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THE MOUNT LYELL MINING AND RAILWAY CO. LTD./RENISON LTD.

75-1114
ANNUAL REPORT

TRIAL HARBOUR S.P.L. 129

1974-75

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AMG REFERENCE POINTS ADDED

August, 1975

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TRIAL HARBOUR, S.P.L. 129

1. INTRODUCTION

Following the recommendations made in the S.P.L. 129 Progress Report, August, 1974 by Newnham and Lees, further investigations involving geophysics, geochemical sampling and geological mapping were undertaken in Area D, East of Kelvin and Maynes workings; in addition, some sampling was undertaken in the Tenth Legion area. Several lines were also flown to evaluate the Input airborne E.M. system and as a result a further 11 square kilometres of ground was pegged immediately to the East of the present area.

Rationalisation of the Consolidated Syndicate agreement early in March, 1975 resulted in the withdrawal of C.G.F.A. from the project which is now 50% Mt. Lyell - 50% Renison Ltd. Staffing during 1974-75 was provided by the Mt. Lyell Mining and Railway Co. Ltd. The diamond drilling was carried out under contract by A.D.D. Pty. Ltd., all the geophysics was carried out under contract by Scintrex Pty. Ltd., while the road building and site clearance were undertaken by a local contractor.

Expenditure during 1974-75 amounted to \$25 977 and total expenditure since 1973 has reached \$27 477. A budget of \$24 000 has been recommended for 1975-76.

The exploration programme planned for 1975-76 consists of:

1. Evaluation of anomalous Areas A, B and C and completion of Area D, South of the Heemskirk Granite, by detailed geological mapping, ground magnetics and deep soil geochemistry.
2. Exploration of the Eastern margin of the Heemskirk Granite for altered and metasomatised zones possibly related to tin mineralisation and the detailed exploration of any such zones.

2. AREA D

2.1 Introduction

Area D was defined by Newnham (August, 1974) as the area on the old E.Z. grid between 20E and 26E and from 00 to 30N (Fig. 2). Previous work by the E.Z. Co. Ltd. had outlined a number of sizeable geochemical anomalies, including tin, coincident with a strong magnetic response and some anomalous I.P. results existed on line 24E; the only line surveyed with I.P.

Lines 24E and 25E, 500' apart were cleared out and repegged from 30N to 10N in December, 1974. Subsequently lines 23E and 26E were also

repegged from 30N to 10S and 10N respectively, while lines 24E and 25E were each extended to 7S and 4S respectively.

2.2 Geology

Mapping undertaken during the year in Area D, indicates that there is no Oonah Formation to the East of Kelvin and Maynes workings (Fig. 3). The abrupt change in the magnetic, geochemical and I.P. responses between 24E and 23E suggests the possibility of a fault to the East of line 23E. In Area D the Heemskirk Granite is intruded directly into Crimson Creek rocks which consist largely of argillaceous sediments with minor tuffs and some small basic/ultrabasic intrusives, possibly related to the McIvor Hill gabbro or the Trial Harbour serpentinite. The Crimson Creek rocks are extensively altered and metasomatised (see Section 2.5 and Fig. 8) with the development of hornfels near the granite contact. Disseminated sulphides, mainly pyrrhotite and arsenopyrite(?), are developed over a wide area.

2.3 Geochemistry

2.3.1 Soil Geochemistry

In Area D, the soil profile over the Crimson Creek Formation contrasts markedly with the profile over the granite. Over the majority of the Crimson Creek rocks a deep residual soil with a well developed profile occurs and samples were taken from the 'C' horizon. The soil over the granite consists essentially of "peat" resting directly on a fine gravel/coarse sand consisting of weathered out quartz grains. Here, samples were taken from as deep as possible.

Sampling at 100' intervals was undertaken on all four lines. Initially, sampling was undertaken to confirm the previous E.Z. anomaly and coverage was limited to lines 24E and 25E. Samples from these two lines were sieved into two fractions -10+85# (A) and -85# (B) and analyzed by X.R.F. for : Arsenic, tin, copper, lead and zinc. The previous E.Z. anomaly was confirmed and evaluation of the data illustrated that a better contrast existed in the -85# (B) fraction. Analysis of all subsequent samples was completed on the -85# (B) fraction only.

The geochemical line profiles for : Arsenic and tin only are illustrated in Fig. 4. The background (median) values for arsenic and tin are 40 p.p.m. and 10 p.p.m. respectively. Examination of the line profiles reveals a very strong tin anomaly, through the centre of the area on line 24E and, coincident with a very strong arsenic anomaly, on line 25E

and although much weaker it still appears to persist on line 26E. Although the data on line 23E is incomplete, there appears to be a change in character from the other three and a fault is suspected East of line 23E (see Section 2.2). The soil sampling coverage will need to be extended South on line 23E.

Anomalies occurring at the Northern ends of lines 24E, 25E and 26E appear to be on or near the edge of the granite and are possibly due to "wash" off the topographically higher granite. However, if this anomaly has a limited strike length further work will possibly be justified.

Although no obvious anomalous zones occur in the : Copper, lead and zinc results, contouring of the data (Fig. 4) reveals a generally higher zone in the vicinity of the main tin anomaly.

2.3.2 Rock Geochemistry

Two grab samples were obtained from a gossanous zone near line 24E, 00 and assayed for :

	Sn	Cu	Pb	Zn (p.p.m.)
T.H. Gossan	8	4 200	300	300
T.H. Gossan 2	1 895	60	120	40

This gossanous zone occurs on or adjacent to a fault (Fig. 3) and is reflected by anomalous soil geochemistry at 24E, 100S (Fig. 4). It also coincides with both magnetic (Fig. 6) and I.P. (Fig. 7, Section 2.4.2) anomalies.

An adit, giving access to a small level developed from the foot of a shaft, was discovered West of line 23E. This, believed to be the Orient Mine, was mapped and grabbed sampled at 10' intervals. The workings are developed in a white/grey medium grained granite with numerous veins up to 2.0 m wide, of coarse grained, almost pegmatitic granite consisting of : quartz, muscovite, tourmaline and minor sulphides. Some of the veins carry anomalous tin values and the grab sample results and the mapping are presented in Fig. 5.

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2.4 Geophysics

2.4.1 Magnetics

A ground magnetic survey was conducted over all four lines with a Geometrics G816 Proton magnetometer. Readings were taken at 50' intervals and the data is shown in Fig. 6.

A magnetically active area is apparent through the centre of the area on lines 24E and 25E and although more subdued, is still apparent on line 26E. There is an abrupt change in character, very apparent from the contours, between lines 24E and 23E : On the latter traverse the more magnetically active area appears to be further West.

The large magnetic anomalies, particularly on lines 24E and 25E, appear to coincide with I.P. and some of the geochemical anomalies (Figs. 4, 6 and 7).

2.4.2 I.P.

A gradient array reconnaissance I.P. survey, using a 100' potential dipole was undertaken over the four lines by Scintrex Pty. Ltd. The survey is described in Scintrex report Tas.-025D by A. W. Howland-Rose, January, 1975, to which the reader is referred. The line profiles are presented in Fig. 7.

