suggests a maximum depth of about 160 feet.

The source is interpreted to be weakly interconnected sulphide (and/or graphite) or coarsely disseminated sulphides (and/or graphite) within a host less resistive than the enclosing host rocks. The maximum depth to source is 160 feet. This response is still considered of primary interest on geophyiscal grounds.

ZONE W14 ....(TAS-035C, Page 24)..... This zone was first defined on line 34N at 150W. On line 33.5N the anomaly occurs as a 15 millivolts/volt (12 milliseconds) above the 23 millivolts/volt (19 milliseconds) background, between 750W and 550W. The resistivity is a higher 10,000 ohm-metres with the decay form as seen by ΔMn at about +9% slower than normal in the western sector of the anomaly falling to near normal on the eastern section. The maximum depth to source is about 150 feet.

This response is confirmed on the intermediate line to consist of disseminated sulphides within a resistive host, the grain size of which appears to coarsen from east to west over the broad (100+ feet) source. This source is considered of secondary interest at best.

ZONE W15 ....(TAS-035C, Page 24)..... This zone was first recorded on line 36N at about 1400W as a chargeable conductive zone in close proximity to the major change from the eastern to western sectors. The resurveying showed line 36N to lie to the south of its theoretical position, so lines 36.25N and 36.5N were inserted. These clearly demonstrate the very limited strike length of zone W15, which is significant only on lines 35N, 36N and 36.25N. On the latter, a 25 millivolts/volt (20 milliseconds) above the 28 millivolts/volt (22.4 milliseconds) background was recorded centred at 1750W, coincident with a rapid decrease in apparent resistivity from 13,000 ohm-metres at 1650W to 900 ohm-metres at 1950W. The source therefore lies on the contact between two materially different rock units. The maximum depth to source is estimated at 100 feet.

On line 35N the decay form located on the eastern flanks of the anomaly at 800W shows slow decay forms of $\Delta Mn = +7\%$, inferring a coarser grain size, while on the western flank, the decay form is normal. The decay form change crosses from high (15,000 ohm-metres) in the east, to low (8000 ohm-metres) resistivities in the west.

It is concluded that Zone W15 is of primary interest on line 36N and perhaps line 35N also, where a weakly conductive and chargeable zone is inferred.

ZONE W16 ....(TAS-035C, Page 25) ..... This response is only significant on the original discovery line, 36N, at about 1800W.

On this line the response is of secondary interest at most, and is due to disseminated sulphides or graphite.

ZONE W17 ....*(TAS-035C, Page 25)*..... The comments made in the original report are confirmed by the detailed survey. The intermediate line shows a 38 millivolts/volt (30 milliseconds) response centred at 1650W comparable with those defined on lines 37N and 38N. The decay forms observed in all three W17 responses are normal to slow, and the general conclusions are as per page 26 of report TAS-035C. However, the *orientation* of the response is changed (providing the stations are in their true relative positions).

ZONE W18 ....*(TAS-035C, Page 26)*..... The additional lines 36.5N, 37.5N, 38.5N and 39.5N have further resolved the structure and strike length of this zone. The zone has been shown to be two quite separate lenses of charge material.

Zone W18S ..... The response was recorded on the original survey at 3150W and 3400W on lines 37N and 38N respectively. On the intermediate line 37.5N a significant response of 63 millivolts/volt (as against 30 millivolts/volt background) was recorded at 3150W. In form, the anomaly is very similar to that on line 38N. In both cases the profile shape suggests an east dip, slow decay forms (line 38N $\Delta Mn = +8\frac{1}{2}\%$, line 37.5N $\Delta Mn = +6\%$), and lie between two relatively high (3000$\pm$ ohm-metres) resistivity maxima within relatively low 700 to 800 ohm-metres apparent reisstivity. The respective depths to source are estimated at 100 feet on line 38N and 150 feet on line 37.5N. The 20 millivolts/volt response on line 37N at 3150W shows the same general form as the above but is somewhat subdued. The maximum depth is about 100 feet, while the decay form is only slightly slower than normal. Also, the apparent resistivities, although lower over the chargeability response, are about 2000 ohm-metres.

This significant response is considered to be due to a coarsely disseminated source within a host significantly less resistive than the enclosing rocks, OR weakly interconnected chargeable material, and is considered of primary interest on lines 37.5N and 38N.

Zone W18N .... Two substantial chargeability highs of 40 millivolts/volt (32 milliseconds) and 30 millivolts/volt (24 milliseconds) were recorded on the detailed survey on line 38.5N and 39N at 3750W and 3850W respectively. In the case of the former, a significant reduction is resistivity to about 400 ohm-metres was observed, while on the latter although still a relatively low 1000 ohm-metres over the chargeable source, they are 600 ohm-metres to the immediate east of it. In both cases the decay form, ΔMn, is a slow +5%, and therefore infers a coarser than normal grain size to the source. The maximum depth to source in both cases is estimated at 150 feet.

This zone is considered to be of primary geophysical interest, particularly on line 38.5N at 3750W.

ZONE W22 ....(TAS-035C, Page 28) ..... This zone was defined at 2750W and 3300W on lines 40N and 41N respectively on the original survey and is confirmed on the detailed survey. The detailed survey infers *two* loci on each line, 3250W and 3050W on line 41N and 2900W and 2650W on line 40N. The intermediate line 40.5N has a chargeability maximum of about 10 millivolts/volt above background centred at about 3200W, while to the south on line 39.5N it is located at 2950W and 3150W of 10 and 5 millivolts/volt above background respectively. One of the striking features of this zone which can be traced intermittently as far south as W15, is the *slow* decay rates having ΔMn values greater than +5% arising from *fast* decay backgrounds, often -1% or less. The depths to source vary to 150 feet.

The conclusions drawn after a study of the data from the first survey still hold, with the additional comment that the formational pyritic and/or graphitic material would have to be coarse grained.

ZONE W23 ....(TAS-035C, Page 28)..... This zone was first located on lines 40N and 41N at 3500W and 3550W where 15 milliseconds anomalies above background were defined within a significant fall in apparent resistivity. An intermediate line, 40.5N, placed between these two did not traverse sufficiently far west to cover the zones, while one placed at 41.5N showed the anomaly at or west of 3750W. The decay forms show variation along strike - on line 40N ΔMn = +5%, on line 41N ΔMn = 0, on line 41.5N ΔMn = +2%, and on line 42N ΔMn = +5%.

The source is considered to be of formational origin. The grain size varies along strike and the maximum volume of chargeable material occurs on lines 40N and 42N.

CONCLUSIONS

1 - The additional lines, together with the relocation of line 36N, have defined the chargeable zones more accurately, and have inferred a slightly altered structural picture.

2 - The orientation of the chargeable zones (with the exception of zone W17), remains grid north-north-west, while the close line spacing shows that the strike length of the chargeable zones is rarely greater than 200 metres.

3 - For the most part, the chargeable zones show weak conduction which can either be due to conduction within the host rocks to the chargeable source or weak interconnection between the chargeable particles.

4 - The decay forms within the chargeable zones are invariably slower than normal (which infers a coarse grain size), while that of the enclosing rocks varies from normal to slow (inferring a finer grain size).

5 - Individual depth determinations and a summary of the main features of each significant anomaly, are contained in the text.

B - CONTOUR INTERPRETATIONS

The contour interpretations of the original data were presented on Plates 2 to 5 in report TAS-035C and discussed on pages 7 to 14 of that report. The following comments should be considered in conjunction with the earlier opinions.

One point which is of concern to the author is that the *relative* positions along adjacent lines should be reasonably well known. Any gross errors will result in a false impression of strike direction and orientation. There is some doubt as to the orientation of lines 39.5N (eastern detail) and line 36.5N (western detail). However, the discussion below assumes the relative position of *all* lines is correct.

CHARGEABILITY CONTOUR PLAN (TAS-035C, Page 8) .... The data from the present survey has been recontoured in the areas of (a) repositioning of lines, and (b) additional lines. This data is presented on Plate 2 of TAS-054C which should be viewed in conjunction with Plate 2 of TAS-035C.

Eastern Detail:

The series of anomalous responses located between lines 37.5N and 41.5N *about* the 5000E co-ordinate show a general north-north-west/ south-south-east trend, although the trend of individual responses within this overall zone is more grid north-south. A major change in continuity (and resistivity level, see below), was defined between lines 39.5N and 40N.

The original zone E2 is split into two zones, E2S and E2N, while zone E3 is better defined, and E3E becomes more emphasised. Each of the blocks, E2N, E2S and E3/E3E could be interpreted as being displaced by a series of transverse displacements, semi-parallel to the lines, between them, or alternatively an en-echelon lensing in and out of chargeable zones. A fault, however, is favoured between lines 40N and 39.5N.

Western Detail:

The additional lines together with the repositioning of line 36N, have resulted in some modification of the major rock type change from chargeable/less resistive to the west and low chargeability/ highly resistive to the east. The most significant is that caused by line 36.5N which infers a sinistral swing to the contact, and zone W17 as shown in Plate 5.

A further major revision is the removal to the south by 800 to 1000 feet of the dislocation previously crossing line 38N at about 2000 feet west of the baseline. This has the effect of showing zone W18 to be continuous between lines 38N and 37N, however, the extension to the west of the dislocation previously crossing line 40N at about 2300 feet west of the baseline is proposed to explain the displacement of zone W18N from W18.

Other slight modifications to the positions of dislocations and geologic boundaries do, however, not alter the main conclusions.

RESISTIVITY CONTOUR INTERPRETATION (TAS-035C, Page 10)....... Plate 3 shows the apparent resistivity data in contour form over the detailed areas. Only in the eastern area is there a significant change in the form of the data, where a marked change between lines 39.5N and 40N was noted, with resistivities to the north being significantly higher (3 to 4 fold). This is *not* caused by a gradient block boundary, and is a real feature.

TOTAL MAGNETIC FIELD CONTOUR INTERPRETATION (TAS-035C, Page 10) .... This data is presented on Plate 5. Both the original survey data *and* the new survey data from the eastern half is presented. The revised position of line 36N has also been allowed for.

The most striking feature of the data is the pronounced grid north-south strike *east of* the major north-north-west/south-south-east contact, and the north-north-west/south-south-east strike *west of* the contact. As it would be very difficult to harmonise the strike on both sides of the contact, it is con idered a real and significant feature. The author suggests that the major rock type change is therefore a fault contact or an unconformity. The latter is suggested as the strike of the western sedimentary sequences appears to follow the contact quite closely.

Unfortunately the detailed intermediate lines which were surveyed with EIP were not surveyed for total magnetic field, and it is strongly recommended that this be done at some convenient time,

In the eastern detail, the magnetic anomalies located in this season's work do not appear to be directly related to either the apparent resistivity or chargeability trends. Either they are intrusions or perhaps lensoidal, and have been interpreted as having linear trends which are illusory. (This could be true for the eastern sector as a whole, however, a number of the more significant features can be traced over many thousands of feet and across several lines).

The magnetic field survey has enabled a number of the proposed dislocations to be extended into the western area.

CONCLUSIONS

1 - The detailed work has enabled the strike length and orientation of the chargeable zones located in the first survey to be more precisely defined. However, this definition is only as good as the accuracy in the line and station positions allows. Should survey errors in areas of interest be defined, it is recommended that the data be recontoured in the affected areas.

2 - To further define the geological strike and continuity, it is recommended that the EIP detailed lines also be surveyed for total magnetic field, and that this data then be incorporated

in the total magnetic field contour plan.

3 - All three physical properties are capable of being further refined to obtain a more detailed physical property map. Should this be required over the area as a whole, or over selected areas, this should be done at a scale of 1:2500 (±500).

4 - The apparent sharp divergence of the strike of the magnetic features to the east and west of the grid north-north-west/ south-south-east trending physical property boundary (see Plate 5), infers either a fault of unconformity as the cause of the observed change. As the strike of the volcanogenic sedimentary sequence west of this boundary parallels the boundary itself, an unconformity is suggested, perhaps younging to the west.

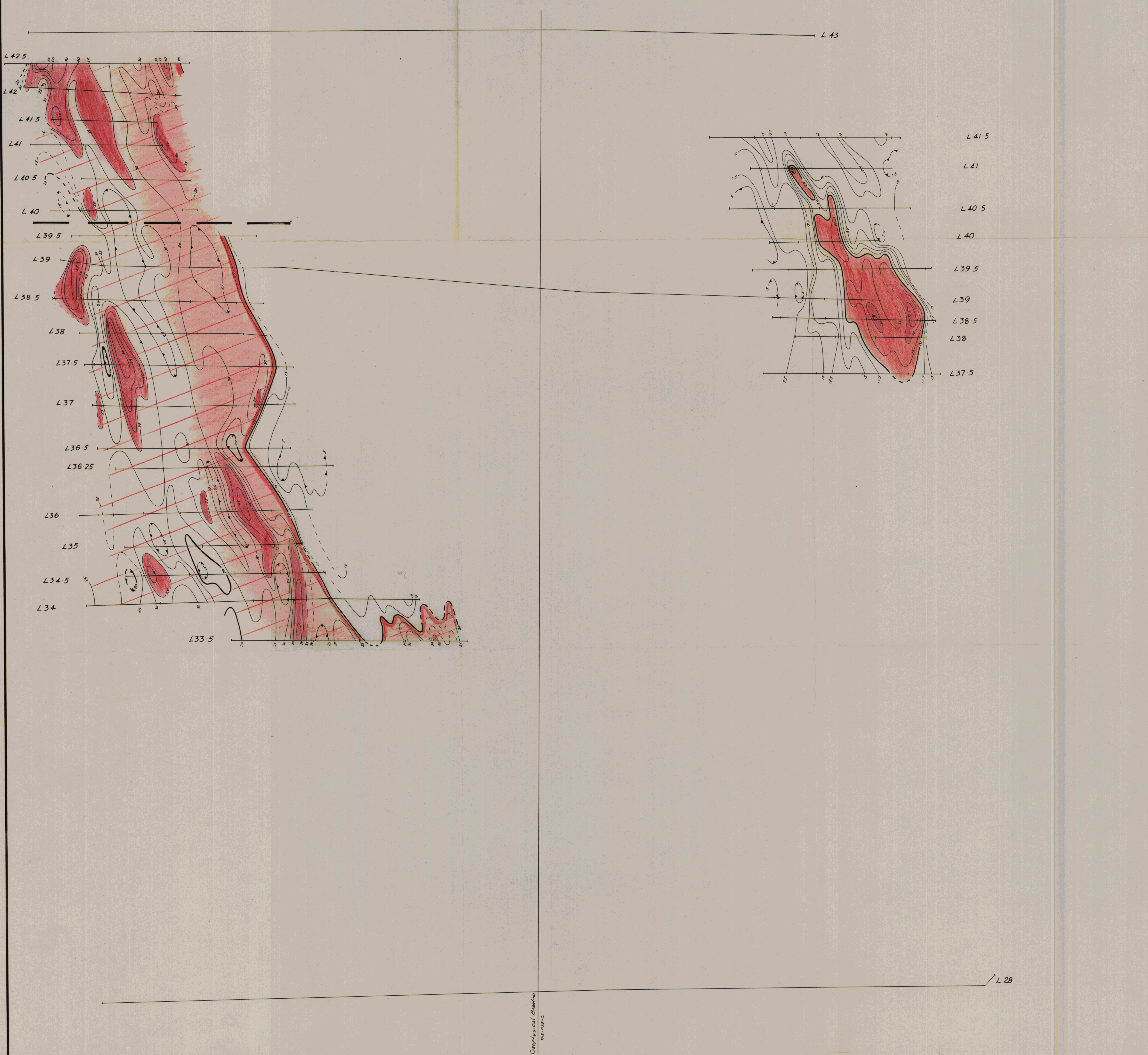
The author looks forward to discussing these results with the Officers of Mount Lyell Mining & Railway Company Ltd. in the near future.

Respectfully submitted on behalf of:

SCINTREX PTY. LTD.

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

GEOPHYSICIST



LEGEND

Chargeability contours in milliseconds

Gradient block boundary ———

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

WHITE SPUR

(NR) QUEENSTOWN - WEST COAST - TASMANIA

ELECTRICAL INDUCED POLARIZATION SURVEY
GRADIENT ARRAY
CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX PTY. LTD

APRIL - MAY 1978

319027

5 cm

1000 500 250 0 500 1000

1 : 6000 (feet)

Job No TAS-054-B (TAS-033-C REVISED) Sheet 1 of 1 PLATE 2

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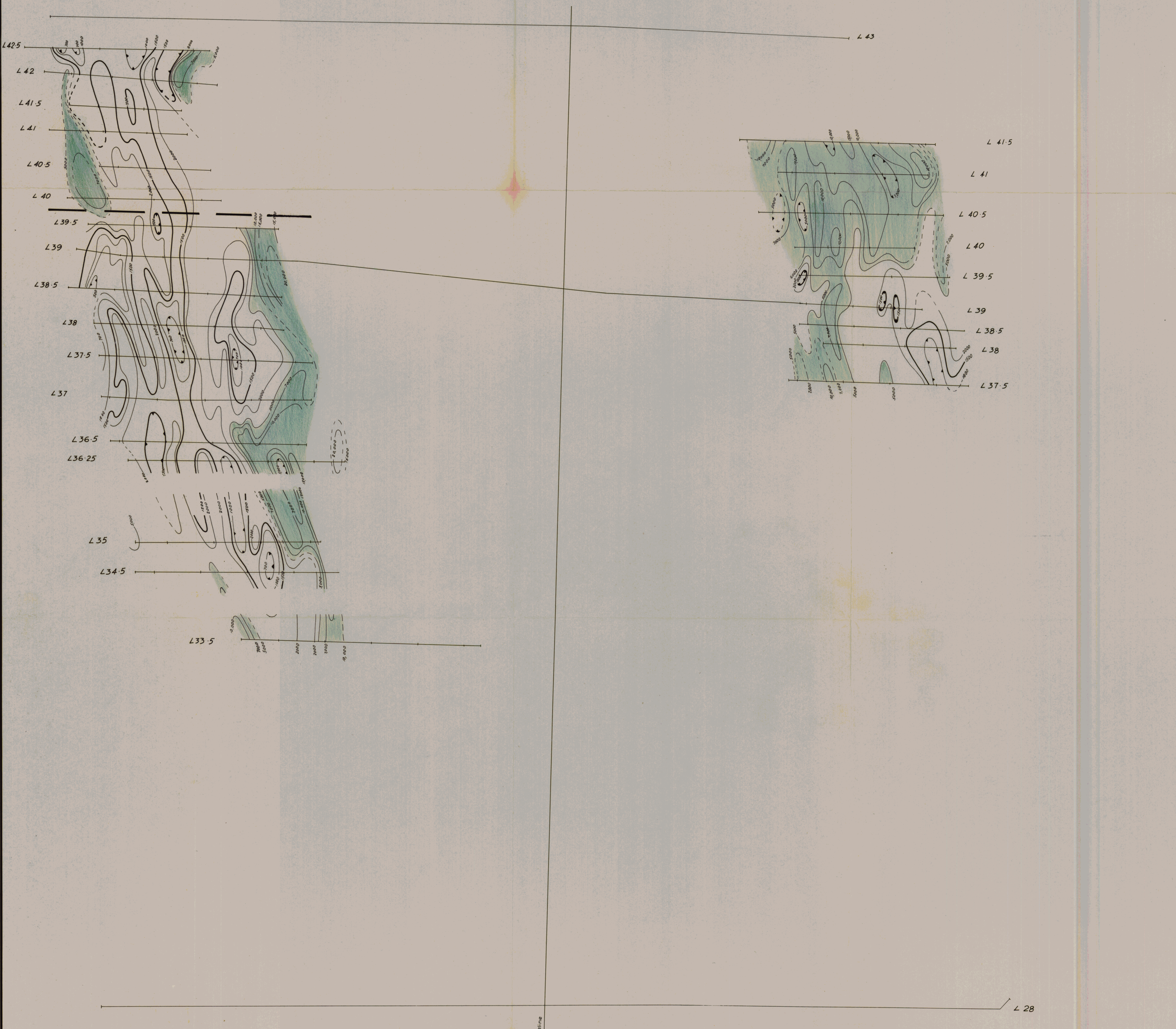


MOUNT LYELL MINING & RAILWAY COMPANY LTD.

WHITE SPUR

(NR) QUEENSTOWN-WEST COAST - TASMANIA

ELECTRICAL INDUCED POLARIZATION SURVEY
GRADIENT ARRAY
RESISTIVITY CONTOUR PLAN

LEGEND

Resistivity contours in ohm-metres

Gradient block boundary

319028

SURVEYED & COMPILED BY
SCINTREX PTY. LTD

APRIL - MAY 1978

5 cm

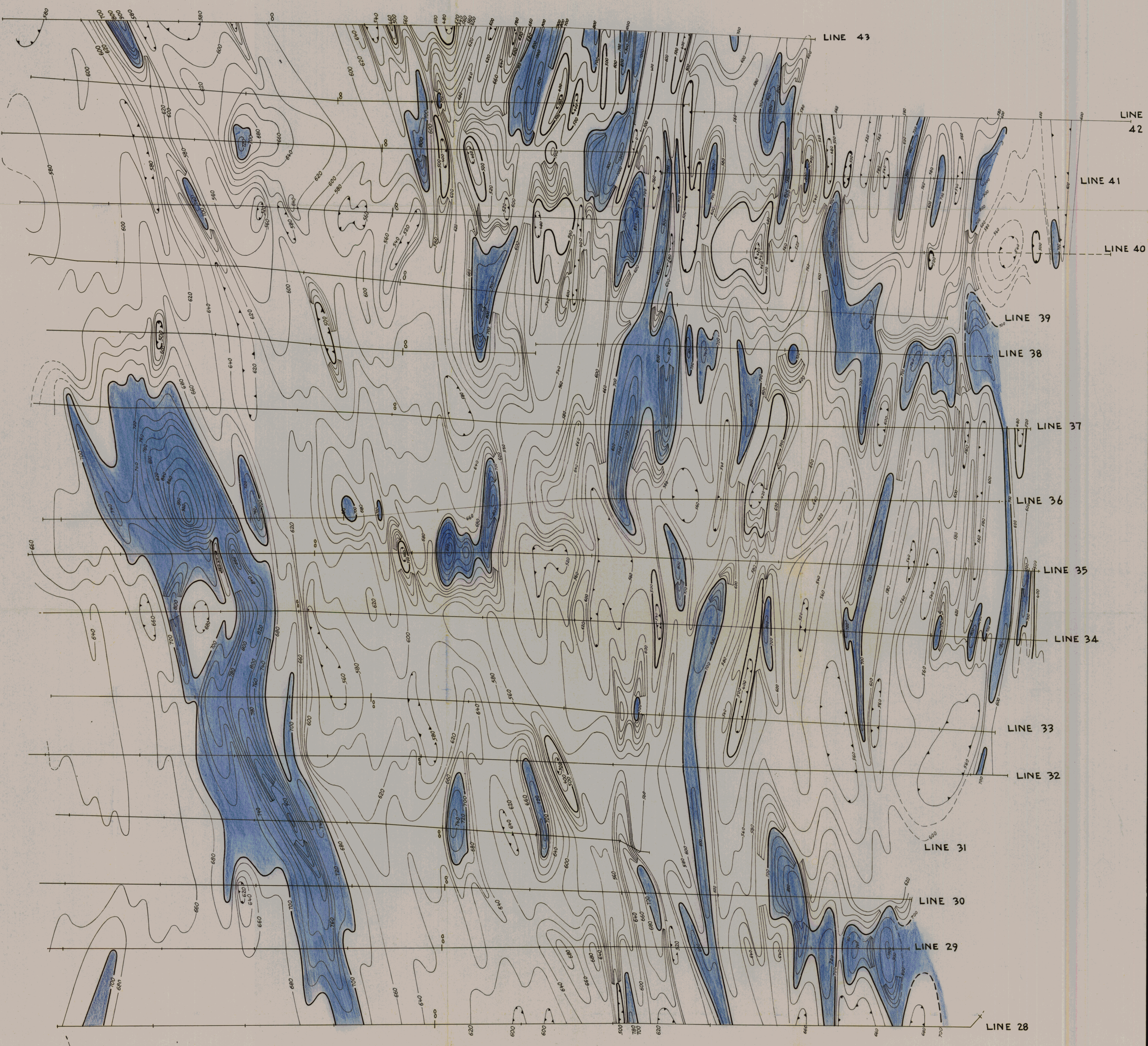
1000 500 250 0 500 1000

1 : 6000 (feet)

Job No. TAS-054-B (TAS-035-C REVISED) Sheet 1 of 1 PLATE 3

84-2241 vol 1/2

026



Note: For correct total field, add 62,000 gammas to all values.

