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REPORT ON

THE MACKINTOSH AREA, TASMANIA.

1970-71

R. J. VARLEY,
March, 1971.

I N D E X

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ACKNOWLEDGMENTS

The writer wishes to thank Messrs. G. Krummel, A. Ross and L. G. Shields for their support and thoughtful suggestions during the programme. Also Messrs. E. Smith, R. Brennan, J. Taylor, P. Greer, R. Pickup, G. Roberts, G. Dawson, M. Berwick, D. Anthony, R. Healey, C. Ashworth and R. Piatowski for their willing participation, work and company during the season.

INTRODUCTION

The following progress report describes the findings and results of investigations in the Mackintosh Area and around the Back Peak Prospect within the boundaries of E.L.2/70, conducted between November, 1970 and March, 1971.

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S U M M A R Y

A summer programme of geological, geochemical and limited geophysical investigations was conducted in the Mackintosh Area, Central Tasmania, as follow up work to the previous programmes. These were conducted on a regional scale to the north and east of the Cradle Mountain-Lake St. Clair National Park Boundary, and on a detailed scale to the N.E. and S.W. of the old Back Peak Prospect along a belt of volcanic rocks.

Well defined soil geochemical anomalies were detected within the volcanic belt for a combined total strike length of approximately 18,000 ft. Of these, the most prominent Pb, Zn and Ag geochemical patterns could be explained by the underlying geology and structure.

On a semi-regional scale, it was found that the dispersion patterns of Pb and Zn developed in the soils investigated could be useful guides to the stratigraphy and sulphide mineralisation in the area.

Geological investigations suggest a stratigraphic influence coupled with a tectonic influence on the location of Pb-Zn mineralisation. Volcanics containing the mineralisation have been faulted and brecciated, concentrating the mineralisation within fault and brecciated zones.

Geochemical stream sediment results could also be explained by the regional geology.

Geophysical investigations were found to be of no value for determining either geology or structure.

CONCLUSIONS

1. Magnetometer surveys are of no value in defining stratigraphic boundaries of the rocks in the area investigated.
2. Anomalous Pb, ^{Zn?} Sn and Ag concentrations in the soils of the area appear to reflect bedrock type.
3. High Cu, Pb, Zn and Ag values within the broad soil anomalies appear to indicate tectonic structures within the bedrocks of the area.
4. The Pre-Cambrian sequence contains negligible Cu, Pb, Zn and Ag mineralisation.
5. The Cambrian porphyries contain only weak mineralisation (if any) at the Cambrian volcanic-porphyry boundary.
6. The Cambrian volcanic suite appears to be the host for the sulphide mineralisation, especially in brecciated zones in the areas investigated.
7. The fault zones inferred within the areas of investigation would appear to act as locators of sulphide mineralisation.
8. The occurrence of higher Zn, Pb and Cu stream sediment values in the areas of Cambrian outcrop suggest these areas as locations for more detailed investigation.
9. From the geological mapping, the structures envisaged in the 1969-70 progress report are correct.
10. The results obtained to date warrant the continuation and extension of geological and geochemical investigations over the favourable rock sequences in the Mackintosh Area in the future.

1. EXPLORATION ACTIVITIES

During the 1970-71 summer season, the following exploration was carried out.

1.1 Gridding

Two grids were constructed to follow favourable geological trends on either side of the original 1969-70 grid. These were termed the Northern grid and Southern grid.

Using a base peg termed 65N/50E, the northern base line was extended to 193N/50E on a bearing of 41° magnetic. A northern sub-base line was also constructed from 125N/10E to 193N/10E, also on a bearing of 41° magnetic.

Similarly, from the same base peg, the southern base line was extended in a S.W. direction to 1N/50E on a bearing of 221° magnetic. A southern sub-base line was also constructed from 1N/86E to 19S/86E.

Traverses were cut at 400 ft. intervals on bearings of 131°-311° magnetic at right angles to the base lines.

1.2 Magnetometer Survey

A magnetometer survey was completed along lines -

65N/55E to 35E	} at 50 ft. intervals.
67N/55E to 35E	
79N/50E to 40E	

1.3 Soil Sampling

Soil samples, where possible, were taken at locations 200 ft. apart from the limonitic B horizon along all traverses. These samples were analysed for Cu, Pb, Zn and Ag.

1.4 Stream Sediment Sampling

An orientation survey was conducted along the Fleece River for approximately 1½ miles with a sampling interval of 500 ft. This was used as a guide for further regional sampling at predetermined locations. These samples were assayed for Cu, Pb and Zn.

1.5 Geological Mapping

Lithological and structural mapping was implemented on all traverses.

1.6 Statistics

The exploration crew consisted of a geologist supported by a temporary geologist, six student geologists, two field assistants and a cook, under the general administration of a field supervisor and overall guidance and supervision of a senior geologist.

Northern Grid

Base lines - total footage = 19,600 ft.
 Traverses - total footage = 94,600 ft.
 Mapping - total footage = 94,600 ft.

Soil samples:
 Taken = 470
 No samples = 20

Southern Grid

Base lines - total footage = 8,800 ft.
 Traverses - total footage = 46,800 ft.
 Mapping - total footage = 46,800 ft.

Soil samples:
 Taken = 225
 No samples = 19

Overall Totals

Base lines = 28,400 ft.
 Traverses = 141,200 ft.
 Mapping = 141,200 ft.

Soil Samples:
 Taken = 695
 No samples = 39

Sample recovery = 94.68%

Stream Sediment samples = 182

Details of traverses are given in the monthly progress reports.

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2. TOPOGRAPHY AND VEGETATION

The topography of the areas investigated varied greatly from rugged, steep cliffs and gorges to flat undulating plains and shallow valleys.

Similarly, the vegetation types varied markedly from flat boggy button grass plains through light and heavy scrub to dense rain forest regions.

3. DETAILED GEOLOGY

Further to last year's rock types, the following were also found (see Fig. 2):-

3.1 Pre-Cambrian Beds

- (a) Crenulated black quartz mica schists reported in the northern sector by A. Ross which he correlates with the Dove Schist belonging to the older Pre-Cambrian. These were absent in the southern sector.
- (b) Highly crenulated and micaceous, laminated quartzites found in the southern sector and reported from the northern sector by A. Ross. Ross reports their fold style as being similar to that of the black schists. He also suggests the age of this unit to be younger Pre-Cambrian. This was supported in the south by their position between the proposed older Pre-Cambrian quartzites and Cambrian sequence.
- (c) Banded quartzites and siliceous sandstone as reported by A. Ross to outcrop in the northern sector over a restricted area. These were absent in the southern sector.