The observed chargeability backgrounds are very high, varying from 20 to 30 milliseconds, which together with the high apparent resistivity, indicate that disseminated sulphides possibly occur over the whole area (this is confirmed by geological mapping). Within this high background zones of significantly higher chargeability up to 50 milliseconds with marked reductions in apparent resistivity are possibly associated with more massive mineralisation. The large anomalies on line 25E, 1450N and line 24E 1150N are associated with magnetic and geochemical anomalies (compare Figs. 4, 6 and 7).

A gossanous zone discovered near line 24E 00 (see Section 2.3.2) was covered with a limited Pole-Dipole survey along a line run at right angles to the grid line at 24E 00 (Fig. 7). Two anomalies were located at 180W and 080E of about 20 milliseconds above background associated with 80%-95% reductions in apparent resistivity. This zone which has both geochemical and magnetic expression as well as I.P. is located on a fault and further investigations are recommended.

2.5 Diamond Drilling

After construction of an access road and drill site at the beginning of April, diamond drill hole T.H. 1 was collared on 17th April, 1975 at 1100N, line 25E, with a dip of -45° and a bearing of 00° (Fig. 8). The hole was initially planned to test the strong coincident I.P., magnetic and geochemical anomalies between 1250N and 1550N and was scheduled to reach 200 m. However, the hole was extended to cover the major geophysical anomalies at 1750N - 1900N and 2120N and was finally completed at 413 m on 19th May, 1975. The drill log is included as Appendix I.

Diamond drill hole T.H. 1 intersected two main rock types, Cambrian Crimson Creek Sediments from 0 to 318.5 m and Devonian, Heemskirk Granite from 318.5 m to 413 m, the end of the hole. The granite, a biotite adamellite, consists of fairly equigranular crystals of pink to buff/green feldspar and white/cream quartz with smaller crystals of biotite and tourmaline. The rock is generally unaltered but one small greisen vein carrying fluorite and occasional veins of quartz/tourmaline occur. The granite exhibits a chilled margin and the Crimson Creek sediments are strongly altered.

The Crimson Creek rocks are essentially a greywacke sequence including shales and sandstones, possibly tuffaceous in part. The sequence has been strongly affected by the intrusion of the Heemskirk Granite, being bleached, silicified and strongly metasomatised with the development of tremolite-actinolite and axinite. Sulphides, predominantly pyrrhotite with occasional minor amounts of chalcopyrite and sphalerite are developed throughout the sequence and a carbonate rich horizon between 90 m and 125 m has been largely replaced by semi-massive to massive magnetite with pyrrhotite (approximately 10%). Tin values throughout the hole are generally $< 0.1\%$ Sn. However, values in the magnetite/pyrrhotite zones, although still averaging $< 0.1\%$ Sn are higher, the better assay runs including 2.10 m of 0.25% Sn from 30.2 m to 32.3 m and 4 m of 0.20% Sn from 106 m to 110 m.

The main anomalous zone on line 25E from 1250N to 1550N is adequately explained by the magnetite/pyrrhotite zone from 98.4 m to 125.0 m. However, the anomalous zones at 1750N - 1900N and 2120N have not been explained by the drilling. The I.P. profiles indicate that the source of the anomalies is shallow and possibly they represent further replacement magnetite/pyrrhotite zones within the sediments not intersected by the drill hole.

2.6 Conclusions

The soil geochemistry, magnetics and I.P. very effectively outlined the massive magnetite/pyrrhotite zone intersected by the diamond drill hole. Several other anomalous zones still remain untested and require further investigations, e.g. line 24E 00. Although tin values obtained in the drill hole were disappointing, the geological environment (extensive metasomatic alteration of a sequence including a carbonate rich horizon) is considered to be favourable, for the development of replacement cassiterite mineralisation. The tin content of a magnetite/pyrrhotite body such as intersected in the drill hole can be erratic, particularly around the margins, e.g. Queen Hill. The change in trace element content from the surface to the drill hole has some similarities to geochemical haloes around base metal deposits in skarns, described by Ovchinnikov and Grigoryan (1971) and the zone probably justifies a second diamond drill hole, either deeper, nearer the granite contact or laterally; particularly if further strike length can be proved.

The possibility of replacement tin deposits in the margins of carbonate rich basic/ultrabasic bodies known to exist, within the Crimson Creek sediments, in the area has still not been investigated and the whole zone along the Southern margin of the granite is considered to warrant further investigation.

3. TENTH LEGION AREA

Several samples were taken from the massive magnetite zone at Tenth Legion and analysed for tin. Samples of a gossan outcropping on the road to Kynance, also adjacent to the Tenth Legion Fault and of gossanous material and underlying gabbro to the West of McIvor Hill and immediately South of the Trial Harbour road were also collected.

1.	"Gossan" S. of Trial Harbour, W. of McIvor Hill	20 p.p.m. Sn
2.	" " " " " " " " " "	25 p.p.m. Sn
3.	Gabbro underlying gossan	10 p.p.m. Sn
4.	Massive magnetite, Tenth Legion	1 600 p.p.m. Sn
5.	Magnetite and phlogopile, Tenth Legion	230 p.p.m. Sn
6.	Coarse grained magnetite	650 p.p.m. Sn
7.	Gossan - road to Kynance	40 p.p.m. Sn

The magnetite at Tenth Legion is probably derived from the Cambrian amphibolite with which it is associated. However, it lies within the metamorphic aureole of the Heemskirk Granite and alteration, with the development of a white calc-silicate hornfels is extensive. The occurrence of anomalous tin values within this metamorphosed zone was considered

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encouraging and further samples were obtained from diamond drill core, from two vertical holes drilled at Tenth Legion, by the Tasmanian Mines Department in 1958 (Hughes, 1959). Tin and arsenic values from the drill core are presented below; values for other elements including : Copper, lead, zinc, molybdenum and barytes are presented in Appendix II.

T.L. 1		Sn.	As	p.p.m.	T.L. 2		Sn	As	p.p.m.
	8'	160	30			10'	20	20	
	20'	60	20			20'	20	280	
	30'	40	15			30'	40	10	
	40'	40	45			40'	40	10	
	50'	20	30			50'	60	20	
	60'	40	45			60'	40	20	
	70'	70	20			70'	80	30	
	80'	50	65			80'	60	10	
	90'	740	65			90'	60	250	
	100'	500	30			100'	20	280	
	110'	20	15			110'	20	200	
	120'	20	130			120'	40	70	
	130'	330	65			130'	20	80	
	140'	50	20			140'	60	540	
	150'	20	20			150'	20	170	
	160'	50	10			160'	80	20	
	170'	20	50			170'	60	70	
	180'	20	10			180'	20	170	
	190'	20	15			190'	60	90	
	200'	240	125			200'	100	1 060	
	210'	700	165			210'	20	120	
	220'	800	65			220'	250	40	
	230'	1 100	55			230'	20	70	
	240'	780	55			240'	20	120	
	250'	340	70			250'	3 030	70	
	260'	210	65			260'	20	120	
	270'	50	45			270'	20	130	
	280'	50	15			280'	20	140	
	290'	80	20			290'	50	70	
						300'	90	20	

The tin values are obviously erratic but geochemically anomalous tin does exist and further work in the area is probably justified.