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

WHITE SPUR

(NR.) QUEENSTOWN - WEST COAST - TASMANIA

TOTAL FIELD MAGNETOMETER SURVEY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX PTY. LTD.

319029

NOVEMBER - JANUARY 1977. TAS-035·C
APRIL - MAY 1978. TAS-054·B

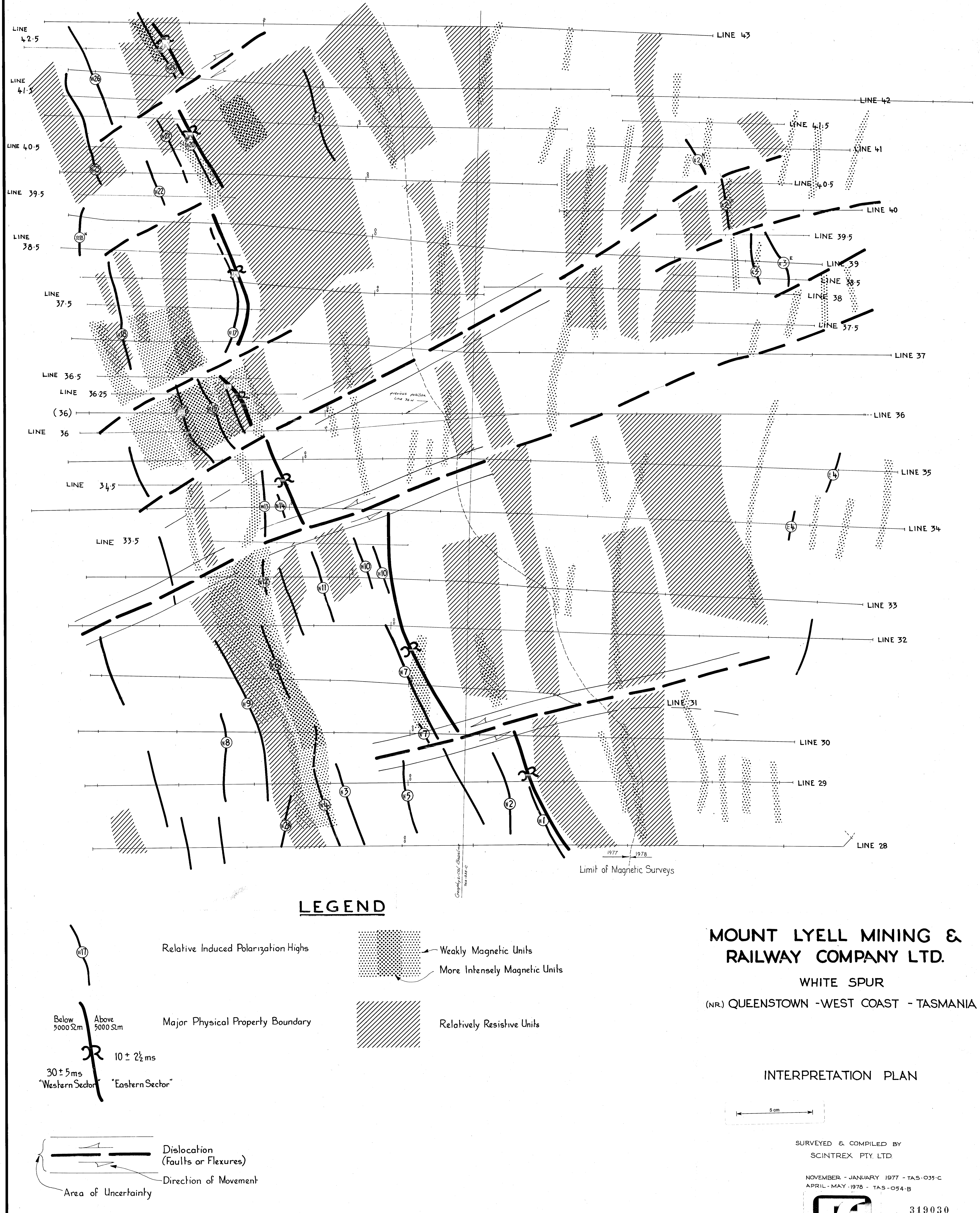
5 cm

1000 500 00 250 500 1000 (Feet)
1 : 6000

027

84-2241 Vol 1/2

JOB Nº TAS-054 B (PLATE 4 TAS-035C - REVISED) Sheet 1 of 1 PLATE 4



MOUNT LYELL MINING & RAILWAY COMPANY LTD.

WHITE SPUR

(NR.) QUEENSTOWN - WEST COAST - TASMANIA

INTERPRETATION PLAN

5 cm

SURVEYED & COMPILED BY
SCINTREX PTY. LTD.

NOVEMBER - JANUARY 1977 - TAS-035-C
APRIL - MAY - 1978 - TAS-054-B

319030

1000 500 00 250 500 1000 (Feet)
1 : 6000

028

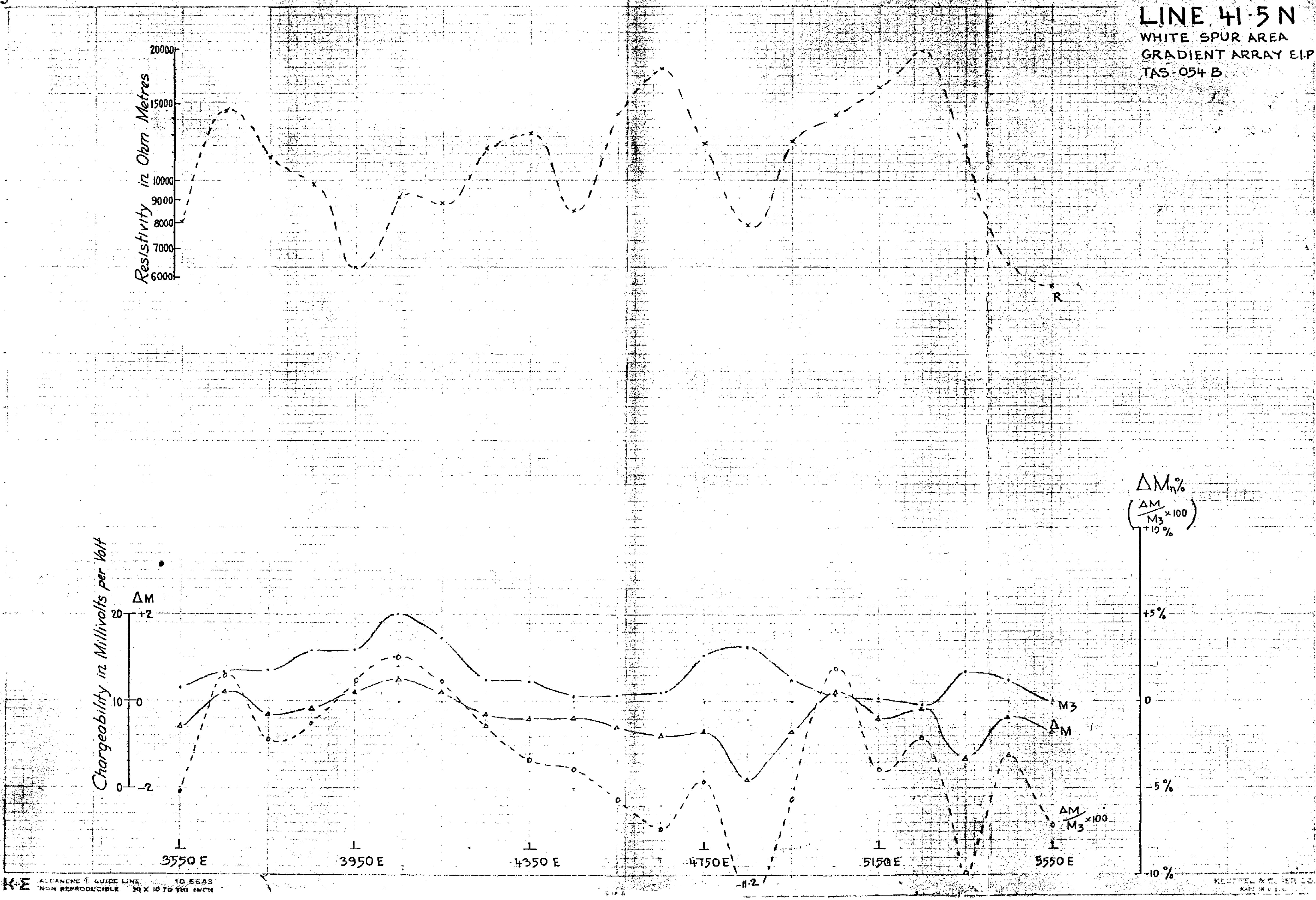
Job Nº TAS-054-B (TAS-035-C REVISED) Sheet 1 of 1 PLATE 5

84-2241 vol 1/2

319031

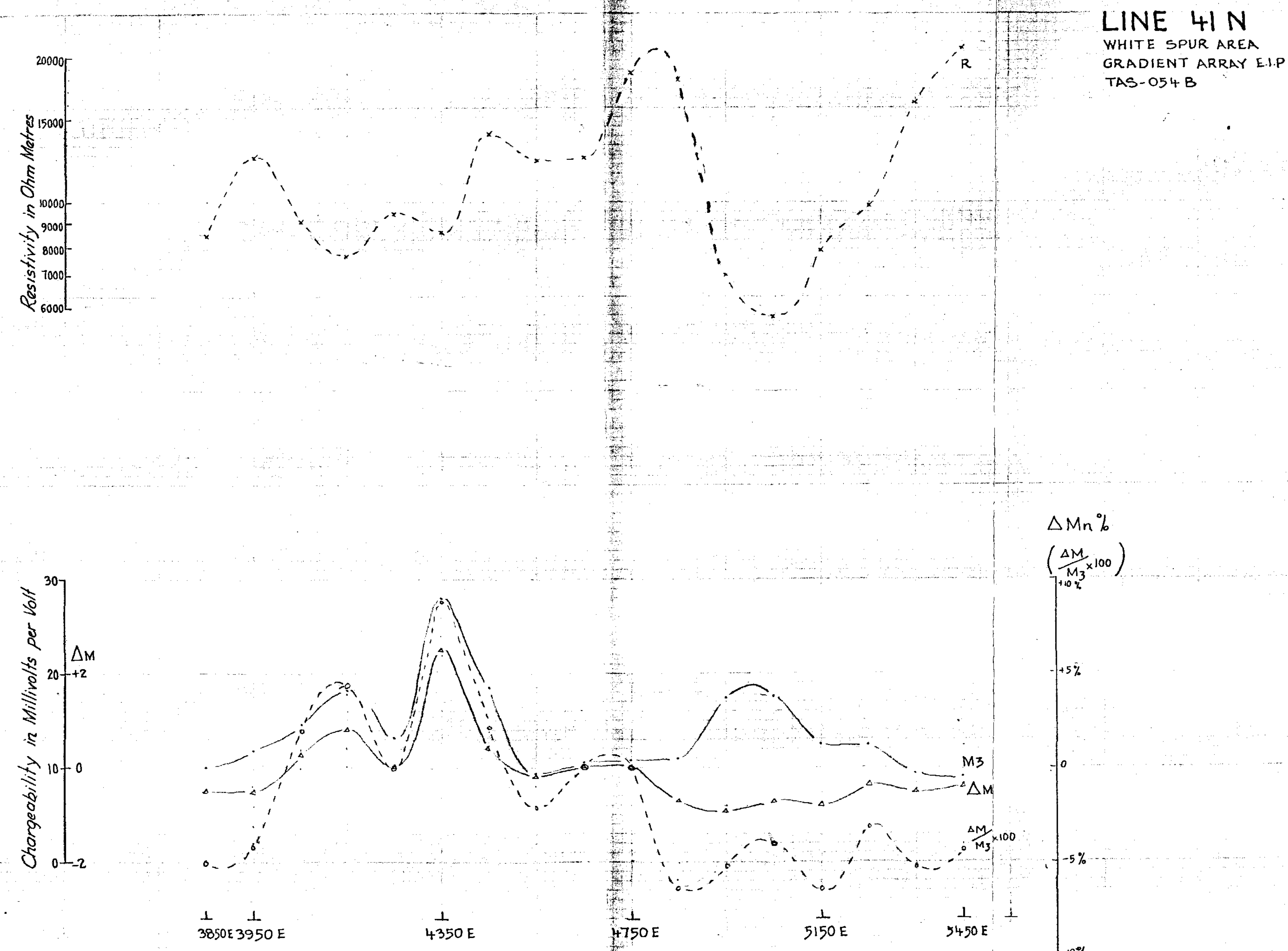
029

LINE 41·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B



K·E ALBANENE GUIDE LINE 10 5643 NON REPRODUCIBLE 10 X 10 TO THE INCH
KEUFFEL & ESSER CO.

319032

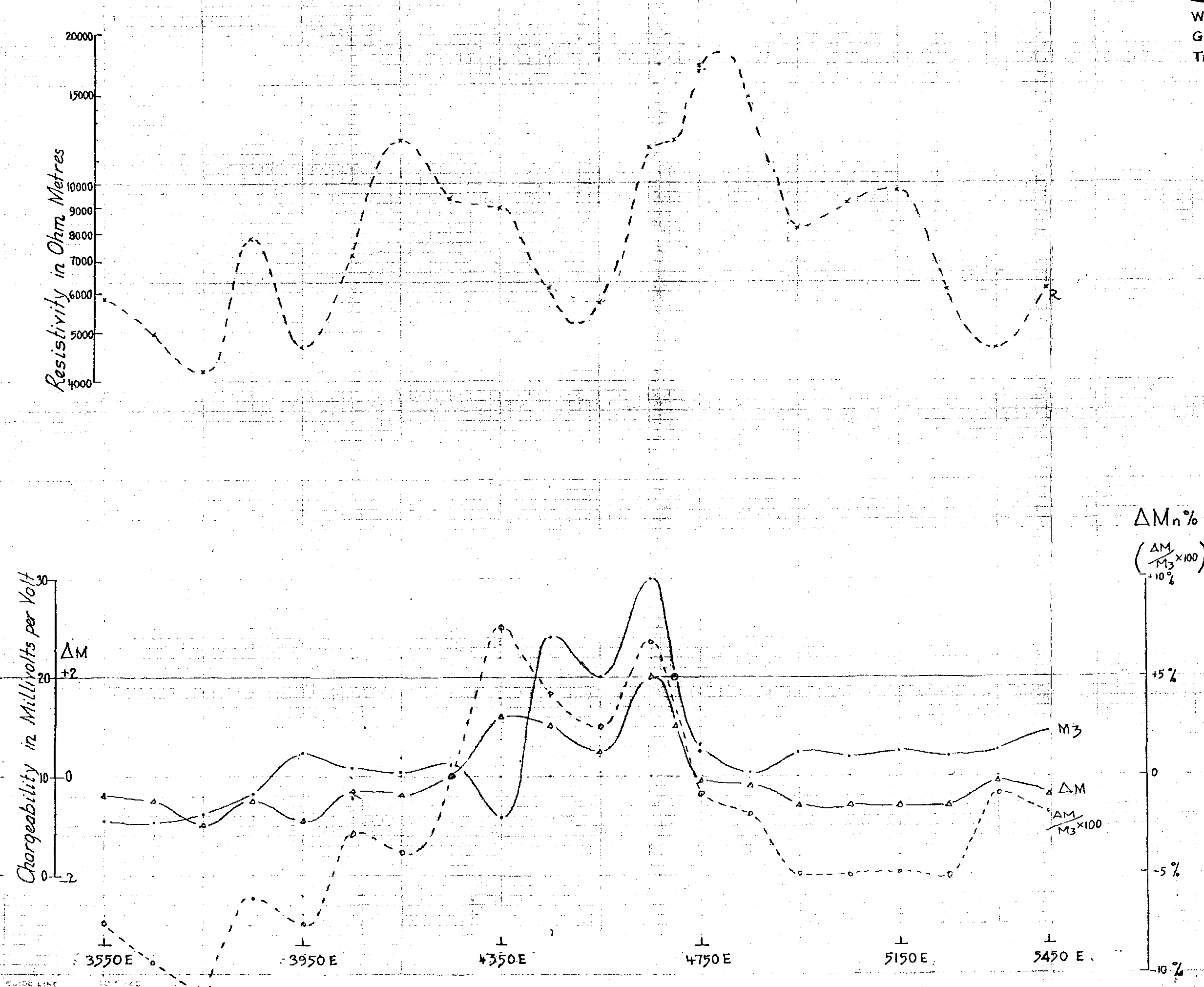


LINE 41 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B
Resistivity in Ohm Metres
20000
15000
10000
9000
8000
7000
6000
R
Chargeability in Millivolts per Volt
ΔM
30
20
+2
10
0
0
-2
M3
ΔM
ΔM/M3 x100
ΔMn %
(ΔM/M3 x100)
+10%
+5%
0
-5%
-10%
3850E
3950 E
4350 E
4750 E
5150 E
5450 E

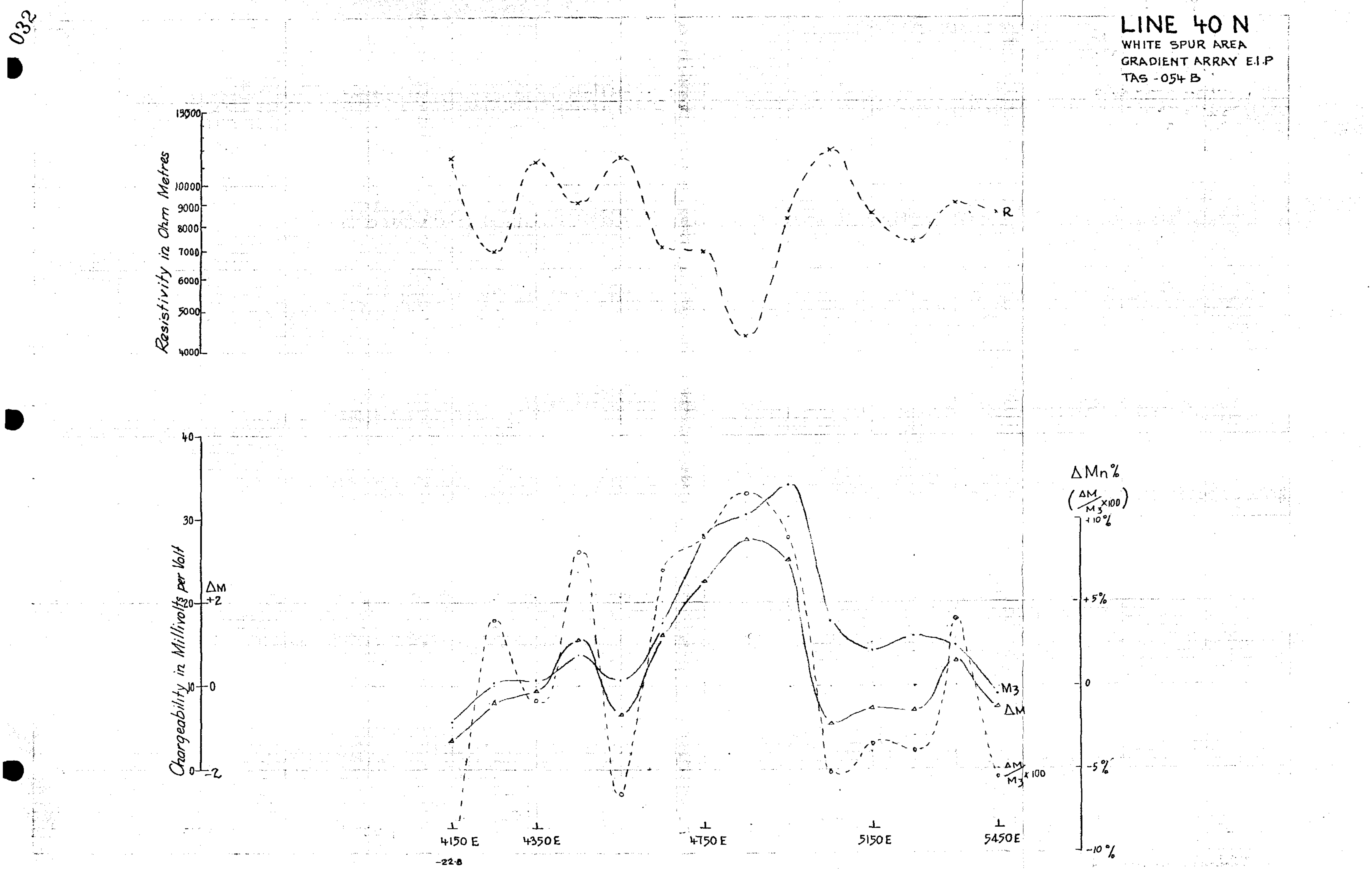
319033

LINE 40·5N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS -054 B



319034



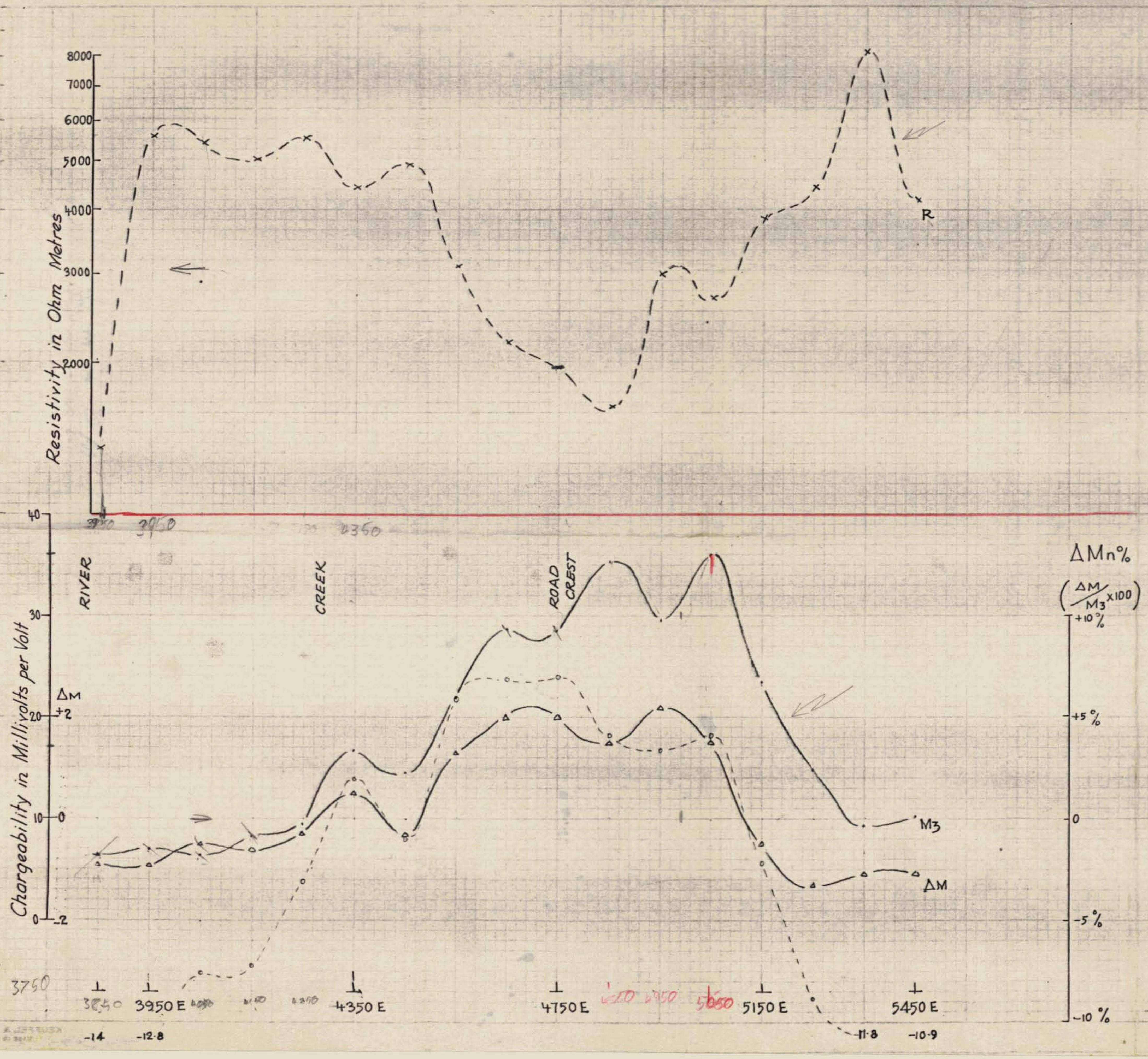
032
LINE 40 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS - 054 B
Resistivity in Ohm Metres
15000
10000
9000
8000
7000
6000
5000
4000
R
Chargeability in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
ΔMn%
(ΔM/M3 x100)
+10%
+5%
0
-5%
-10%
M3
ΔM
ΔM/M3 x 100
4150 E
4350 E
4750 E
5150 E
5450 E
-22.8