3.2 Cambrian Beds

- (a) A massive white quartzite found in the southern sector and reported by A. Ross from the north. In the south, it occurs as elongated lenses parallel to the general strike of the surrounding volcanics.
- (b) Intercalated quartzites and slates reported to outcrop in the north by A. Ross. These were absent in the south.

3.3 Structure

In the southern sector, five faults have been inferred. The faults to the east of 13N, F1, F2 and F3 were determined mainly on field evidence by stratigraphic displacement and brecciation. The faults further west, F4 and F5, were determined mainly by interpretation of air photo trends (see Fig. 2). Field checks over a limited area leave some doubt as to their exact location.

3.4 Mineralisation

Observed sulphide mineralisation from both sectors included pyrite, chalcopyrite, arsenopyrite and galena. The mineralisation was confined in general to the chertified volcanics, breccias and fault zones.

4. GEOCHEMISTRY

4.1 Surface Soil Geochemistry

Soil samples collected by hand auger beneath the humic horizon in the area were analysed for p.p.m. Cu, Pb, Zn and Ag by absorption spectroscopy at the Geochemical and Mineralogical Laboratories, Rushcutters Bay, Sydney. The depth from which samples were obtained was determined by the thickness of superjacent humic horizon.

The results of the analyses for each element were contoured.

The significance of the results for each element was determined by visual inspection of contour maps.

(i) Copper

Anomalies were rather patchy for both the north and south sectors and were located around spot highs (see Fig. 3). The anomalies showed no evident relation to rock type and occurred on all rocks belonging to both the Pre-Cambrian and Cambrian sequences. However, in the north, the extensive anomalies did appear to be associated either with the Cambrian volcanic suite (e.g., 125N-129N) or the Pre-Cambrian/Cambrian contact (e.g., 165N-169N). The spot high on 117N as with the spot highs on 1N and 9N were detected over a button grass region and are possibly due to accumulations of copper in the humic horizon.

Copper values in the soils are generally low, ranging from 0 p.p.m. to a maximum of 190 p.p.m. in the north and 94 p.p.m. in the south.

The correspondence between Cu-Pb and Cu-Zn is very poor, but Cu-Ag shows some correspondence on lines 1N, 0N and 117N in humic regions.

(ii) Lead and Zinc

The anomalies detected for Pb and Zn show a high degree of correlation and comprise two types:
(a) small and patchy, generally of a low order;
(b) large and continuous of a higher order (see Figs. 4 and 5).

The southern grid shows the best developed pattern of a type (b), extending in a southerly direction from 41N to 3S with a possible continuation from 11S to 19S. The gap between these two anomalies is probably due to a blanket of well-drained glacial material.

The northern grid also shows a pattern of type (b), but only from 117N southwards. To the north of 117N, the anomalies show a greater scatter; the reason may be stratigraphic control, i.e., the absence of volcanics, and the latter's re-appearance to the north.

In both the north and south areas, the anomalies are located over areas of volcanics with high Pb/Zn values in or near fault zones. In general, both lead and zinc values are low over Pre-Cambrian rocks in the area. The values for Pb range from 6 p.p.m. to 1,700 p.p.m., and Zn from 4 p.p.m. to 920 p.p.m.

(iii) Silver

Low-order silver anomalies are fairly extensive, particularly in the south (see Fig. 6). In both the north and south, they generally correspond with the underlying volcanics and overlap to the west into areas of Cambrian porphyries. Weak anomalies are also found to continue into the Pre-Cambrian along lines 13N, 17N, 89N, 121N, 125N, 185N and 189N. High values show a spotty distribution. Some of these appear to be located in or near fault zones, with the remainder being associated with humic accumulations in button grass areas. There is a broad correspondence in the north and south between Ag-Zn and Ag-Pb, with the south showing a higher degree of fit.

Silver values vary from <0.1 p.p.m. to 17 p.p.m.

4.2 Stream Sediment Sampling

Stream sediment samples collected by hand were analysed for p.p.m. Cu, Pb and Zn by absorption spectroscopy at the Geochemical and Mineralogical Laboratories, Rushcutters Bay, Sydney.

The orientation survey conducted along the Fleece River served to show dispersion trails for Cu, Pb, Zn and Ag. Of these, the dispersion trail for Pb was the most strongly defined, followed by Zn and Cu. The dispersion trail for Ag was comparatively negligible. Thus, geochemical analyses for this element were discontinued in stream sediment work.

The composite results of analyses for each location were plotted on a regional geology map (see Fig. 7). The regional map shows sample locations on rocks of Tertiary, Ordovician, Cambrian and Pre-Cambrian ages. In general, the values for zinc are the highest, followed by lead, then copper.

Element values for the Cambrian rocks are the highest, followed by the Tertiary, then the Pre-Cambrian rocks.

These results reflect on a larger scale the soil sample results and show the Cambrian rocks to be the most favourable suite geochemically.

5. GEOPHYSICS

5.1 Magnetometer Survey

This was completed along lines in the vicinity of the old prospect investigated during the 1969-1970 season. The magnetic variations along these lines were of low order, giving a near flat profile for each line. Diurnal variations were taken into account using a base station pre-set to +1000 gammas. Due to the low variations, the profiles were re-checked and substantiated with another magnetometer.

These results were plotted at 1" : 100' scale. From the results, it appeared highly unlikely that magnetometer surveys would be of any use in detecting lithological boundaries presently known, i.e. -

- (i) Pre-Cambrian/Cambrian Boundary.
- (ii) Cambrian volcanics/Cambrian porphyry Boundary.

6. DISCUSSION

From the geochemical investigations, it is evident that dispersion patterns have been formed locally for Cu, Pb, Zn and Ag, and regionally for Cu, Pb and Zn.

In the soils, the anomalies for Pb, Zn and Ag seem to form the guides of mineralisation influences. These are stratigraphic guides, the undifferentiated Cambrian volcanic suite and structural guides, namely, faulted and brecciated zones within the volcanics. Minor anomalies were also found, but these are thought to be associated with humic accumulations and hence of less importance.

On a regional scale, the stream sediment samples have indicated favourable areas for more detailed work - these are within the Cambrian succession. The Cambrian volcanic suite consists of 5 distinct units - a volcanic quartzite, a chertified volcanic, a chertified volcanic quartzite, an agglomerate and a fine grained volcanic. These units show no ordering and occur possibly as lenses or facies changes within the volcanic suite.

REFERENCES

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"Progress Report on the Back Peak Prospect,
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For Aberfoyle Management Pty. Ltd.,
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Ross, A., 1971

"Geology of the Northern Sector - Back Peak Area"

Report on Mackintosh Exploration Project, Tasmania

For Aberfoyle Management Pty. Ltd.,
Melbourne.

