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PROGRESS REPORT ON ACTIVITIES

IN E.L. 8/65 (MOINA AREA)

TO MARCH 1969

BY

M.J. FOSTER

CONFIDENTIAL

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THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

PROGRESS REPORT ON ACTIVITIES IN THE MOINA AREA E.L. 8/65 TO JULY, 1969

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1. INTRODUCTION

This report covers all the work performed in the Moina lease area E.L. 8/65 from June 1967 to March 1969. The bulk of the work was carried out by the writer and two field assistants between May 1968 and March 1969. The work was orientated towards the secondary investigation of the anomalous areas delineated by the previous geochemical and geophysical programmes carried out by the Company. The reader is asked to refer to a previous report by K.O. Reid (1967) in which the regional geology, access, geography and climate are adequately recorded; and also to the Mines Department report by I.B. Jennings "Regional Geology of the Middlesex Sheet".

During the period May 1968 - March 1969 the work carried out consisted of:

- 1) Soil geochemistry over known prospects and anomalies.
- 2) Geological mapping of (1)
- 3) Reconnaissance geophysical surveys using magnetometer and V.H.E.M. equipment.
- 4) Drafting of the information gathered.

The regional geology of the Middlesex and Sheffield Quadrangles has already been discussed at length in a Mines Department report (Jennings 1963 and Gee 1966) As the work carried out by the writer has only altered this in detail and specific sections of the area only, it is unnecessary to repeat a description of this work.

Minor alterations in detail will be readily apparent from the accompanying maps and the following text. Each of the areas worked upon will be dealt with separately.

The A.M.E.G. (March and April 1966) aeromagnetic survey of the lease outlined 13 trends and 39 anomalies, most of which were due to the ubiquitous Tertiary basalt. This interpretation was deemed insufficient and a second interpretation of the same data by Mr. J. Webb (1968, Austral Exploration Services) was undertaken. In this second interpretation, the total magnetic intensity values were statistically

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reduced to 7 residual anomalies, and a number of trends which both consultants consider a reflection of the regional structure. These residual anomalies (numbered A to F) have been followed up and are discussed below. It is generally agreed that due to the extreme variation of the topography, and of the paucity of control points, the original data (flown by helicopter with a trailing "bird") it may be subject to considerable error, which may account for the displacement of anomalous centres when followed up by a ground survey.

The residual map shows a broad uniform intensity area to the south of the lease, corresponding with the Precambrian Dove group; an erratic and complex area of isolated anomalies forming a "plateau" corresponding to the outcrop of the Tertiary basalt in the central and northern portions of the sheet, and a number of outstanding anomalies to which no particular source can be related (anomalies A to F)

The Bismuth Creek Fault can also be traced on the residual anomaly map, but in general, only in those areas where it is exposed; the basalt cover masking its effect when present. The various granite exposures in the area show up as regions of little magnetic variations, with the exception of the Powerful granite, the outline of which is not indicated by the aerial magnetics in any way. This is probably due to either or both of the following factors. (1) The granite is obscured by the basalt in many places. (2) It contains hematite-quartz veins which were mined for their gold content in this area.

It has been suggested by Jennings that these hematite-gold quartz veins are restricted to the area of the Dove granite which also includes the Powerful granite. However similar bodies of this nature occur to the north being associated with the Dolcoath granite and it would seem that this restriction is at best generalised.

During the winter of 1968, work on the area was hampered by climatic conditions, and proceeded at a slow rate, however, the exposures afforded by the H.E.C. workings in the Cethana-Wilmot area tended to offset this. The writer wishes to acknowledge the assistance of the

H.E.C. in permitting free access to their roads, tunnels and quarries. Much information was derived from conversations with Mr. Jack Kennelly, Engineer on the Cethana, Wilnot tunnel and Mr. Frank Sano, Geologist. The H.E.C. office in Hobart was also most co-operative in providing prints of all current maps and sections of the area, and the staff of their Gowrie Park office provided keys to restricted areas of the project. The writer is also indebted to Mr. Jack Smith of Erriba, who provided his customary hospitality, and to Mr. R.W. Granfield, whose farm house at Moina was of great value in housing the track cutters when in the area.

In this report the various areas in which work was conducted are dealt with separately; the results obtained are discussed and the recommendations presented for each area individually (Fig. 1)

2. LORINNA AREA (ANOMALIES A & B)

A large aeromagnetic anomaly overlies Cambrian and Ordovician rocks on the north side of the Bismuth Creek Fault at Lorinna (Fig. 1) The maximum intensity of anomaly A is 4160 gammas and it is associated with two smaller but almost equally intense anomalies to the south west, the second of which, (B), is on the west bank of the Forth River. Mineralisation in the area is confined to numerous gold workings all of which are inaccessible. The Campbell's Reward Mine which is in Cambrian volcanics was located on a kaolinised feldspars vein (Jennings 1963) and on the northern "slope" of the aeromagnetic anomaly. Other mineralisation in the area includes the pyritic-quartz-sericite schists along the Bismuth Creek Fault. This fault separates the main anomaly A from the negative anomaly to the south west.

In order to further define the main anomaly (and the negative anomaly mentioned above) a grid of eleven lines, 1000 feet apart, with base line bearing 310° from the Lorinna Post Office, was cut, and a ground magnetometer survey carried out over this using a Sharp S3. Geological mapping was at a preliminary stage when the cause of the anomaly was discovered. A quartz-magnetite schist in the Cambrian rocks orientated parallel to the Bismuth Creek Fault, below the Lorinna-Cethana road, was found to

give magnetometer readings in excess of 10,000 gammas. This rock type was exposed at the surface on line 7 for several chains and geochemical soil samples and chip samples were taken.

Geology:-

By comparison of the ground magnetometer results and geological information (Fig. 2 & 3) it is apparent that the magnetic anomaly is centrally located over a sheared quartz magnetite chlorite schist, dipping to the north. This unit is unconformably overlain by an outlier of Moina Sandstone, the boundaries of which are difficult to establish, but which outcrops on the top of a small hill immediately north of the anomaly. Due to the presence of Tertiary gravels on the saddle between this small hill and the eastern side of the Forth Valley it is thought that a fossil channel of the Forth River exists.

Division of the Cambrian sequence into magnetiferous quartz porphyries and predominantly sedimentary rocks is fairly arbitrary and is based mainly on the magnetic data, geochemistry and geophysics. The reconnaissance stream geochemistry showed no anomalous values on the east side of the Forth River in this area, although there are a series of anomalous values for copper, zinc and tin on the western slopes of Tin Spur. Further to the north, however, a zinc-copper anomaly does exist in the creek draining the abandoned farms on the west bank of the Forth, just above the Bismuth Creek Fault.

Analysis of rock and chip samples from magnetic schist on line 7 (Rock samples 023 - 026, chip samples 027, 028) did not reveal any significant economic concentration of elements. A soil traverse over the magnetic anomaly (samples -36 - 068) was more enlightening (Fig. 4) The Moina sandstone capping appears to be totally unmineralised, regardless of the numerous quartz veins which can be seen at this location. On the other hand the soil over the Cambrian schist shows a marked cobalt anomaly which may indicate a basic or ultra-basic origin. As exposure is poor it is problematical if the soil sample giving rise to the 380 p.p.m. Cobalt value (see section Line 7 Lorinna) is residual or transported, i.e. derived from the Basalt (see section of the Powerful Mine

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following). It is thought that closer examination and analysis of the Tertiary Basalt may explain some of the peculiar geochemical anomalies in this area. A third possibility may be that the cobalt is associated with the quartz-hematite veins, although work over the Powerful Mine area tends to refute this.

The grid was intended to cover anomaly A and the negative cell to the south-west. This negative cell was not picked up on the ground survey probably because the traverse lines did not extend far enough to the south. However, it should be noted that the trace of the Bismuth Creek Fault is outlined well by a low negative cell near the base line on lines 6, 7 and 8.

Traverses along the Bull Creek Track which pass through the centre of anomaly B failed to detect it, the magnitude of this anomaly was 200 gammas (aeromagnetic survey) and its area restricted.

A small hill capped with Moina sandstone exists on the west bank of the Forth opposite the Lorinna Post Office. A trench on this hill appears to follow one of the numerous quartz hematite veins in the area (rock specimen 070 - hematite quartz vein material, was found to give 170 p.p.m. copper, 850 p.p.m. zinc) It is thought that this occurrence may be one of several, and the magnetite associated with these at depth is giving rise to aeromagnetic anomaly B.

Recommendations

- (1) That anomaly "A" have preliminary V.H.E.M. coverage along lines 6, 7 and 8.
- (2) These lines be geochemically sampled in association with (1) above.
- (3) The Tertiary basalt be analysed (spectrographically) for its cobalt content, and its magnetic susceptibility measured.
- (4) The V.H.E.M. will probably give a sizeable anomaly over the quartz magnetite schist. If the geochemical cobalt anomaly is still unexplained by the above steps, two drill holes could be drilled on line 7 to intersect the anomalous zone.

(6) The pyritic zone along the Bismuth Creek Fault is assumed to be semi-continuous along the length of this structure. Accordingly, a grid ("G") has been commenced on the western slopes of the Forth Valley below the Iris Mine. This grid is incomplete and no test work has been done. Further work on this pyritic zone would involve V.H.E.M. coverage and geochemical sampling of grid A lines 9, 10 and 11 as these lines are in close proximity to the stream geochemical copper-zinc anomaly found in the reconnaissance sampling. A minor ground magnetic high exists on line 11 but in the writer's opinion further work on this pyritic zone would be of no economic value.

3. POWERFUL MINE AREA (AEROMAGNETIC ANOMALY "C")

The Powerful Mine, a small hematite-gold occurrence in the Dove Granite and surrounding sediments is situated near the confluence of the Dove and Forth Rivers. A small but relatively strong (3010 gammas) aeromagnetic anomaly covers the mine area. There is also a "possibly anomalous" stream sediment sample in a small tributary of the Forth draining part of this anomaly. A grid was cut over the plotted centre of the aeromagnetic anomaly:- 9 traverse lines, total length 27,500 feet bearing 110° (magnetic) connected by a base line 4000 feet long bearing 19° (magnetic). This grid was covered by a ground magnetometer survey (McPhar M700) by Messrs. Newham and Pollock. Geochemical soil samples (B horizon) were also taken subsequently on lines 2, 3 and 5 the soil cover in most cases proving to be extremely thin (0° - 6")

The ground magnetic survey picked up a variable anomaly (maximum value 3200 gammas) corresponding fairly well with the outcrop of the Tertiary Basalt, which forms a thin cover over the Moira sandstone, the Dove granite and an exposure of Precambrian rock to the south. The diffuse and variable nature of the magnetic anomaly can be explained by the presence of magnetite in the hematite gold quartz veins, as was observed while taking geochemical soil samples 071 to 078. The restriction of the magnetic anomaly to the area of the basalt has not been satisfactorily explained. (Fig. 5)

Geochemistry also proved unsatisfactory in localising mineralisation, some high and probably anomalous values were obtained from lines 2 & 3 (cobalt and zinc) which do not appear to be "tied" to any magnetic feature, although the individual values have a tendency to concentrate on the margins of magnetic "highs" (Fig. 6)

Recommendations

It is thought that the geochemical anomalies connected with this mine are of no economic significance, being due to the break down of ferromagnesian minerals in the basalt; however this should be checked by further soil and rock sampling lines 4, 6 and 7. The ground magnetic anomaly should also be checked as it appears to be more diffuse than indicated by the aeromagnetic anomaly.

4. DOVE RIVER AREA (AEROMAGNETIC ANOMALY "D")

Late in the field season a grid of ten lines totalling some 44500 feet was cut over a partially defined aeromagnetic anomaly in the extreme south west of the lease. These lines were cut at 20° magnetic and geophysical, geochemical and geological work was carried out.

The geology of this area is simple: a series of quartz-sericite-garnet schists ranging from extremely pyritic in the southern portion of the grid grade northwards into normal quartz sericite schist near the Dove River. The schistosity of this metamorphic sequence strikes 55° plus or minus 10° magnetic and has a northerly dip ranging from 45° to vertical. In a quarry close to Haines Road, where it approached the extreme south west corner of E.L. 8/65, a pyrrhotite-pyrite exposure in these schists was found to correspond with a narrow magnetic anomaly trending parallel to the strike. As there is little exposure to the north and east of this quarry due to button grass cover and glacial fill, the nature of this "horizon" north east along strike where the magnetic anomaly is strongest, (-1095 to -3859 gammas measured on a McPhar M700) is unknown. (Fig. 7) The entire ten traverse lines were tested with the McPhar V.H.E.M. instrument, the result of which indicated a conducting body corresponding with the ground magnetic anomaly.

It is necessary to give some data about the geophysical techniques used before a tentative analysis is made.

The ground magnetometer survey recorded points 100 feet apart on the traverse lines except where a rapid change occurred and it was found convenient to record data at 50 feet or even 25 feet intervals. The McPhar M700 instrument used on this grid is not corrected for southern hemisphere use, and thus all anomalies are reversed in polarity. Considerable diurnal variation was found to exist in the area at the time of the survey, thus all values were automatically corrected to zero.

A vertical loop in-line survey using the McPhar V.H.E.M. unit with a coil separation of 300 feet was carried out over all traverses; a broadside in-line survey over lines 2 and 3 was also partially completed with a separation of 500 feet. Owing to the fact that the traverses were at 45° to the assumed strike of the pyritic (?) body, the broadside traverses were of little help other than to distinguish between various "peaks" out-lined by the in-line traversing.

As no sequence can be determined, conclusions are deduced from the geophysical data as follows:-

- (1) The magnetic anomalies found in the area roughly parallel the schistosity, which is extremely fine and has obliterated any original compositional changes. (Fig. 7) The negative anomalies tend to become concentrated towards the south of the area. If the mineralisation is partially controlled by the schistosity, as it appears to be, detailed mapping may produce evidence of a steeply plunging fold, however, no such structure can be seen on the ground or from the air photographs and costeaning to bedrock will probably be necessary in order to obtain further information. It should be pointed out that as the exposure and anomaly both occur right on the southern boundary of the lease, all efforts should be made to acquire the ground to the south and south west, over which this anomaly extends.

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- (2) Soil geochemistry over lines 0, 1 and 2 have not revealed any significant anomalies to date, with the possible exception of a zone on line 0 from 600 feet north to 1300 feet north. It is interesting to note that this correlates with a positive magnetic anomaly (255 gammas) and a sharp cross over on the E.M. profile. Geochemical analyses were conducted for Zn and Cu and locally for Co and Ni but only back ground values, generally less than 50 p.p.m. were recorded.
- (3) The main in-line E.M. anomaly (Fig. 8) between 400 south and 900 north on line 2 east has a maximum field distortion of 20° , which occurs close to the pyrite-pyrrhotite exposure mentioned. This anomaly when compared with the broad side E.M. profile (transmitter line 3, receiver line 2) is apparently composed of two separate peaks roughly centred at 300 feet and 600 feet north respectively on line 2 east, corresponding with a magnetic anomaly on this line. This correlation is not viable on line 3 east (broadside); the main anomaly is separated by two peaks centred at 200 feet north and 800 feet north - if these peaks correlate between lines 2 and 3. The other controlling factor over the mineralisation maybe two regional cleavages measured on the main exposure striking $135/85^{\circ}$ south and $65^{\circ}/60^{\circ}$ south.

A strong E.M. trend is seen to extend from 4 E/2600N through 5E/3050N and 6E/3450N to 7E/3500N. This trend includes both positive and negative magnetic values and it is postulated that this anomaly represents an outlying "pod" on the flanks of the main body.

- (4) A tentative structural picture of the metalliferous bodies is a series of pods or lenses lying parallel to the schistosity but partially controlled by a south westerly dipping cleavage. It should be evident that the sulphide body will in all probability change with depth. An example cited to the writer by I.B. Jennings (persoem) was that of the Felton copper mine which, was pyritic at the surface but changed at depth to a pyrite-chalco-

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pyrite-sphalerite-galena body. According to Jennings it also had significant tin values associated with it. The magnetic body, which may be pyrrhotite should lie at depths of the order of 150 to 250 feet, if the width of the "negative" anomalies is an indication.