033

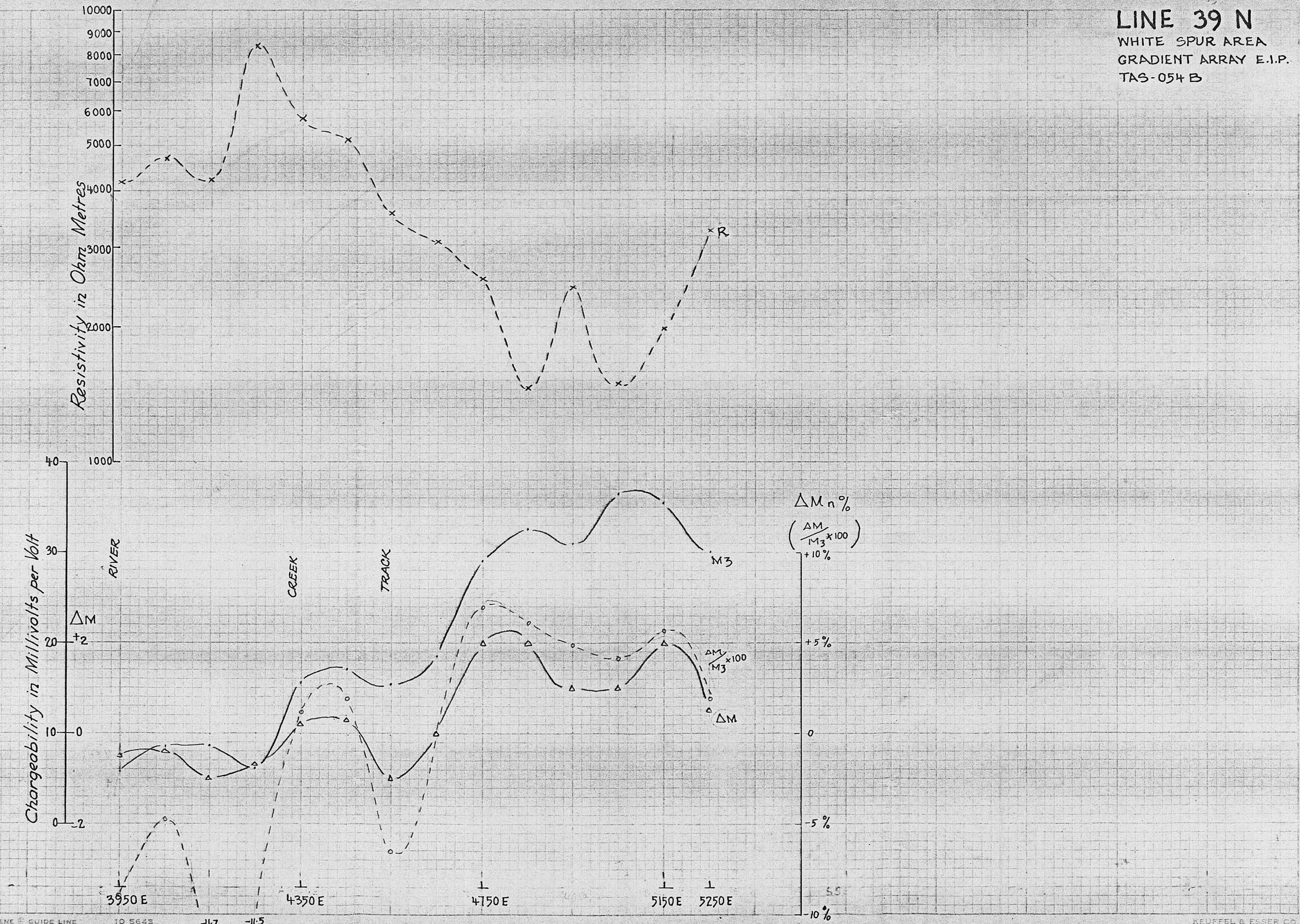
319035

LINE 39·5 N

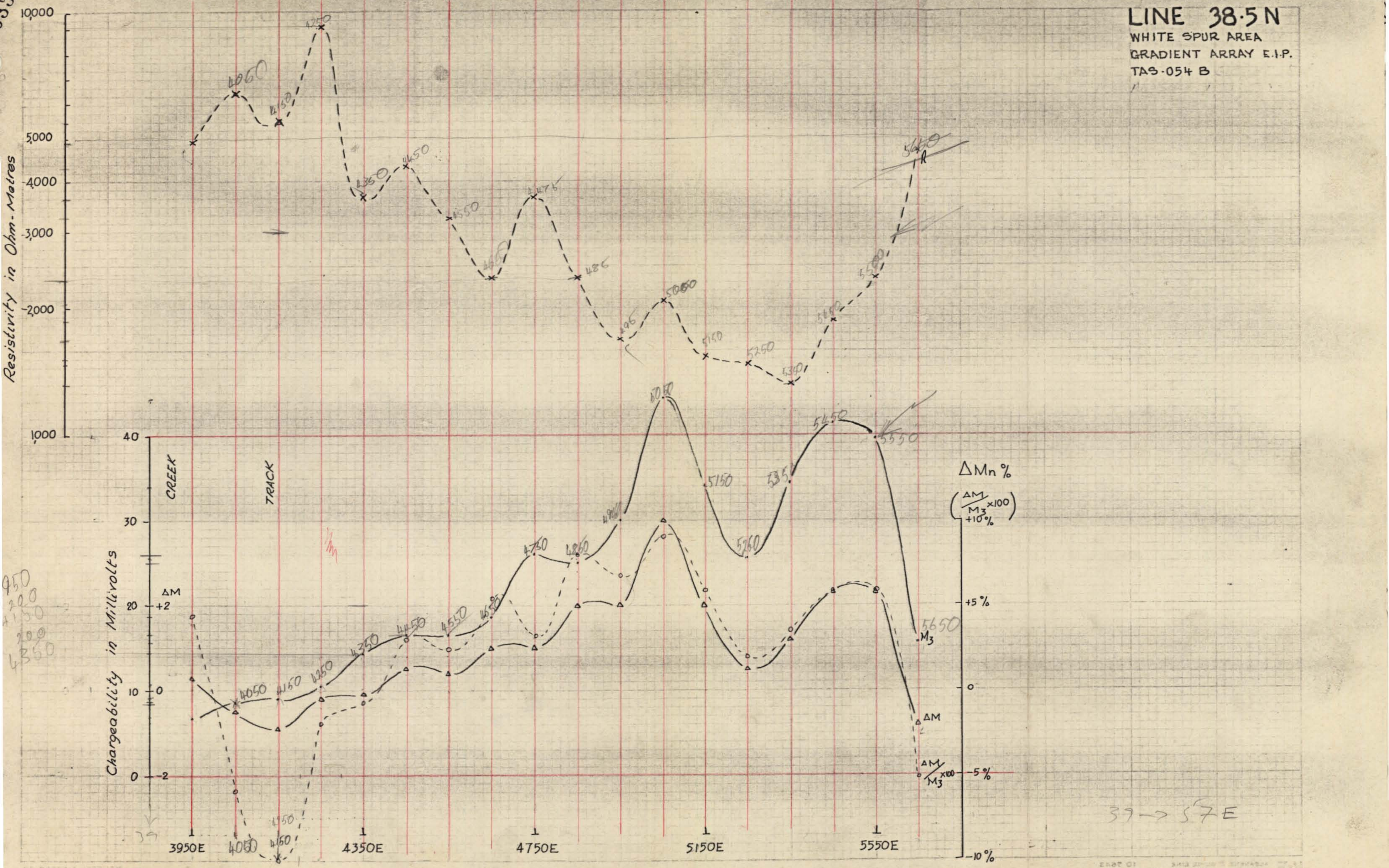
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS -054 B



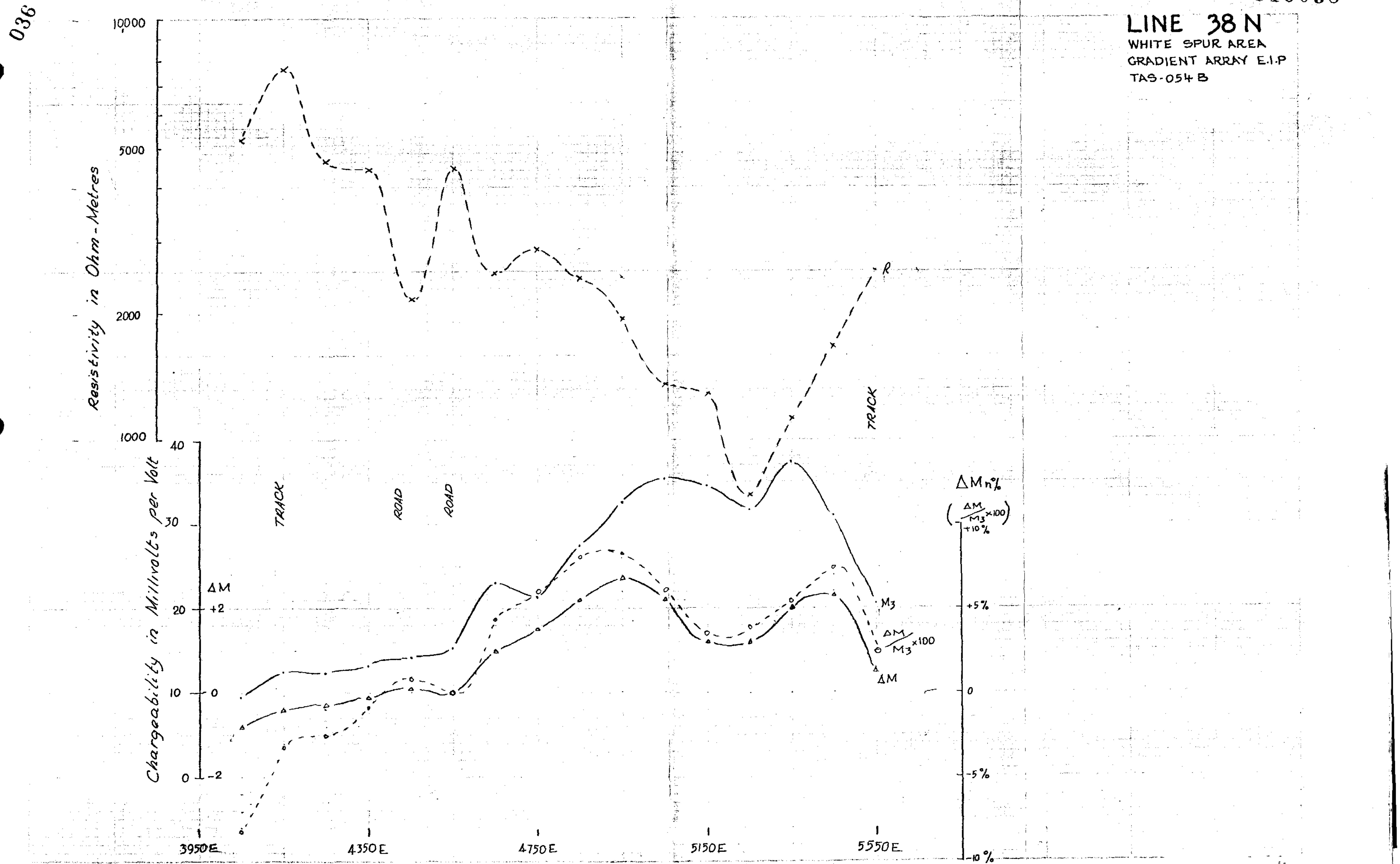
319036


LINE 39 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS-054 B
Resistivity in Ohm Metres
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
R
Chargeability in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
RIVER
CREEK
TRACK
M3
ΔM/M3 x100
ΔM
ΔMn %
(ΔM/M3 x100)
+10 %
+5 %
0
-5 %
-10 %
3950 E
4350 E
4750 E
5150 E
5250 E
-11.7
-11.5

319037

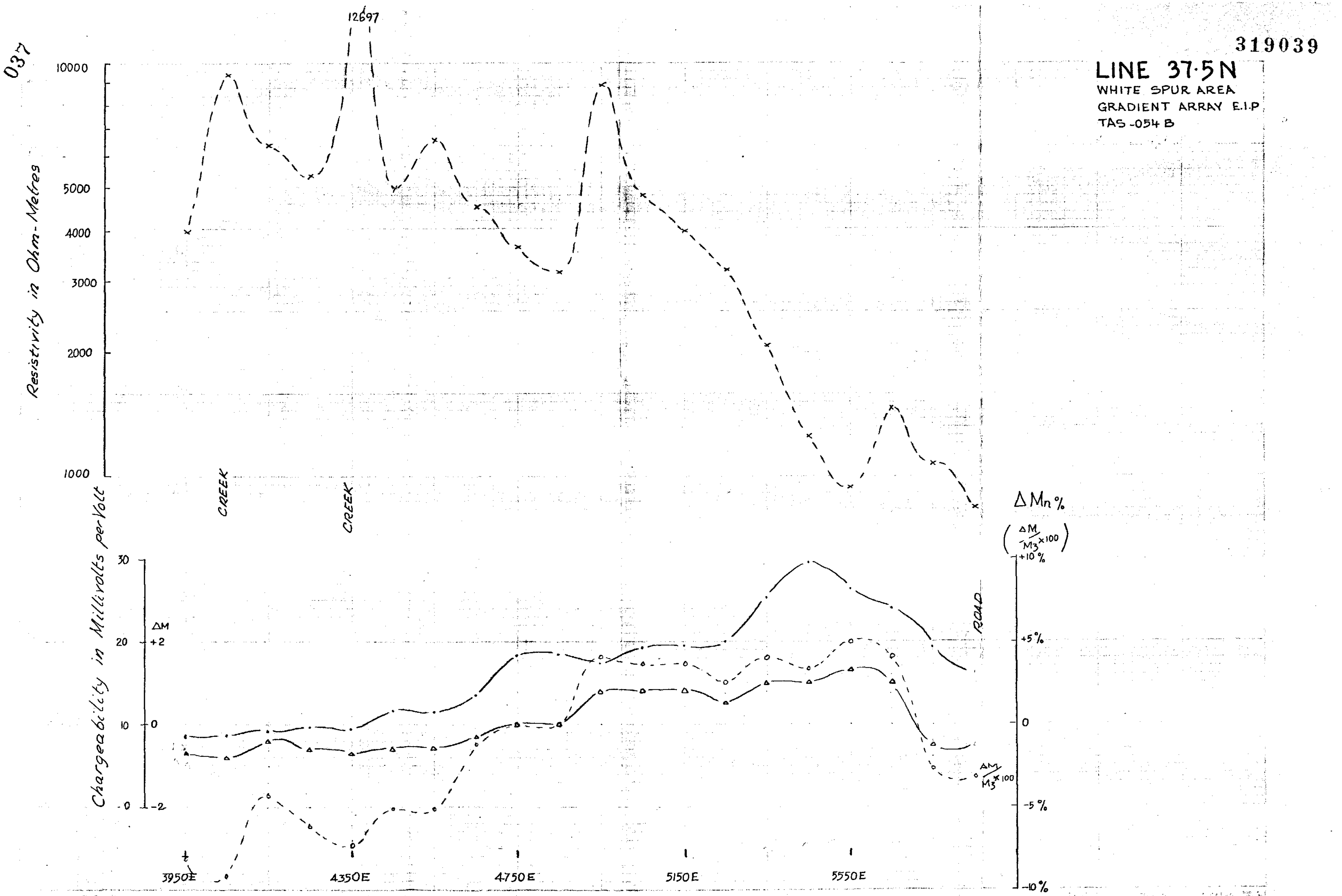

LINE 38·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS-054 B
Resistivity in Ohm-Metres
10,000
5,000
4,000
3,000
2,000
1000
Chargeability in Millivolts
40
30
20
10
0
ΔM
+2
0
-2
CREEK
TRACK
ΔMn %
(ΔM/M3 x100)
+10 %
+5 %
0
-5 %
-10 %
M3
ΔM
ΔM/M3 x100
3950E
4350E
4750E
5150E
5550E
39 → 57E

319038



036
LINE 38 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B
Resistivity in Ohm-Metres
10000
5000
2000
1000
R
TRACK
Chargeability in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
TRACK
ROAD
ROAD
M3
ΔM/M3 ×100
ΔM
ΔMn%
(ΔM/M3 ×100)
+10%
+5%
0
-5%
-10%
3950E
4350E
4750E
5150E
5550E

319039

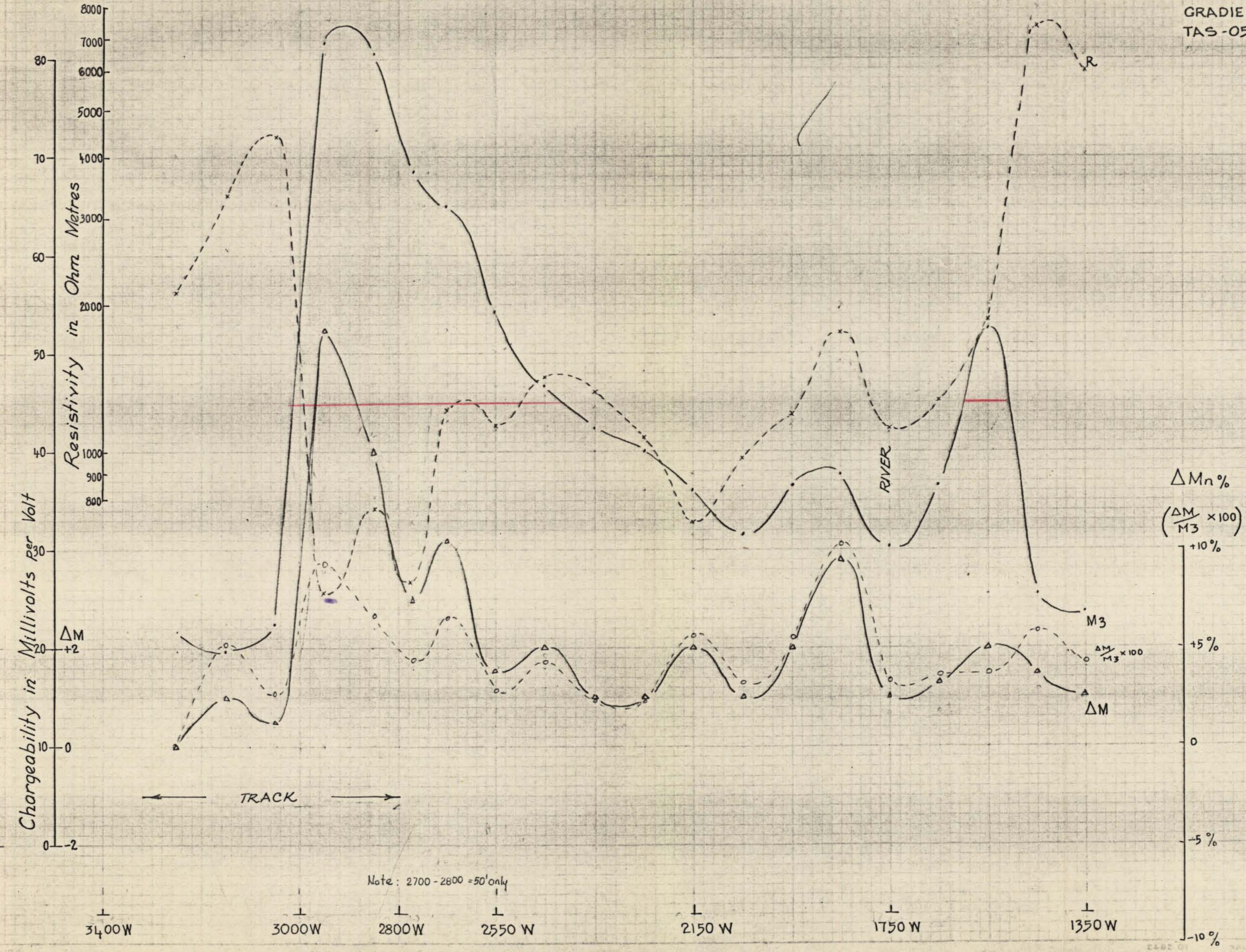


037
LINE 37·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS -054 B
Resistivity in Ohm-Metres
10000
5000
4000
3000
2000
1000
12697
CREEK
CREEK
ROAD
Chargeability in Millivolts per Volt
30
20
10
0
ΔM
+2
0
-2
ΔMn %
(ΔM/M3 ×100)
+10 %
+5 %
0
-5 %
-10 %
ΔM/M3 ×100
3950E
4350E
4750E
5150E
5550E