MACKINTOSH EXPLORATION PROJECTREPORT ON GEOLOGY OF NORTHERN SECTOR - BACK PEAK AREADetailed Geology

Pre-Cambrian schists and quartzites outcrop over the entire area mapped. The Pre-Cambrian can be sub-divided into three units:-

1. Black quartz mica schists - crenulated. On a regional basis this unit can be directly correlated with the Dove Schist outcropping in the Middlesex area. Jennings and Burns (1958) suggest that the Middlesex succession is similar to the older Pre-Cambrian succession around Frenchman's Cap.
2. Laminated Quartzites - This unit is highly crenulated and micaceous. The fold style is very similar to that of the Black Schists. The age of this unit could be younger Pre-Cambrian.
3. Banded Quartzites and Siliceous Sandstone outcrop over a restricted area between 153N and 165N. The Banded Quartzite displays a fold style similar to that of the other two units although kinking is more prevalent. There are a few outcrops near 149N of siliceous sandstone (Mines Department) which may in fact be a fault breccia.

Cambrian?

1. The Pre-Cambrian-Cambrian suspected contact may be represented by a siliceous breccia often found outcropping adjacent to the laminated quartzite (Pre-Cambrian) to the south of 129N. Further north the "break" is less distinct. However, line 129N provides a good section for the "Pre-Cambrian to Cambrian".
2. (a) Quartz-chlorite-schist outcrops south of the fault near 149N. For the main part, the schistosity is well developed but locally the schistosity becomes indistinct.
(b) Further west of the quartz chlorite schists a massive white quartzite is often encountered to the south of 149N.
3. To the south of 101N, a lens of intercalated quartzites and slates outcrops the entire length of a southerly trending gorge. The sequence is argillaceous and presents a blocky, gently folded aspect.
4. A belt of undifferentiated volcanics, tuffs ??, shard bearing quartzites, and cherts extends the entire length of the grid. Due to difficulties in correlation at this stage, these rocks have been collectively mapped as volcanics but on the fact map the sequence has been subdivided into agglomerates, shard bearing quartzites, fine grained volcanics, chertified quartzites. Occasionally, phyllites are found associated with the volcanics.

To the north of approximately 165N, the volcanic sequence is highly siliceous, the dominant lithologies being chertified quartzite and pure chert. Occasionally chertified agglomerate is found. These chertified rocks are commonly highly cheared and contorted.

An interesting point to note is the absence of the quartz chlorite schist unit in this area.

5. In the extreme west of the mapped area, quartz-mica and quartz-mica-feldspar porphyries can be found.

Faulting

In the process of mapping, a number of NW and N trending faults have been proposed on the basis of displacement, presence of breccia and air photo interpretation.

Mineralisation

As demonstrated in the 1969-70 programme, sulphides are detectable in the volcanic suite, along joint or bedding planes in a chertified volcanic and in fault breccias. Again, the phyllite associated with the volcanics has yielded traces of mineralisation. In addition, a grey quartzite in the suite has often contained disseminated sulphides.

Sulphides included pyrite, chalcopyrite, galena, arsenopyrite ?.

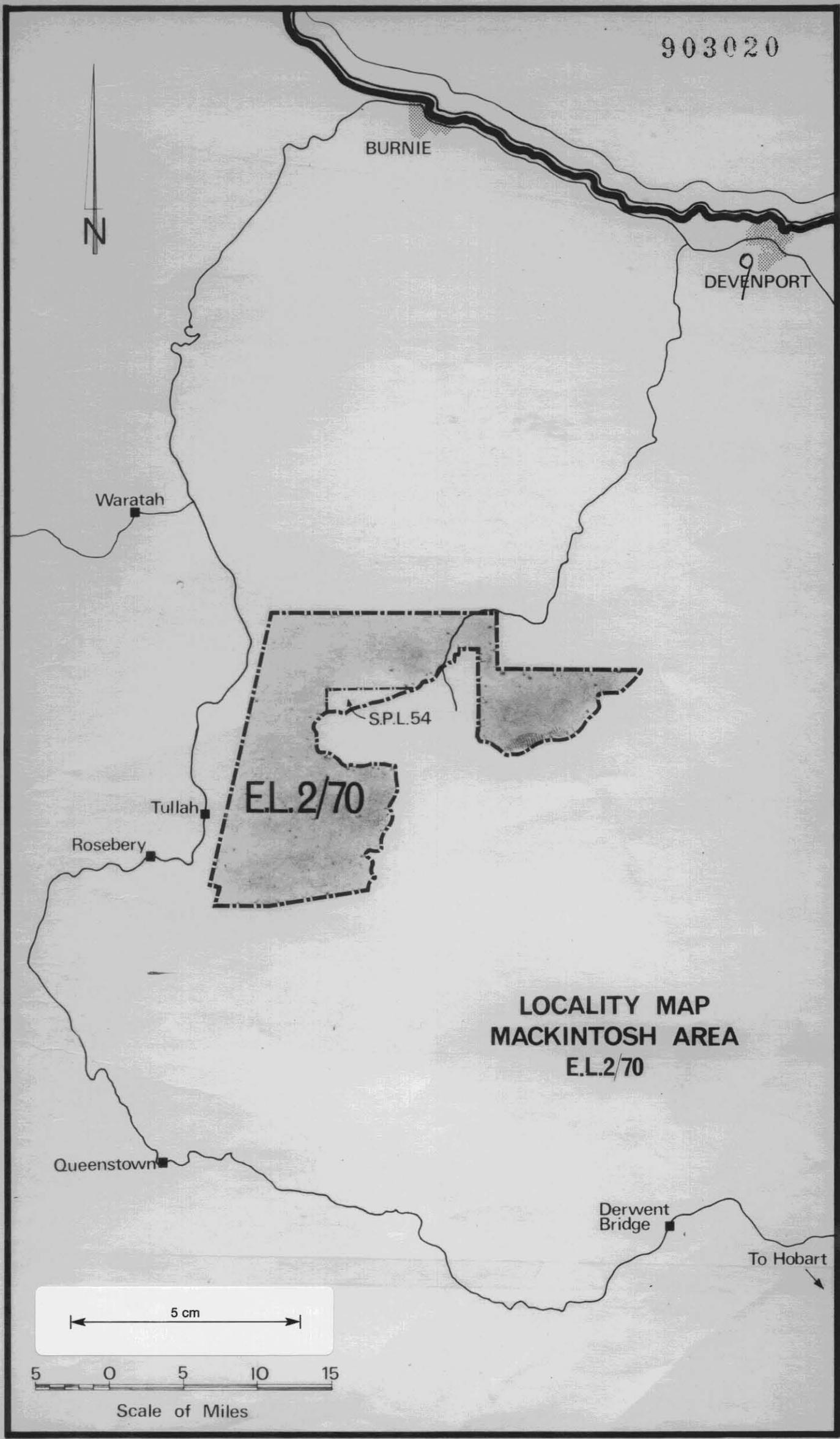
A. F. ROSS,

Assistant Geologist.