4. INPUT SURVEY

Several test lines were flown, at the beginning of April, to evaluate the Barringer Input, airborne E.M. system. The survey is detailed in Geoterrex Pty. Ltd. report 83-259, by G. R. Butt, May, 1975, to which the reader is referred.

On S.P.L. 129 two, North to South, lines approximately 2.5 km in length and 0.6 km apart were proposed over Area D. Navigational error resulted in the lines being flown too far to the East (Fig. 9). Traverse lines 1 South and 1A South were recovered on the aerial photograph by Geoterrex Pty. Ltd., but traverse lines 2N and 2AS were even further East and were not recovered. Subsequently line 2N was recovered at Mt. Lyell, but line 2AS has still not been located. However, no anomalies were indicated on this traverse.

Considerable conductivity is recorded on the Northern ends of lines 1S, 1AS and 2N (Fig. 9). Geoterrex Pty. Ltd. suggested that the association of these conductive anomalies with strong magnetic activity indicated that the source of the anomalies might be associated with ultrabasic material. However, no ultrabasic rocks are known in the immediate vicinity of the anomalies and the anomaly on line 2N is over known massive silver, lead, zinc mineralisation, i.e. Comstock workings. All three anomalies are along strike from one another and possibly represent one extensive formation. Further ground work is recommended.

When line 2N was first recovered an error in the location of the Northern end of the line resulted in the anomaly being plotted further South near the Stonehenge workings and an area of 11 square kilometres was pegged and added to S.P.L. 129, to cover this zone. Further examination of the tracking film has resulted in the relocation of the anomaly over the Comstock workings and only the anomaly on line 1AS is within the new area.

5. RECOMMENDATIONS AND BUDGET 1975-76

The exploration programme for 1975-76 will consist of the detailed evaluation of anomalous zones South of the Heemskirk Granite and examination of the Eastern margin of the granite, particularly the Western Contact of the McIvor Hill Gabbro. The programme can be described under the following headings:

1. South of the Heemskirk Granite.
2. Eastern margin of the Heemskirk Granite.
3. Other areas.

5.1 South of the Heemskirk Granite

The recognition of a strongly metasomatised zone South of the Heemskirk Granite has added to the potential of the area for the development of a viable tin deposit. Examination of the original E.Z. data by Newnham and Lees, August, 1974, outlined four major areas of interest : Areas A, B, C and D. Work planned for 1975-76 involves detailed investigations of Areas A, B and C and completion of investigations into Area D (Fig. 10).

To cover Area A, which is over the metamorphosed Trial Harbour Serpentinite - Crimson Creek Formation contact, lines 4W to 00 inclusive, of the old E.Z. grid, totalling 8400' will have to be repegged. Contiguous with Area A, Area B covers an area of disseminated sulphides adjacent to the Crimson Creek/Oonah Formation boundary. Five lines, from 1E to 5E inclusive, totalling 12,000' will need to be repegged to cover the area. Area C, well to the South of the other areas within the Crimson Creek Formation, will require lines 13E to 19E inclusive, totalling 14,600' repegged.

To complete the coverage of Area D lines 20E to 22E and 27E to 29E will also need to be repegged, a total of 21,300'. At the present time, the four areas, together with the base line will involve a total of 68,800' of repegging. However, all four areas form a semi-continuous zone (Newnham, March, 1974, Map 5) and further lines and/or intermediate lines may need to be established to complete the coverage of the anomalous areas.

All four areas will be covered with ground magnetics and deep soil geochemistry. Any anomalies should be surveyed with I.P. or E.M., particularly geochemical anomalies, unsupported by magnetics; which may be due to "wash" off the topographically higher granite.

5.2 Eastern Margin of the Heemskirk Granite

Delineation of a zone of metasomatic replacement within the metamorphic aureole to the South of the granite suggests the possibility of a similar zone around the Eastern margin. No known work has been undertaken in the area and the programme for 1975-76 is designed to look for altered and metasomatised zones particularly in the Western margins of the McIvor Hill Gabbro.

An East to West grid consisting initially of 13 lines, 1000' apart, totalling 52,000' (Fig. 10) will be surveyed with detailed geological mapping, ground magnetics and deep soil geochemistry. Any anomalous zones discovered will require more detailed work, on a closer spaced grid with intermediate lines, to give a grid line spacing of 500'.

5.3 Other Areas

After completion of the above programme, several other areas still remain outstanding, in particular the Tenth Legion Fault area from the Tenth Legion Mine to the Swansea Mine and including the Input, airborne E.M. anomalies. To effectively cover this area and accurately locate the Input anomalies a North to South grid, consisting of up to 22 lines, 500' apart, totalling approximately 105,000', will be required.

Regarding the present budgetary and manpower problems, it is probably not feasible to investigate this area during 1975-76, although should the programmes South and East of the granite be completed earlier than expected, work can start in this area. However, it is expected that work in the area will, together with evaluation of anomalies, outlined South and East of the granite, by diamond drilling and/or costeaning, form the major part of the exploration programme in 1976-77.

5.4 Staffing

The majority of the work scheduled for 1975-76 can be undertaken by one geologist and one field assistant, supplemented by an additional field assistant to help with the trackcutting.

5.5 Budget

A budget of \$24 000 for S.P.L. 129 has been proposed for 1975-76.

The budget has been compiled as follows:

1. Salaries

A total of \$15 000 has been budgetted, for salaries, to cover the following activities.

	\$
1) Re-establishment of E.Z. grid - 72,500'	1 000
2) Cutting grid lines along Eastern margin of granite - 52,000'	1 500
3) Soil sampling programme	3 000
4) Ground magnetics programme	1 000
5) Geological mapping, planning, report writing, etc.	3 500
	<hr/> 10 000
Plus a 50% loading to cover overhead expenses	5 000
	<hr/> \$15 000 <hr/>

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2. Materials

A total of \$2 000 has been budgetted to cover the cost of all stores and non-returnable items, including fuel, sample bags, field equipment, etc.

3. Geophysics

An estimate of \$5 000 has been allocated to cover the cost of detailing with I.P. any anomalous zones outlined by geological mapping, geochemistry and magnetics.

4. General Costs

To cover the cost of vehicle operating, surveying, assaying costs, the hire of equipment and for miscellaneous minor items a total of \$2 000 is budgetted.