Recommendations

- 1. Acquire additional ground to completely cover the entire length of the magnetic anomaly. Prospect to the south by cutting lines (up to a mile long) to the west and south of the known anomalies.
- 2. Further exposure is required on lines 2, 3, 4 and 5 east from 500 south to 2000 north. Costeaming would provide ample exposure for mapping and chip sampling. If this is not considered necessary, a soil geochemical programme over the remainder of lines 2 to 7 east is thought to be an essential alternative.
- 3. Additional broadside E.M. work would greatly facilitate definition of the remaining anomalies. Lines cut at 355° (magnetic) from 00 on traverses 2, 3, 4, and 5 east when processed by the broadside E.M. method should narrow the extent of the E.M. anomalies, especially if carried out with a 20 foot reading interval.

5. SHEPHERD AND MURPHY MINE AREA
(Anomaly E and Extensions)

A small but intense aeromagnetic anomaly overlies the Shepherd and Murphy Mine at Moins, which is adjacent to the Bismuth Creek Fault. The original stream sediment sampling programme carried out in 1967 showed the area surrounding this anomaly to be geochemically anomalous for copper, zinc and tin. A ground magnetometer survey over the mine area itself was completed in early 1968, using the McPhar instrument. The geology of the mine and environs has already been amply covered by a previous publication and will only be summarised here. The oldest rocks in the area mapped are in the Cambrian lavas and keratophyres, these are schistose and variable in colour, composition and texture. They constitute the upper member of the Cambrian system which overlaps

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the Precambrian block unconformably in the Dove River Valley and are in turn unconformably overlain by the Ordovician Roland Conglomerate. This unit is overlain conformably by the Moina sandstone or quartzite, and this in turn by the Gordon limestone. These three lithological facies have gradational boundaries in places which are usually quite distinct; it is not uncommon for marginal diastems to occur.

Tertiary lake sediments occur extensively throughout the Moina area. These have been described in detail by S.J. Patterson (1967) and do not enter the scope with this report, other than the noted occurrence of extensive outcrops of sub-basaltic siliceous conglomerate (greybilly) which is thought to be a silicified scree or fan conglomerate, and the "deep leads".

A stock-like granite body, of Devonian age intrudes the Cambrian and Ordovician sediments resulting in their induration and metasomatisation. Late stage dyke and mineralised veins intrusion also occur. These vein intrusions form the bulk of the once economic mineral deposits of the Moina region, with their detrital derivatives.

The regional structure of the Ordovician sedimentary basin is outlined by two fold trends (north west to south east primary and east west secondary) characterised by open concentric folds relieved by bedding plain slip and break thrusts, and a series of north-west to south-west trending wrench faults. The Bismuth Creek Fault is an example of this wrench faulting and is reputed to have a "vertical" heave of at least 1200 feet and a dextral transcurrent movement of the same order (Blake 1956).

Mineralisation: The Moina Sandstone is host rock to most of the mineralisation derived from the Dalcoath granite; disseminated pyrite is almost universal, and numerous quartz muscovite tension veins containing wolframite, pyrite, molybdenite, beryl, fluorite, and occasional bismuthinite can be found within the area mapped.

These veins were formed by the in-filling of tension gashes due to stresses set up during the formation of the Dalcoath anticline. Unmineralised quartz filled tension gashes are common in the Roland conglomerate but mineralisation of this unit is rare, probably due to prior silicification. The conglomerate appears to have acted as a shield or cap rock preventing upward extension of mineralising solution (Nixon 1954).

The intrusion of the Dalcoath granite has metasomatised the basal marls (transition zone) of the Gordon Limestone to a garnet-pyroxene-magnetite-epidote skarn rock or tectite. This rock formed an impervious cap rock through which further mineralising fluids could not penetrate, thus confining the bulk of the mineralisation to the horizon between this and the Roland conglomerate i.e. the Moira sandstone. The skarn rock is an important host rock for bismuth in the area. For further description of the ore controlling factors see report by K. Reid (1967) With the above summary in mind, the exploration programme in the Moira area was aimed at:

1. Checking out geochemical and geophysical anomalies on the Lea, Iris and Forth Rivers.
2. Extending the soil geochemistry in the Fletchers Adit, Stormont Bismuth area.
3. Assessing the economic potential of the area between the All Nation Mine and the Stormont Mine. Primarily a grid of eleven lines (totally 37,500 feet) was cut over the mine area and traversed by Messrs. Newnham and Poltock using the McPhar M700 magnetometer. The traverses were orientated north-south and averaged 3000 feet in length. The preliminary and interpretation analysis of the work was carried out by Mr. J. Webb (July 1968). Subsequently the following steps were undertaken by the writer.
(a) Extension of the existing grid to the east and west with emphasis on following trend A(26 lines).

- (b) Soil sampling and geological mapping over all the area included in this grid.
- (c) Magnetometer, and V.H.E.M. (vertical loop-in-line method separation of 300 feet). All results are included with this report and an estimate of the various footages involved appears as under: - Total grid footage 114,000 feet. E.M. and Magnetometer line footage 95,500 feet. Geochemical sampling (100 feet intervals) approx. 100,000 feet. Original McPhar magnetometer survey 33,000 feet.

The analysis of the McPhar ground magnetics over the mine by Mr. J. Webb (1968) suggested that neither the Moina sandstone nor the basalt could give rise to the irregular distribution of magnetic highs and lows; that the source was shallow and that in all probability the skarn was the cause of this anomaly, dipping underneath the basalt to the west (approx. line 6 East). In order to explore for possible repetition along strike of the structural features present at the Shepherd and Murphy Mine, lines 00 to 21 West were cut at 500 foot intervals and geophysical and geochemical methods applied. It seems evident that the skarn is semi-continuous throughout the area but varies widely in degree of alteration and mineralisation. This extreme variation is thought to be due to the regional folding and cross folding and its attendant wrench faulting. A repetition of the structural features at the Shepherd and Murphy Mine would be accompanied by a corresponding change in the physical and chemical nature of the skarn (irregular distribution of magnetite, concentration increasing in proximity to fault). This is recognizable from geophysical measurements and ground observation in the mine area; plans of all data accompany this report; areas are dealt with in order west to east.

5.1 Fletcher's Adit - Stormont Mine Area (Westerly Extension Sheet)

Sketch geology is drafted onto the magnetic reading map which itself is uninformative: it does however indicate the presumed basalt contact and the Stormont Fault (Fig. 9) The Fletcher's

Adit Fault does not show up on 100 feet interval magnetics but may do so if shorter intervals are used. In general, the skarn does not show any geophysical similarities to that at the Shepherd and Murphy Mine although both the controlling faults are expressed in the V.H.E.M. profiles. Some portions of the skarn show a definite positive anomaly, (negative on plan) - however adjacent lines show no similarity over the same rock type. The geochemistry over these lines (soil B horizon at 100 feet intervals) was even less informative (Fig. 10)

Any effects which might have been due to mineralisation in the skarn are marked by the preponderance of the 1.25 to 2 copper zinc ratio found throughout the basalt and basalt scree slopes in this area. This bismuth test, which in areas to the east outlines outcrops of the skarn, appeared of little use over these four lines: with the obvious exception of the samples taken around Stormont, which are probably due to the Stormont Fault or surface contamination by workings.

It is noticeable that no bismuth anomalies appear over the Fletcher's Adit area: two costeans were bulldozed over a geochemical anomaly found to exist on the grid cut by K. Reid (1967) the maximum value of which was 230 pp.p.m bismuth. These costeans, 800 feet long produced limited exposure and have not been sampled to date. Both skarn and Moira quartzite were exposed, and both have been observed to be sparsely mineralized with bismuthinite over limited distances (near S.666) The V.H.E.M. traverses did not show any unexpected features. A crossover indicated the lower contact of the skarn with the Moira sandstone. It is considered by the writer that line 18 has been misnumbered 200 feet south. In generally E.M. anomalies increase towards the Lea River. The Stormont Fault, or the hidden body of skarn associated with it produced a positive distortion, correlating with a positive magnetic anomaly and a geochemical soil anomaly of 1100 p.p.m. bismuth. The Fletcher's Adit fault produced a

positive distortion of the same order at line 17W/4250S, but is not supported by the magnetics or soil geochemistry. The synclinal outlying both mapped by (Burns 1958) could be represented by the E.M. anomalies lying between line 20W/4500-5500 south and 19W/4300 to 19W/5000 and may in fact lie between these limits. The sketch outline drawn on the geochemical plan is only approximate as this body was never seen.

On the original magnetic interpretation by J. Webb a broad east-west trending high is located on the northern slopes of Mt. Stormont; it is thought that this is probably due to the basalt, but a contributory factor may be sub-basaltic skarn. It is noticeable that this particular anomaly is not of the normal "basalt" type.

Recommendations

Although the work on this extension sheet did nothing to improve our knowledge of the geology of the area, it is noted that other parts of the Moira area mapped give higher geochemical and geophysical results. The following recommendations are made:

1. Soil sample at 20 feet intervals the two costeans above Fletcher's Adit. Analysis for bismuth, zinc and copper.
2. Deepen the above to bedrock and take grab samples.
3. Magnetometer, E.M. and geological work should be done over the following extensions of the grid: base line 6200S extended to 1100W.
 Line 22W⁰ to 4700S
 Line 21W⁰ to 4700S and to 7000S
 Line 18W⁰ to 2700S
4. Consideration should be given to cutting lines at 180° magnetic from line 19W in order to pick up the synclinal body outlined by Burns.

5.2 Moira Sheet 1

This includes the area between Fletcher's Adit (approx Line 17W) and the farmhouse at Moira (Approx. line 00).

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In interpreting the magnetics, it is seen that virtually no control over the distribution of anomalies is exercised by the basalt and it is clear that the controlling factor is the skarn distribution. It is fairly certain that this rock type is continuous across Sheet 1; the main magnetic anomaly, centred on Ti-Tree Creek (Burns 1958) is due to the hypothetical faulting of the lower members of the Gordon Limestone against the Moina quartzite. This produced a situation similar to that at the Shepherd and Murphy Mine where, (a) skarn rock is mineralised with irregularly distributed magnetite, pyrite, chalcopyrite and bismuth, causing strong V.H.E.M. anomalies. (b) the skarn in some locations, particularly line 6W 1000 to 2000S exhibits the pink high temperature orthoclase found commonly in the skarn at the Shepherd and Murphy Mine area, but not in any of the Lea River exposures nor on the east side of the Iris River (Fig. 11)

This faulted contact is postulated to extend from line 8W/4200S to line 12W/2250S (F.2) and is confirmed by geology, E.M. and magnetics although the actual contact is not visible. From the section, and the known geology, the structure of the skarn appears to be a shallow faulted syncline plunging to the south east and terminated to the east by a second inferred fault (F.1) running north to north east and crossing lines 7A and 8W. This skarn east of the Iris River is different from that on the western portion of this sheet in that there is no evidence of orthoclase veins, and little magnetite. Other features having continuity are:-

1. A negative distortion (dipping the west) on line 13W/4600S to 11W/4350S, possibly extending to 10W/4500S. A pyritic zone in the Moina quartzite corresponds with this trend on line 10W/4400S but no further comment can be made as there were no corresponding magnetic or geochemical anomalies (Fig. 13)
2. A line of E.M. negative distortion stretches from 13W/1950S to 17W/3500S, closely following a zero magnetic contour and the alluvial flats of the Lea River (Fig. 12 and 13). This anomaly

on line 11W is associated with considerable thickness of tachylyte tuff and considered evidence in favour of the reversed drainage pattern proposed by Mr. S.J. Patterson, i.e. this anomaly outlines the southern edge of the pre-tertiary drainage channel now filled with Tertiary basalt.

The traverses east of the Iris River remain effectively "dead" as far E.M. measurements are concerned; further evidence in support of Webbs postulated fault (F.1) between lines 6 and 7W. A strong N.W.-S.E. magnetic trend exists between 3W/3500S to 3800S and 6W/2800S to 3200S where it is terminated by the fault (F.1) This trend is seen to conform generally with the outcrop of relatively unmetamorphosed Gordon Limestone just to the north of the skarn outcrop. It is terminated to the east by a blocky basalt outcrop which probably masks its geophysical response.

Geochemistry

It is noticeable that the trace element distribution in the soils bears very little relationship to the geophysics of the area: This is because:

- (a) the Tertiary basalt has its usual masking effect with regard to zinc and copper.
- (b) Bismuth is distributed throughout the skarn, generally in close proximity to the faults.
- (c) The geochemical test (A.A.S) for bismuth is considered to be of low sensitivity, and that this element may be subject to biological concentration. From the geochemical sheet 1 - bismuth, it is evident that the main concentration in the soil is to be found in Ti-Tree Creek, with a large dispersion area to the northwest which may be either an expression of sub-basaltic skarn or background bismuth for the basalt, neither of these possibilities can be proved without further work.

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The main anomaly in Ti-Tree Creek is closely related to the mineralised skarn, as is the anomaly towards the north end of line 7W. (Fig. 14, 15, 16) The arcuate anomaly on lines 5 & 6W is similarly associated flecks of a light grey metallic mineral having been recorded from this location. The shape of the anomaly is due to topography, line 6W is along the steep western bank of the Iris River and lines 4 & 5W cover a gentle northerly dipping strike slope.

The anomaly at 9W/10668 is unexplained, but may be due to F.1 Along the southern bank of the Lea River between the lines of 14 and 17W a fairly extensive anomaly occurs which can be attributed to (a) down stream contamination from Fletcher's Adit. (b) biological concentration. It is recommended that small notice be taken of this anomaly.

The only zinc anomaly of interest is that covering the skarn between lines 4 and 9W (Fig. 15). This anomaly is thought to be directly due to the skarn and is unaffected by the presence or absence of magnetics. Further exposures will be required to test the validity of this anomaly. The distribution of soil copper is unusual. (Fig. 14) Although linked closely to the zinc distributions over the basalt by an approx. 1.25 to 2 ratio, copper, being less mobile than the zinc, has tended to produce high anomalies of restricted area. In this instance the source is considered to be close to the contact between the skarn and Moira sandstone, whether faulted (8 and 9W/39008) or unfaulted (5 & 6W/37008). Another anomaly on line 10W is seen to be adjacent to the postulated F.2. The final anomaly of any importance at the northern end of 7, 8 and 9W is considered to be due to mineralised skarn as this coincides with zinc and bismuth anomalies. It is thought that this latter outcrop represents the northern limb of the postulated faulted syncline, as seen on line 6W (section.)

Conclusions and Recommendations

From the above the following can be inferred:

1. The Palaeozoic sequence is folded into a shallow syncline plunging S.W. and is faulted to the east, south and probably north.
2. Mineralisation of the members of the Gordon limestone has occurred in close proximity to these faults, and in all probability extends, with the skarn, beneath the capping Tertiary basalt.
3. The altered zone of the basal marls probably averages 20 feet in thickness: it is unlikely that the entire thickness will be economically mineralised, if at all. Never the less, the area of skarn anomalous for Bismuth, copper and zinc is considerably larger than that inferred for the Fletcher's Adit-Stormont area (G.I. Wilson 1962) and the geochemical values are higher.
4. The presence of high temperature orthoclase indicates hydrothermal activity contemporaneous with the faulting. The area is thus of importance as a repetition of the conditions controlling the S & M orebodies is likely.

Recommendations -

Sheet 1: To properly evaluate the economic potential of the skarn rock, the following lines should be costeamed.

Lines 4 & 5W/2700S to 4300S

Lines 6W/3700S to 1300S

Lines 7W/3000S to 1000S

Lines 8W/4500S to 2500S

Lines 9W/4200S to 2200S

Lines NW (exploratory) 2700 to 3700S.