12/2/1971.

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**LOCALITY MAP
MACKINTOSH AREA
E.L.2/70**

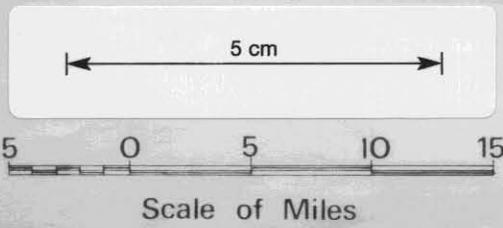
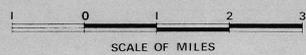


FIG 1A



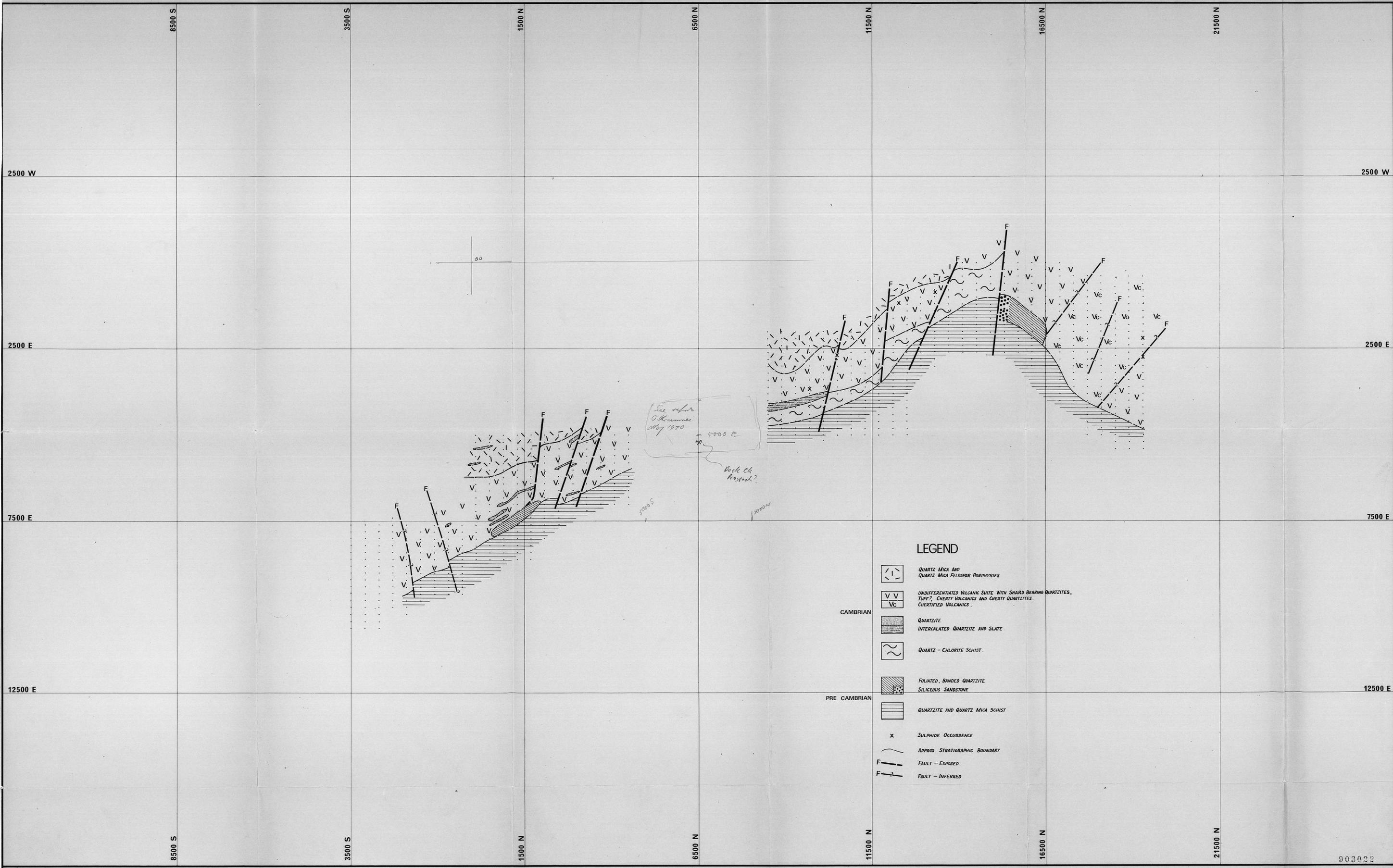
P.M.E.C.L.
MACKINTOSH AREA - E.L.2/70
ACCESS & DRAINAGE

- MAJOR ROAD
- MINOR ROAD
- TRACK and WALKING TRACK

- SURVEY - - - / /
- GEOLOGY - - - / /
- DRAWN - B.R.J. - - / 3 / 71
- TRACED - - - / /

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DRAWING No. - FIG 1B



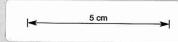
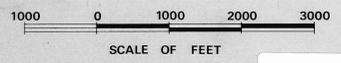
LEGEND

- QUARTZ MICA AND QUARTZ MICA FELDSPAR PORPHYRIES
- UNDIFFERENTIATED VOLCANIC SUITE WITH SHARD BEARING QUARTZITES, TUFF?, CHERTY VOLCANICS AND CHERTY QUARTZITES, CHERTIFIED VOLCANICS.
- QUARTZITE
- INTERCALATED QUARTZITE AND SLATE
- QUARTZ - CHLORITE SCHIST.
- FOLIATED, BANDED QUARTZITE
- SILICEOUS SANDSTONE
- QUARTZITE AND QUARTZ MICA SCHIST
- SULPHIDE OCCURRENCE
- APPROX STRATIGRAPHIC BOUNDARY
- FAULT - EXPOSED
- FAULT - INFERRED