BUDGET 1975-76

TRIAL HARBOUR AREA

Period No.	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
No. of Working Days	Mine 20	20	20	20	20	20	14	19	20	19	19	19	20	250
	Mill 28	28	28	28	28	28	21	28	28	28	28	28	28	357
Salaries	1 600	500	500	1 000	1 500	1 500	2 000	1 500	1 500	1 000	1 000	500	900	15 000
Materials				200	200	200	300	300	300	200	200		100	2 000
Outside Services														
Diamond Drilling														
Geophysics								5 000						5 000
Geology														
General Costs	100			200	200	200	300	300	300	200	200			2 000
Hire of Equipment														
Capital														
Total Cost Trial Harbour Area	1 700	500	500	1 400	1 900	1 900	2 600	7 100	2 100	1 400	1 400	500	1 000	24 000
1/2 Mt. Lyell Cost	850	250	250	700	950	950	1 300	3 550	1 050	700	700	250	500	12 000

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		DESCRIPTION	REMARKS
0	- 6.00 m	Soil, sand and rubble.	
6.00	- 32.29 m	Dark grey/black/purple shale with minor bands of slightly coarser material - fine grained tuffaceous sediments? e.g. 16.10 - 16.70 m. Very fine grained sulphide scattered through core - vein of massive pyrite at 31.00 m. Magnetite throughout core.	6.00 - 14.50 m ground badly broken.
32.29	- 32.85 m	Light grey fine grained igneous rock? Possibly aplitic? Very fine light crystals? in a darker groundmass. Rock is intermittently altered either side of this; back to 30.25 m and downhole to 39.25 m - latter zone shows extensive silicification with less magnetite.	
32.85	- 65.75 m	Dark grey/black siltstones. Very similar to 6.00 - 32.29 m but slightly coarser grained - possibly tuffaceous. Contains magnetite and very fine grained scattered sulphides (pyrrhotite). From approximately 60.00 m core becomes mottled brown and pale grey (bluish), sulphides slightly coarser - often in veinlets.	
65.75	- 69.50 m	Dark grey/black rock, magnetite with veins and disseminations of pyrrhotite. Minor mica. Possible bedding at 68.25 m, B.C.A. = 25°. If bedding, it suggest that magnetite is primary, being in obvious bands. (probably showing replacement of bedding)	
69.50	- 72.54 m	Light grey siliceous rock. Shows fracturing and probably silicified. However lower contact appears to be parallel to bedding. Pyrrhotite and chalcopryrite developed at 69.60 m.	
72.54	- 76.60 m	Brown, slightly mottled with light grey patches, siltstone or possibly a fine ash/greywacke? (dolomitic?). Mottling perhaps due to fracturing or bleaching in metamorphic aureole from granite. Development of massive pyrrhotite at 72.55 m and 74.66 m. Former pyrrhotite near upper contact developed as bands parallel to contact - metasomatic replacement along original bedding? B.C.A. = 50°. Minor veinlets of pyrite, and extremely minor fine veinlets of carbonate.	
76.60	- 85.66 m	Gradual change to a dark green brecciated, tuffaceous greywacke? This gradually changes to a light grey siliceous sandstone (greywacke?) at 77.60 m which contains odd dark green fine grained patches. From 80.24 m merges with a fine grained but stronger "brecciated" zone (although core not broken) - again probably bleaching. Pyrrhotite developed in coarser sections.	
85.66	- 90.93 m	Dark green/brown tuffaceous? siltstone - probably a greywacke (dolomitic?). Similar to 72.54 - 76.60 m but coarser grained. No visible mineralisation. Extremely minor carbonates in fine veinlets. From 89.00 m the core becomes mottled with white quartzose patches, also darker areas contain chlorite(?).	
90.93	- 95.24 m	Black (magnetite) and light grey rock (quartz). Gradual increase in amount of magnetite from 90.93 m and from 92.50 m veins and disseminations of pyrrhotite become obvious, increasing down the hole.	
95.24	- 98.40 m	Gradual change to a light grey fine grained siliceous rock. Mottled appearance due to metamorphic bleaching. If originally a greywacke sequence could represent the fine grained part of a bed. No visible mineralisation.	
98.40	- 125.00 m	Change to dark grey/black rock. Original rock medium grained and probably a sandstone (greywacke). Large percentage of magnetite, often massive and extensive veins and disseminations of pyrrhotite (some minor veins possibly pyrite?). Rock also contains a significant amount of carbonate. Some small light coloured siliceous patches similar to 95.24 - 98.40 m, have no carbonate and no visible mineralisation, e.g. 115.00 - 115.45 m. From approximately 119.00 m the percentage of magnetite decreases. However, the percentage of pyrrhotite appears to remain constant (approx. 10%?) to 125.00 m. 123.00 - 124.00 m core is banded.	
125.00	- 138.00 m	Transition to a light grey fine grained "quartzite" similar to 115.00 - 115.45 m. Appears vaguely brecciated (bleached) and darker patches are associated with minor pyrrhotite mineralisation in cracks. "Tremolite-actinolite" developed.	
138.00	- 153.24 m	Transition to a darker medium grained "sandstone", shows some mottling possibly "brecciation" but probably bleaching and some small fine grained patches, e.g. 143.00 m, which are brecciated contain carbonate. Elsewhere little or no carbonate - possibly dolomitic and brecciation due to dolomitisation? Numerous dark olive green fine grained patches. Pyrrhotite as disseminations and veinlets is developed extensively throughout the core. Probably some magnetite.	
153.24	- 185.40 m	Dark grey, slightly reddish fine grained sediment. Strongly brecciated from 153.24 - 156.50 m. Carbonate in matrix of brecciated zone and as narrow veinlets elsewhere. Small light green patches. Whole zone dolomitic? Bedding at 170.00 m. B.C.A. = 30°. Rare veinlets of pyrrhotite but generally barren. Lighter coloured medium grained more siliceous zone 179.69 - 181.50 m.	172.20 - 173.40 m core badly broken and some core loss - probably associated with a fault.
185.40	- 220.10 m	Light grey fine to medium grained mottled, due to bleaching or brecciation, (probably the former), sandstone.	

DIAMOND DRILL LOG T.H. 1

APPENDIX 1

506016

016

017

506017

DESCRIPTION SECTION No. 16712

T.H.I. 320m.

a. Hand Specimen:

Grey, medium to coarsely crystalline granitic rock.
K feldspar stain test positive.

H.W. Funder CMS/HS/S/23

b. Microscopic:

This is a stressed micro-adamellite, with minor primary biotite and traces of tourmaline. It is thus quite similar to other described intersections of Pine Hill Porphyry.

This rock tends to be porphyritic but not strongly so. There are larger patches of quartz and microperthite, set in a microgranular, sometimes graphic, intergrowth of quartz microperthite and sodic oligoclase (fairly strongly argillised). The biotite occurs as rather poorly developed shreds and is uncommon; it is a very dark variety, and contains iron oxides and minute ? zircon inclusions with pleochroic haloes. Accessory apatite is scattered through the rock. Traces of ? xenotime occur.

The tourmaline is a very dark green variety, occurring as small, poorly defined, irregular patches associated with microfractures. Isolated small patches of fluorite are present, and are associated with chlorite and ? allanite. There is a possibility that traces of cassiterite may be present, though fine grained and difficult to identify. The secondary minerals are post-magmatic and are possibly related to the stress phase which is evident in the primary minerals.

DESCRIPTION SECTION No. 16713

T.H.I. 386m.

a. Hand Specimen:

Pinkish, coarsely crystalline granitic rock.
K feldspar stain test positive.