The above, grand total 10,300 feet to be costeamed to bed rock and the following carried out.

- (a) Chip sample the above costeams. As the mineralisation may be geographically or stratigraphically restricted, a percussion drill rig is considered ideal for the job.

- (b) A percussion drill rig would also enable confirmation of the extent of the skarn underneath the basalt, (lines 9 and 10W). The basalt cover is not expected to be thick.
- (c) A diamond drill hole collared at 9W/3000S bearing 225° Mag. inclination -45° , would give valuable information about the nature of F.2, and also the cause of the intense magnetic anomaly at this point. Assuming the fault to be vertical the expected length of hole would be approx. 7000 feet. A similar hole collared at 8W/3100S at 50° mag., inclination 45° would provide information at the nature of the sub basaltic skarn and the location and orientation of F.1

5.3 Moina Sheet 2

Information on this area which stretches from the Moina farmhouse to the All Nations Mine and includes the Shepherd and Murphy Mine, accompanies this report on the following sheets - Geological Sketch map (Fig. 17), magnetic (Fig. 18) and E.M. (Fig. 19) plans, geochemistry (copper, Fig. 20, Bismuth Fig. 22 and zinc Fig. 21 separately) and sections along traverses 00 to 16E. As discussed above the original magnetic survey has already been commented upon by Mr. J. Webb and his recommendations followed up.

From the very detailed magnetics on the intermediate lines 4 AE to 7 AE it is evident that, as suggested, the skarn is responsible for the magnetic anomaly. A further inference, that the skarn extends beneath the basalt, west of the mine is substantiated by the magnetics on line 4AE and by the E.M. affects from the mine westward to 5E.

A suggestion that a relationship exists between the known ledes and the magnetic anomalies does not appear to have much foundations, as the detailed ground magnetic do not support this idea. The outlier of skarn on the northern side of the Bismuth Creek Fault

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was not found by the writer on the second magnetic and E.M. traverses; this body is considered to lie between lines 9 and 10E and be largely obscured by quartzite scree.

A wide low positive magnetic trend bearing E-N.E. from 16E/1500S correlated with the trend to C-C' outlined by Mr. J. Webb, with a disjunction between 12E and 13E. This magnetic trend corresponds with a minor E.M. distortion between lines 13E and 16E and may represent a hydrothermal fissure vein parallel to the All Nations lode. It is noticeable that virtually no effect either magnetic or E.M. occurs over the All Nations however trend C-C' does correspond with a small trench or line 12E and a zone of shearing on line 13E and should be treated as a potential ore zone.

The Bismuth Creek fault is considered to run from 11E/2550S to 7E/400S, and on the northern side of this line 7, 7A, 8 and 9E quite intense E.M. anomalies occur. The reason for this effect is unknown, but it is considered that the Bismuth Creek Fault passes beneath the basalt cover at 7E/400S and may possibly have a skarn body on its northern side. This fault has a secondary parallel shear 300 feet to the S.W. in the upper Bismuth region (inferred but not proven). From the E.M. it is possible that the individual lodes may be outlined by the negative peaks on the E.M. section; however, line 9E, the only remaining section where the lodes are exposed at surface without skarn or basalt cover shows no such correlation. The fact may be related to the stoping out of the lodes.

The Pig and Whistle Lode (according to Gee, unpublished thesis/ actually the Lady Barron) which is in Cambrian rocks (the Bull Creek Volcanics) near the contact with the Palaeozoics shows a distinct crossover. As this lode has not been worked with any degree of enthusiasm, it is reasonable to suppose that geophysical results obtained over this lode may be of the order to be expected, and the crossovers at 16E/2550S and 15E/2400S are thought to be typical. As the zone including the Lady Barron and Pig and Whistle lodes does not appear to be adequately prospected, further work is advocated for this area.

Geochemistry

Over Sheet 2, geochemistry is considered to be of little value due to the large numbers of contaminating sources and also to the wide distribution of the Tertiary basalt. Sampling was abandoned when basalt cover became universal.

When the three sheets for copper, zinc and bismuth are compared with the geological sketch map, copper and zinc are seen to conform with the outcrop of the basalt and also with the 1.25 to 2.00 ratio expected on this source. The bismuth distribution appears to be completely erratic and will be discussed progressively west to east. Line 2E, which was sampled to confirm a stream sediment analysis in Brampton Creek, anomalous for tin (1967 report) was over basalt for most of its length, except for a small "window" of Gordon Limestone in Brampton Creek itself. No bismuth anomaly was recorded, and it was noted that the limestone was unmetamorphosed.

Line 6E shows an assay of anomalous results which the writer concludes to be due to one of the following:

- (a) The proximity of the skarn contact.
- (b) The proximity of the sub basaltic lead
- (c) Contamination by other samples or analytical error.

It is thought that the bismuth analyses for line 2E are typical of the basalt and that the bismuth test is unreliable on this sheet. Several of the anomalies evident are obviously valid; the elongate anomaly in Bismuth Creek opposite and including No. 4 creek Drive is apparently derived from the skarn and or the fault; the Bismuth content of the fissure veins was found to increase approaching this fault.

Similarly, the small anomalies on lines 11, 12 and 13E/1000S probably follow a small fault or quartz stringer, and the isolated value on the All Nations Lode is to be expected. (Reid, 1919) has stated that the All Nations ore minerals consisted of wolframite and bismuth in the proportion 12 to 1 and it appears he was referring to the Lady Barron Lode.

If this is so the occurrence of bismuth above the Iris Mine (16E/2800S) is valid.

Structure

The following points are put forward for consideration:

- (a) Owing to presence of unmetamorphosed limestone in Brampton Creek, close to the interpreted sub-basaltic skarn (4 and 5E), it is considered that this creek follows a post-mineralisation fault (west side down).
It is thought that this hypothetical fault displaces the Bismuth Creek Fault and is mapped by the H.E.C. as passing to the west of the Wilmot Dam, diversion tunnel intake (WIL-L. Plan B8265).
- (b) It is thought that the displacement of the weak magnetic and E.M. trend between lines 12 and 13E may be another fault parallel to the Bismuth Creek Fault, with sinistral trans-current movement. However, a drag fold in the Moina sandstone exist along this line as the Cambrian Bull Creek volcanics are not seen to outcrop on the Cradle Mountain road. This suggestion is made without supporting evidence.

Recommendations Moina Sheet 2

In order of importance:

1. Further geochemical sampling on lines 5E, 4E and 3E be carried out to confirm the bismuth anomaly on line 6E.
2. Lines 4AE to 7AE be tested with the V.H.E.M. unit to further outline the skarn extensions.
3. Lines 6, 7, 8 and 9E be extended to 1000N following by magnetometer and E.M. values north of the Bismuth Creek Fault.
4. The two holes outlined in (Reid 1967) should be drilled collared at line 6E/1000S and 6E/1500S. These holes should bear 180° magnetic and be inclined -25°. No drilling is recommended at the moment for the northern geophysical anomalies on lines 7, 8 and 9E.

5. Lines 14 to 16E should be extended north to the base line, in order to cover any further zones parallel to the All Nations Lode.

5.4 Aeromagnetic Anomaly F.

A grid of eight lines average length 2700 feet orientated 00° Mag. was cut over Mr. Webbs anomaly "F", little work has been done at this location: E.H.E.M. traverses have been carried out over lines 1E to 1W, and geochemical sampling over lines 1E to 2W has also been completed. Geology consists of a small area of basalt capped Moina sandstone exhibiting barren quartz filled tension veins. This area is regarded as being of some importance due to the reported occurrence of chalcopyrite in the Moina sandstone at this point (Reid 1967) and the presence of low order stream sediment anomalies in the immediate vicinity. Future work should consist of completion of the magnetometer, E.M. and geochemical traverses.

6. MISCELLANEOUS

A grid was commenced over the pyritic zone in the Cambrian, South of the Iris Mine. This was not completed and although E.M. results were encouraging it is recommended that further work on this area be discontinued until a later date.

The Wilnot Tunnel was visited by the writer periodically during its construction. Several exposures of academic interest occur in this tunnel: measured from the Uethana end as follows:

- (a) A zone of Cambrian schists is present from 620' to 2550' within which occur strong magnetite pyrite zones; quartz porphyries increase towards the faulted Roland Conglomerate contact which has small mineralised tension veins. The Moina quartzite in which the rest of the tunnel lies is mineralised with pyrite and serpentinised quartz porphyry occurs along a fault at 6450' and again at 6980'. Both of these exposures have been sampled with negative results.

A major fault zone exists between 6900' and 7100' and no other evidence of economic mineralisation exists until 13500' where small tension gashes exhibit galena.

wow!

- (b) An outcrop of serpentinitised Precambrian sediments near the Lemonthyme to Mersey Road was examined and geochemically sampled. The proximity of this outcrop to a nearby granite is responsible for the minor pyrite-chalcopyrite mineralisation, however no geochemical or magnetic response was obtained.

7. SUMMARY

Each area has pertinent recommendation enumerated with it. Several points below summarise areas which are considered to be of interest and have not yet been dealt with.

1. Copper, zinc and tin anomalies on the eastern slopes of Bell Mount. Molybdenum is also reported from this area by Jennings (pers. comm).
2. Zinc, copper and tin anomalies in the vicinity of Wanning Paddock Creek.
3. The tin anomalies in Brampton and Bismuth Creeks having been negated or dismissed as contamination. The tin and copper anomalies in tributaries of the Wilmot River below Bell Mount (labelled C5 on the original stream sampling), correlated with a low intensity anomaly and are considered to be of interest.

M.F. FOSTER

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8. APPENDIX

8.1 Olivers Hill Area

During May and June of this year the Department of Mines conducted a geochemical and geological survey over a ferro-manganese gossanous zone, over 1 mile long and up to 500' wide on Olivers Hill. The gossans outcrop as two sub parallel bodies trending WNW and aligned parallel to the regional structure.

The geochemical soil survey conducted by the Department of Mines suggest a zone, at least 2500' long, containing concentrations of lead in excess of 1700 p.p.m. with associated weak to moderate copper and zinc anomalies (in excess of 100 p.p.m. and 300 p.p.m. respectively). Jennings 1963 (Explanatory Report - Middlesex Quadrangle) summarises Robinsons findings (unpublished report 1958). Robinson reported that the ferro-manganese mineralisation "does not persist even to shallow depths" as indicated in several short shallow adits and "postulated that the main outcrops are simply surface enriched cappings underlain at shallow depth by leached sandstone". There was no mention of sulphide mineralisation, however samples from surface outcrops gave erratic values up to 8.8% lead and 2 oz/ton silver.

It is interesting to note that results obtained during the 1966/67 field season (Reid 1967) indicated that a small stream draining from the western extension of the gossanous zone was anomalous for copper, zinc and tin. From an examination of the aerial photos it appears that the gossanous zone probably lies along a major fault zone and consequently the mineralisation is expected to be similar to that on the Five Mile Rise, east of Lorinna i.e. a mineralised fault zone outcropping as a gossan but passing into sulphides at depth.

As a result of the information supplied by the Department of Mines an I.P. survey is proposed, in order to gain some indication of

the presence or absence of sulphide mineralisation at depth, to define the approximate size and shape of the mineralised zone and to subsequently assess its potential as a drilling target. The geophysical grid proposed consists of a base line 5,600' long with 8 traverse lines, about 2000' in length, spaced at 800' intervals, for a total of 21,600'. If the results from this reconnaissance survey are encouraging, intermediate traverse lines at 200' intervals will be surveyed.

8.2 Shepherd and Murphy Mine - Fletcher's Adit Area

It is considered that the geochemical and geophysical response obtained during the 1968/69 field season were sufficiently interesting to warrant further more detailed examination. Consequently it is proposed that selected areas of this area be re-examined by I.P. and or electromagnetic (Turam) surveys, depending on the recommendation of the Compagnie Generale de Geophysique. It is also recommended that additional geochemical data be obtained and that the areas selected be re-surveyed by ground magnetics to confirm and clarify several areas of apparent incompatibility in the magnetic results. Extensions to the existing grid are also recommended.

8.2.1 Shepherd and Murphy Mine - All Nations Mine

An additional 5,900' of traverse line is recommended to cover the immediate south-eastern extensions of the Bismuth Creek Fault, and Lawkentaw Mine area. The existing grid consists of 38,200' of traverse line which with the above proposed footage totals 44,100' (approx. 8.4 miles).

8.2.2 Iris River Area

The present grid consists of approximately 26,100' of cut traverse lines, in addition to which 5,800' are recommended for a total of 31,900' (approximately 6 miles).

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8.2.3 Fletcher's Adit-Stormont Mine Area

This grid consists of 9,900' of traverse lines to which an additional 9,100' is recommended for a total of 19,000' (approximately 3.6 miles)

The track cutting will be carried out By four men from the Lake Margaret Gang. It is anticipated that the overall cost of the recommended track cutting will be approximately \$1100.

K.O. Reid

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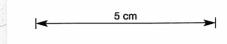
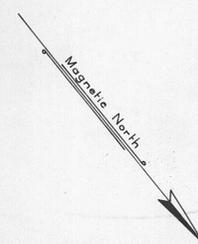
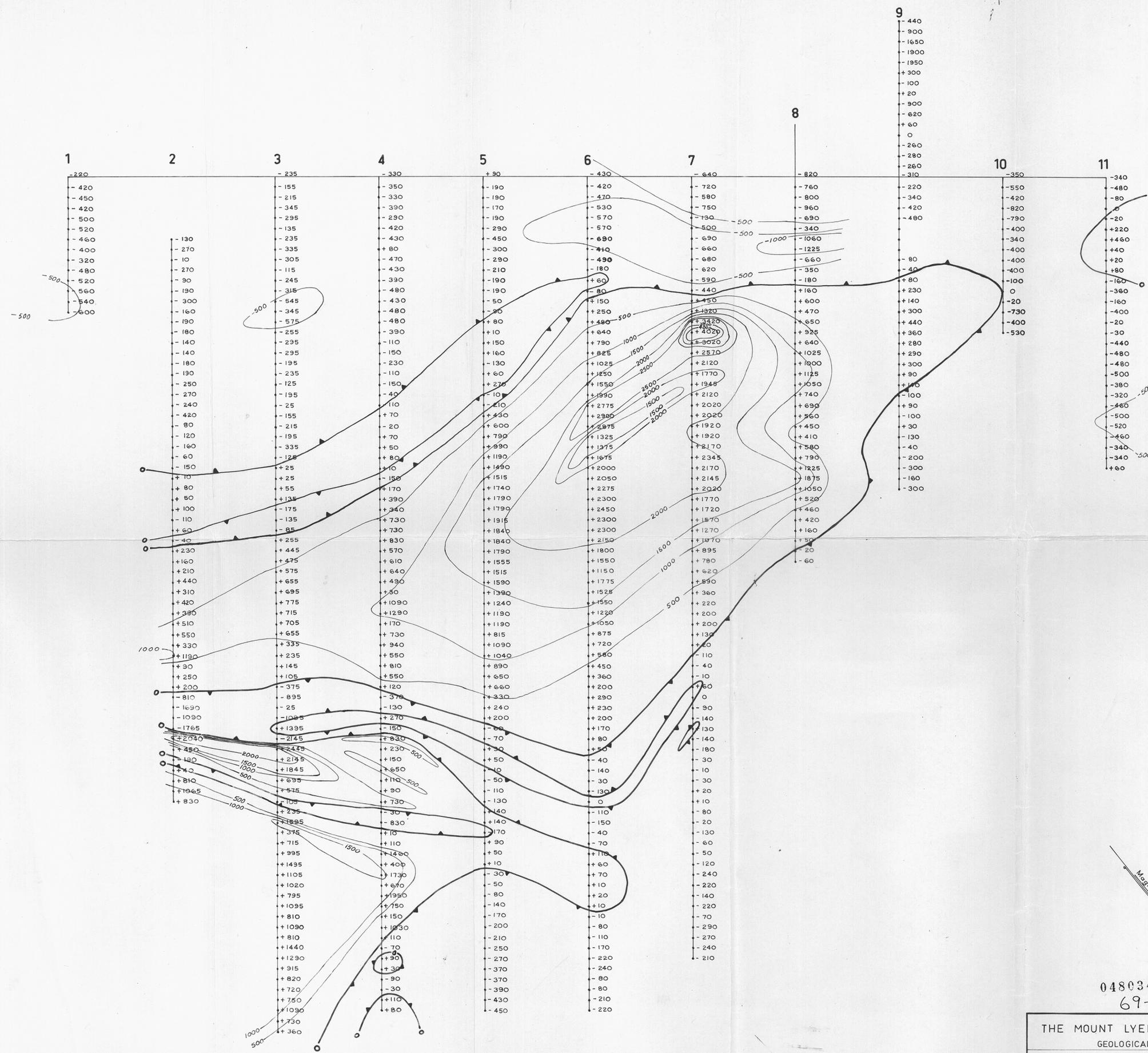
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X " " " First Progress Report - Ground Follow Up of the Staverton Airborne Magnetic Survey - Shepherd and Murphy Mine Area. Private report for Mt. Lyell

X " " 1969 Second Progress Report - Staverton Geophysical Results (Moina Sheet 1 and 2) Private report for Mt. Lyell Mining & Railway Co. Ltd.