CAMBRIAN

PRE CAMBRIAN

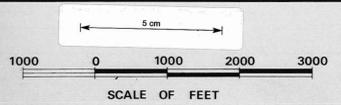
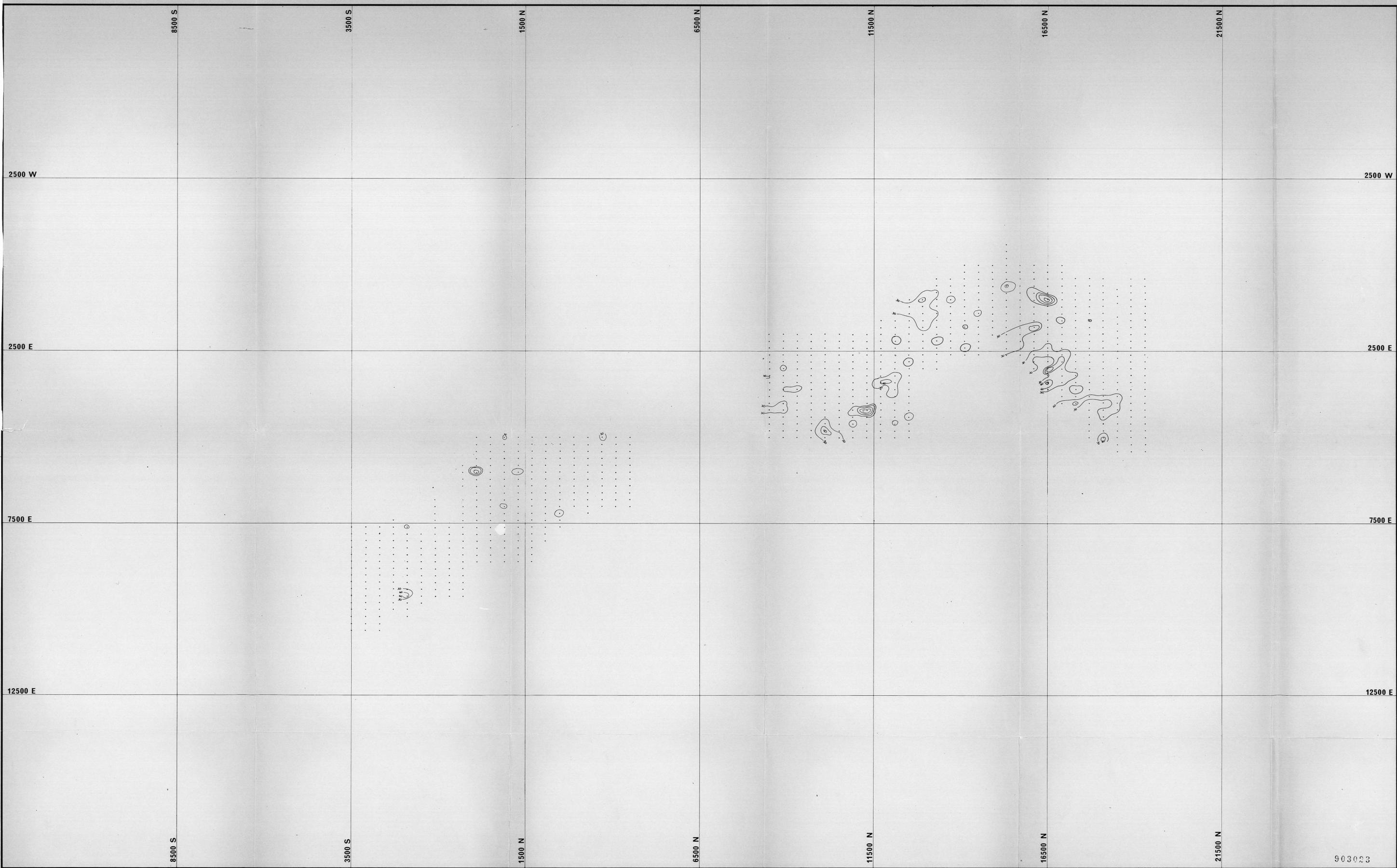
P.M.E.C.L.
MACKINTOSH AREA - E.L.2/70
GEOLOGY - INTERPRETATION



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GEOLOGY	A.F. ROSS	-	/	2 / 71
	R.J. VARLEY	-	/	3 / 71
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P.M.E.C.L.
 MACKINTOSH AREA - E.L.2/70
 SOIL GEOCHEMISTRY
 p.p.m. COPPER

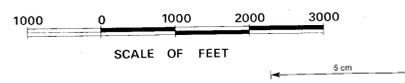
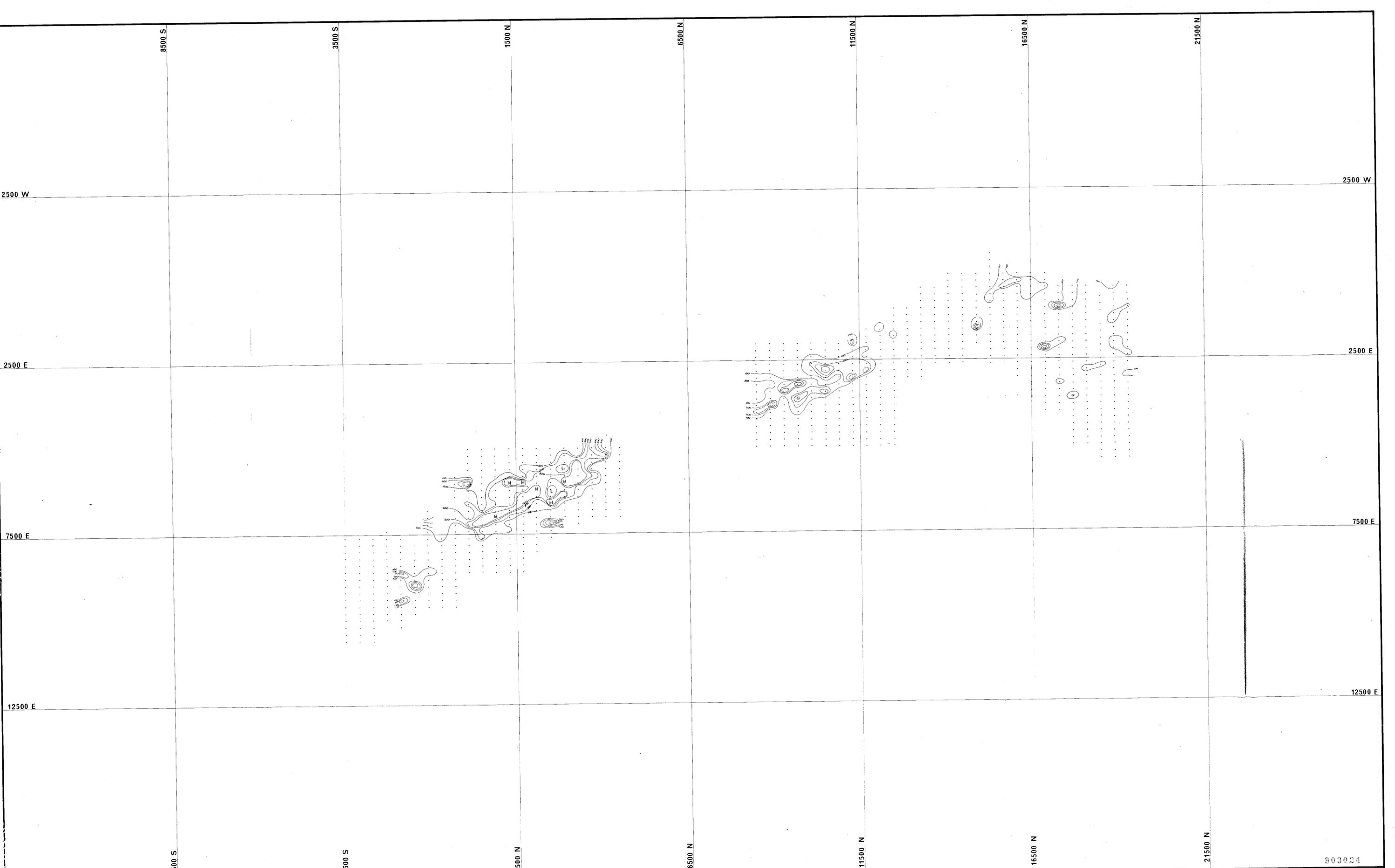
CONTOUR INTERVAL