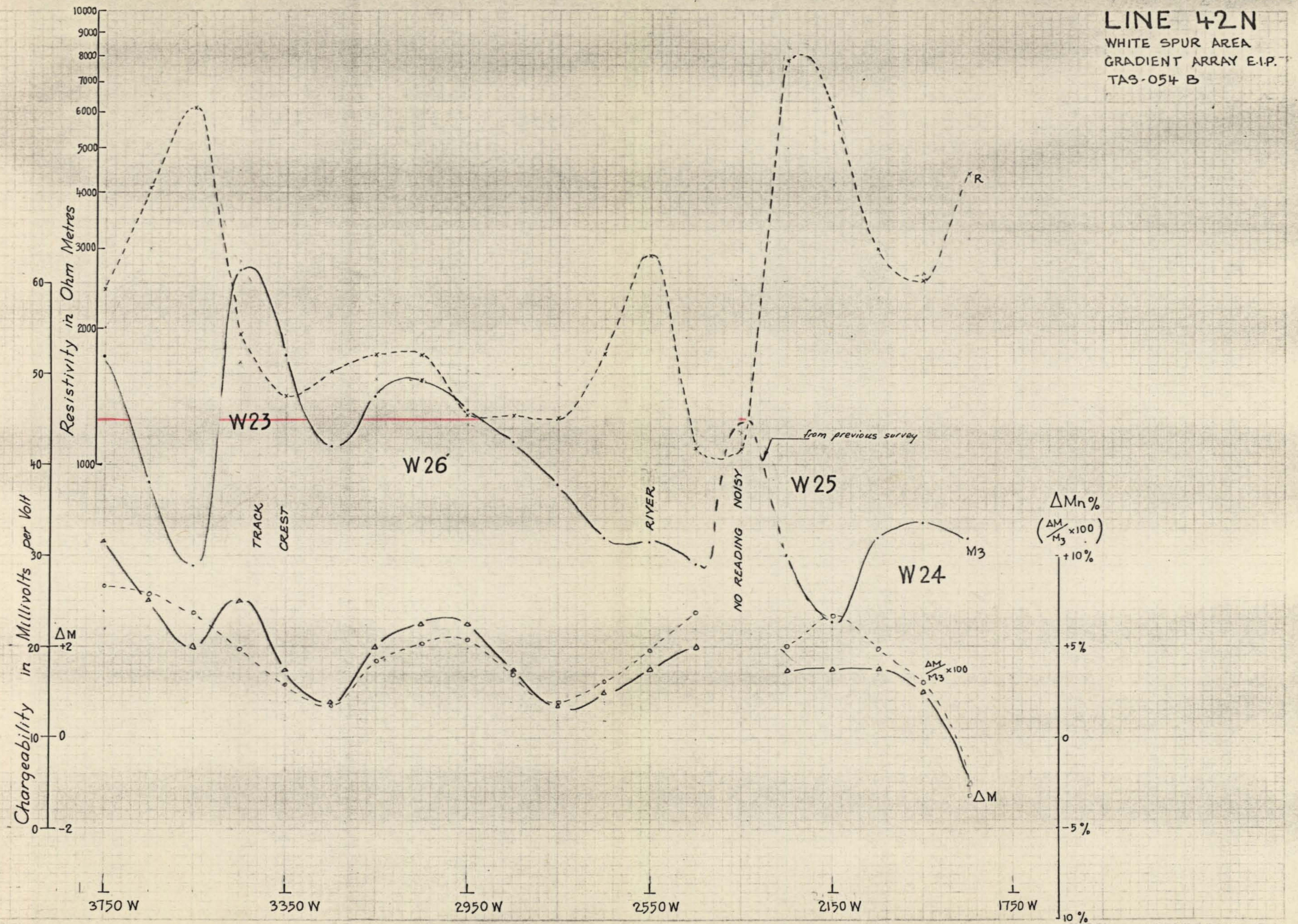
319040

LINE 42·5 N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS-054 B



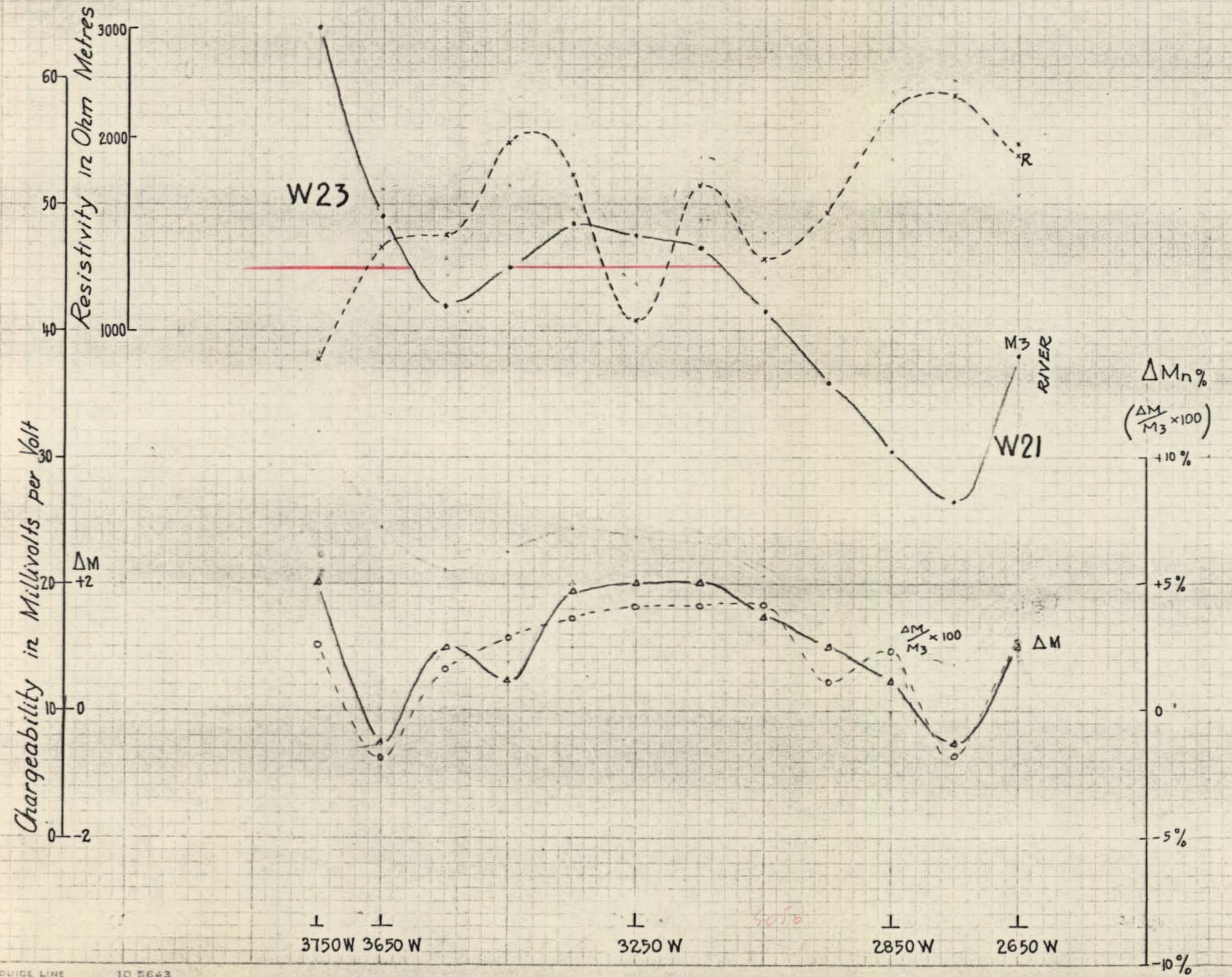
319041


LINE 42N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS-054 B
Resistivity in Ohm Metres
Chargeability in Millivolts per Volt
ΔM
ΔMn%
(ΔM/M3 ×100)
W23
W26
W25
W24
R
M3
ΔM
ΔM/M3 ×100
TRACK
CREST
RIVER
NOISY
NO READING
from previous survey
3750 W
3350 W
2950 W
2550 W
2150 W
1750 W

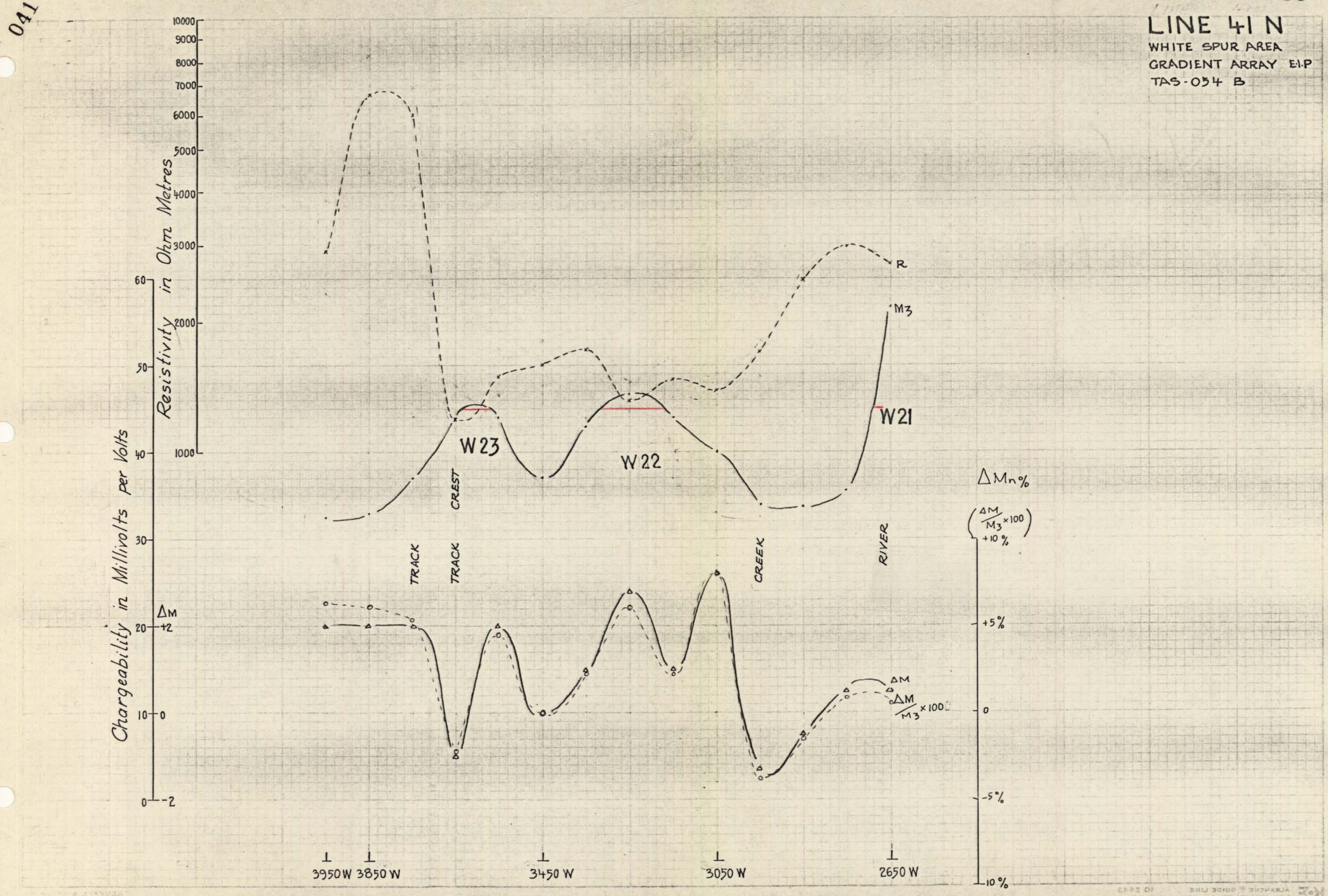
319042

LINE 41·5 N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054B



319043



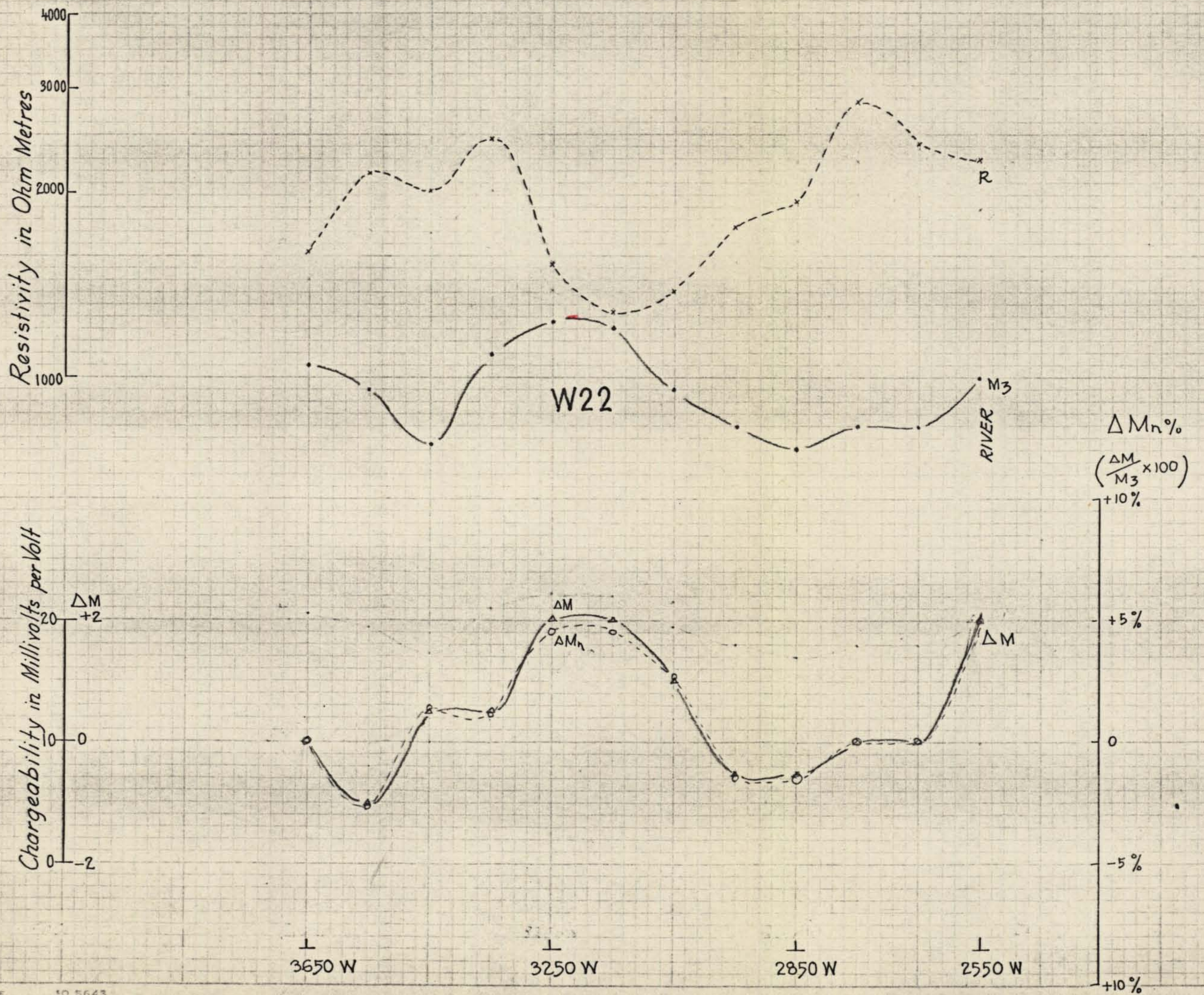
041
LINE 41 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B
Resistivity in Ohm Metres
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
Chargeability in Millivolts per Volts
60
50
40
30
20
10
0
ΔM
+2
0
-2
R
M3
W23
W22
W21
CREST
TRACK
TRACK
CREEK
RIVER
ΔM
ΔM / M3 × 100
ΔMn %
(ΔM / M3 × 100)
+10 %
+5 %
0
-5 %
-10 %
3950 W
3850 W
3450 W
3050 W
2650 W

319044

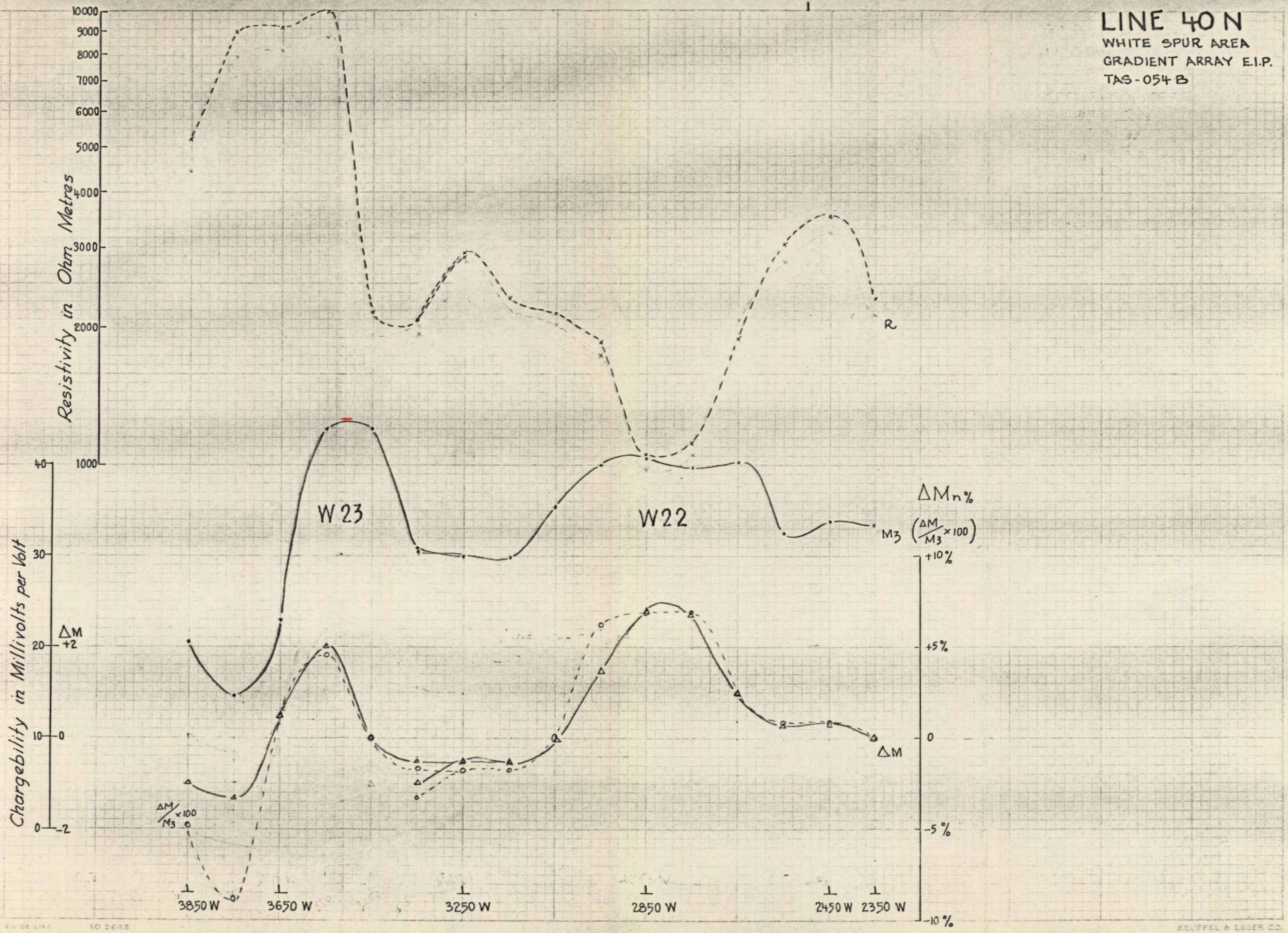
042

LINE 40·5 N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054B



319045



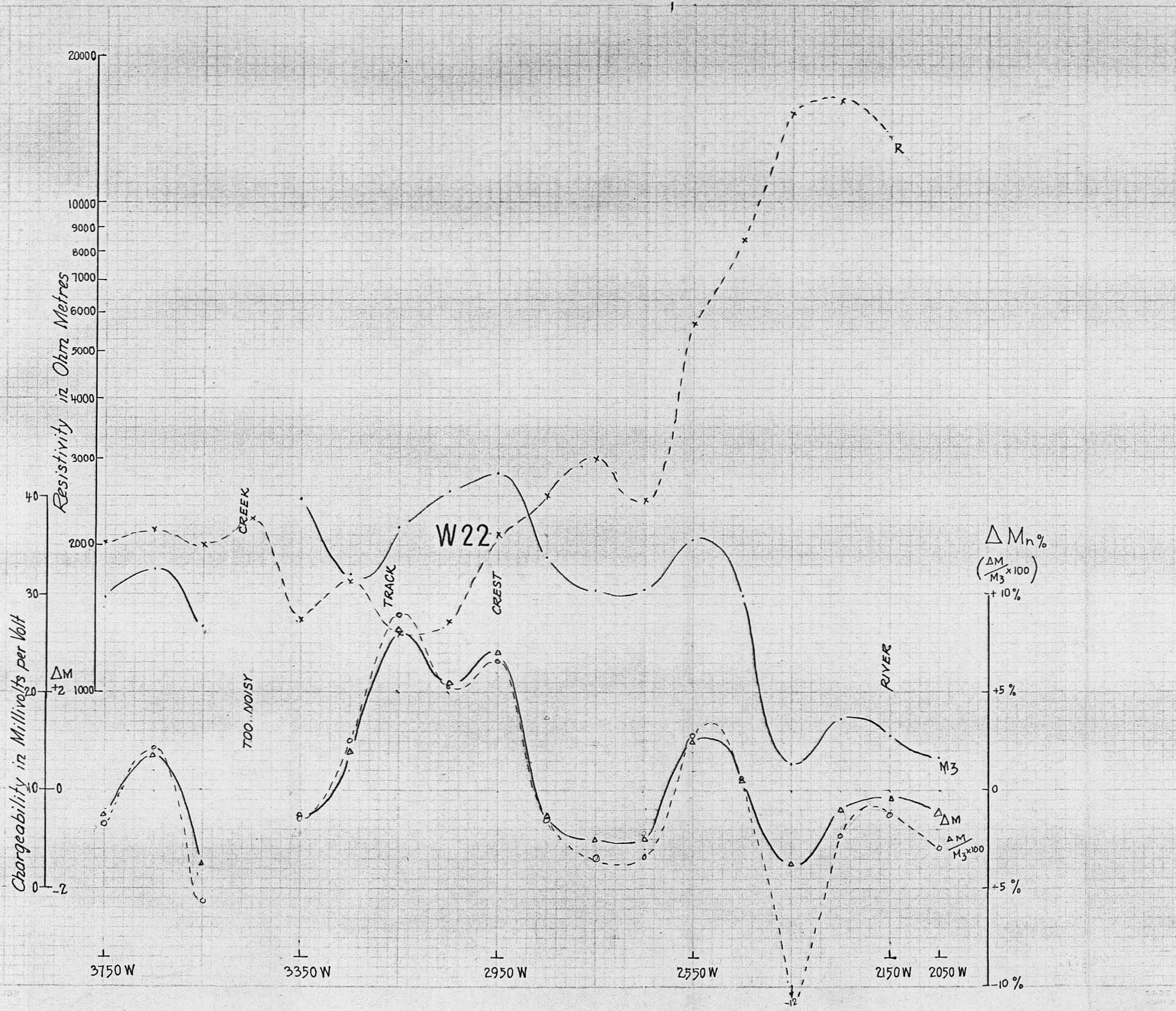
LINE 40 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS-054 B
Resistivity in Ohm Metres
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
R
W 23
W 22
ΔMn%
M3 (ΔM/M3 × 100)
Chargebility in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
ΔM/M3 × 100
+10%
+5%
0
-5%
-10%
ΔM
3850 W
3650 W
3250 W
2850 W
2450 W
2350 W