✓ WILSON, G.I. 1962 Report on Special Prospector's Licence No. 378. Mt. Stormont Area, Tasmania. Unpublished report for New Consolidated Gold Fields (A/asia) Pty. Ltd.



048034 69-592	032	37/25 FIG. 2
THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT		DRAWN BY H.F.F. TRACED BY H.F.F. CHECKED BY KOK DATE 19-8-69 SCALE 1" = 500' MAGNETOMETER USED SHARPE M.F. 1.
LORINNA GRID MAGNETICS		



LEGEND

- T_B TERTIARY BASALT
- T_{BF} BASALT FLOAT AND TALUS
- T_G TERTIARY GRAVELS
- O_M MOINA SANDSTONE
- E₁ MAGNETIC CAMBRIAN - QUARTZ PORPHYRIES
- E₂ CAMBRIAN GREYWACKES AND SILTSTONES

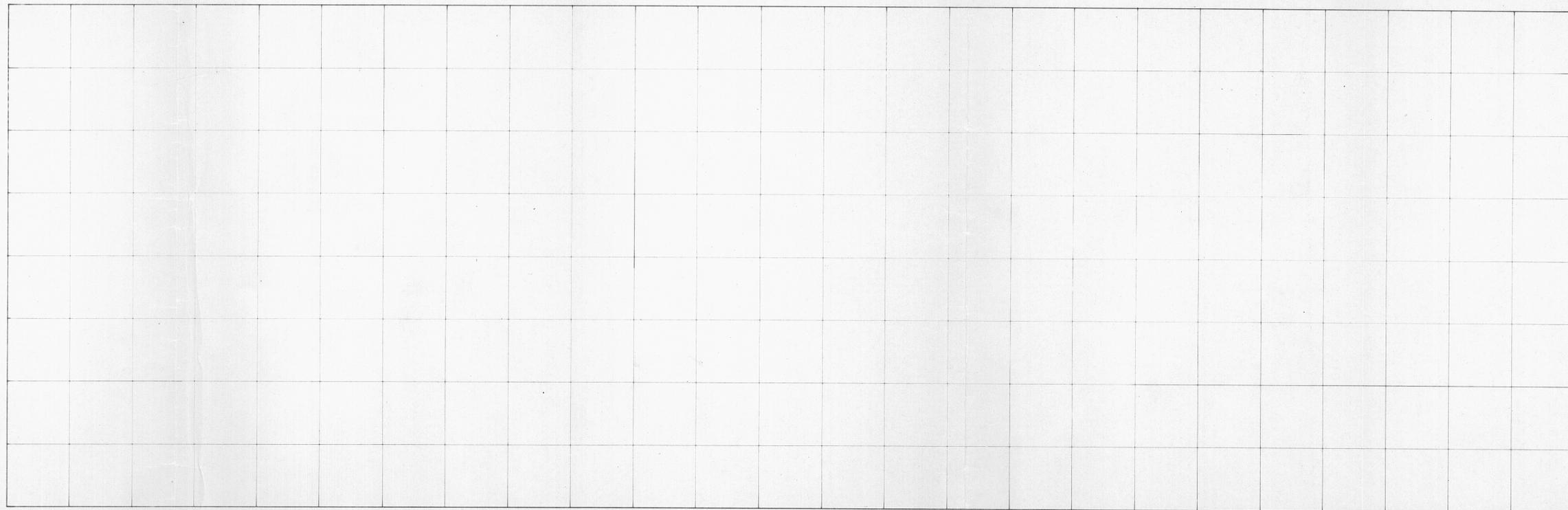
048035

5cm

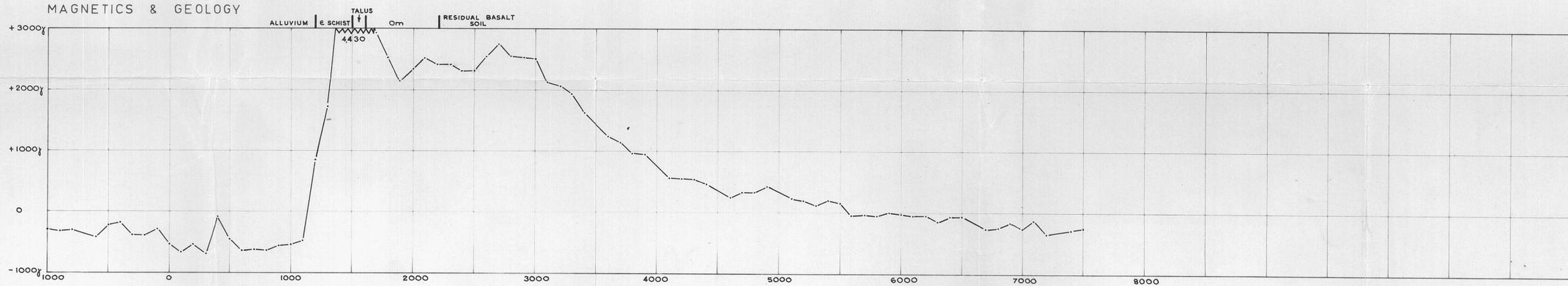
69-592 033

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY: H.F.F. TRACED BY: H.F.F. CHECKED BY: KOK DATE: 19-8-69 SCALE: 500' = 1"
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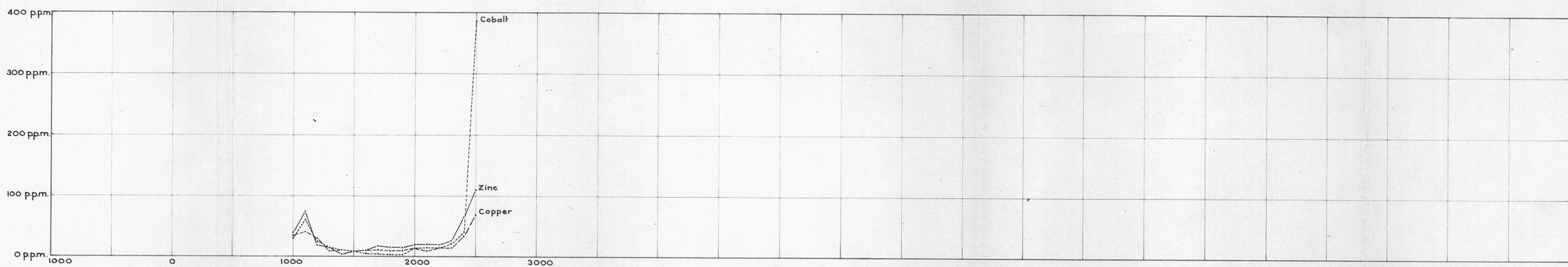
E. M.



MAGNETICS & GEOLOGY



GEOCHEMISTRY



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4665 69-592

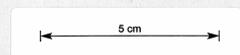
FIG. 4

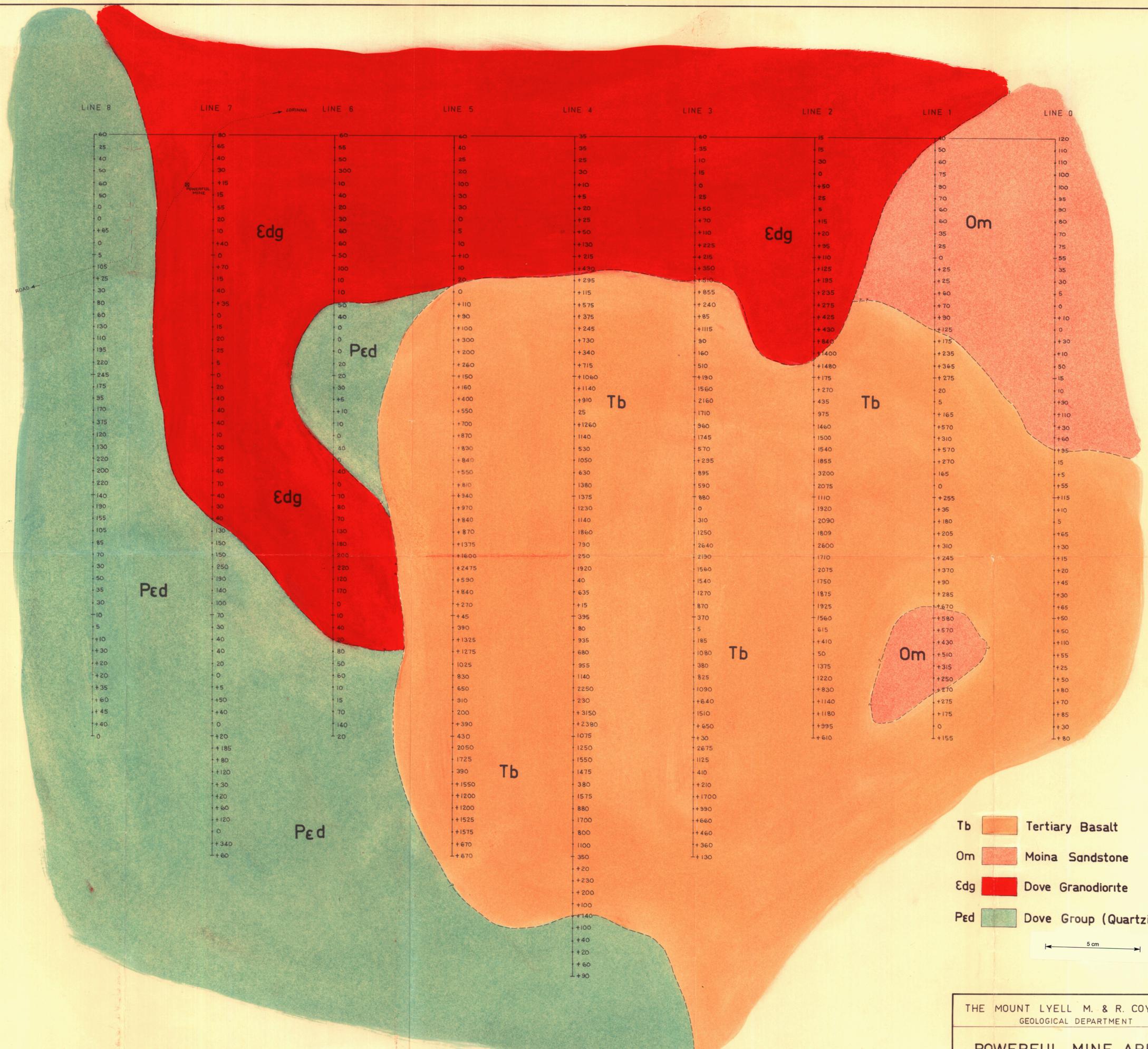
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ORIENTATION: 040° M.

THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT

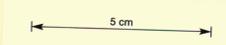
**LORINNA
SECTION SHEET
LINE 7**

DRAWN BY H.F.F.
TRACED BY H.F.F.
CHECKED BY K.O.R.
DATE 19-8-69
SCALE 1" = 500'
MAGNETOMETER USED
SHARPE M.F. 1.





- Tb Tertiary Basalt
- Om Moina Sandstone
- Edg Dove Granodiorite
- Ped Dove Group (Quartzites)

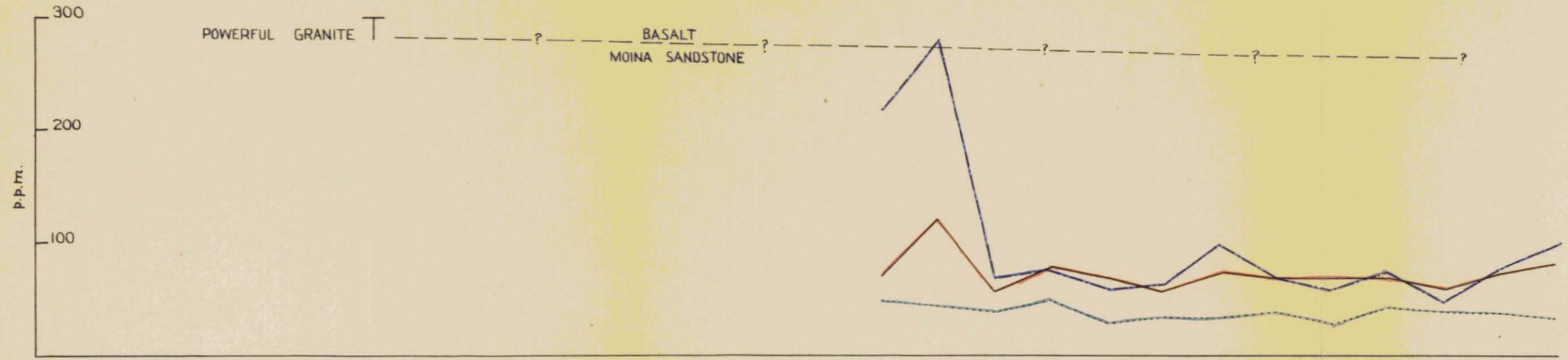


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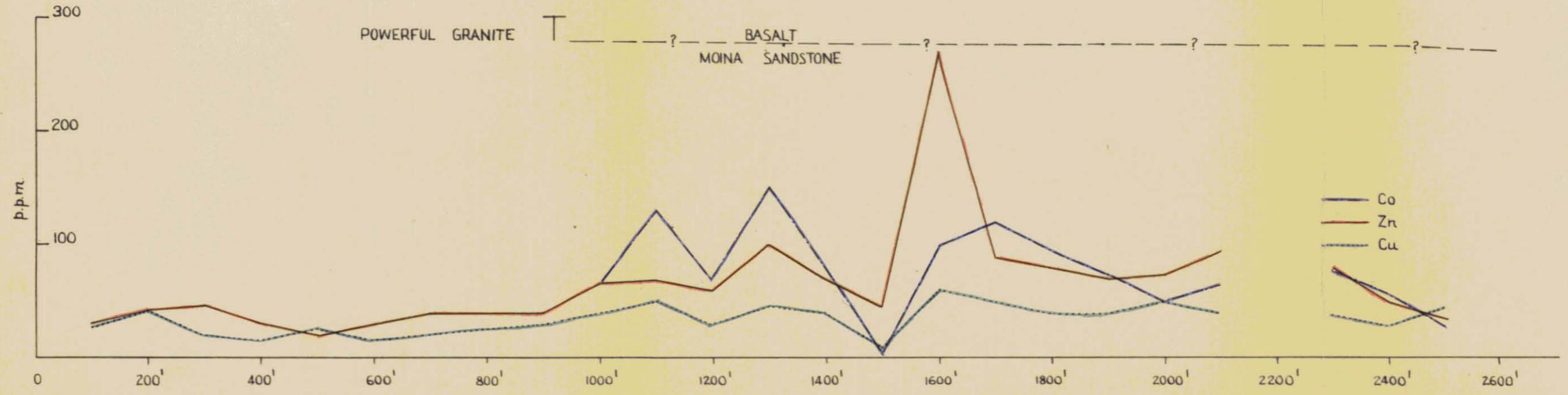
69-592 4666

MAGNETICS AS READ FROM McPHAR M 700
(CORRECTED TO ZERO)

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY H.F.F. TRACED BY H.F.F.
POWERFUL MINE AREA	CHECKED BY
GROUND MAGNETOMETER SURVEY	DATE 19-8-69 SCALE 200'=1"
FIG. 5 37/25	



LINE 3.