0	<	30	p.p.m.
30	<	60	"
60	<	90	"
90	<	120	"
120	+		"

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SURVEY	-	-	//
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TRACED	-	-	//

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 MACKINTOSH AREA - E.L.2/70
 SOIL GEOCHEMISTRY
 p.p.m. LEAD

CONTOUR INTERVAL

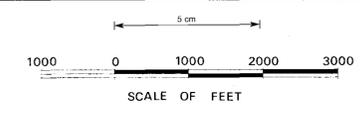
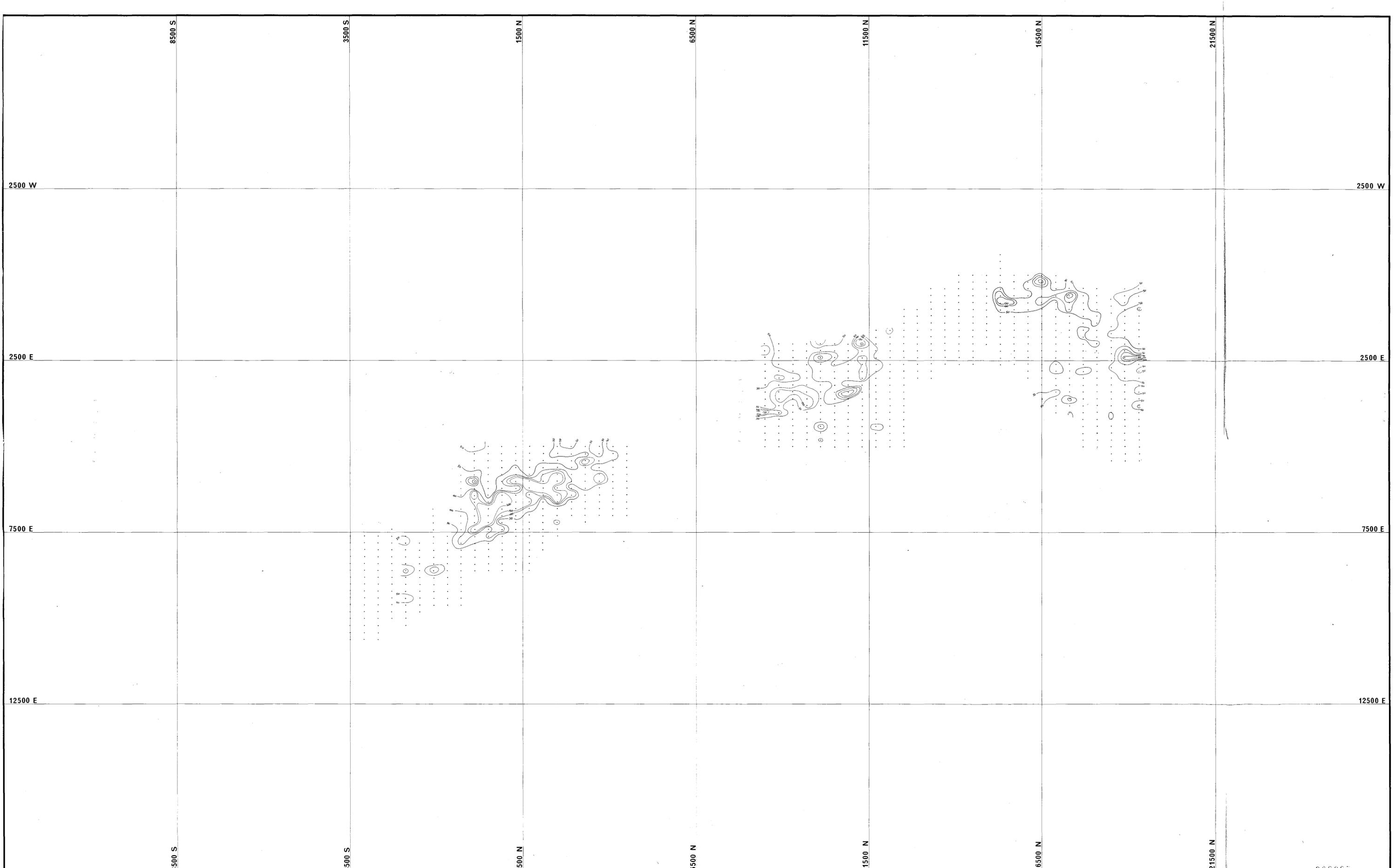
0 - < 100	p.p.m.
100 - < 200	"
200 - < 300	"
300 - < 400	"
400 +	"
H	High > 1000
L	Low < 100

SURVEY	-	-	//
GEOLOGY	-	R.J. VARLEY	- /12 /70
DRAWN	-	B.R.J.	- /3 /71
TRACED	-	-	//
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P.M.E.C.L.
 MACKINTOSH AREA - E.L.2/70
 SOIL GEOCHEMISTRY
 p.p.m. ZINC