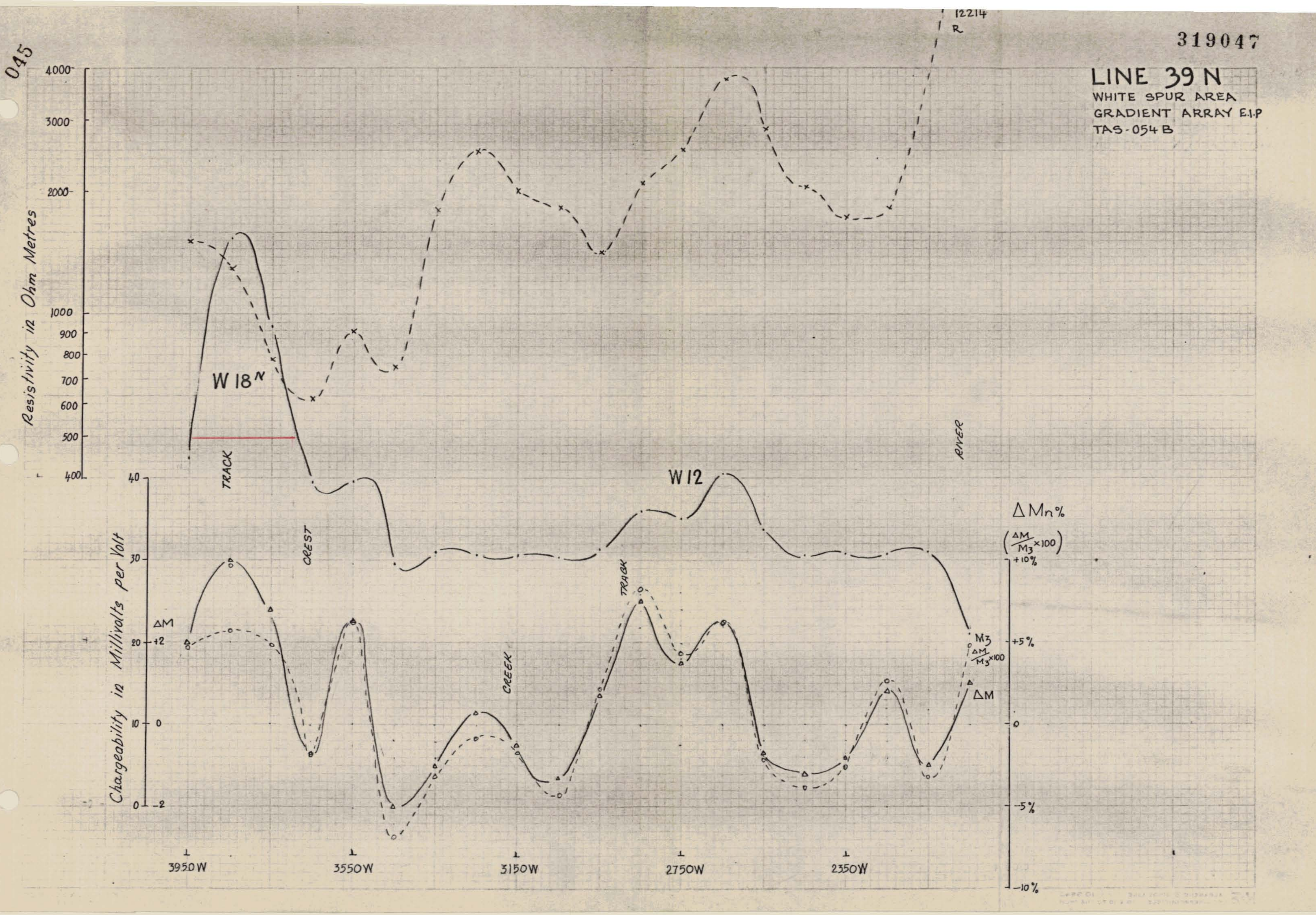
044

319046

LINE 39·5 N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B





045
12214 R
LINE 39 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B
Resistivity in Ohm Metres
4000
3000
2000
1000
900
800
700
600
500
400
W 18 N
TRACK
CREST
RIVER
W 12
Chargeability in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
ΔMn%
(ΔM/M3 ×100)
+10%
+5%
0
-5%
-10%
M3
ΔM/M3 ×100
ΔM
TRACK
CREEK
3950W
3550W
3150W
2750W
2350W

319048

LINE 38·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS - 054 B

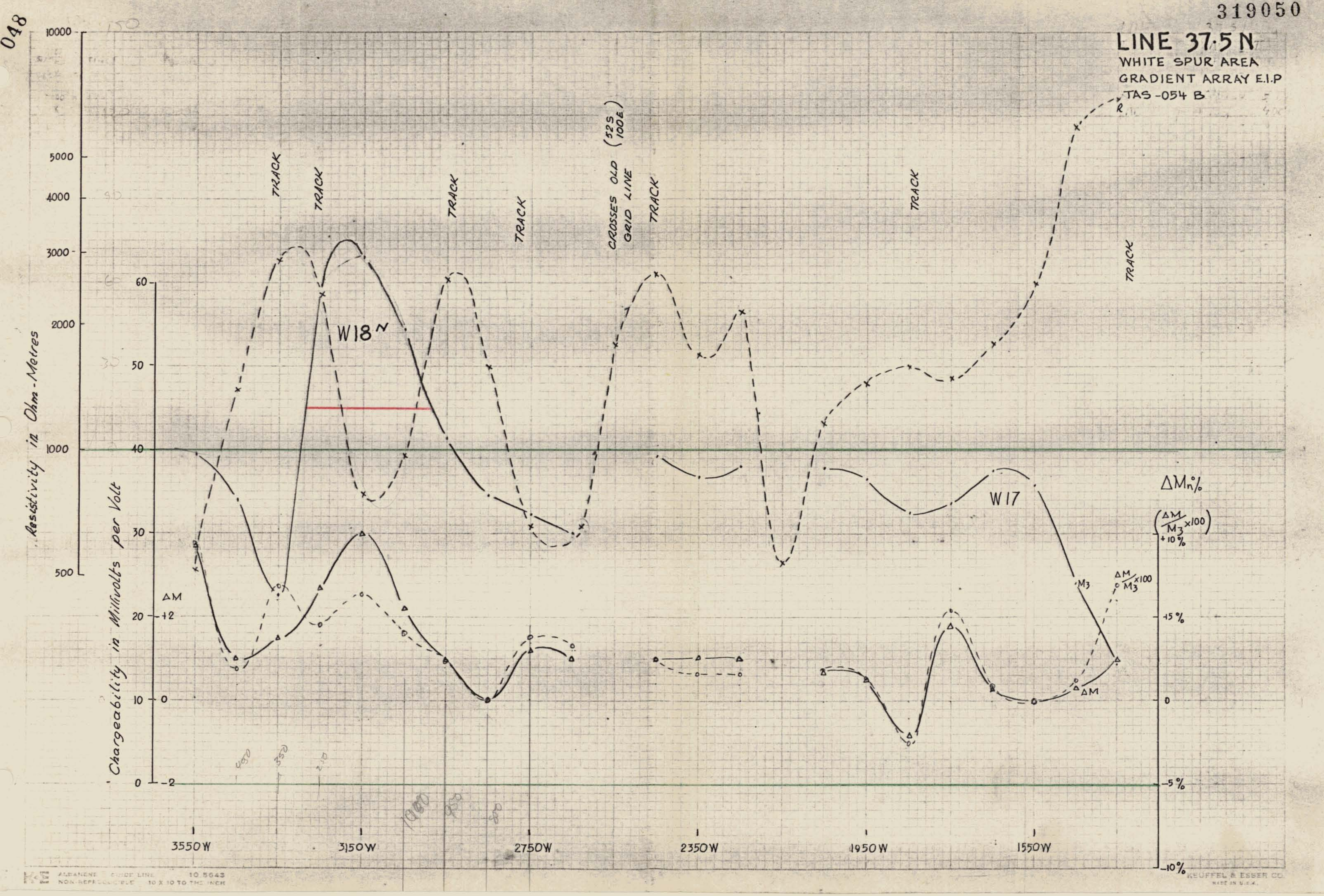
047

319049

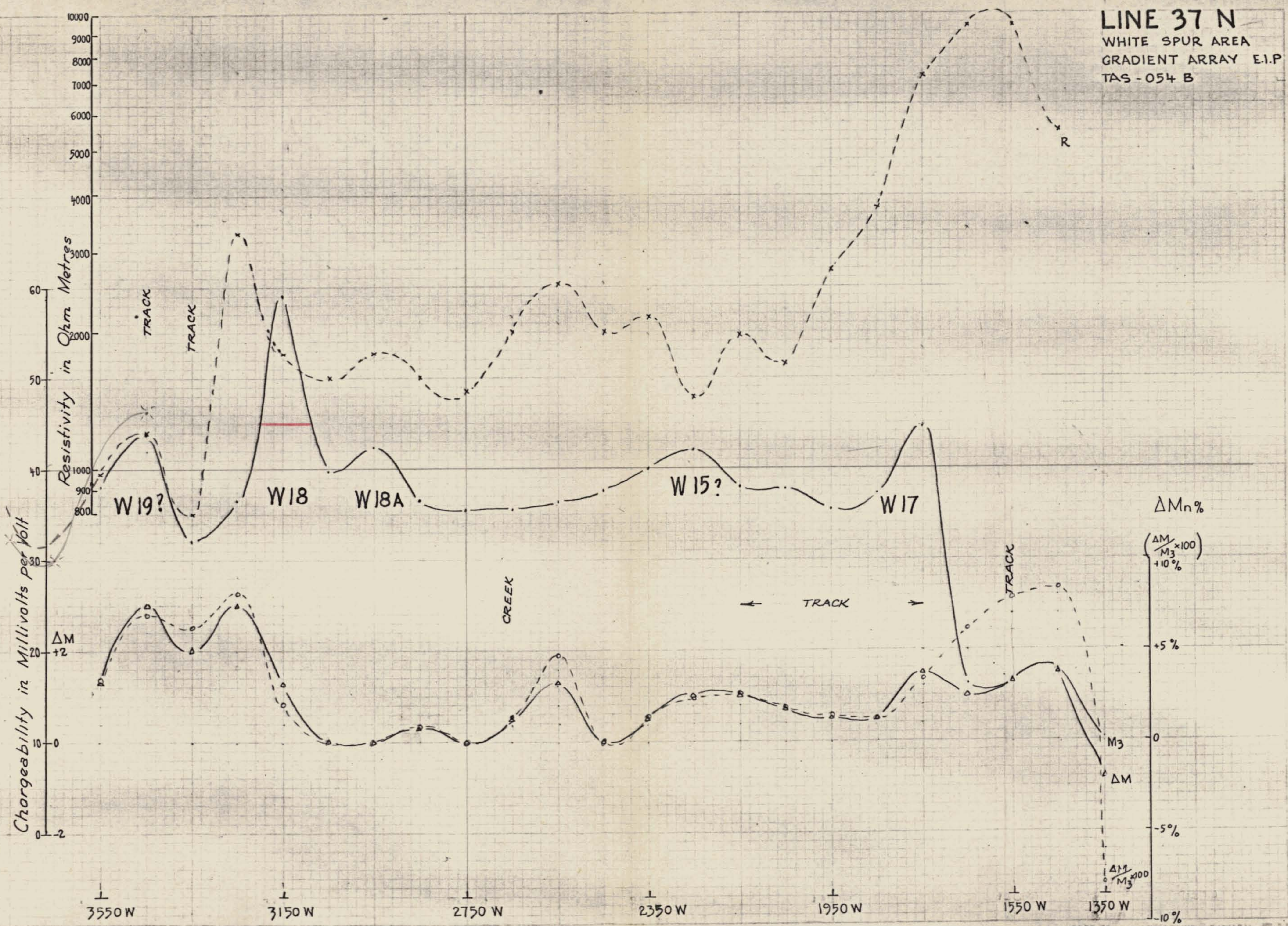
LINE 38 N

WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS -054 B

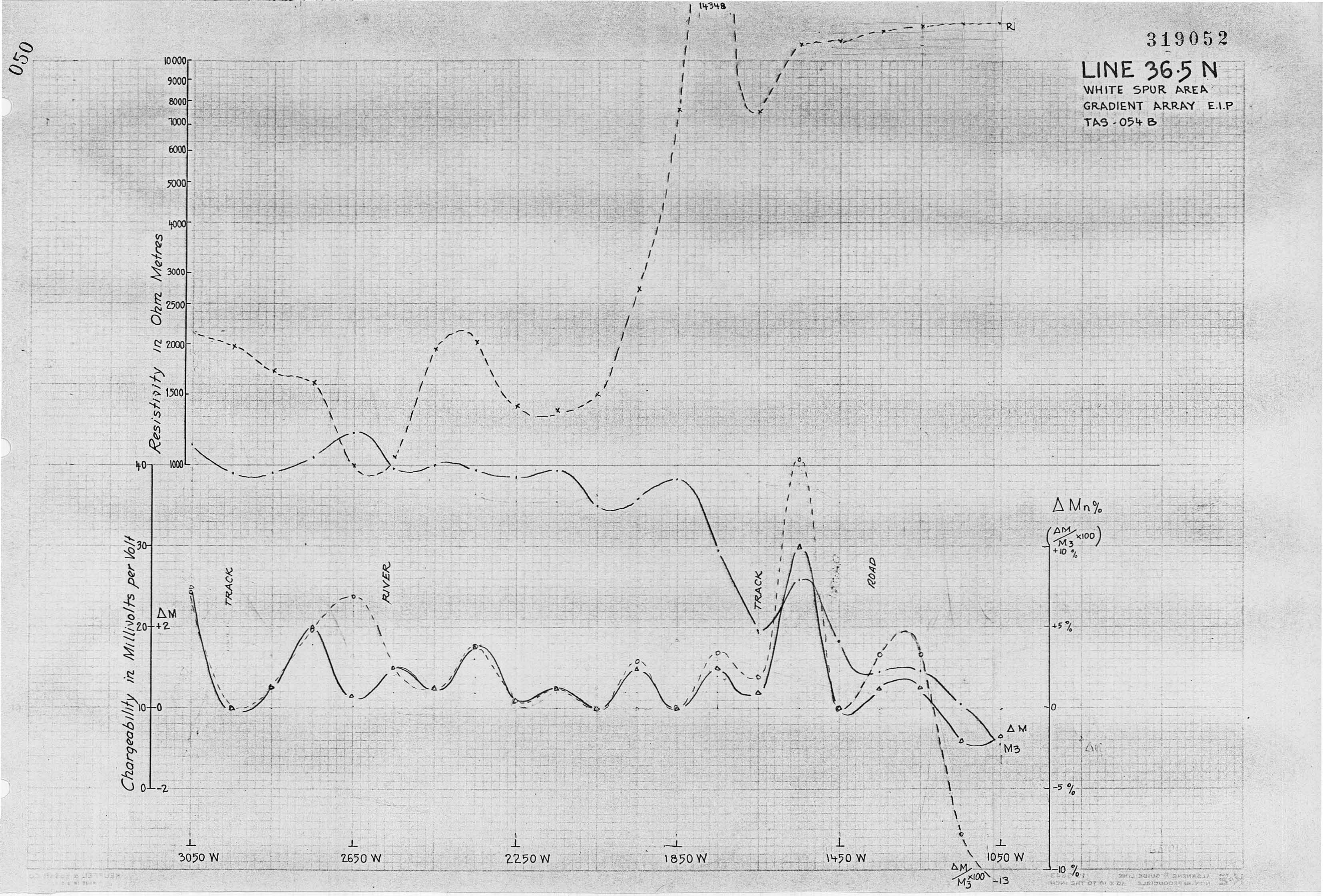
319050


LINE 37·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS -054 B
Resistivity in Ohm-Metres
Chargeability in Millivolts per Volt
10000
5000
4000
3000
2000
1000
500
60
50
40
30
20
10
0
ΔM
+2
0
-2
TRACK
TRACK
TRACK
TRACK
CROSSES OLD GRID LINE (52S 100E)
TRACK
TRACK
TRACK
W18N
W17
ΔMn%
(ΔM/M3 x100)
+10%
+5%
0
-5%
-10%
M3
ΔM/M3 x100
ΔM
3550W
3150W
2750W
2350W
1950W
1550W
KEUFFEL & ESSER CO.
ALBANENE
10 X 10 TO THE INCH
10 5643

319051

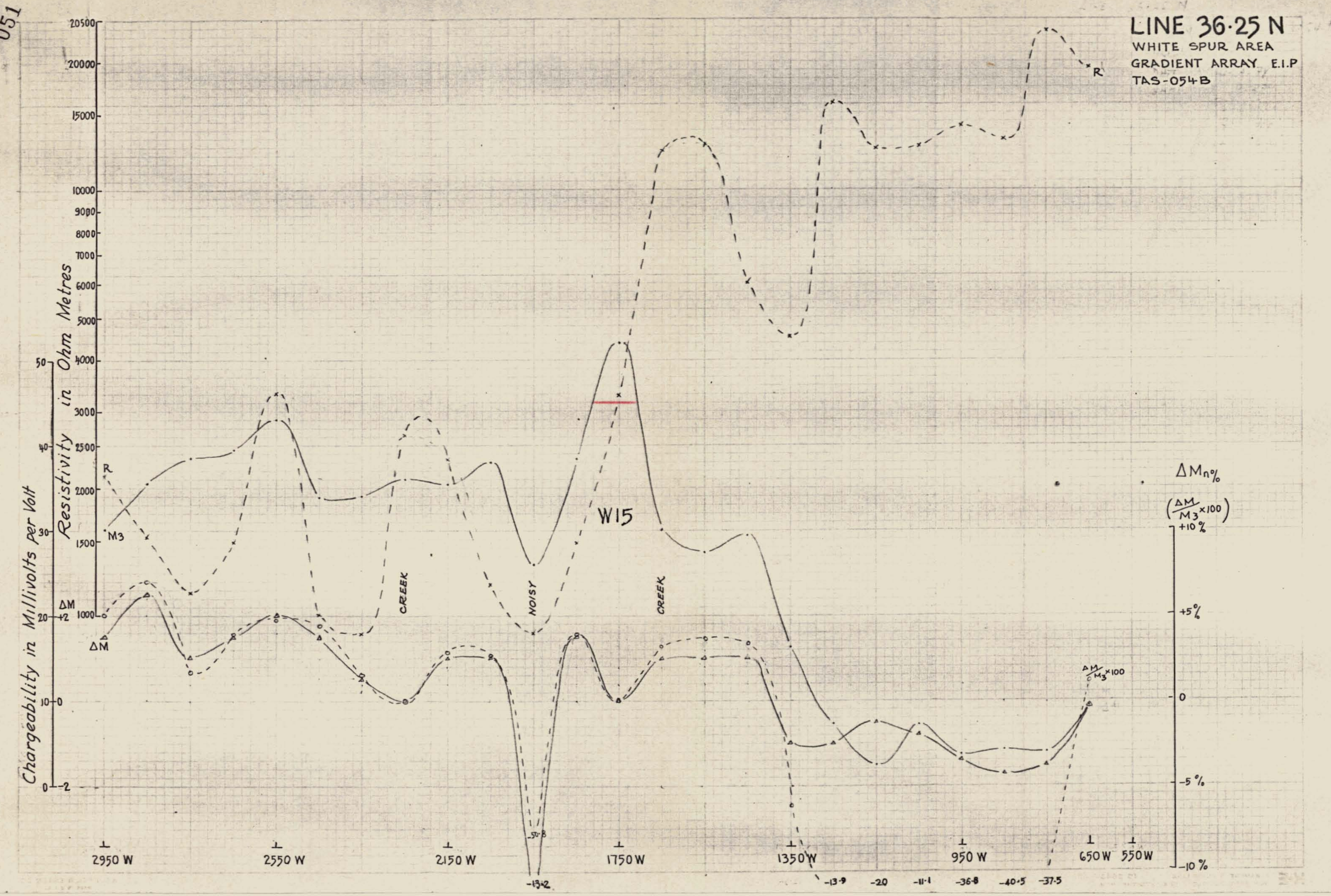


LINE 37 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS - 054 B
Resistivity in Ohm Metres
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
900
800
Chargeability in Millivolts per Volt
60
50
40
30
20
10
0
ΔM
+2
0
-2
TRACK
TRACK
TRACK
TRACK
CREEK
W19?
W18
W18A
W15?
W17
R
ΔMn%
(ΔM/M3 ×100)
+10%
+5%
0
-5%
-10%
M3
ΔM
ΔM/M3 ×100
3550 W
3150 W
2750 W
2350 W
1950 W
1550 W
1350 W