H.W. Funder CMS/HS/S/23

b. Microscopic:

This is a biotite adamellite, with accessory tourmaline and fluorite. Compositionally it is quite similar to the intersection at 320m, but appreciably more coarsely crystalline; it also contains more biotite. Petrologically it can be correlated with the Pine Hill porphyry; its fabric suggests however, that it represents a major intrusive, of which the Pine Hill porphyry would be an offshoot. It would be interesting and relevant to compare this rock with the larger granites in the region (i.e. Heemskirk, Meredith).

The major minerals are microperthite (40%), quartz (30%) and sodic oligoclase (25%), with 5% of biotite, and accessory zircon, xenotime, apatite and iron oxide (? magnetite). Fluorite patches and semi-opaque tourmaline probably represent introduced, deuteric minerals.

The fabric is fairly typical of granites, with a tendency for occasional phenocrysts to form. The feldspars are only lightly argillised. Microperthite is pink due to very fine iron oxide pigmentation. Some of the biotite is chloritised.

The rock is slightly stressed; microfractures are filled with carbonate films.

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

HOLE NUMBER T.H.1

019

ADVANCE		RECOVERY		S _n ASSAYS							BULK ASSAYS				REMARKS					
From	To	m.	%	From	To	m.	%Cu	%FeS ₂	Ag/m/T	Pb/m/T	Zn	From	To	m.		%Cu	%FeS ₂	Ag/m/T	Pb/m/T	
				15	17	2	0.04	<0.10												
					19		0.05	"												
					21		0.06	"												
					23		0.03	"												
					25		0.05	"												
					27		<0.03	"												
					29		"	"												
					30.25	2.25	"	"												
					32.39	2.14	0.25	"												
					32.85	0.46	0.05	"												
					34	1.15	0.04	"												
					36	2	"	"												
					38		0.05	"												
					39.25	1.25	0.04	"												
					42	2.75	<0.03	"												
					44	2	"	"												
					46		"	"												
					48		"	"												
					50		"	"												
					52		"	"												
					54		"	"												
					56		"	"												
					58		"	"												
					60		<0.03	<0.10	70	<10	100									
					62		0.06	"	115	"	170									
					64		0.04	"	155	"	190									
					65.75	1.75	<0.03	"	45	"	75									
					68	2.25	<0.03	"	95	"	145									
					69.50	1.50	<0.03	"	220	"	200									
					72.50	3.00	0.05	"	60	"	50									
					74	1.50	<0.03	"	135	"	75									
					76.60	2.60	"	"	50	"	55									
					78	1.40	"	"	50	15	50									
					80	2	0.05	"	35	<10	45									
					82		0.04	"	35	"	75									
					84		<0.03	"	75	"	75									
					85.60	1.60	"	"	65	"	55									
					88	2.40	"	"	40	"	65									
					90.93	2.93	"	"	40	"	60									
					92	1.07	0.07	"	660	30	600									
					94	2	<0.03	"	285	<10	370									
					95.24	1.24	"	"	390	"	900									
					97	1.76	"	"	180	20	65									
					98.40	1.40	"	"	175	35	170									
					100	1.60	0.07	"	165	60	1260									
					102	2	0.19	"	670	70	380									
					104		0.04	"	100	25	380									

A 66701

506019

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

506019A 020

ADVANCE		RECOVERY		ASSAYS						BULK ASSAYS						REMARKS			
From	To	m.	%	From	To	m.	%	%FeS ₂	%Cu	Ag/m ²	Ag/m ²	From	To	m.	%Cu		%FeS ₂	Ag/m ²	Ag/m ²
				104	106	2	0.04	<0.10	195	35	650								
					108		0.14	"	180	45	320								
					110		0.25	"	550	60	240								
					112		0.04	"	1100	65	620								
					114		0.05	"	350	165	1920								
					116		0.05	"	280	15	420								
					118		0.07	"	380	190	3200								
					120		0.06	"	450	20	1800								
					122		0.09	"	660	10	640								
					125	3	<0.03	"	670	15	460								
					127	2	0.04	"	130	30	200								
					129		<0.03	"	100	30	115								
					131		"	"	60	25	60								
					133		"	"	45	40	35								
					135		"	"	120	40	55								
					138	3	0.06	<0.10	60	5	45								
					140	2	0.05	"	525	20	360								
					142		0.06	"	300	10	1245								
					144		0.06	"	520	10	475								
					146		0.06	"	380	5	180								
					148		0.06	"	320	45	575								
					150		0.06	"	440	15	870								
					152		0.05	"	630	65	355								
					153.24	1.24	0.06	"	515	45	355								
					156	2.76	0.06	"	295	15	200								
					158	2	0.05	"	100	5	1210								
					160		0.05	"	60	5	310								
					162		0.05	"	45	45	190								
					164		0.05	"	230	30	260								
					166		0.06	"	215	15	425								
					168		0.05	"	60	5	175								
					170		0.05	"	300	45	160								
					172		0.06	"	90	45	1500								
					174		0.05	"	550	5	70								
					176		0.05	"	220	45	120								
					178		0.05	"	65	45	225								
					180		0.06	"	75	45	75								
					182		0.06	"	60	5	60								
					184		0.10	"	65	40	1050								
					186		0.05	"	85	5	240								
					188		0.04	"	260	45	165								
					190		<0.03	"	705	5	45								
					192		"	"	390	45	55								
					194		0.06	"	660	45	55								
					196		0.05	"	410	45	1380								
					198		0.04	"	370	10	50								
					200		<0.03	"	410	5	45								

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

021

ADVANCE		RECOVERY		ASSAYS								BULK ASSAYS				REMARKS		
From	To	m.	%	From	To	m.	%Cu	%FeS ₂	Augm/MT	%Zn	From	To	m.	%Cu	%FeS ₂		Augm/MT	Augm/MT
				200	202	2	0.06	<0.10	635	30	40							
					204		0.04	"	530	5	40							
					206		0.04	"	300	5	30							
					208		"	"	330	5	40							
					210		0.05	"	475	5	90							
					212		<0.03	"	425	<5	85							
					214		"	"	530	<5	135							
					216		"	"	280	<5	90							
					218		0.04	"	170	<5	50							
					220		0.05	"	130	<5	50							
					222		0.05	"	90	<5	35							
					224		"	"	65	"	45							
					226		0.04	"	100	"	65							
					228		"	"	100	"	55							
					230		"	"	150	"	55							
					232		"	"	130	"	85							
					234		"	"	110	"	55							
					236		"	"	85	5	50							
					238		0.05	"	45	<5	55							
					240		0.04	"	30	"	55							
					242		0.05	"	30	5	45							
					244		0.06	"	40	<5	60							
					246		"	"	60	"	55							
					248		"	0.12	60	"	55							
					250		<0.03	<0.10	80	"	50							
					252		0.04	"	55	50	75							
					254		"	"	35	<5	65							
					256		0.05	"	20	<10	55							
					258		0.04	"	580	<10	80							
					260		"	"	180	"	50							
					262		0.05	"	400	"	65							
					264		0.08	"	165	"	135							
					266		<0.03	"	1200	"	85							
					268		0.06	"	710	"	70							
					270		"	"	230	"	35							
					272		"	"	165	"	55							
					274		"	"	70	"	65							
					276		0.06	"	136	10	980							
					278		"	"	60	<10	600							
					280		0.06	"	45	"	75							
					282		0.09	"	40	"	100							
					284		0.12	"	85	"	325							
					286		0.05	"	25	10	95							
					288		0.03	"	45	<10	80							
					290		0.04	"	150	"	50							
					292		0.03	"	130	10	55							
					294		"	"	60	<10	60							