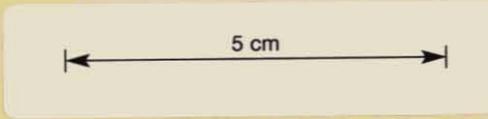


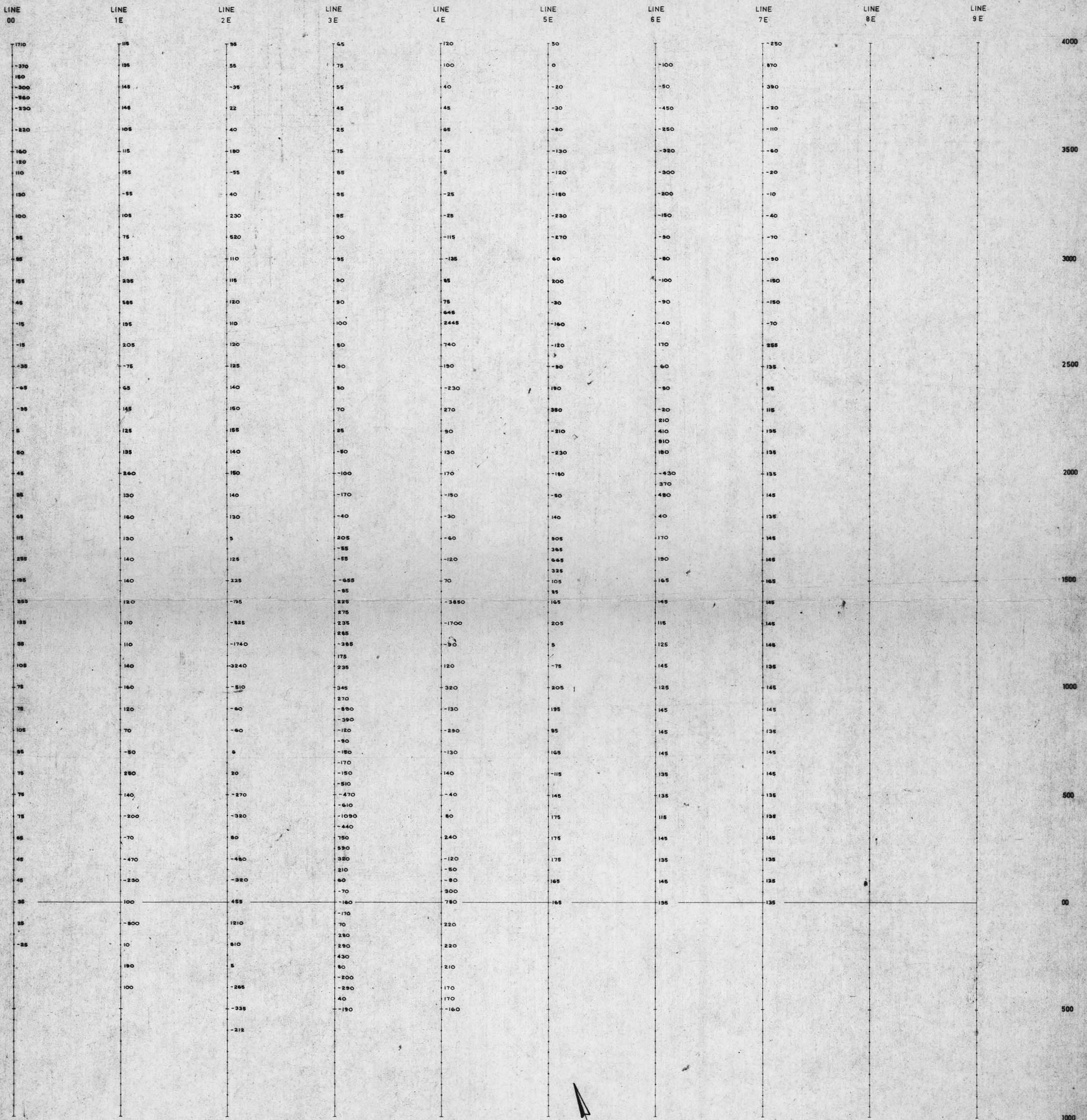
LINE 2.

POWERFUL MINE AREA

FIG. 6.

GEOCHEMICAL SOIL SAMPLING DATA LINES 2&3. 4667



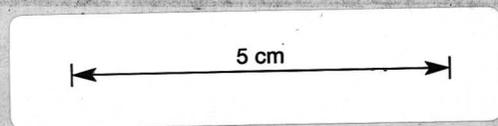


BASE LINE 110' M.



4668 69-592

048039

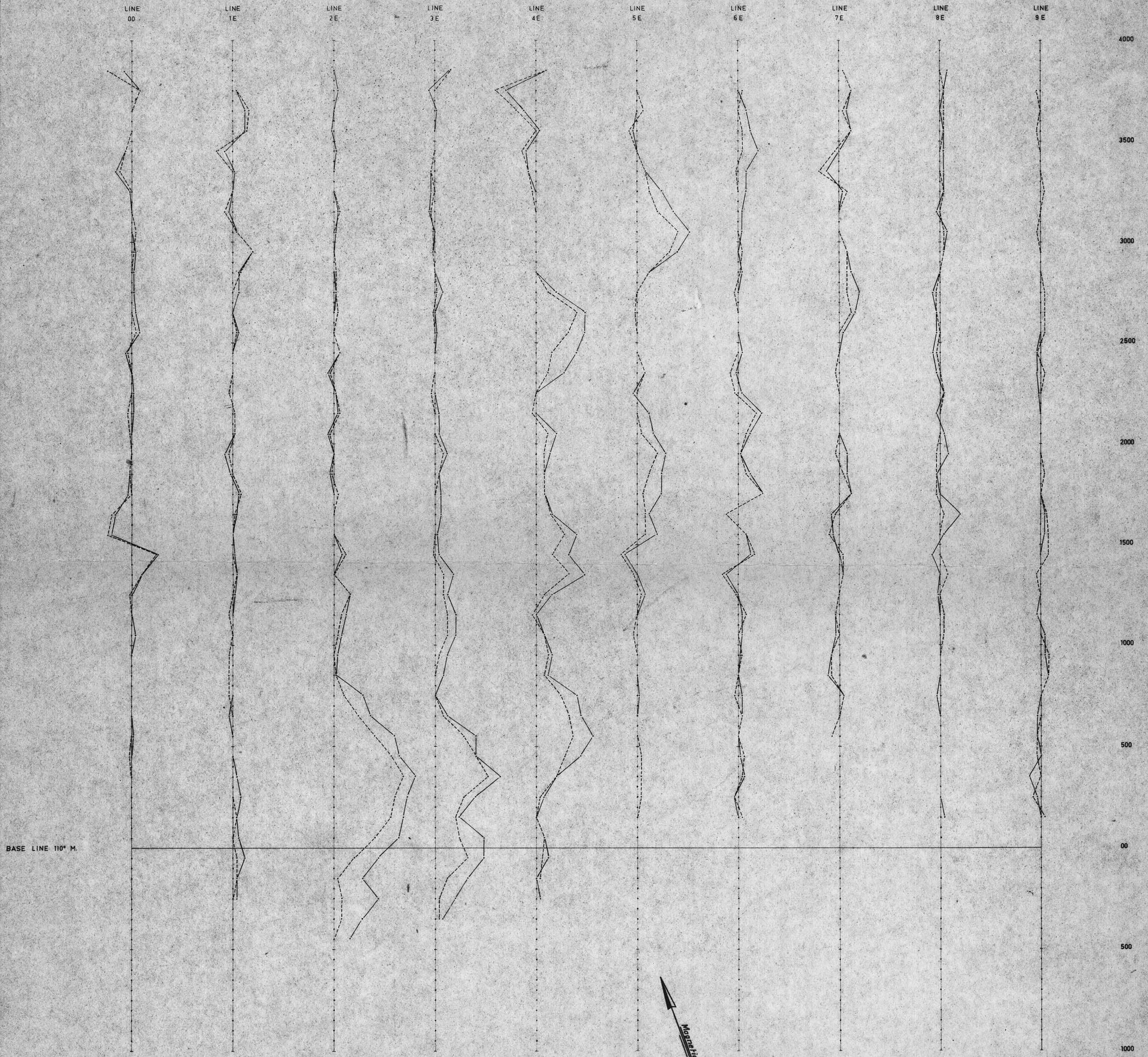


MAGNETICS AS READ FROM MCPHAR M700
(CORRECTED TO ZERO)

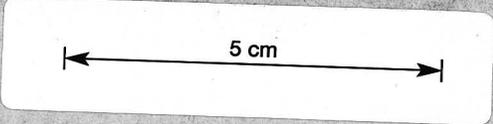
THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT

DOVE RIVER
'D' GRID
MAGNETICS

DRAWN BY H.E.F.
CHECKED BY H.E.F.
DATE: M-8-69
SCALE: 500' = 1"
FIG. 7



048040 4669 69-592



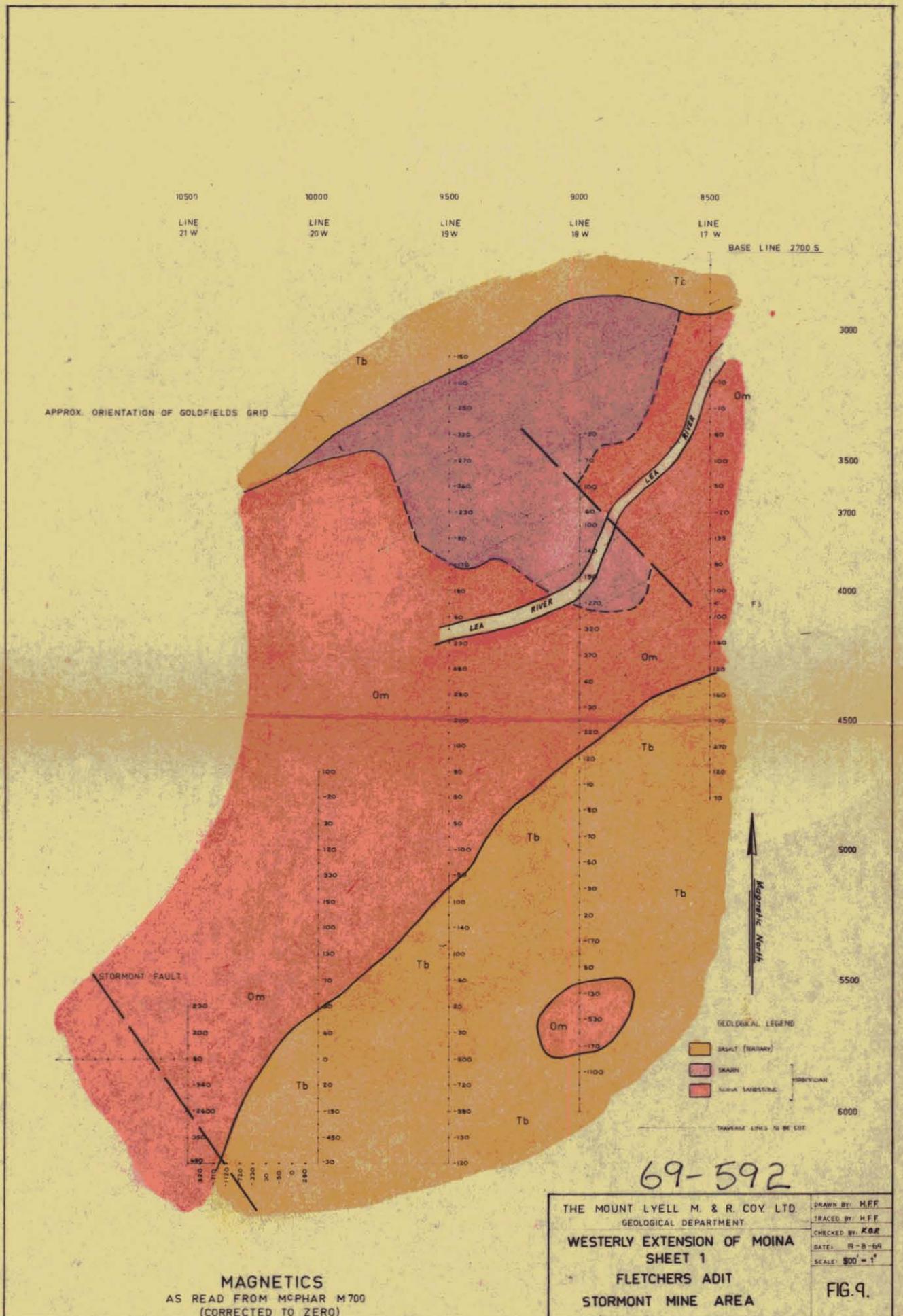
NOTE:
 VERTICAL LOOP IN-LINE SURVEY
 COIL SEPARATION 300 FEET
 - - - - 600 C.P.S.
 - - - - 2400 C.P.S.
 SCALE E.M. DISTORTION 1"=10"

THE MOUNT LYELL M. & R. COY. LTD.
 GEOLOGICAL DEPARTMENT

DOVE RIVER
 'D' GRID
 RECONNAISSANCE E.M.

DRAWN BY: H.F.F.
 TRACED BY: H.F.F.
 CHECKED BY: K.O.R.
 DATE: 11-9-69
 SCALE: 300 = 1" HOB

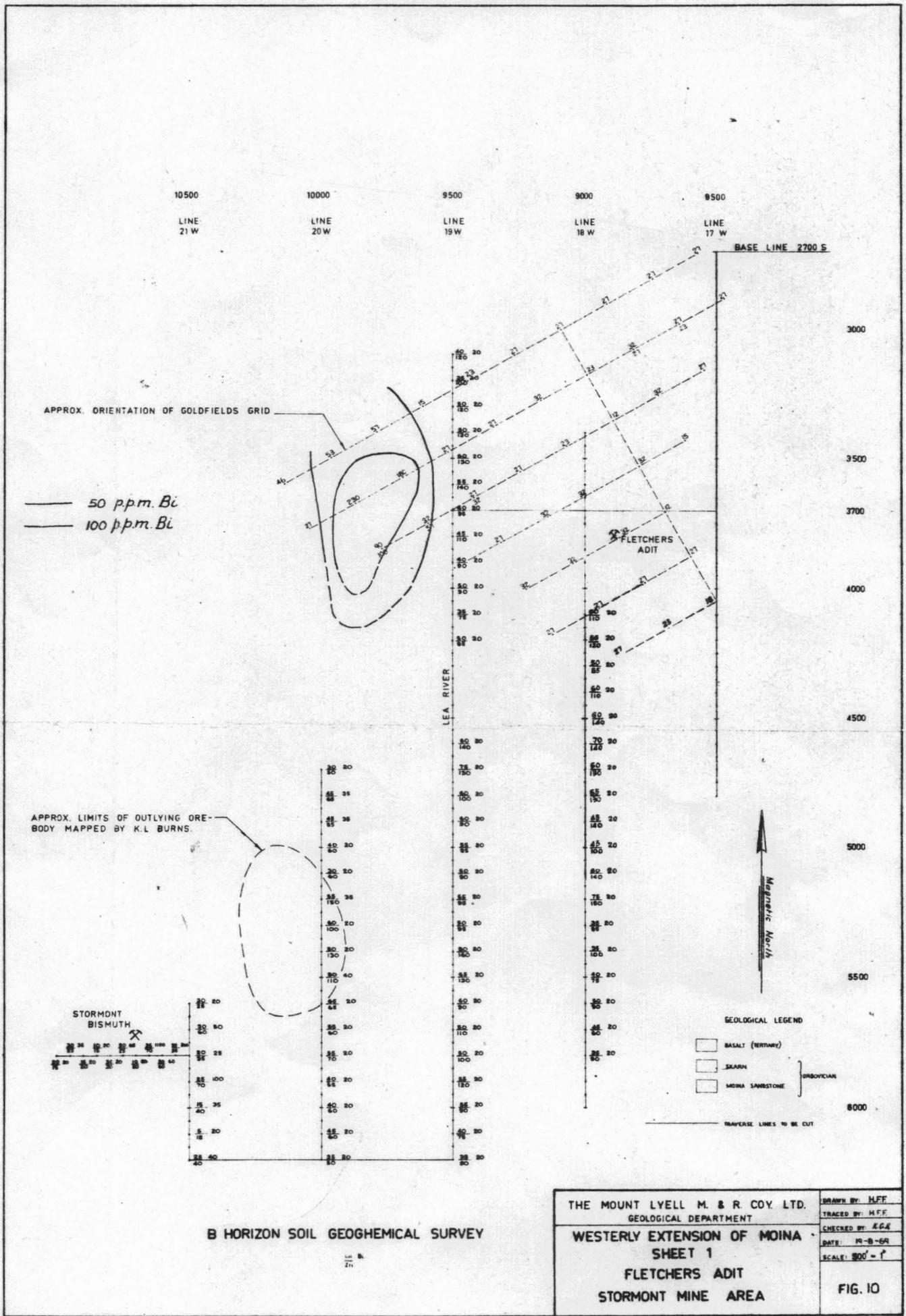
FIG. 8.