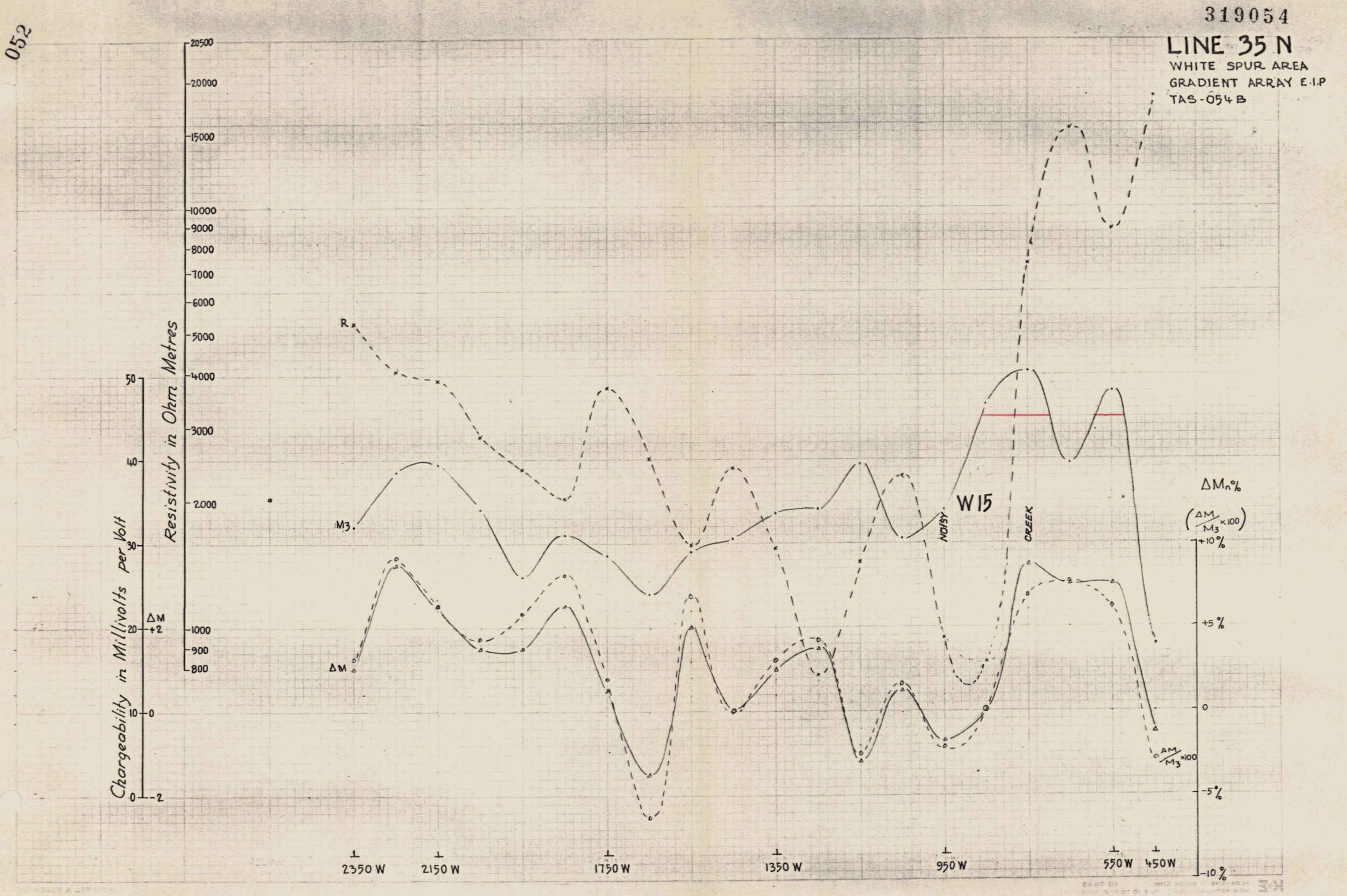


050
319052
LINE 36.5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS - 054 B
Resistivity in Ohm Metres
10000
9000
8000
7000
6000
5000
4000
3000
2500
2000
1500
1000
14348
R
Chargeability in Millivolts per Volt
40
30
20
10
0
ΔM
+2
0
-2
TRACK
RIVER
TRACK
ROAD
ΔMn%
(ΔM/M3 ×100)
+10 %
+5 %
0
-5 %
-10 %
ΔM
M3
ΔM/M3 ×100
-13
3050 W
2650 W
2250 W
1850 W
1450 W
1050 W

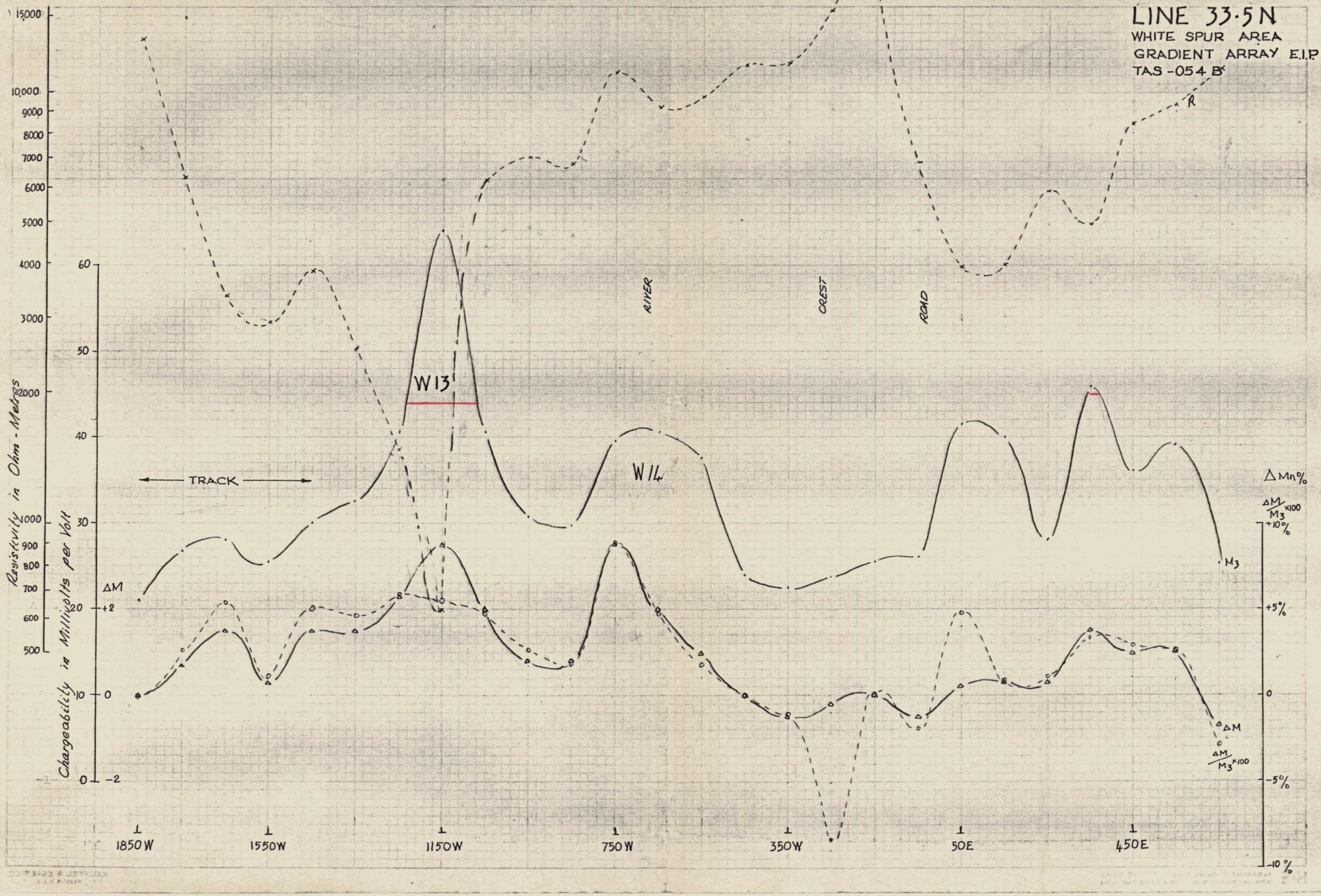
319053



LINE 36·25 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054B
Chargeability in Millivolts per Volt
Resistivity in Ohm Metres
ΔMn%
(ΔM/M3 ×100)
W15
CREEK
NOISY
CREEK
R
M3
ΔM
2950 W
2550 W
2150 W
1750 W
1350 W
950 W
650 W
550 W
-13·2
-50·8
-13·9
-20
-11·1
-36·8
-40·5
-37·5
+10 %
+5 %
0
-5 %
-10 %


052
319054
LINE 35 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B
Chargeability in Millivolts per Volt
Resistivity in Ohm Metres
ΔM
R
M3
ΔM
W15
NOISY
CREEK
ΔMn%
(ΔM/M3 ×100)
ΔM/M3 ×100
20500
20000
15000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
900
800
50
40
30
20
10
0
+2
0
-2
+10%
+5%
0
-5%
-10%
2350 W
2150 W
1750 W
1350 W
950 W
550 W
450 W

319055



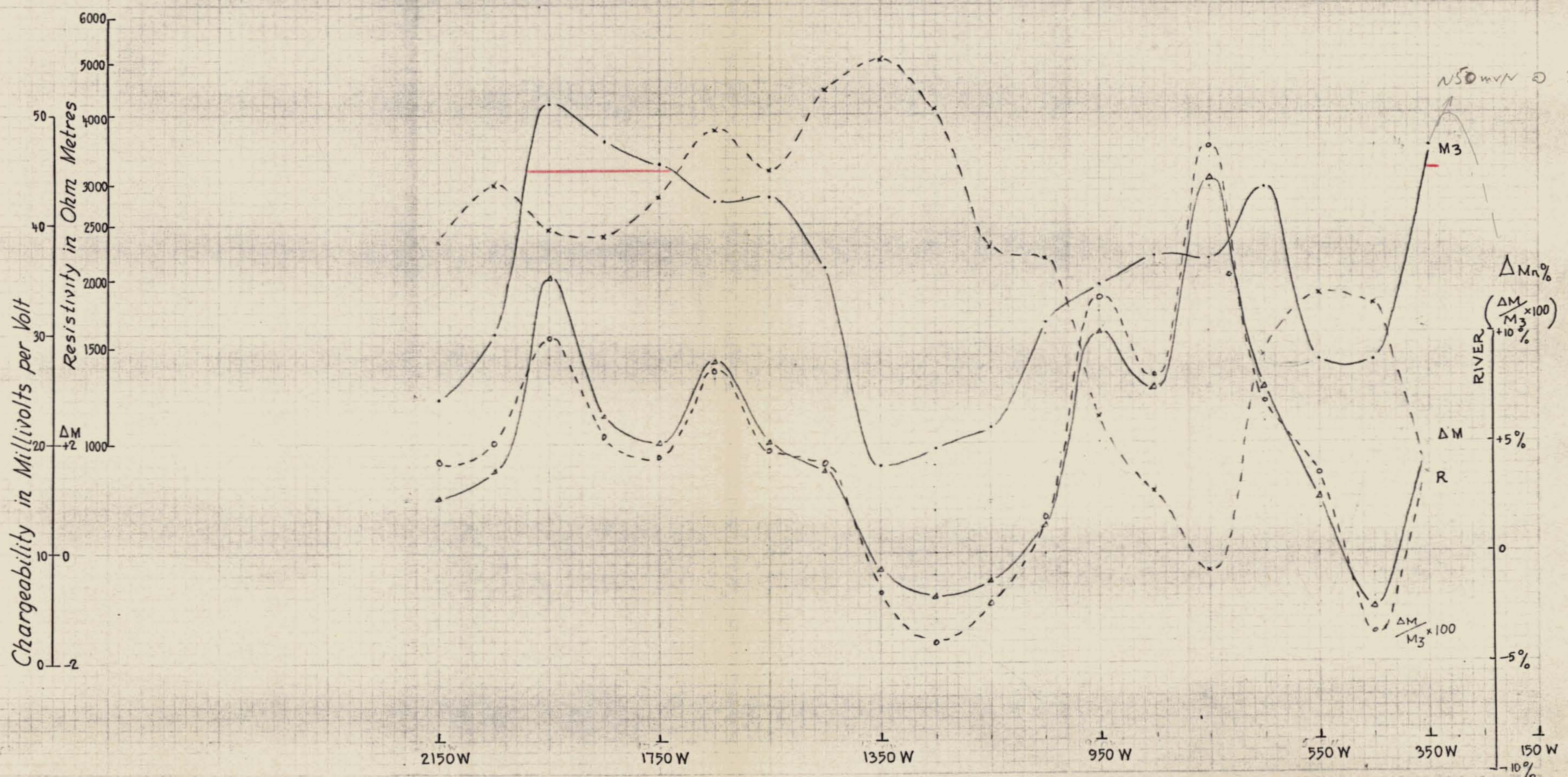
LINE 33·5 N
WHITE SPUR AREA
GRADIENT ARRAY E.I.P.
TAS -054 B
22644
15000
10,000
9000
8000
7000
6000
5000
4000
3000
2000
1000
900
800
700
600
500
60
50
40
30
20
10
0
ΔM
+2
0
-2
Resistivity in Ohm - Metres
Chargeability in Millivolts per Volt
R
RIVER
CREST
ROAD
W13
W14
TRACK
M3
ΔM
ΔM/M3 ×100
ΔMn%
ΔM/M3 ×100
+10%
+5%
0
-5%
-10%
1850W
1550W
1150W
750W
350W
50E
450E

054

319056

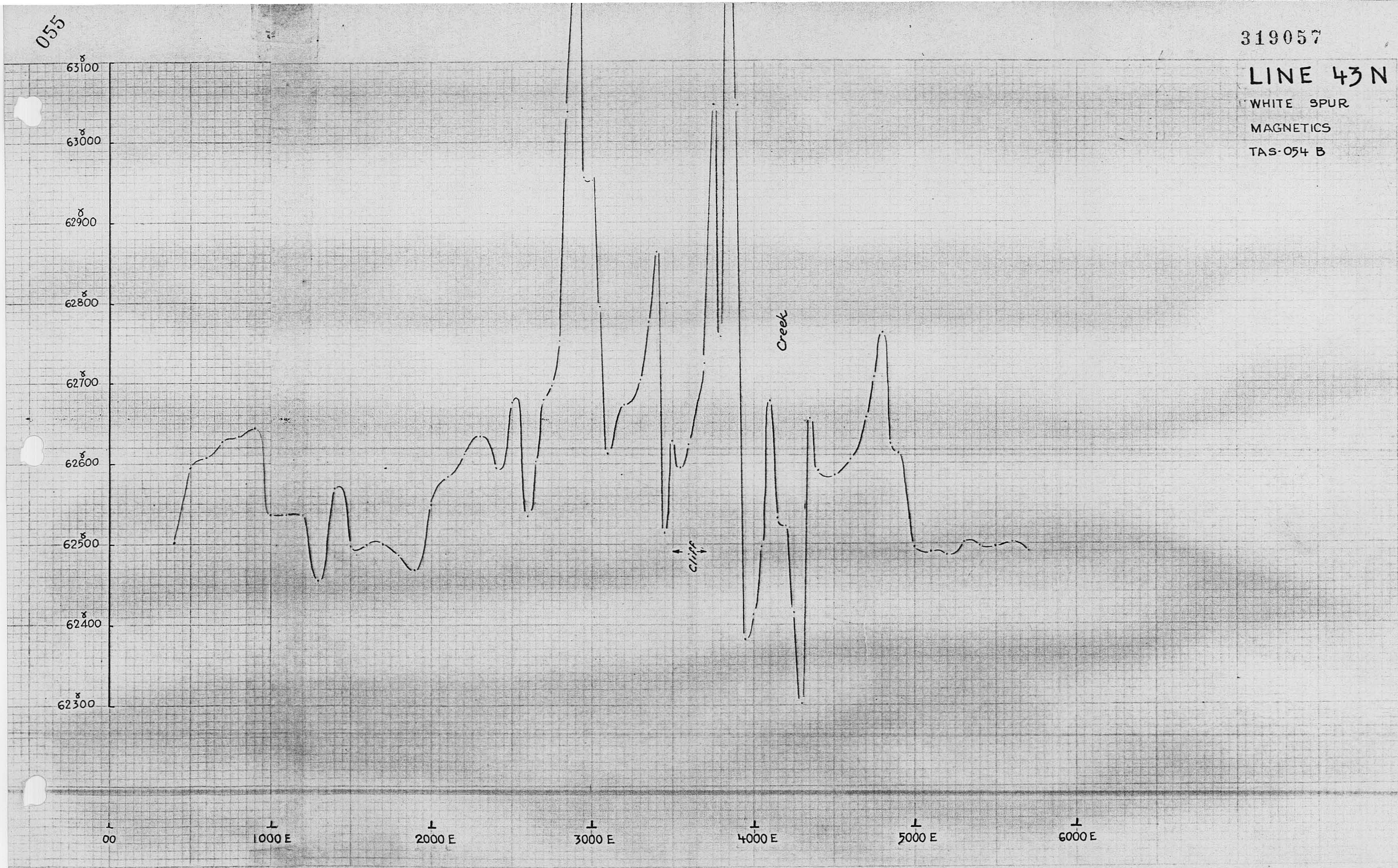
LINE 34·5 N

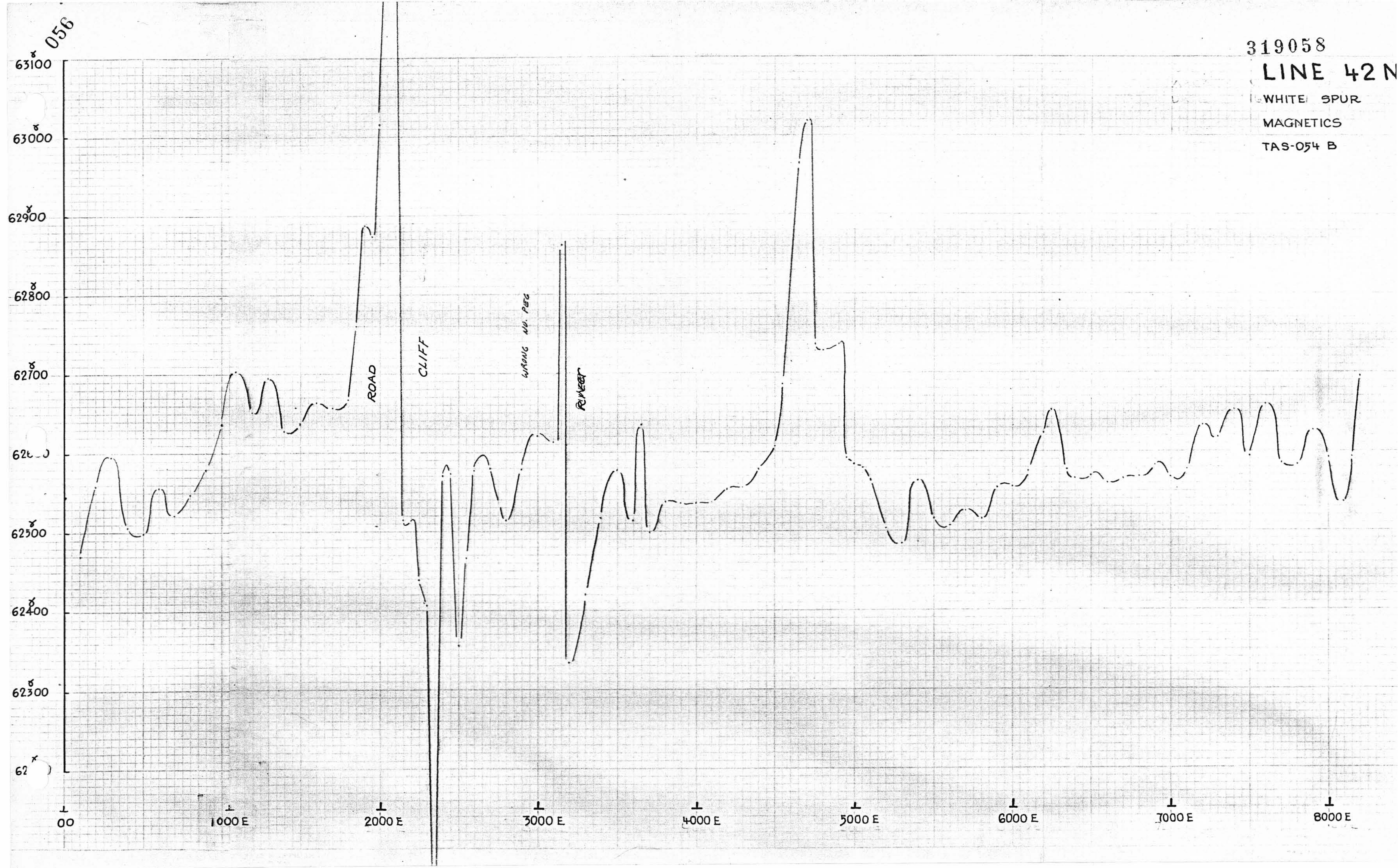
WHITE SPUR AREA
GRADIENT ARRAY E.I.P
TAS-054 B