A 66701

506020

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

022

506021

ADVANCE		RECOVERY		ASSAYS							BULK ASSAYS							REMARKS	
From	To	m.	%	From	To	m.	%Cu	%FeS ₂	Ag/m ²	Pb	Zn	From	To	m.	%Cu	%FeS ₂	Ag/m ²		Ag/m ²
	294	296	2	0.05	<0.10	45	<10	70											
		298		0.04	"	55	"	55											
		300		"	"	60	"	105											
		302		"	"	205	10	145											
		304		"	"	25	<10	60											
		306		"	"	470	40	110											
		308		"	"	115	10	75											
		310		"	"	130	<10	80											
		312		"	"	25	10	70											
		314		"	"	270	"	75											
		316		0.03	"	285	<10	70											
		318		"	"	295	"	60											
		320		0.06	"	35	10	70											
		322		0.07	"	30	55	200											
		324		0.08	"	45	30	150											
		326		0.07	"	35	50	140											
		328		0.06	"	70	30	55											
		330		0.06	"	50	20	105											
		332		"	"	85	25	65											
		334		"	"	40	10	35											
		336		"	"	50	20	40											
		338		0.07	"	40	<10	95											
		340		"	"	75	15	65											
		342		"	"	30	10	30											
		344		0.06	"	40	15	30											
		346		0.07	"	35	10	45											
		348		0.14	"	100	20	640											
		350		0.06	"	85	20	55											
		352		"	"	20	10	40											
		354		"	"	45	10	75											
		356		0.07	"	40	15	35											
		358		"	"	25	20	30											
		360		0.06	"	135	20	35											
		362		"	"	585	120	225											
		364		"	"	140	30	65											
		366		0.10	"	55	40	80											
		368		0.06	"	60	10	35											
		370		"	"	90	20	45											
		372		"	"	30	<10	35											
		374		"	"	25	20	45											
		376		"	"	30	<10	35											
		378		0.08	"	45	10	30											
		380		0.07	"	20	15	35											
		382		0.06	"	40	10	35											
		384		"	"	20	<10	40											
		386		0.07	"	30	15	130											
		388		0.06	"	15	<10	35											

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

Page 2 of 3
HOLE NO. 101
T.H.1

023

ADVANCE		RECOVERY		Sn ASSAYS %Cu %Pb							BULK ASSAYS							REMARKS	
From	To	m.	%	From	To	m.	%Cu	%FeS ₂	Au g/m ³	Ag g/m ³	%Zn	From	To	m.	%Cu	%FeS ₂	Au g/m ³		Ag g/m ³
				388	390	2	0.07	<0.10	10	<10	65								
					392		0.06	"	15	"	40								
					394		0.08	"	10	10	25								
					396		0.10	0.50	10	<10	15								
					398		0.06	<0.10	20	"	160								
					400		0.06	"	10	<10	35								
					402		"	"	10	"	50								
					404		"	"	15	10	80								
					406		"	"	15	20	240								
					408		0.07	"	30	10	125								
					410		0.06	"	40	10	35								
					412		"	"	10	15	40								
					413.24	1.24	"	"	30	30	65								

A 66701

506022

SOIL GEOCHEMISTRY DATA (p.p.m.)Line 23E

	A Fraction (10# +80#)					B Fraction (80#)				
	Sn	As	Cu	Pb	Zn	Sn	As	Cu	Pb	Zn
30N										
29N										
28N										
27N										
26N										
25N										
24N										
23N										
22N						65	10	10	10	10
21N						95	40	35	15	15
20N						165	10	20	10	25
19N						125	25	25	10	10
18N						55	75	40	10	10
17N						70	50	70	10	25
16N						125	125	85	< 10	25
15N						10	10	75	< 10	40
14N						15	50	220	< 10	45
13N						< 5	35	65	< 10	55
12N						20	45	125	10	35
11N						15	50	120	< 10	35
10N						15	10	45	< 10	30
9N						< 5	< 5	50	25	35
8N						5	< 5	50	20	35
7N						10	< 5	115	20	210
6N						10	15	165	20	260
5N						20	< 5	95	25	40
4N						25	< 5	105	30	65
3N						5	< 5	80	30	65
2N						5	< 5	55	30	45
1N						5	< 5	45	40	55
0.20N						15	< 5	65	45	75
00						45	10	55	45	50
1S						40	30	35	50	45
2S						5	< 5	5	45	30
3S						20	< 5	15	40	700
4S						20	< 5	25	35	455
5S						5	< 5	45	35	290
6S						20	5	65	40	190
7S						20	< 5	60	40	145
8S						40	10	50	40	110
9S						30	20	45	40	130
10S						25	< 5	60	140	135

025

506024

Line 24E

	A Fraction (10# +80#)					B Fraction (80#)				
	Sn	As	Cu	Pb	Zn	Sn	As	Cu	Pb	Zn
30N		2	5	5	160	80	< 2	10	< 5	40
29N		2	5	15	55	95	10	15	5	40
28N		2	5	10	60	200	< 2	5	< 5	30
27N		25	10	5	60	85	25	15	10	40
26N		4	5	20	110	75	125	15	20	45
25N		10	10	20	60	80	20	15	15	50
24N		4	15	15	65	100	25	20	15	55
23N		400	25	10	55	65	170	30	10	50
22N		25	100	25	85	30	150	100	25	65
21N		2	195	20	100	5	40	270	10	115
20N		2	25	15	60	5	2	30	5	45
19N		10	30	15	60	10	10	40	15	45
18N		25	80	30	125	40	20	100	30	120
17N		< 2	235	30	200	5	25	300	25	220
16N		< 2	465	20	245	5	45	420	15	145
15N		2	195	10	100	50	120	425	10	140
14N						160	45	35	40	90
13N						295	50	10	10	40
12N						180	40	20	10	60
11N						90	100	25	20	50
10N						45	50	40	20	45
9N						50	125	65	20	25
8N						30	40	45	25	470
7N						50	35	40	15	50
6N						< 5	20	40	15	20
5N						< 5	5	60	20	35
4N						10	15	40	20	30
3N						< 5	< 2	20	20	40
2N						20	40	30	20	40
1N						10	25	35	60	75
00						25	45	15	20	50
1S						185	15	75	40	70
2S						5	75	40	20	110
3S						20	75	45	20	55
4S						10	50	30	20	40
5S						10	40	55	10	40
6S						< 5	50	110	25	90
7S						15	40	35	10	35