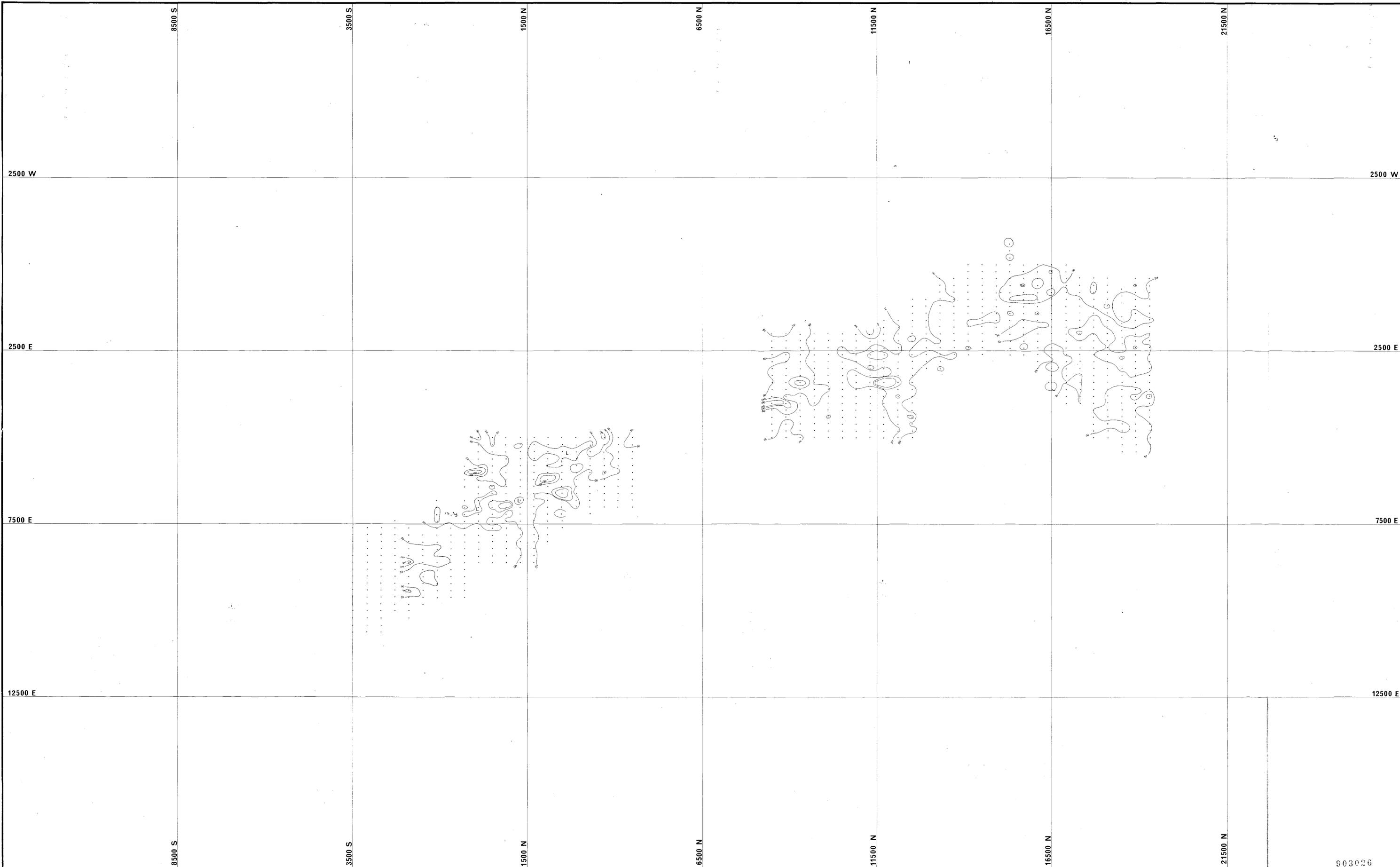
CONTOUR INTERVAL

0	<	50	pp.m.
50	<	100	"
100	<	150	"
150	<	200	"
200	+		"

SURVEY	-	-	//
GEOLOGY	-	R.J. VARLEY	//12/70
DRAWN	-	BRJ	//3/71
TRACED	-	-	//

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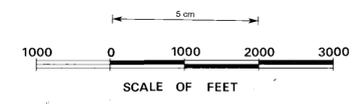
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P.M.E.C.L.
 MACKINTOSH AREA - E.L.2/70
 SOIL GEOCHEMISTRY
 p.p.m. SILVER x 100

CONTOUR INTERVAL
 0 - < 50 p.p.m.
 50 - < 100 "
 100 - < 150 "
 150 + "
 L Low < 50 "

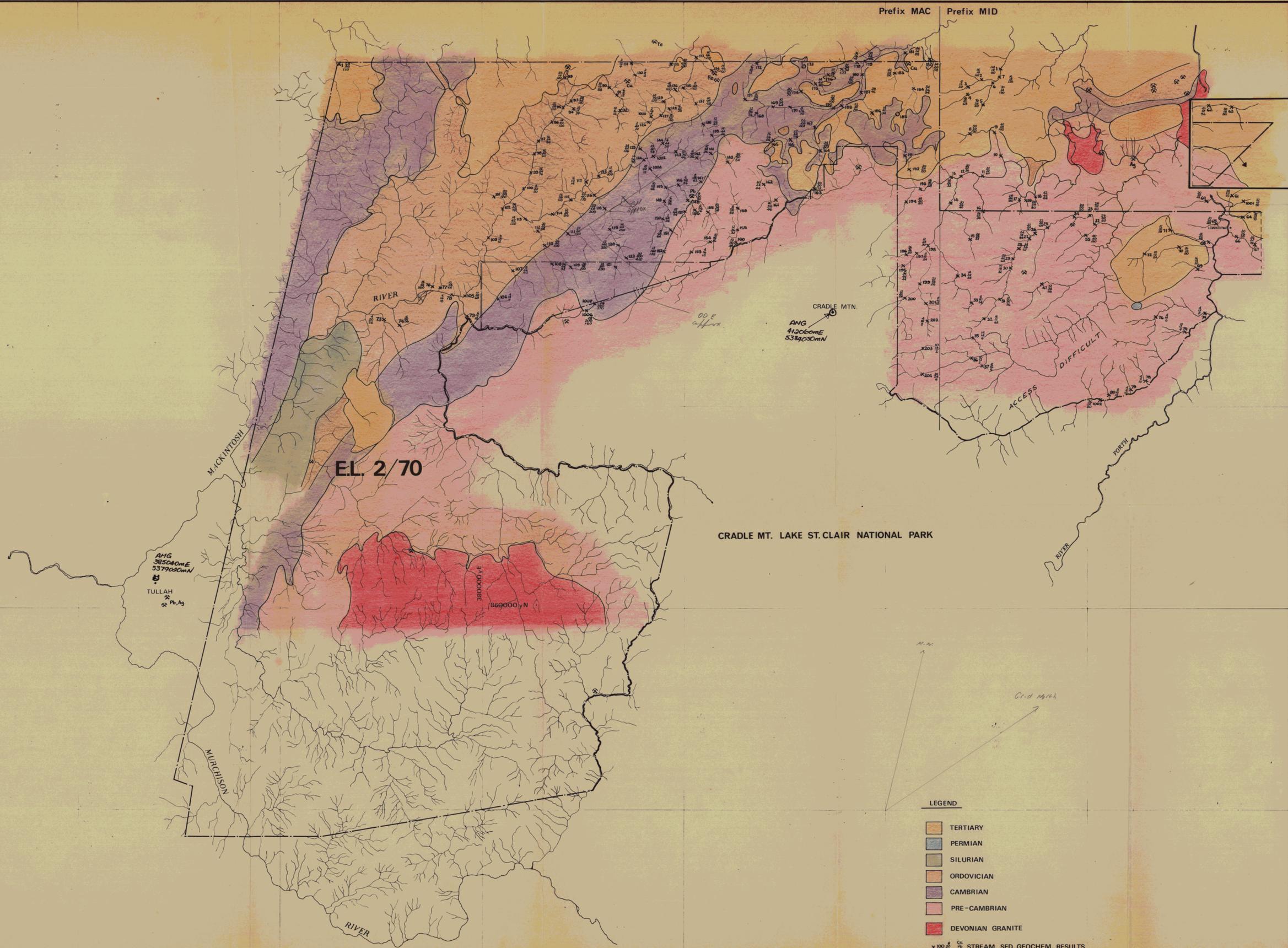
SURVEY - - / /
 GEOLOGY - R.J. VARLEY - /12 /70
 DRAWN - B.R.J. - /3 /71
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 DRAWING No. - FIG 6