055

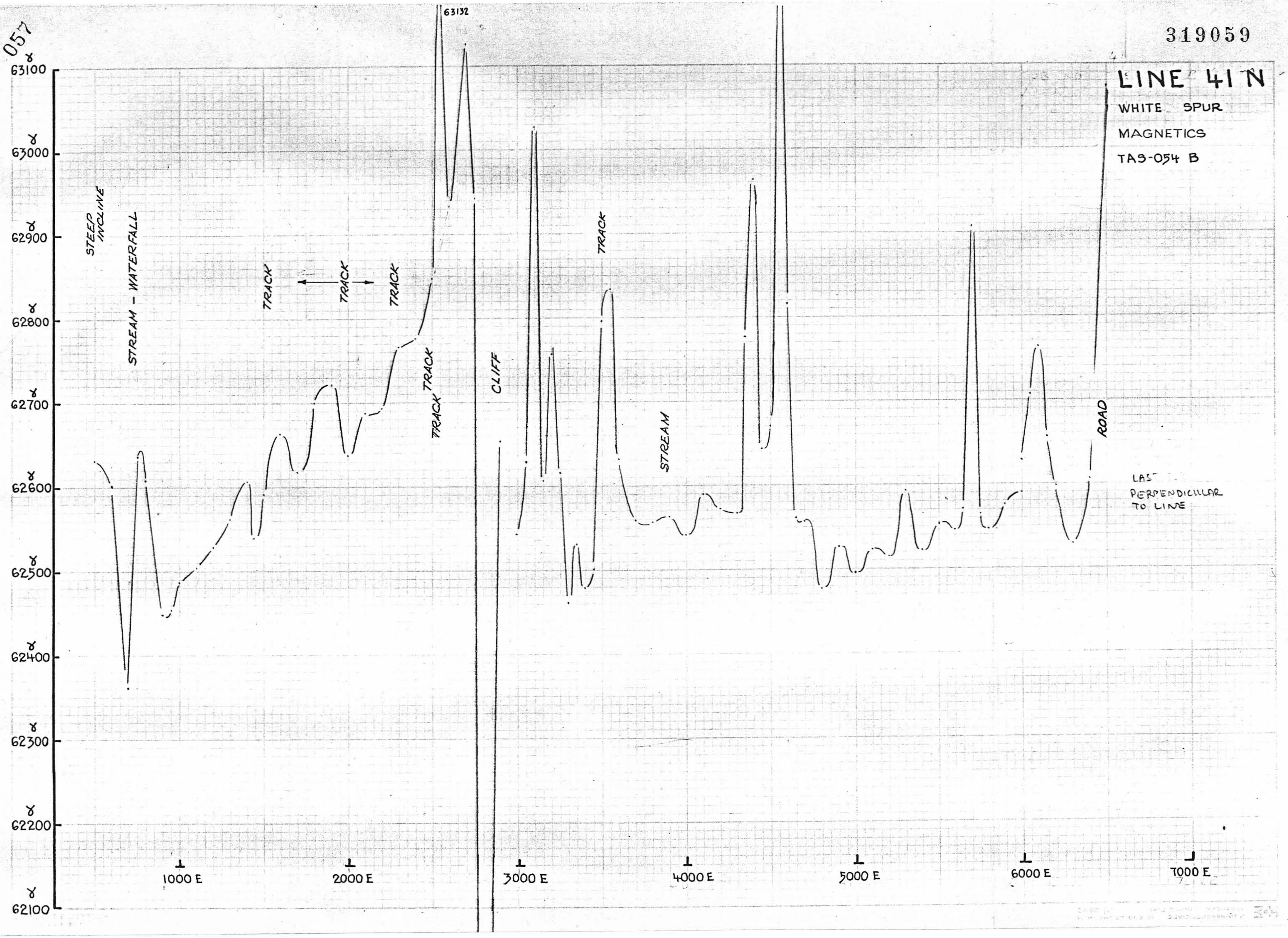
319057

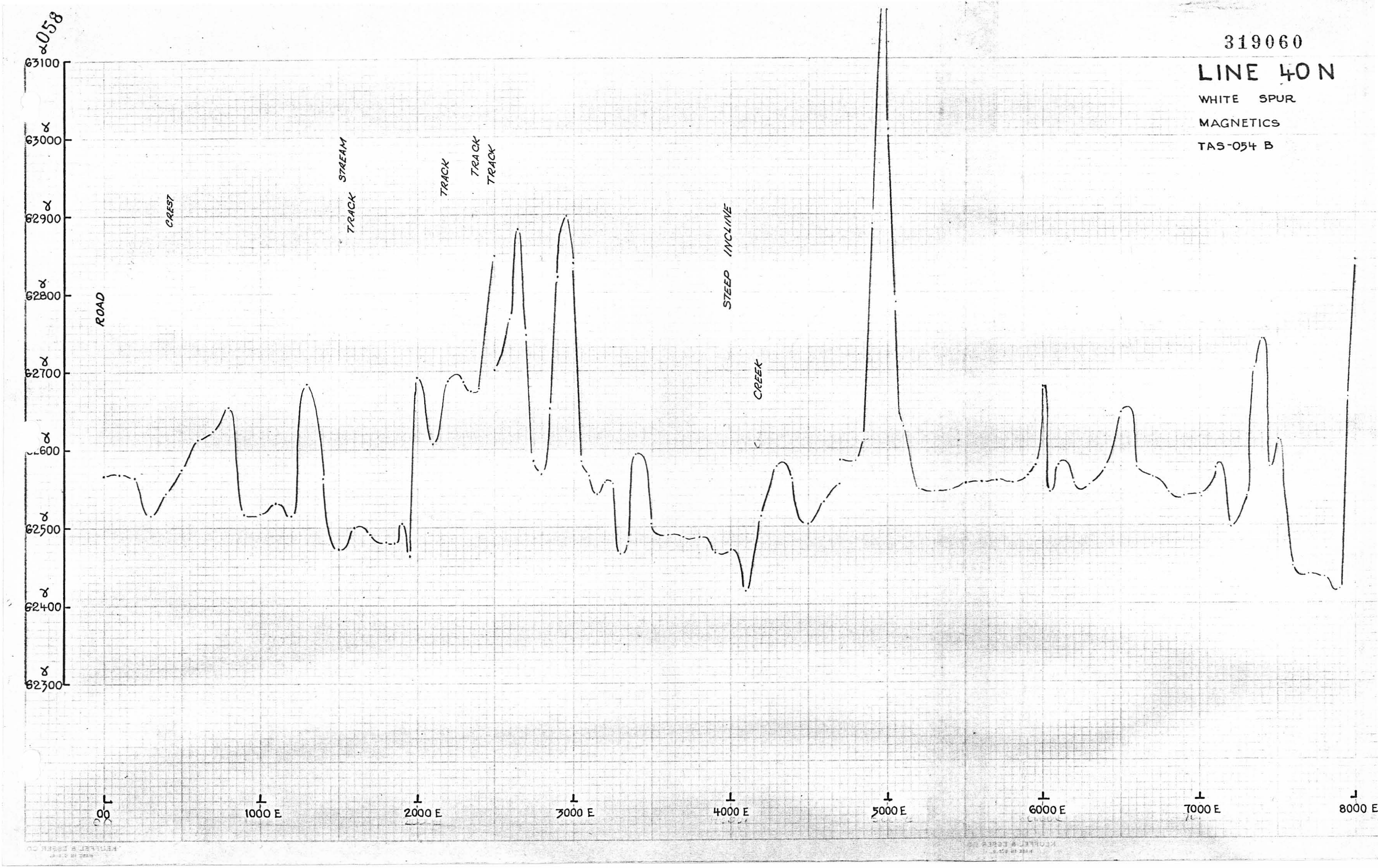

LINE 43 N
WHITE SPUR
MAGNETICS
TAS-054 B
63100 γ
63000 γ
62900 γ
62800 γ
62700 γ
62600 γ
62500 γ
62400 γ
62300 γ
Creek
Cliff
00
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E



056
319058
LINE 42N
WHITE SPUR
MAGNETICS
TAS-054 B
63100
63000
62900
62800
62700
62500
62400
62300
ROAD
CLIFF
WRONG NO. PEG
RIVER
00
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E
8000 E

319059


057
LINE 41 N
WHITE SPUR
MAGNETICS
TAS-054 B
63132
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
γ 62200
γ 62100
STEEP INCLINE
STREAM - WATERFALL
TRACK
TRACK
TRACK
TRACK
TRACK
CLIFF
TRACK
STREAM
ROAD
LAST PERPENDICULAR TO LINE
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E



2058
319060
LINE 40N
WHITE SPUR
MAGNETICS
TAS-054 B
63100
γ
63000
γ
62900
γ
62800
γ
62700
γ
62600
γ
62500
γ
62400
γ
62300
ROAD
CREST
STREAM
TRACK
TRACK
TRACK
TRACK
STEEP INCLINE
CREEK
00
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E
8000 E

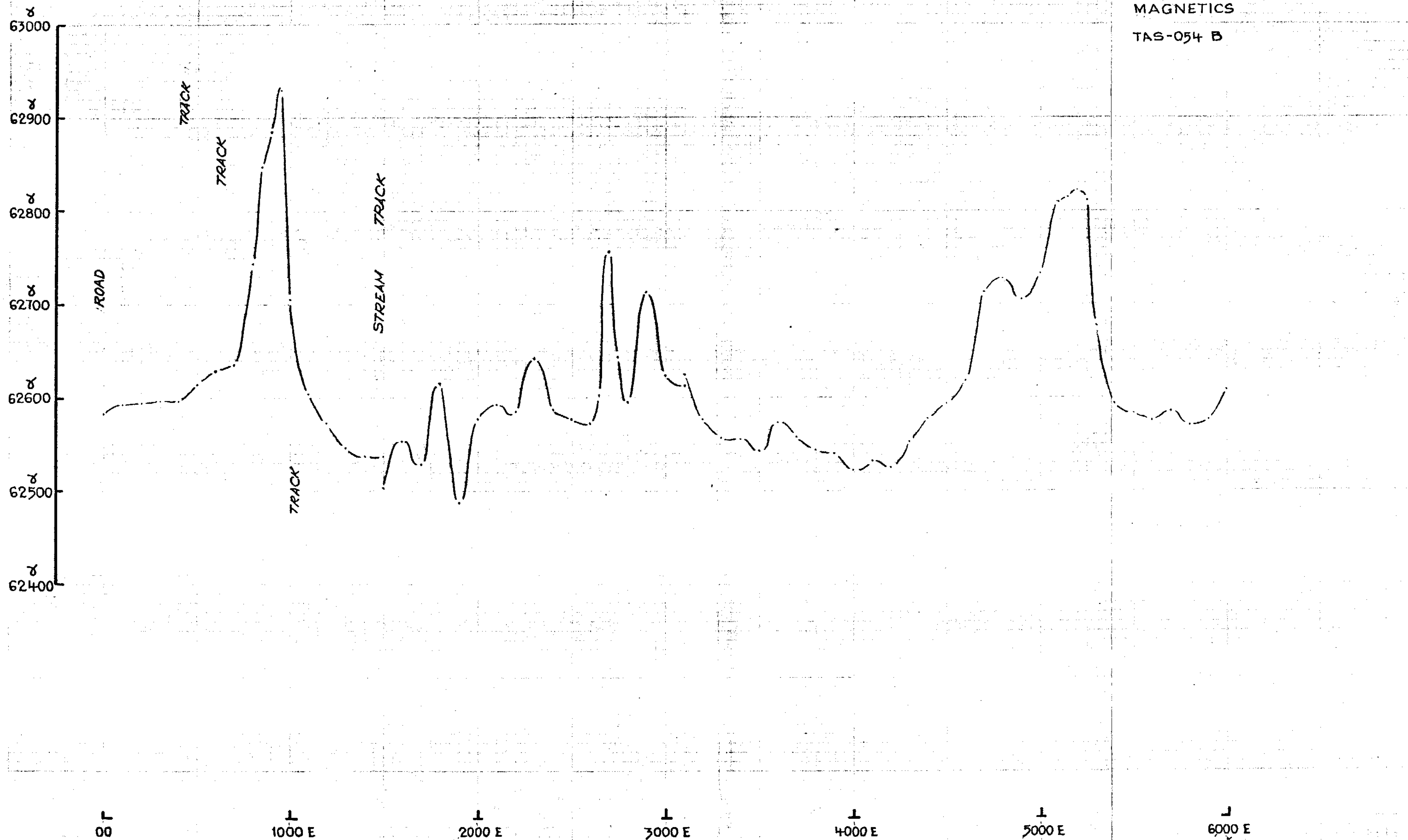
319061

LINE 39N

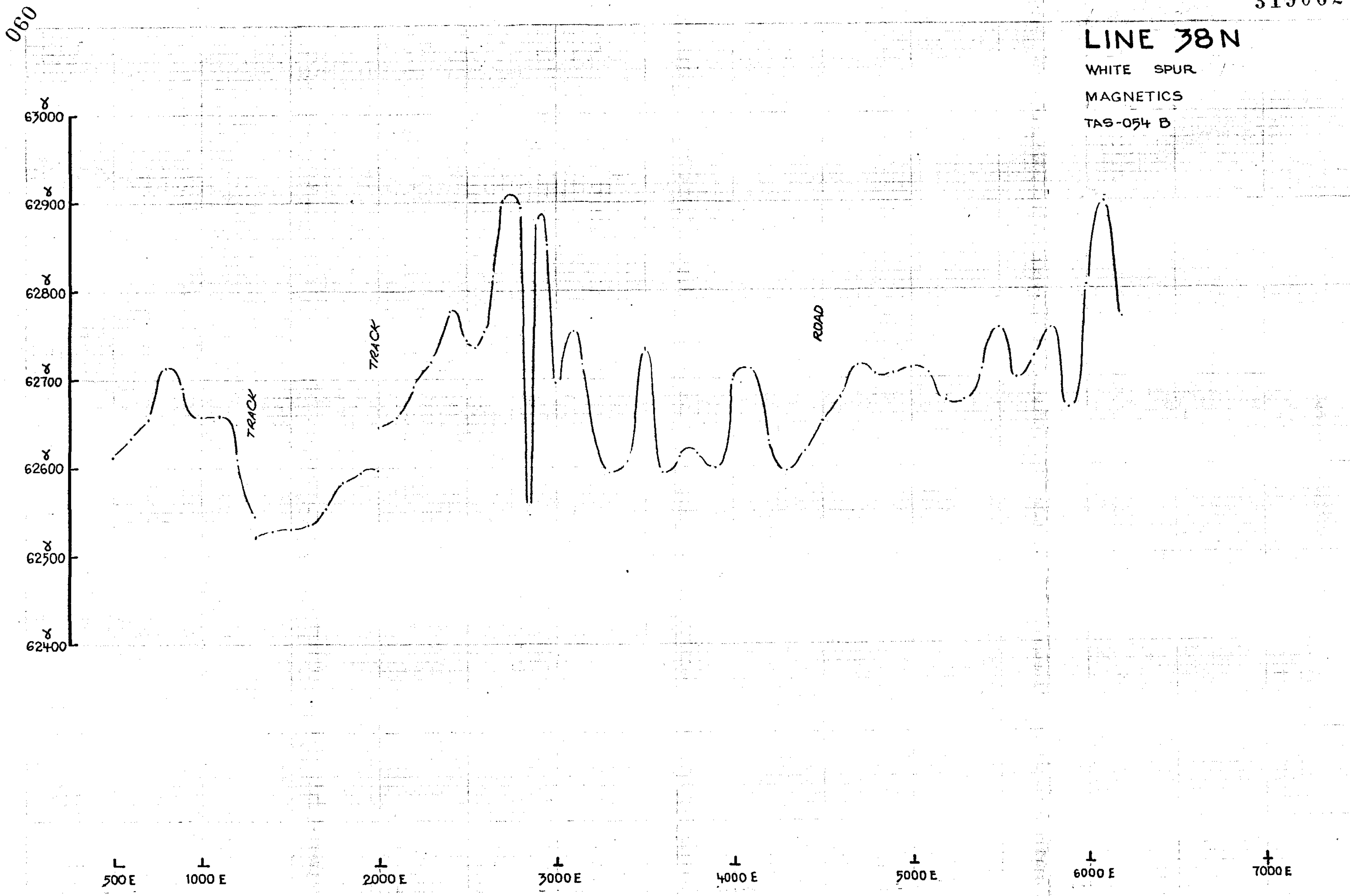
WHITE SPUR

MAGNETICS

TAS-054 B



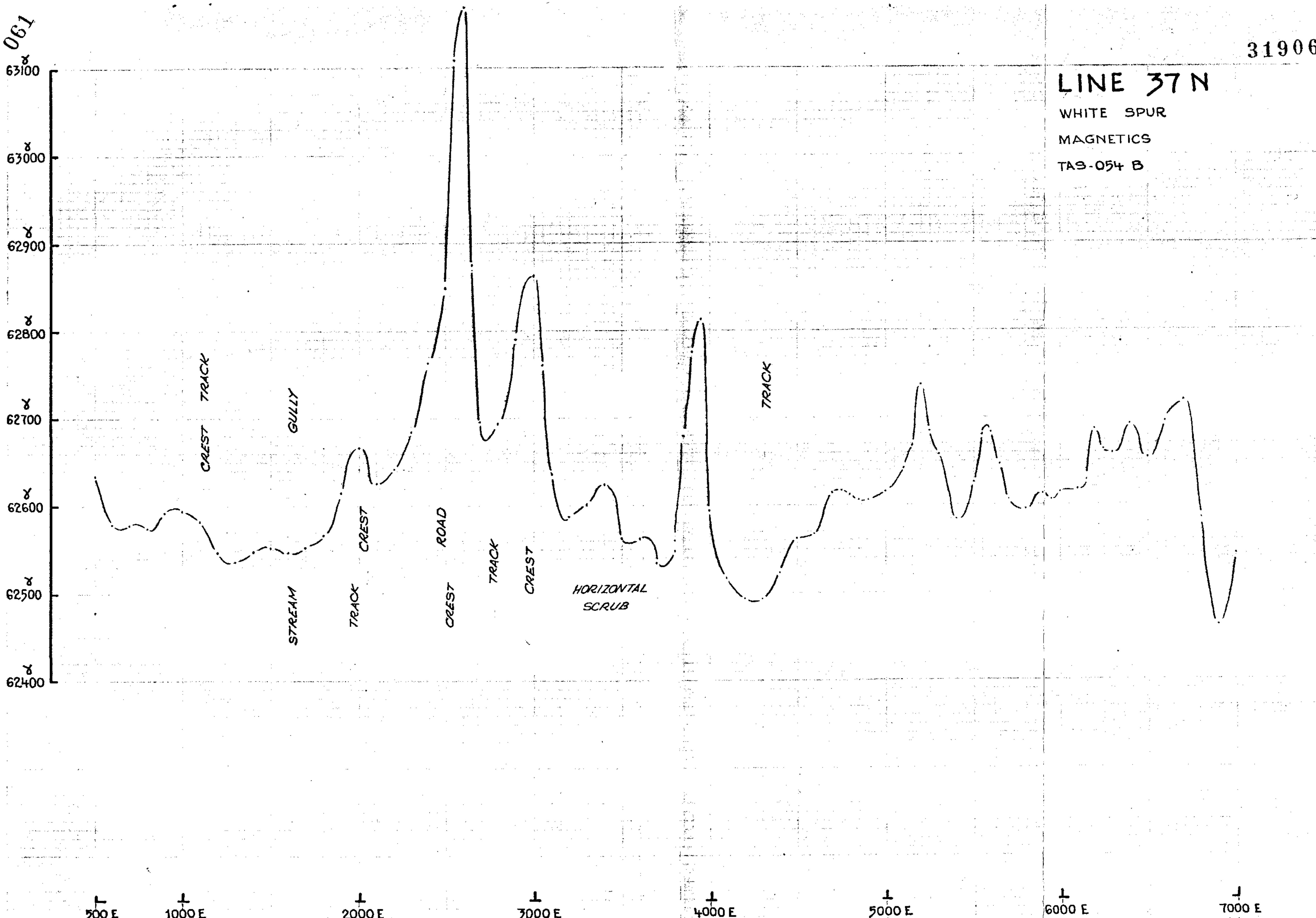
319062



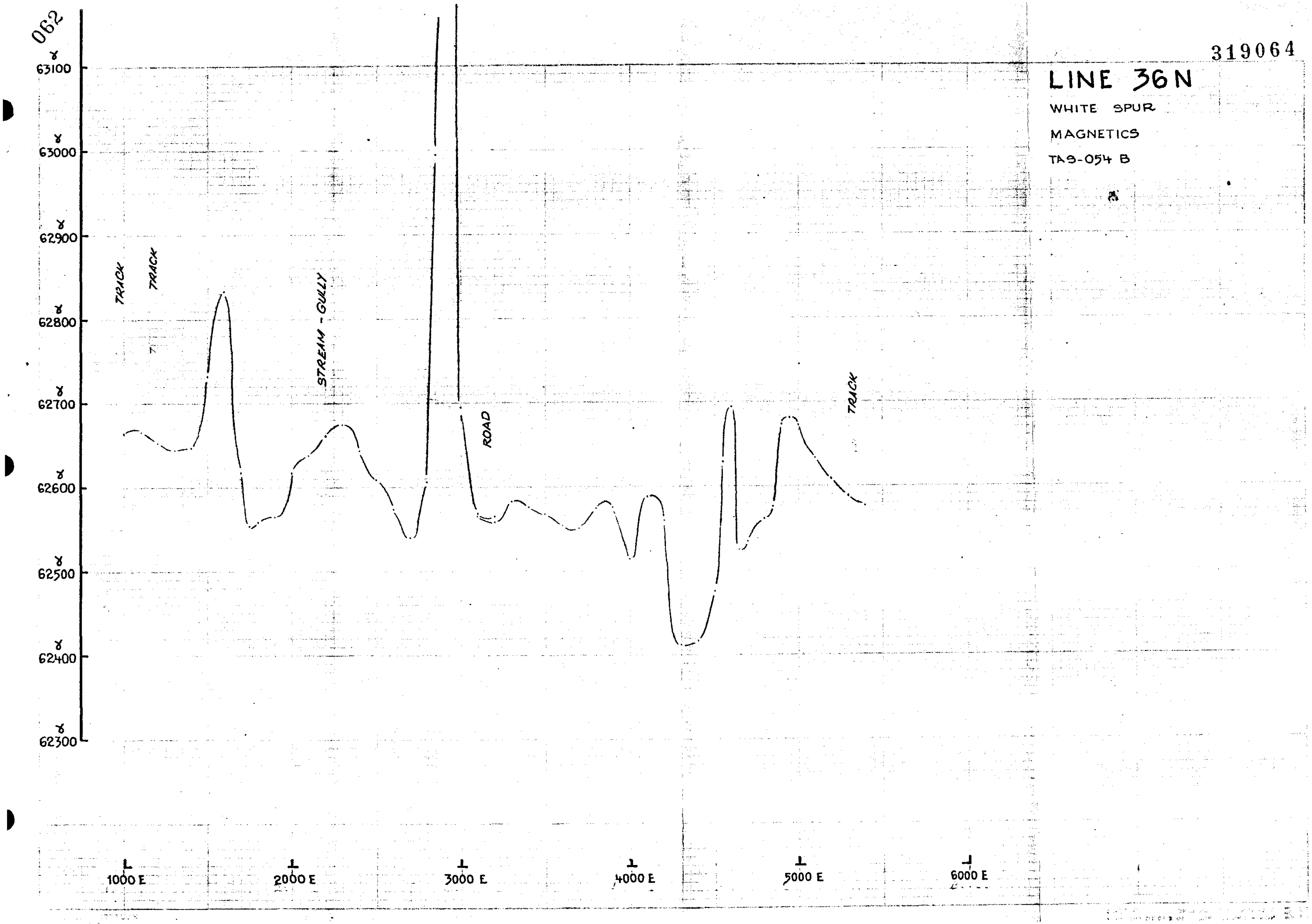
060
LINE 38 N
WHITE SPUR
MAGNETICS
TAS-054 B
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
TRACK
TRACK
ROAD
500 E
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E

061

319063


LINE 37 N
WHITE SPUR
MAGNETICS
TAS-054 B
63100
63000
62900
62800
62700
62600
62500
62400
TRACK
CREST
GULLY
STREAM
TRACK
CREST
CREST
ROAD
TRACK
CREST
HORIZONTAL
SCRUB
TRACK
500 E
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E

319064


062
LINE 36N
WHITE SPUR
MAGNETICS
TA9-054 B
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
TRACK
TRACK
STREAM - GULLY
ROAD
TRACK
1000 E
2000 E
3000 E
4000 E
5000 E
6000 E