026

Line 25E

	A Fraction (10# +80#)					B Fraction (80#)				
	Sn	As	Cu	Pb	Zn	Sn	As	Cu	Pb	Zn
30N	< 2	5	10	10	40	100	< 2	35	10	65
29N	< 2	10	10	10	45	75	< 2	25	10	65
28N	< 2	10	5	5	45	200	< 2	25	10	45
27N	< 2	5	10	10	60	65	45	10	15	55
26N	35	10	5	5	40	50	40	15	15	45
25N	5	10	5	5	55	60	30	15	20	65
24N	5	10	10	10	50	20	5	15	10	55
23N	< 2	70	15	15	55	10	< 2	70	20	65
22N	40	65	15	15	55	15	10	65	15	65
21N	20	85	10	10	115	35	< 2	95	10	115
20N	< 2	15	10	10	55	50	5	150	45	80
19N	5	20	10	10	155	5	10	20	10	215
18N	5	400	5	5	110	5	10	140	10	135
17N	50	70	25	25	75	20	50	80	35	130
16N	50	60	30	30	65	300	200	65	35	55
15N	450	120	25	25	75	170	1500	100	25	60
14N	4000	105	25	25	70	270	4500	95	35	75
13N	100	45	20	20	270	110	100	40	20	55
12N	< 2	55	25	25	75	75	200	55	20	60
11N	< 2	70	20	20	80	50	40	75	15	75
10N	< 2	35	15	15	70	10	30	40	20	60
9N						20	20	10	20	100
8N						< 5	25	35	20	30
7N						< 5	20	30	25	35
6N						< 5	500	30	25	215
5N						15	175	40	30	60
4N						20	150	35	25	45
3N						40	40	60	30	45
2N						35	225	95	60	325
1N						50	175	80	30	85
00						5	30	50	20	170
1S						10	75	35	75	70
2S						< 5	25	35	35	70
3S						5	125	40	30	70
4S						35	50	40	30	85

027

Line 26E

	A Fraction (10# +80#)					B Fraction (80#)				
	Sn	As	Cu	Pb	Zn	Sn	As	Cu	Pb	Zn
30N						< 5	5	5	20	70
29N						5	10	10	15	40
28N						110	35	5	15	25
27N						175	45	15	30	40
26N						60	15	55	10	45
25N						20	25	40	20	45
24N						< 5	50	140	20	35
23N						< 5	10	20	15	35
22N						< 5	5	10	20	60
21N						10	5	15	15	50
20N						35	50	15	15	30
19N						95	50	10	25	35
18N						< 20	35	30	15	30
17N						< 20	N.A.	15	20	40
16N						60	N.A.	85	30	75
15N						30	50	30	20	50
14N						20	75	35	25	40
13N						5	50	15	20	40
12N						< 5	30	25	10	30
11N						< 5	35	10	15	35
10N						< 5	35	25	20	55

028

ROCK GEOCHEMISTRY (p.p.m.) - TENTH LEGION

T.L. 1

Footage	Cu	Pb	Zn	Ba	Mo
8'	<10	10	185	80	<10
20'	95	60	65	200	<10
30'	70	15	35	200	<10
40'	145	15	120	200	<10
50'	135	20	75	240	<10
60'	25	<10	45	120	<10
70'	85	120	60	200	<10
80'	<10	10	120	120	<10
90'	10	65	270	80	<10
100'	10	35	720	160	20
110'	10	<10	410	240	40
120'	80	25	170	80	<10
130'	40	25	115	200	<10
140'	<10	460	750	760	<10
150'	35	70	115	680	<10
160'	15	10	75	80	<10
170'	10	30	170	80	<10
180'	<10	15	30	80	<10
190'	<10	160	255	120	<10
200'	50	30	265	120	<10
210'	15	370	900	120	<10
220'	75	125	125	120	<10
230'	15	400	170	80	<10
240'	30	<10	700	80	<10
250'	30	<10	285	120	<10
260'	35	25	240	560	<10
270'	<10	20	590	1240	<10
280'	<10	10	65	280	<10
290'	10	<10	370	1020	<10

T.L. 2

Footage	Cu	Pb	Zn	Ba	Mo
10'	2000	65	75	520	620
* 20'	103	< 10	455	1860	< 10
30'	1180	25	85	360	80
40'	10	20	90	640	< 10
50'	165	10	70	180	< 10
60'	10	75	160	1140	< 10
70'	< 10	10	45	1160	< 10
80'	10	10	480	180	< 10
90'	20	80	55	880	< 10
100'	35	20	200	120	< 10
110'	30	10	345	260	< 10
120'	15	190	520	180	< 10
130'	20	< 10	130	160	< 10
140'	20	40	170	360	< 10
150'	< 10	30	50	240	< 10
160'	15	< 10	135	160	< 10
170'	70	< 10	80	160	< 10
180'	15	40	35	640	< 10
190'	65	< 10	55	1300	< 10
200'	45	< 10	85	120	< 10
210'	10	< 10	280	200	< 10
220'	35	10	760	180	< 10
230'	300	545	990	2600	10
240'	15	10	75	180	< 10
250'	60	< 10	250	200	< 10
260'	< 10	< 10	330	260	< 10
270'	< 10	< 10	550	260	< 10
280'	15	< 10	420	240	< 10
290'	85	< 10	250	180	< 10
300'	45	65	260	950	< 10

* High copper values. Contamination from Mount Lyell sample mill?

APPENDIX IIIINPUT, AIRBORNE E.M., SYSTEMINPUT EQUIPMENT AND PROCEDURES1. BARRINGER INPUT SYSTEM(a) General

The INPUT (INDuced PUTse Transient) method is based upon the study of the decay of secondary electromagnetic fields created in the ground by short pulses generated from an aircraft. The time-varying characteristics of the decay curve are analyzed and interpreted in terms of information concerning the conductivity characteristics of the terrain.

The principle of separation in time between the production of the primary field and the detection of the measured secondary signal gives rise to an excellent signal-to-noise ratio and an increased depth of penetration compared to conventional continuous wave electromagnetic systems. It also makes the INPUT system relatively independent of air turbulence.

At a normal survey altitude of 400 feet (120 metres) above terrain, the typical effective depth penetration is estimated at about 400 feet (120 metres) below surface, depending on the conductivity contrast between the conductive body and surrounding rocks, the size and attitude of the conductor and the presence or lack of conductive overburden. In optimum conditions a penetration of 600 feet (185 metres) subsurface can be achieved.

One of the major advantages of the INPUT method lies in good differentiation between flat-flying surface conductors and bedrock conductors so that the latter can be detected even under a relatively thick overburden such as glacial or pedological formations (laterite, weathered zone, etc.).

However, the application of the airborne INPUT electromagnetic method is limited to the solution of problems that are characterized by a reasonable resistivity contrast. The method is not considered to be applicable to the direct search for disseminated mineralization, except where this resistivity contrast exists.

(b) Equipment

The INPUT system has been developed by Barringer Research Limited of Toronto, Canada.

The transmitted primary field is discontinuous in nature (Fig. 1A) with each pulse lasting one millisecond; the pulse repetition rate is 288 per second. The electromagnetic pulses are created by means of powerful electrical pulses fed into a 3-turn shielded transmitting loop surrounding the survey aircraft and fixed to the nose and tail of the fuselage and to the wing tips.