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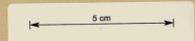
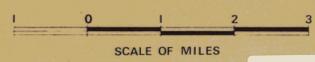


Prefix MAC Prefix MID

EL. 2/70

CRADLE MT. LAKE ST. CLAIR NATIONAL PARK

- LEGEND**
- TERTIARY
 - PERMIAN
 - SILURIAN
 - ORDOVICIAN
 - CAMBRIAN
 - PRE-CAMBRIAN
 - DEVONIAN GRANITE
 - x 100 y 500 STREAM SED. GEOCHEM. RESULTS
 - x SAMPLE TAKEN
 - o SAMPLE NOT TAKEN
 - ⚡ MINE OR PROSPECT



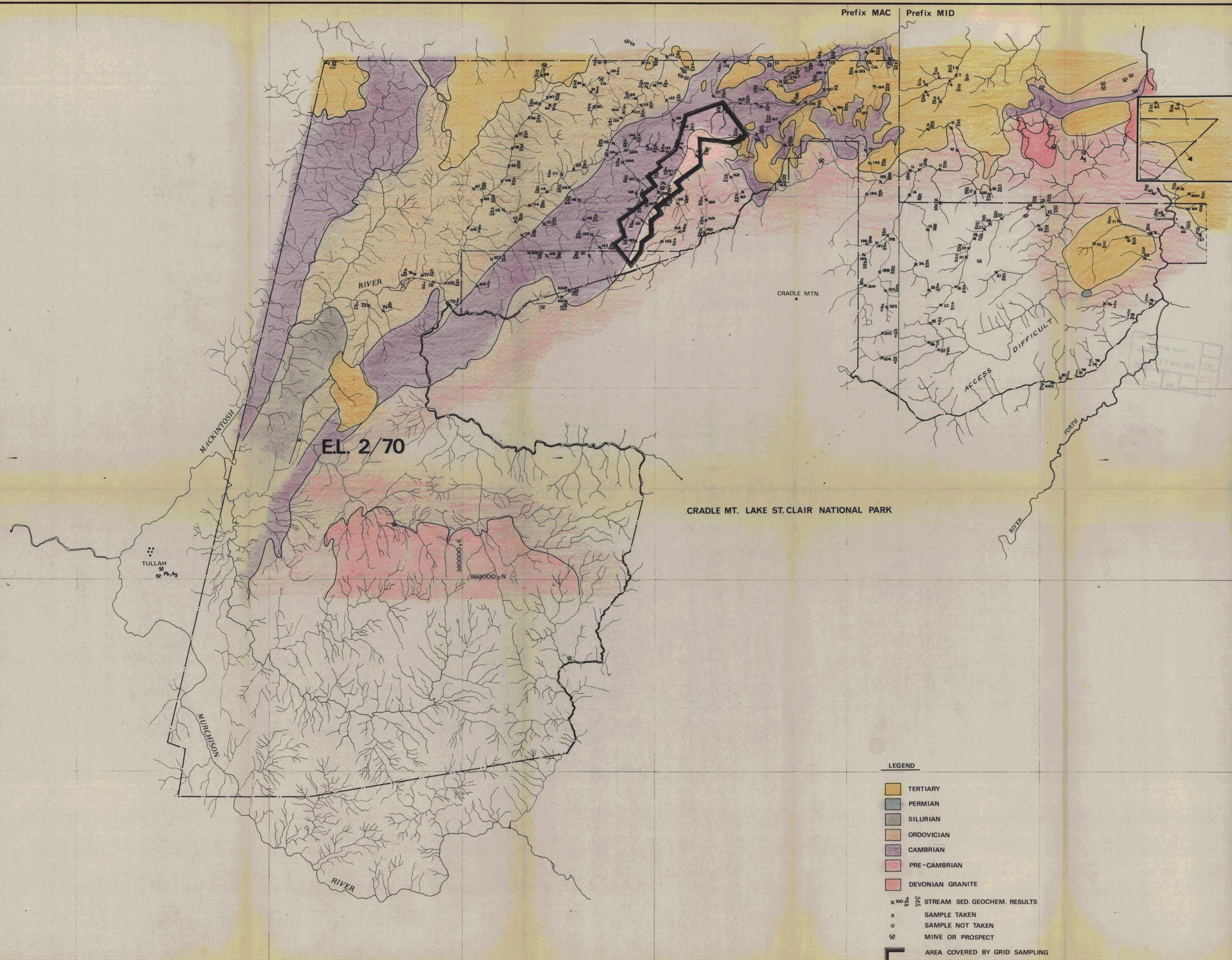
AMG REFERENCE POINTS ADDED

P.M.E.C.L.
 MACKINTOSH AREA - E.L.2/70
 COMPOSITE MAP
 STREAM SEDIMENT GEOCHEMISTRY & REGIONAL GEOLOGY

SURVEY - - - / / /
 GEOLOGY - - - / / /
 DRAWN - B.R.J. - - / 3 / 71
 TRACED - - - / / /
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P.M.E.C.L.
 MACKINTOSH AREA - E.L.2/70
 COMPOSITE MAP
 STREAM SEDIMENT GEOCHEMISTRY & REGIONAL GEOLOGY

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 GEOLOGY - - -
 DRAWN - B.R.J. - / 3/71
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