5 cm

4670

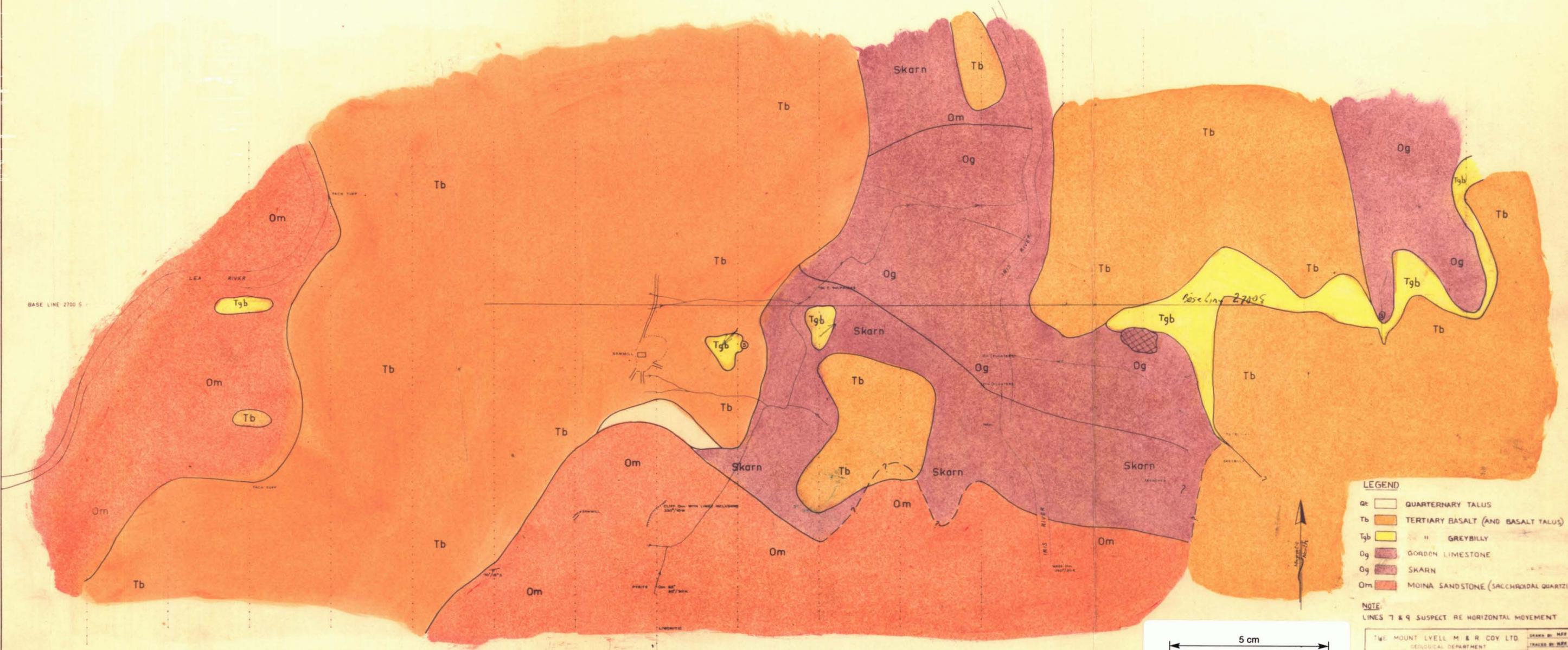
048041



4671

048042

9500 9000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 00
 LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0



- LEGEND**
- Ot QUATERNARY TALUS
 - Tb TERTIARY BASALT (AND BASALT TALUS)
 - Tgb GREYBILLY
 - Og GORDON LIMESTONE
 - Og SKARN
 - Om MOINA SANDSTONE (SACCHARODAL QUARTZITE)

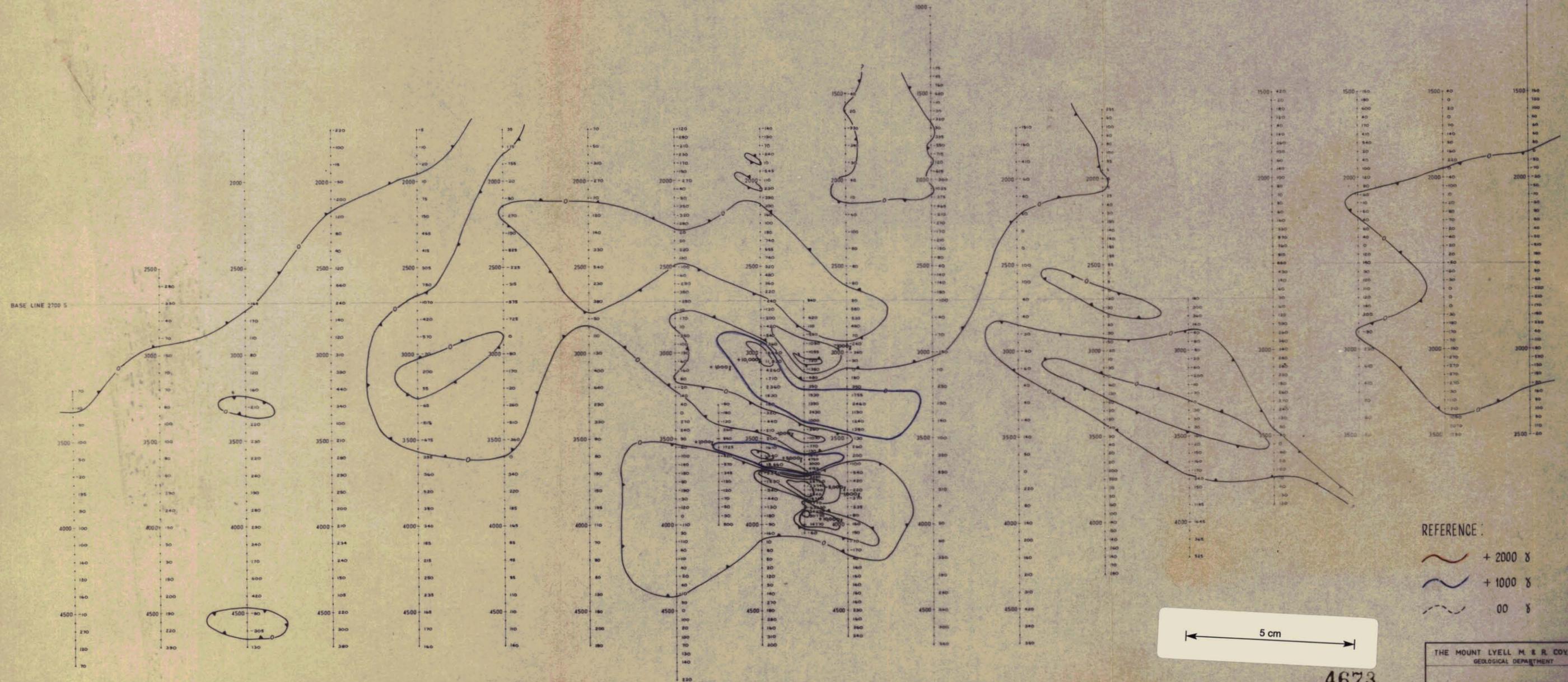
NOTE:
 LINES 7 & 9 SUSPECT RE HORIZONTAL MOVEMENT

5 cm

048043 4672

THE MOUNT LYELL M & R COY LTD
 GEOLOGICAL DEPARTMENT
 MOINA SHEET 1
 GEOLOGY
 FIG.11

8500 LINE 17 W 8000 LINE 16 W 7500 LINE 15 W 7000 LINE 14 W 6500 LINE 13 W 6000 LINE 12 W 5500 LINE 11 W 5000 LINE 10 W 4500 LINE 9 W 4000 LINE 8 W 3500 LINE 7 W 3000 LINE 6 W 2500 LINE 5 W 2000 LINE 4 W 1500 LINE 3 W 1000 LINE 2 W 500 LINE 1 W 00 LINE 0



REFERENCE:
 + 2000 γ
 + 1000 γ
 00 γ

5 cm

THE MOUNT LYELL M & R COY LTD
 GEOLOGICAL DEPARTMENT

MOINA SHEET 1
MAGNETICS

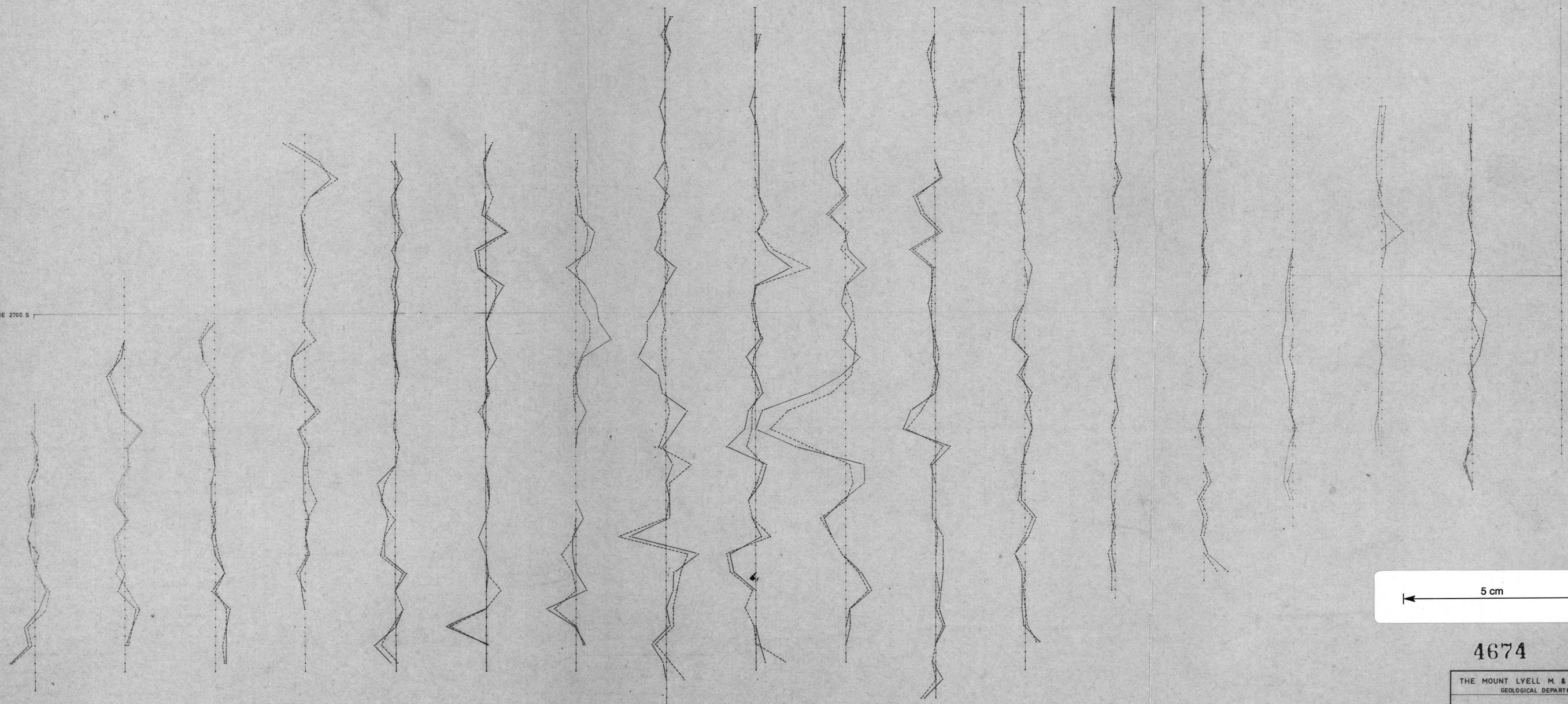
FIG 12

4673

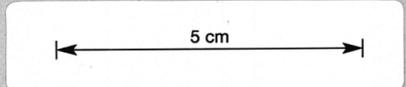
048044

8500 LINE 17 W
 8000 LINE 16 W
 7500 LINE 15 W
 7000 LINE 14 W
 6500 LINE 13 W
 6000 LINE 12 W
 5500 LINE 11 W
 5000 LINE 10 W
 4500 LINE 9 W
 4000 LINE 8 W
 3500 LINE 7 W
 3000 LINE 6 W
 2500 LINE 5 W
 2000 LINE 4 W
 1500 LINE 3 W
 1000 LINE 2 W
 500 LINE 1 W
 00 LINE 0