063

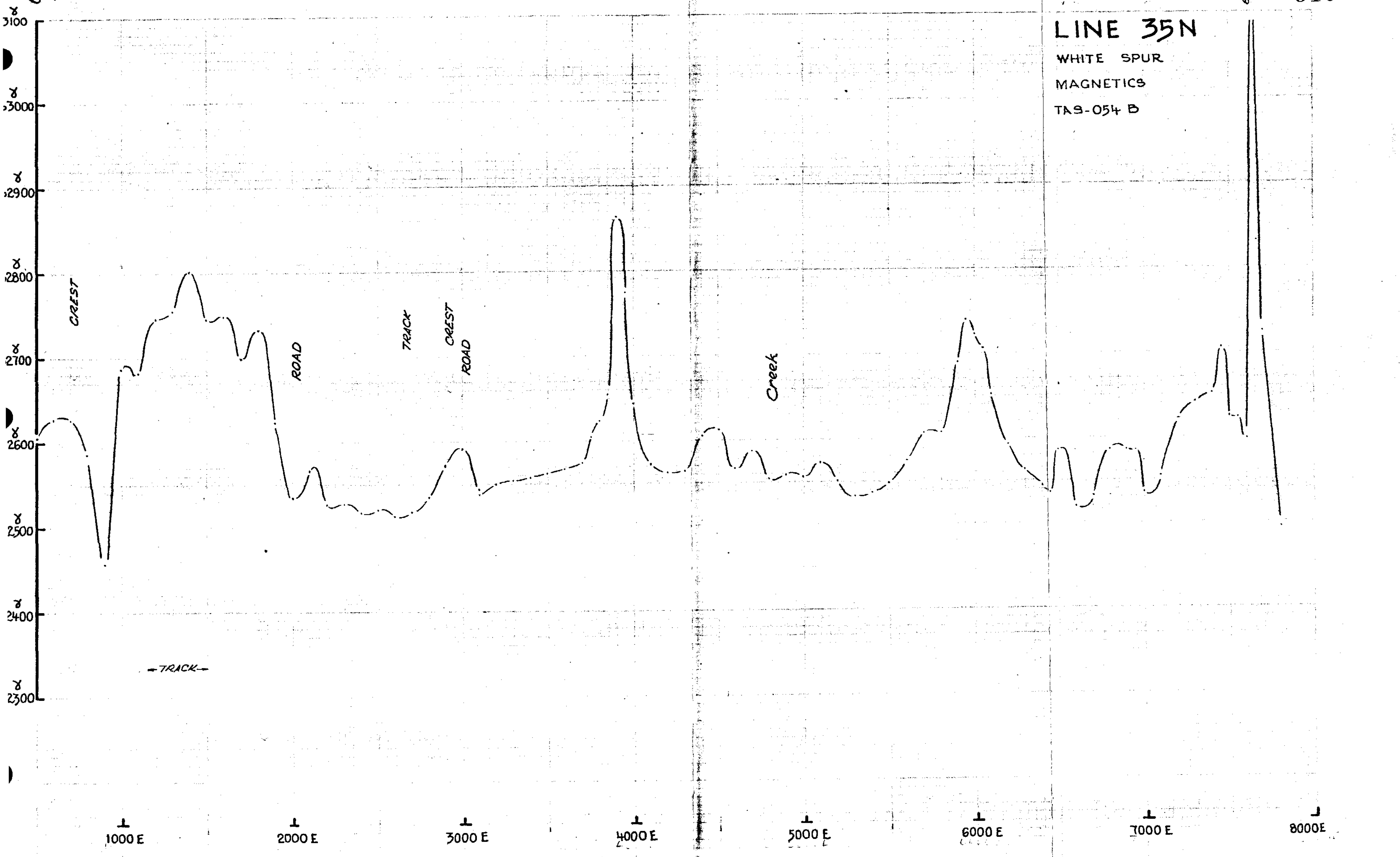
319065

LINE 35N

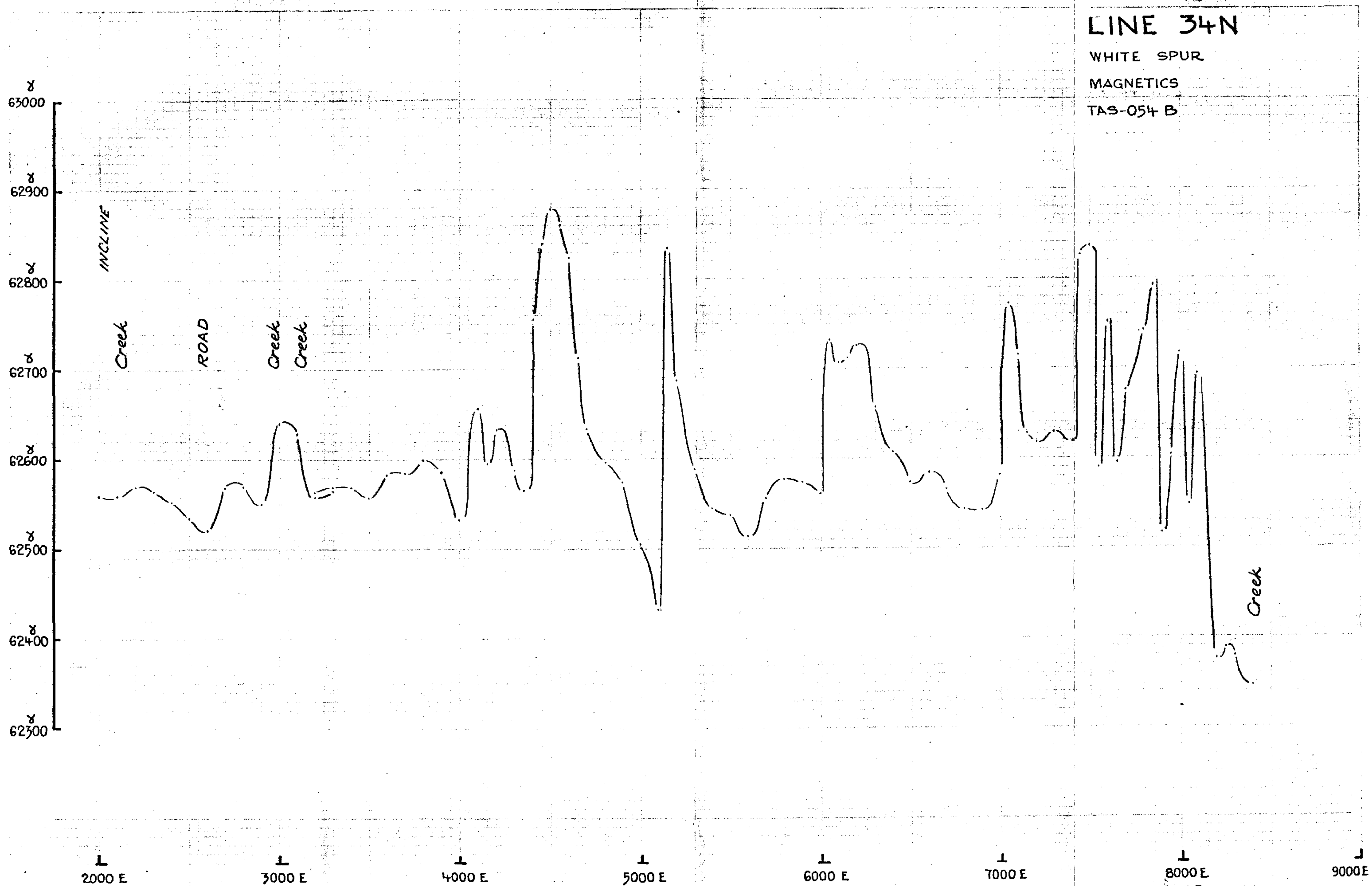
WHITE SPUR

MAGNETICS

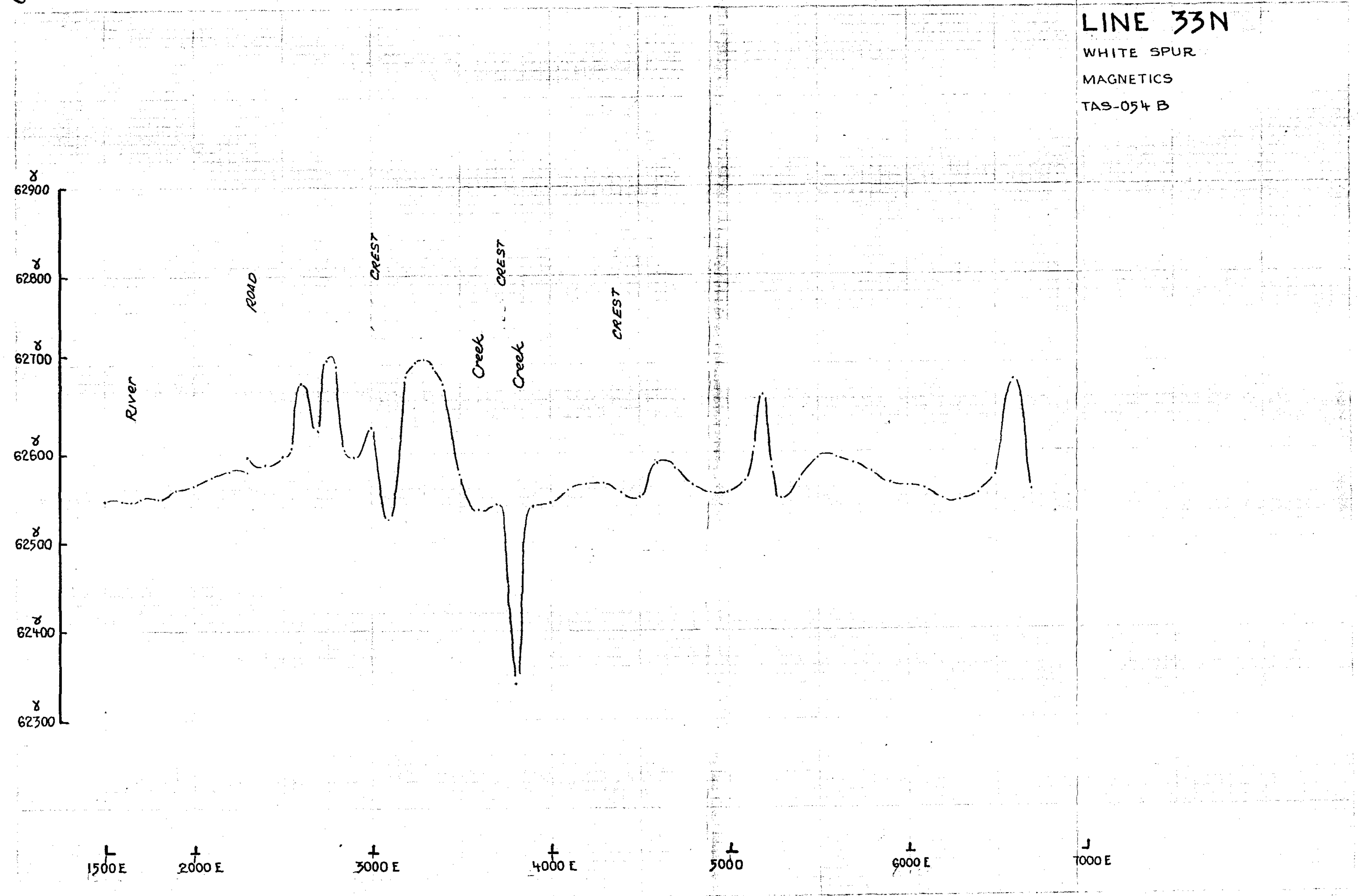
TAS-054 B



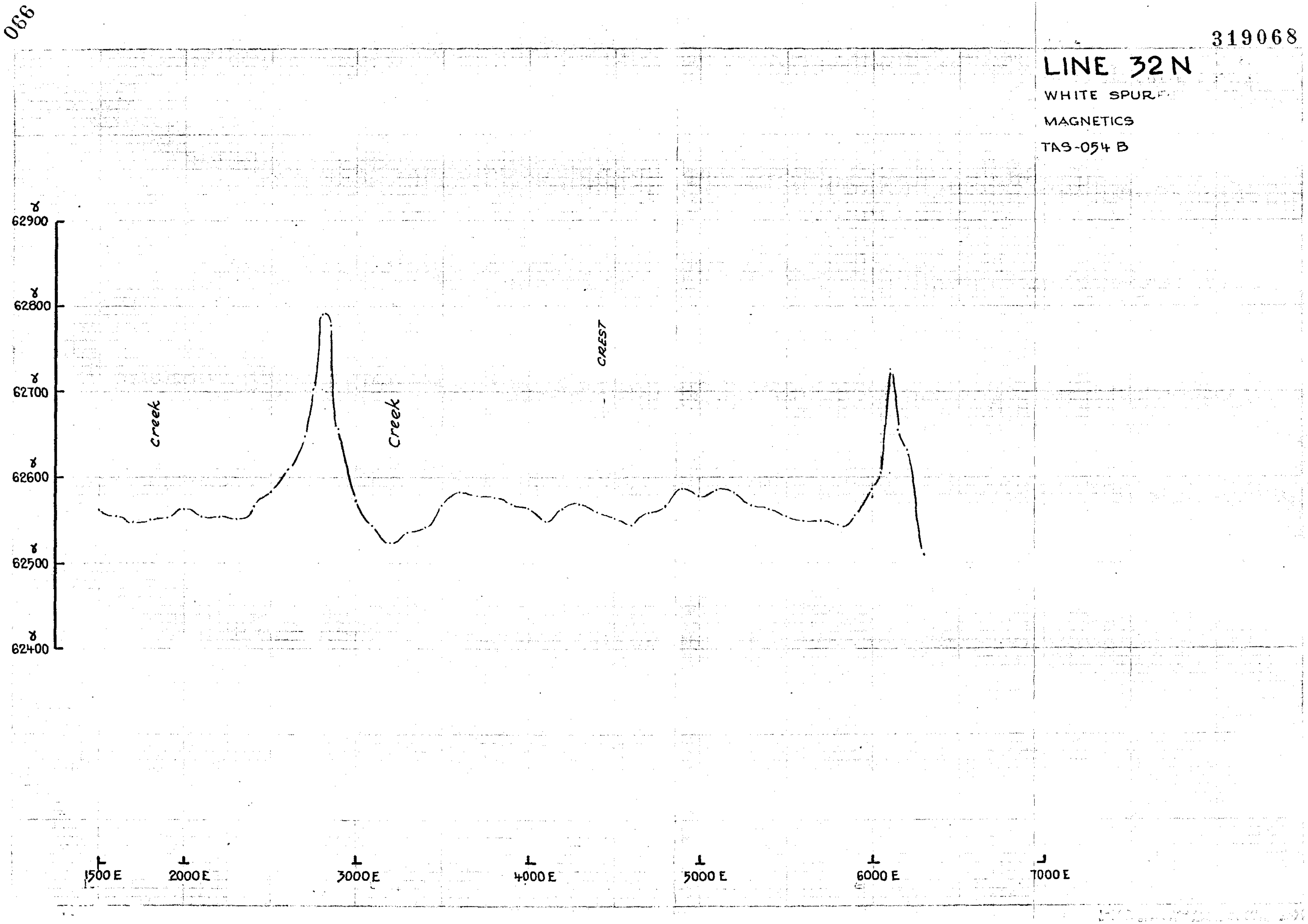
319066


LINE 34N
WHITE SPUR
MAGNETICS
TAS-054 B
63000 γ
62900 γ
62800 γ
62700 γ
62600 γ
62500 γ
62400 γ
62300 γ
INCLINE
Creek
ROAD
Creek
Creek
Creek
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E
8000 E
9000 E

319067


LINE 33N
WHITE SPUR
MAGNETICS
TAS-054 B
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
γ 62400
γ 62300
River
ROAD
CREST
CREST
Creek
Creek
CREST
1500 E
2000 E
3000 E
4000 E
5000
6000 E
7000 E

319068



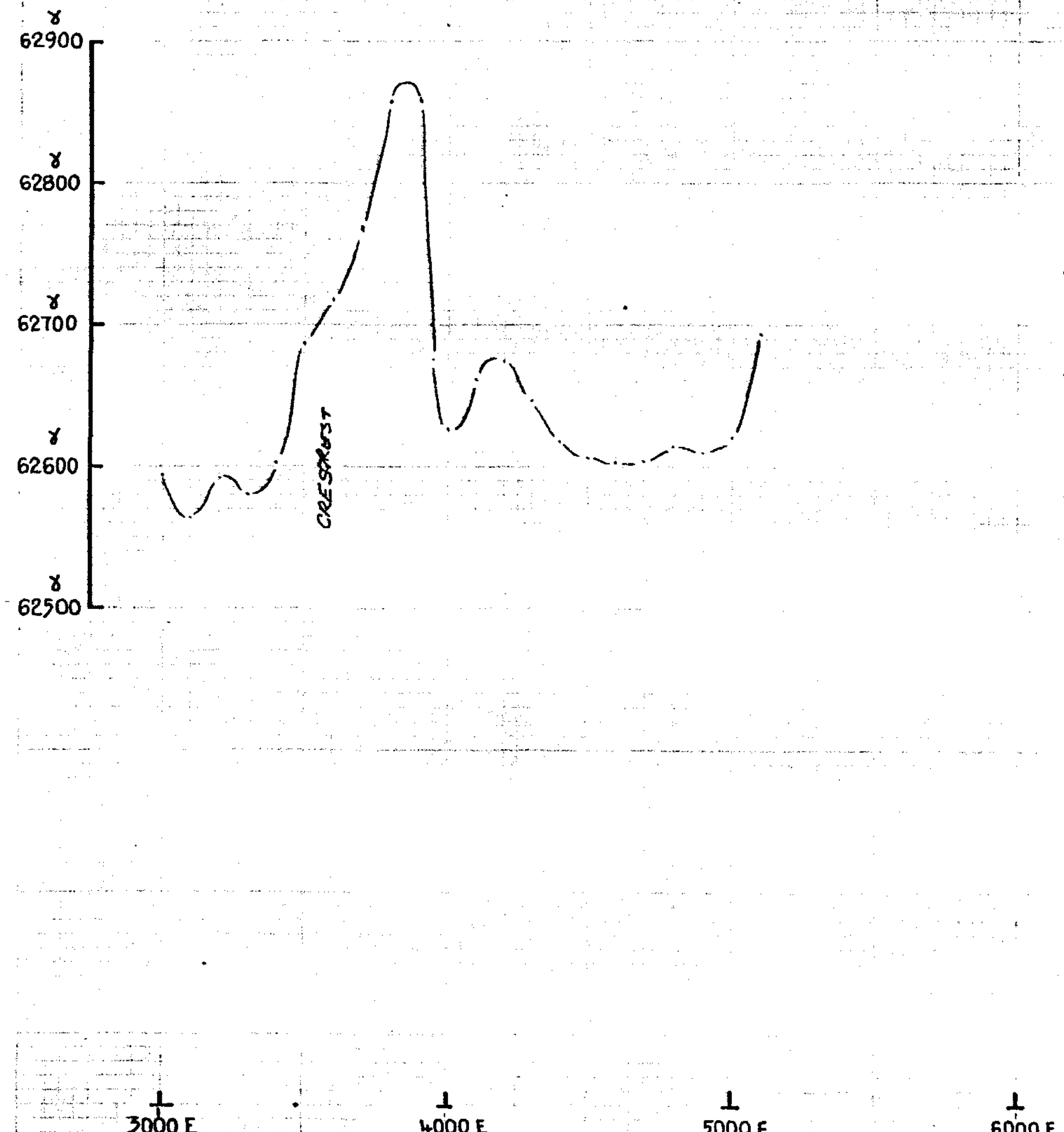
066
LINE 32 N
WHITE SPUR
MAGNETICS
TAS-054 B
62900 γ
62800 γ
62700 γ
62600 γ
62500 γ
62400 γ
creek
Creek
CREST
1500 E
2000 E
3000 E
4000 E
5000 E
6000 E
7000 E

LINE 30 N

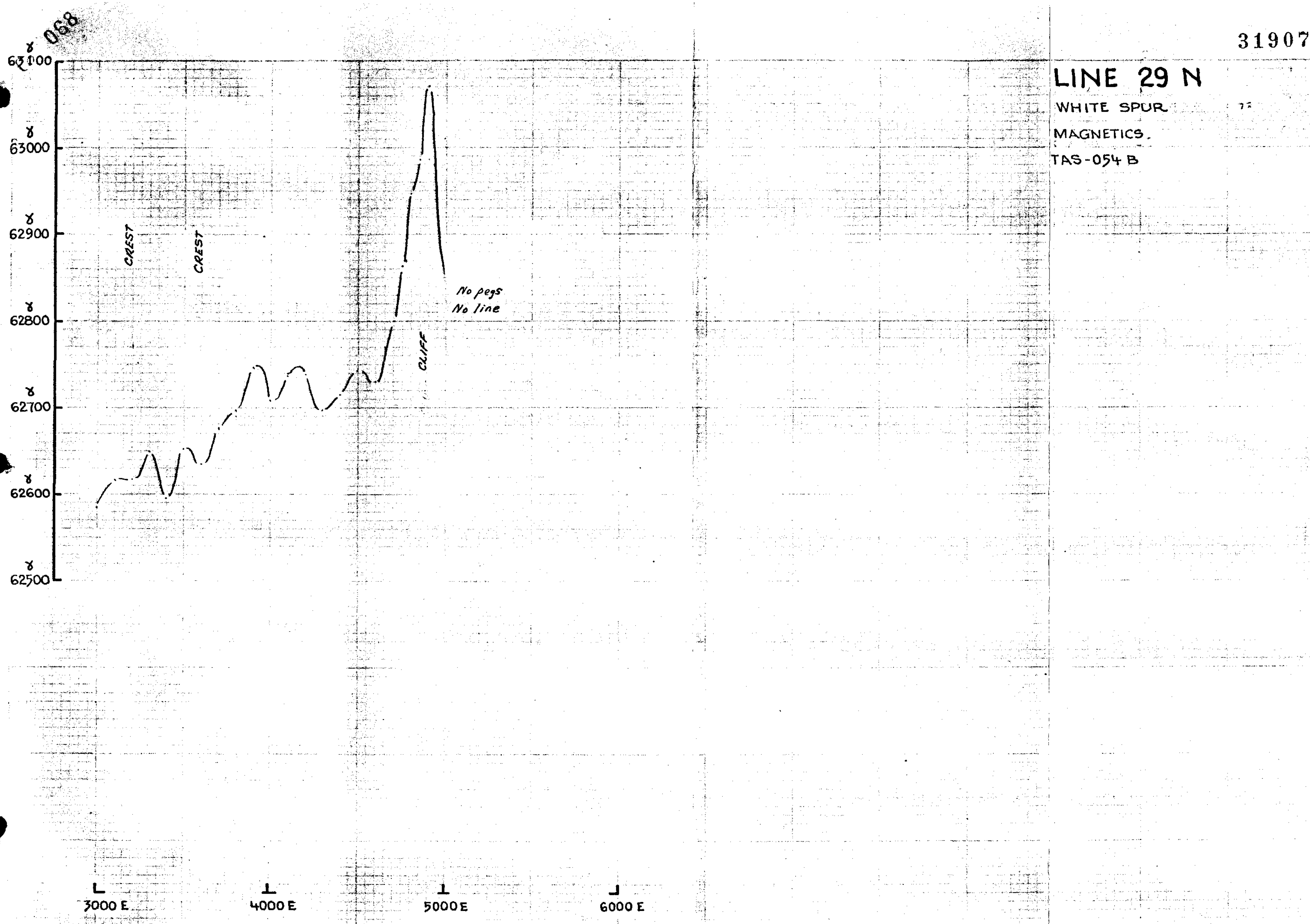
WHITE SPUR

MAGNETICS

TAS-054 B



319070



068
LINE 29 N
WHITE SPUR
MAGNETICS.
TAS-054 B
γ 63100
γ 63000
γ 62900
γ 62800
γ 62700
γ 62600
γ 62500
CREST
CREST
CLIFF
No pegs
No line
3000 E
4000 E
5000 E
6000 E

319071

LINE 28 N

WHITE SPUR

MAGNETICS

TAS - 054 B