BASE LINE 2700 S



500
1000
1500
2000
2500
3000
3500
4000
4500



4674

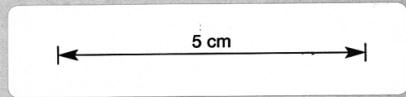
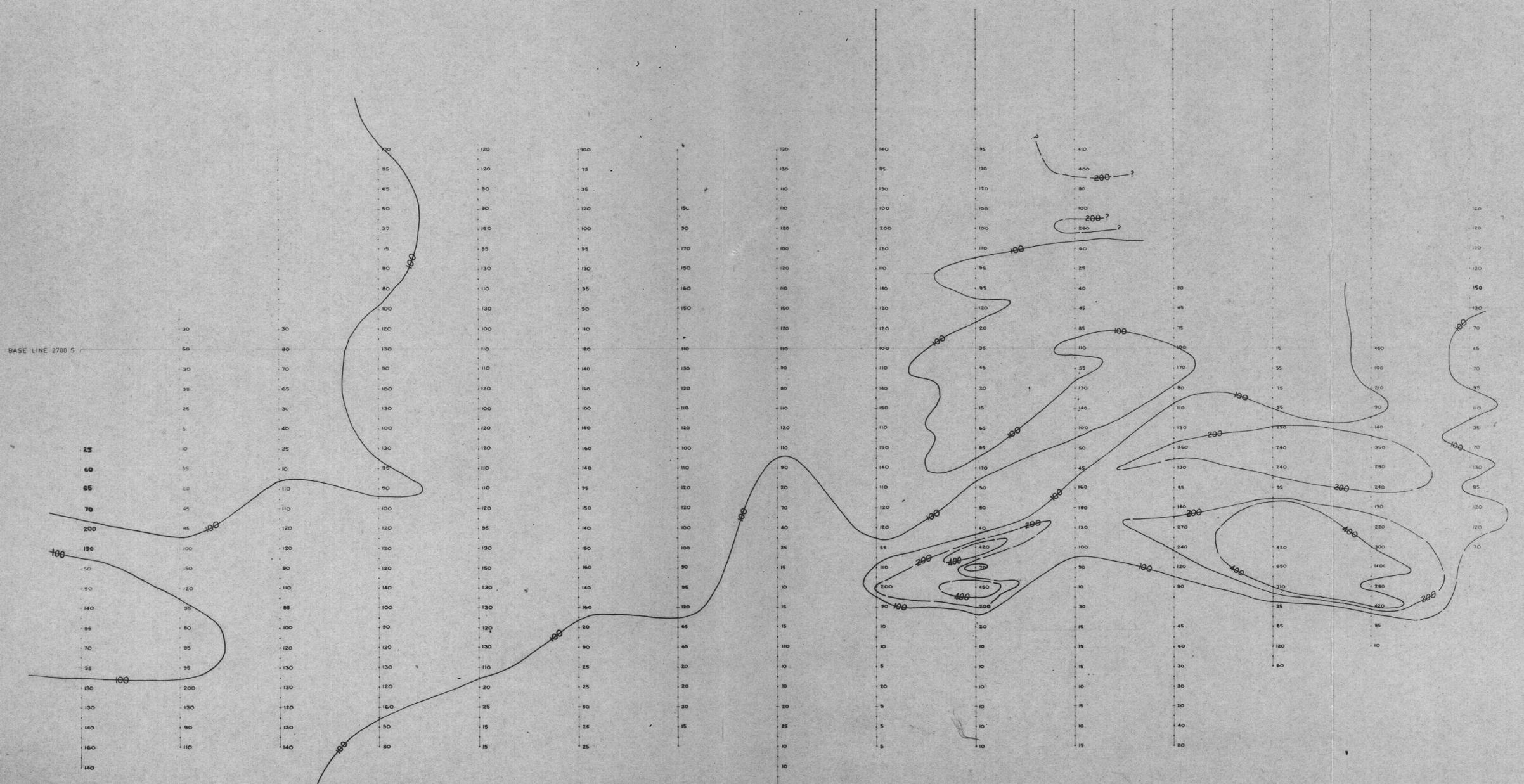
THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY H.E.P. TRACED BY H.E.P. CHECKED BY F.C.C. DATE 6/8/69 SCALE 500'-1"
MOINA SHEET 1 E.M.	
FIG. 13.	

SCALE E.M. 1-10"
 N S
 0 Tx
 300'

048045

9500 9000 8500 8000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 00

LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0



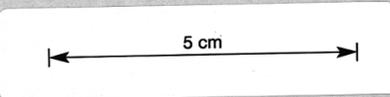
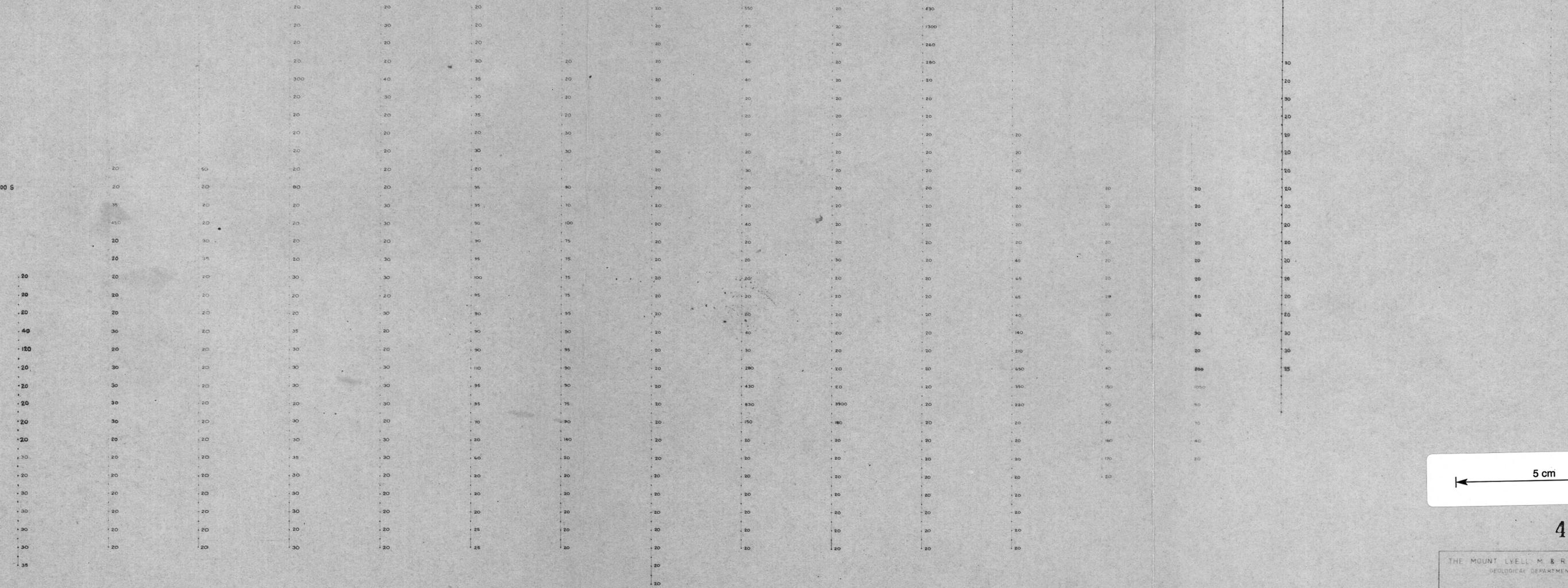
4676

048047

THE MOUNT LYELL M & R COY. LTD. GEOLOGICAL DEPARTMENT		DRAWN BY: HFF TRACKED BY: RSM CHECKED BY: RSM DATE: 5-8-69 SCALE: 1"=500'
MOINA SHEET 1 GEOCHEMICAL SOIL SAMPLING RESULTS ZINC		FIG. 15.

8500 8000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 00
 LINE 17 W LINE 16 W LINE 15 W LINE 14 W LINE 13 W LINE 12 W LINE 11 W LINE 10 W LINE 9 W LINE 8 W LINE 7 W LINE 6 W LINE 5 W LINE 4 W LINE 3 W LINE 2 W LINE 1 W LINE 0

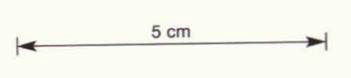
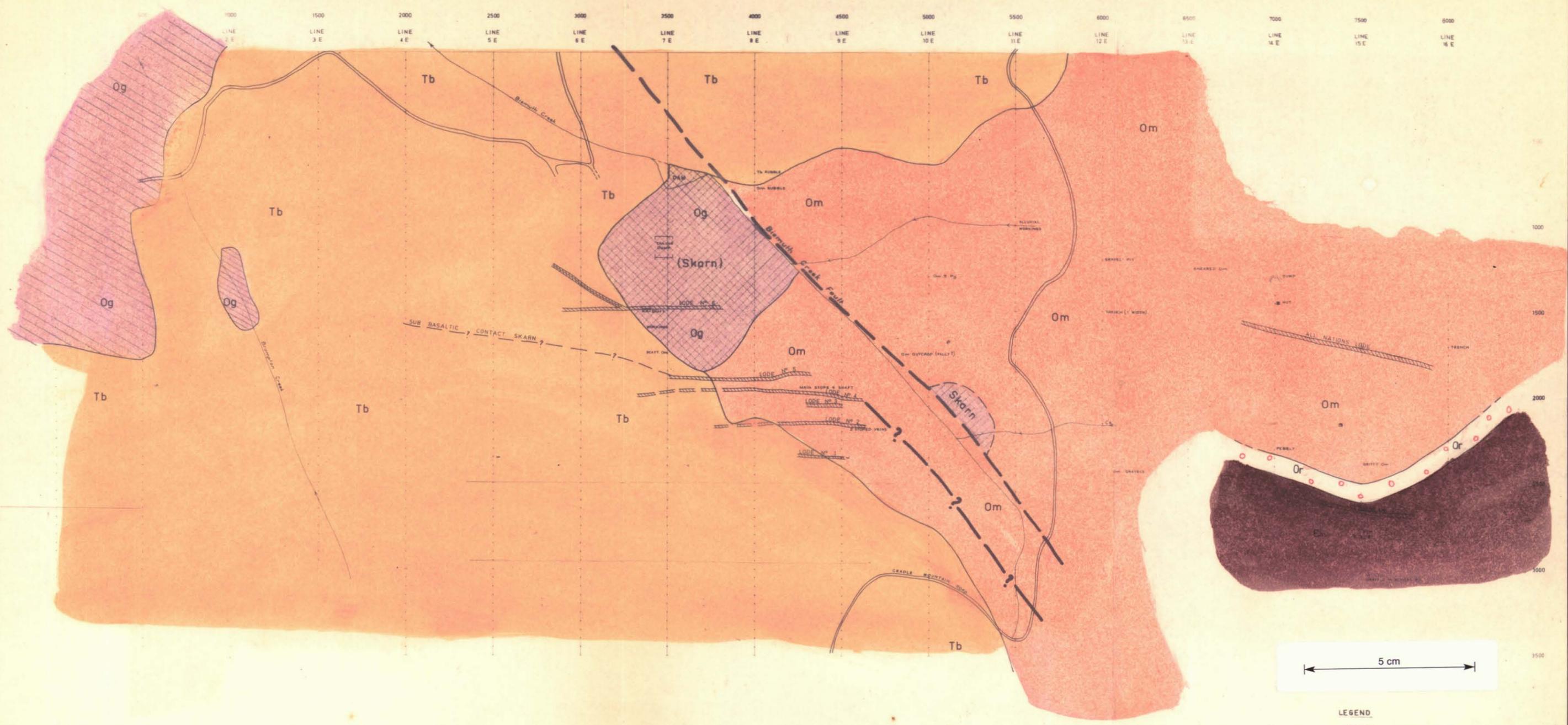
BASE LINE 2700 S



4677

048048

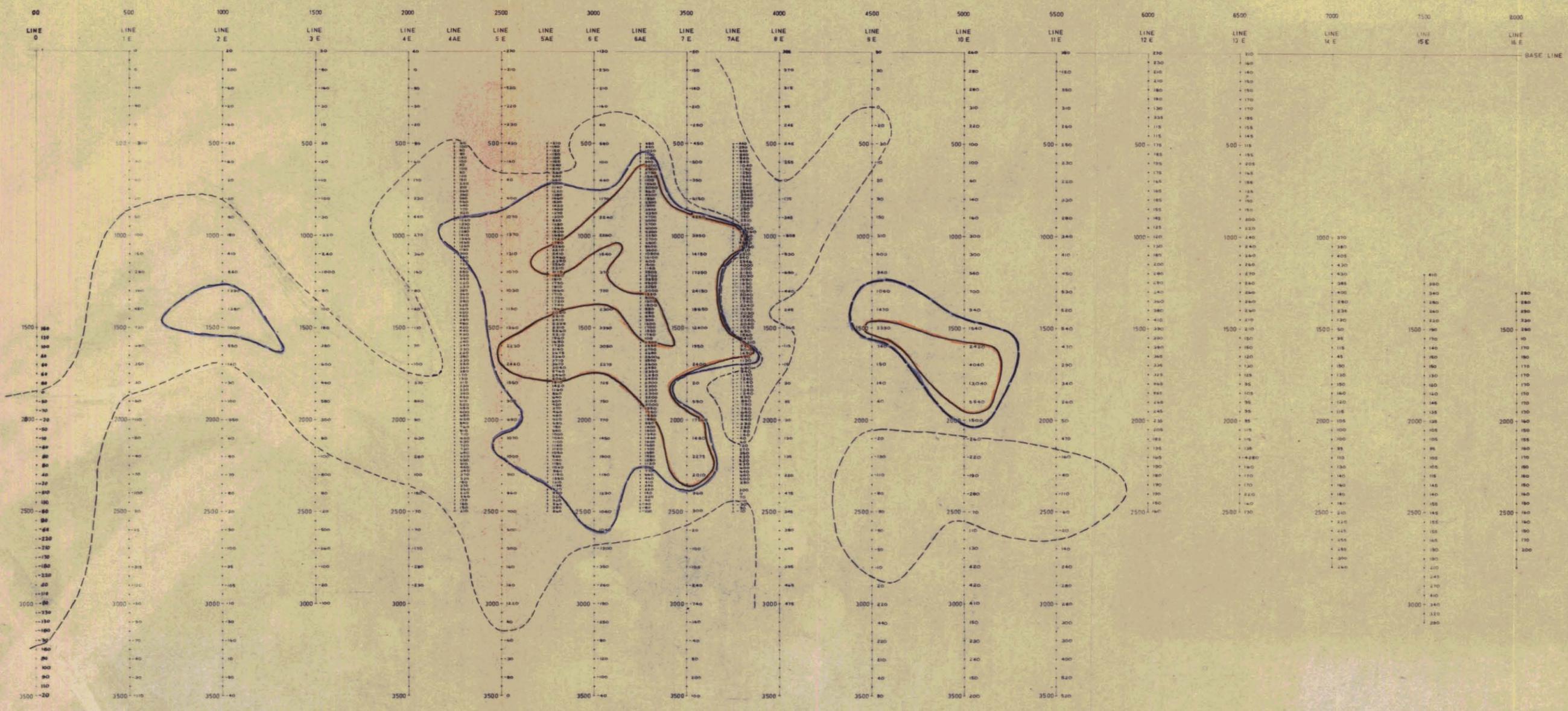
THE MOUNT LYELL M & R COY LTD GEOLOGICAL DEPARTMENT	DRAWN BY HFE CHECKED BY RGW DATE 5/8/69 SCALE 500 = 1"
MOINA SHEET 1 BISMUTH	FIG. 16.



- LEGEND**
- qt QUATERNARY TALUS
 - Tb TERTIARY BASALT (AND BASALT TALUS)
 - Og GORDON LIMESTONE
 - Og SKARN
 - Om MOINA SANDSTONE (SACCHRODAL QUARTZITE)
 - Ebv BULL CREEK VOLCANICS
- NOTE
LINES 7 & 9 SUSPECT RE HORIZONTAL MOVEMENT

4678
048049

THE MOUNT LVELL M & R COY LTD GEOLOGICAL DEPARTMENT	DRAWN BY: H.S.F. TRACED BY: R.G.W. CHECKED BY: R.G.W. DATE: 29/2/59 SCALE: 500' = 1"
MOINA SHEET 2 GEOLOGY	FIG. 17

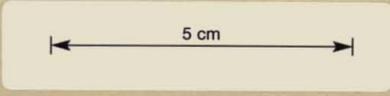


REFERENCE:
 + 2000 X
 + 1000 X
 00 X



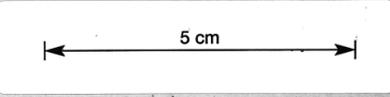
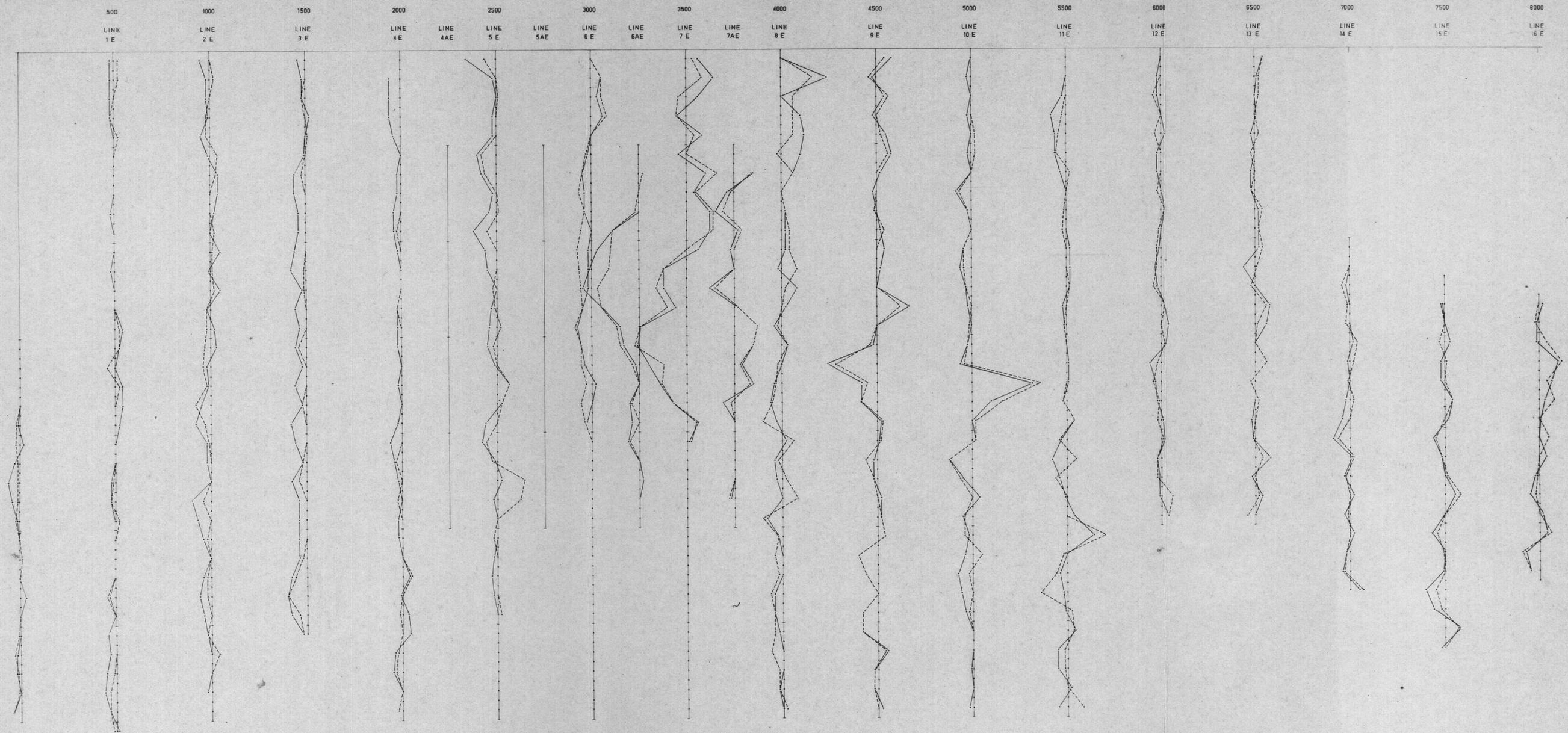
048050

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THE MOUNT LYELL M. & R. COY. LTD
 GEOLOGICAL DEPARTMENT
 MOINA SHEET 2
 MAGNETICS

DRAWN BY: HED
 CHECKED BY: HED
 DATE: 7/8/69
 SCALE: 500'-1"
 FIG. 18.



048051

4680

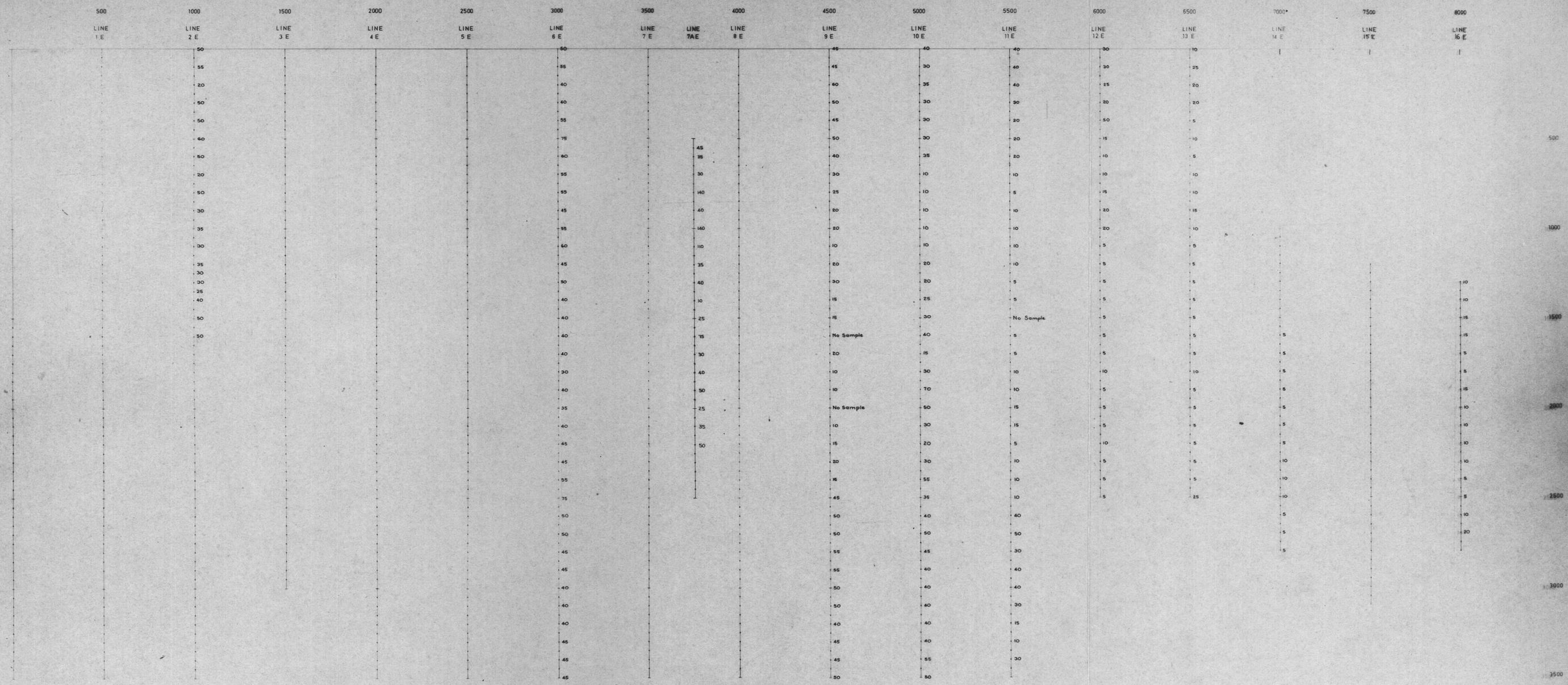
SCALE E.M. 1" = 10'
 N S
 0 Tx
 300'

THE MOUNT LYELL M. & R. COY. LTD.
 GEOLOGICAL DEPARTMENT

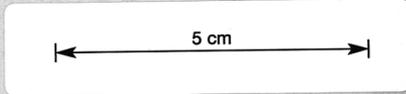
MOINA SHEET 2
 E.M.

DRAWN BY H.E.E.
 TRACED BY H.E.E.
 CHECKED BY H.E.E.
 DATE 6/8/69
 SCALE 500 = 1"

FIG.19.



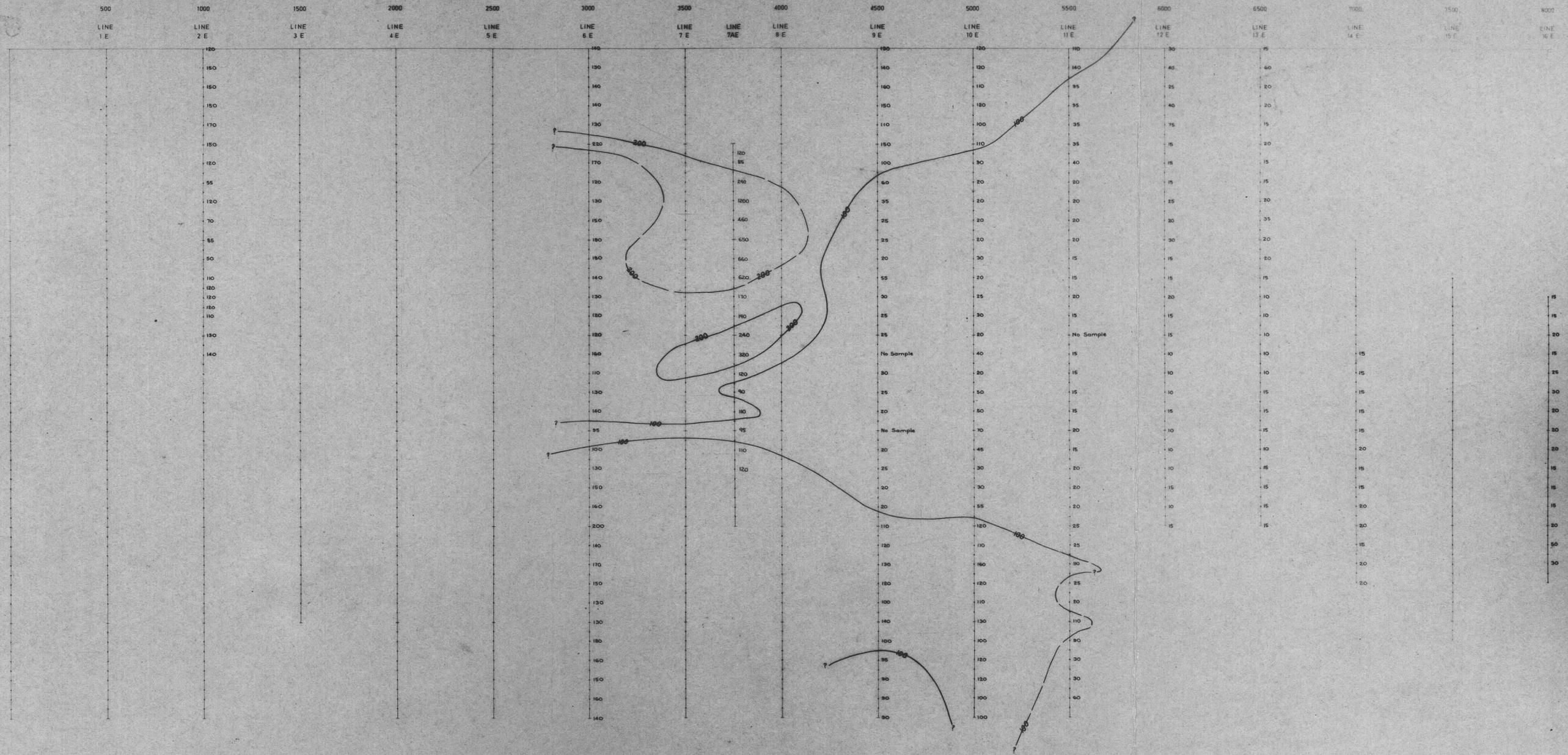
048052



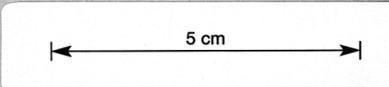
69-592

4681

THE MOUNT LYELL M. & R. COY. LTD.	APPROVED BY: <i>[Signature]</i>
GEOLOGICAL DEPARTMENT	DRAWN BY: <i>[Signature]</i>
MOINA SHEET 2	DATE: 6/18/69
GEOCHEMICAL SOIL SAMPLE DATA	SCALE: 5m = 1
COPPER	FIG. 20.

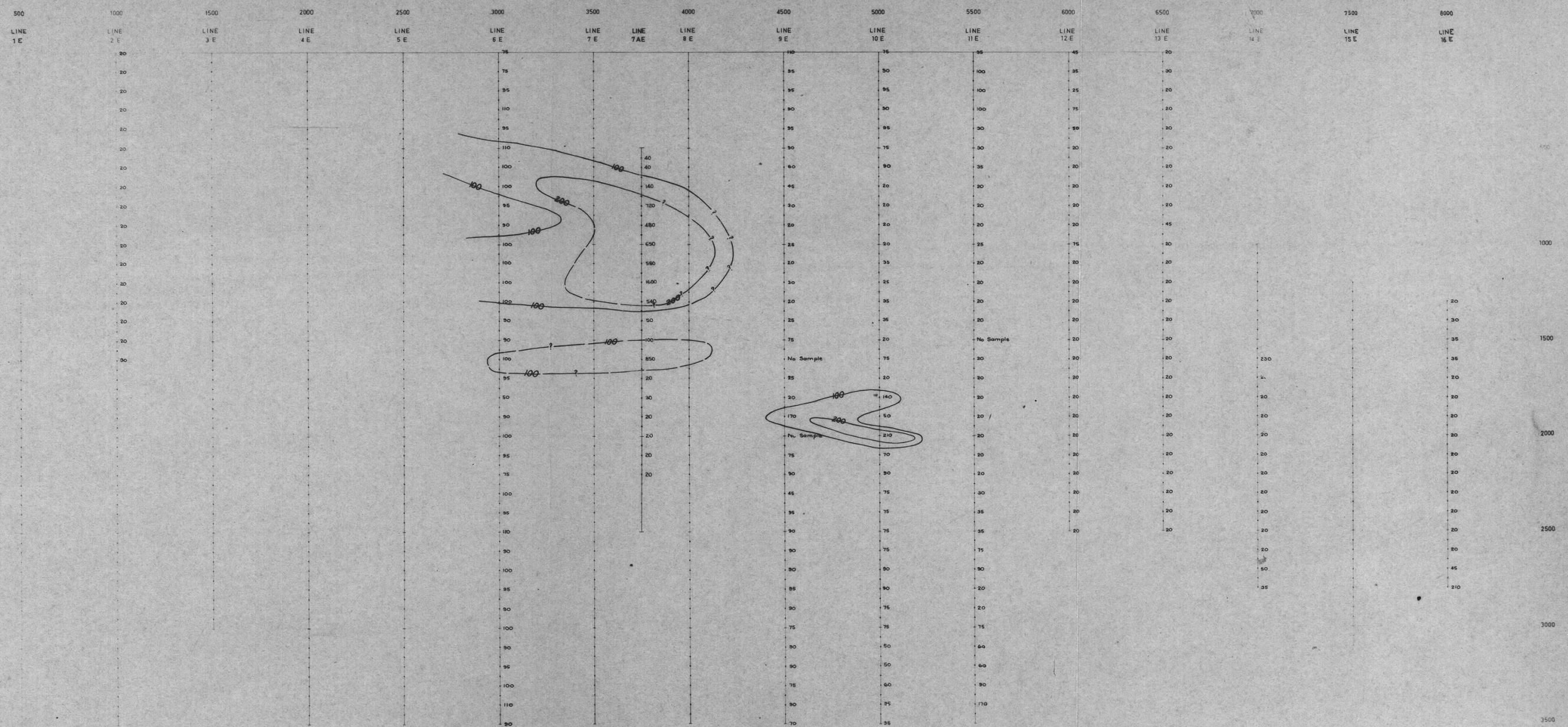


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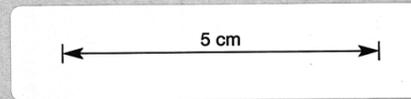


4682

THE MOUNT LYELL M & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY: H.F.F. TRACKED BY: R.S.W. CHECKED BY: K.O.R. DATE: 6/8/69 SCALE: 1" = 500'
MOINA SHEET 2 GEOCHEMICAL SOIL SAMPLE DATA ZINC	FIG. 21.



048054



1683

THE MOUNT LYELL M & R. COY. LTD GEOLOGICAL DEPARTMENT	DRAWN BY M.F.F. TRACED BY R.S.W. CHECKED BY R.S.W. DATE 6/8/69 SCALE 5cm = 1"
MOINA SHEET 2 GEOCHEMICAL SOIL SAMPLE DATA BISMUTH	
FIG. 22.	