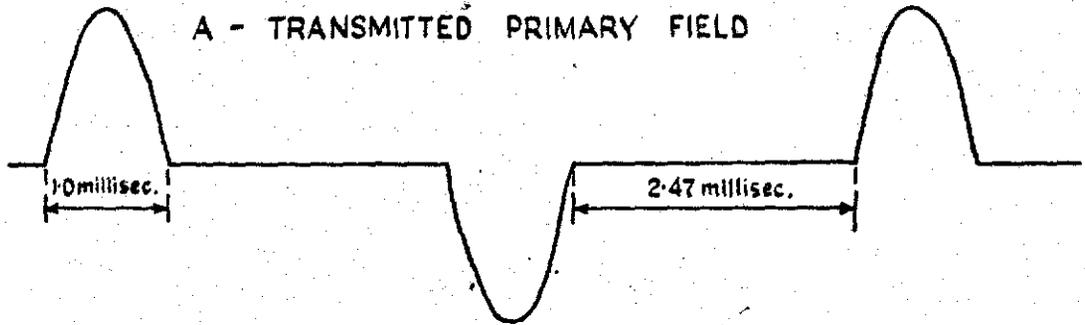
The secondary field reception is made by means of a receiving coil wound on a ferrite rod and mounted in a "bird" towed behind the aeroplane on a 500 foot (150 metre) co-axial cable. The axis of the pick-up coil is horizontal and parallel to the flight direction. Gaps of two and a half milliseconds between successive primary pulses (Fig. 1B) are used for detecting the INPUT voltage, which is a transient voltage (Fig. 1C) corresponding in time to the decay of the eddy currents in the ground.

The analysis of the signal is made in the INPUT receiver by sampling the decay curve at several points or gates, the centre and width of which have a fixed relationship with respect to time zero (t_0) corresponding to the termination of the pulses. There are six sampling gates, the centres of which are commonly at a mean delay of 300, 500, 700, 1100, 1500 and 1900 microseconds after time zero (Fig. 1D).

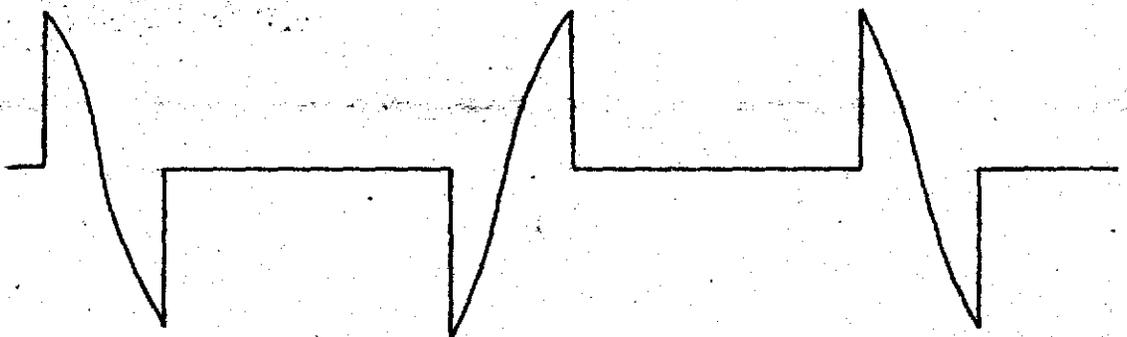
The signals received at each sampling gate are processed in a multi-channel receiver to give six analogue voltages recorded as six continuous analogue traces (Fig. 2) on a Honeywell Visicorder direct-reading optical galvanometer recorder. Each trace represents the coherent integration of the transient sample, the time constant of integration being about three seconds on the Mark V unit.

This integration delay plus the separation between the receiving bird and tracking camera installed in the aircraft introduces a delay which has to be taken into consideration and corrected prior to correlating the electromagnetic data with the other simultaneously recorded data.

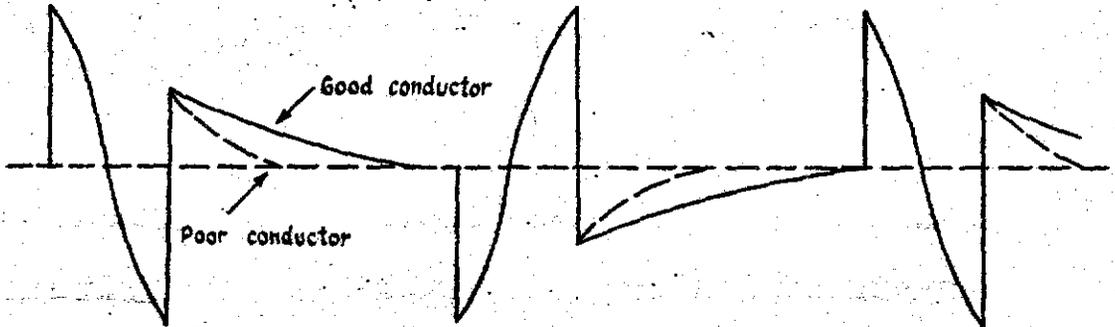
INPUT SIGNAL



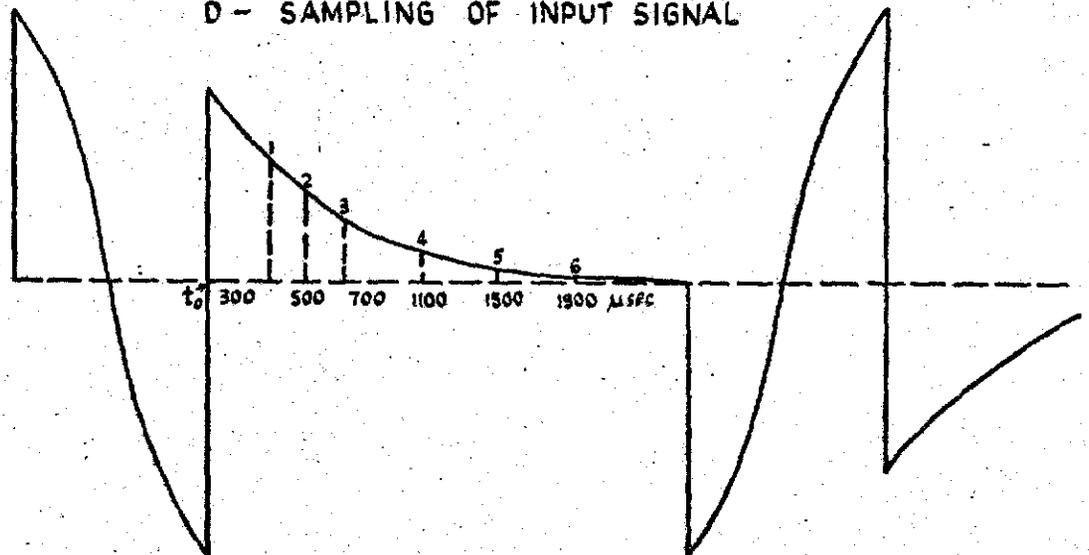
B - PRIMARY FIELD DETECTED IN THE BIRD (after compensation)



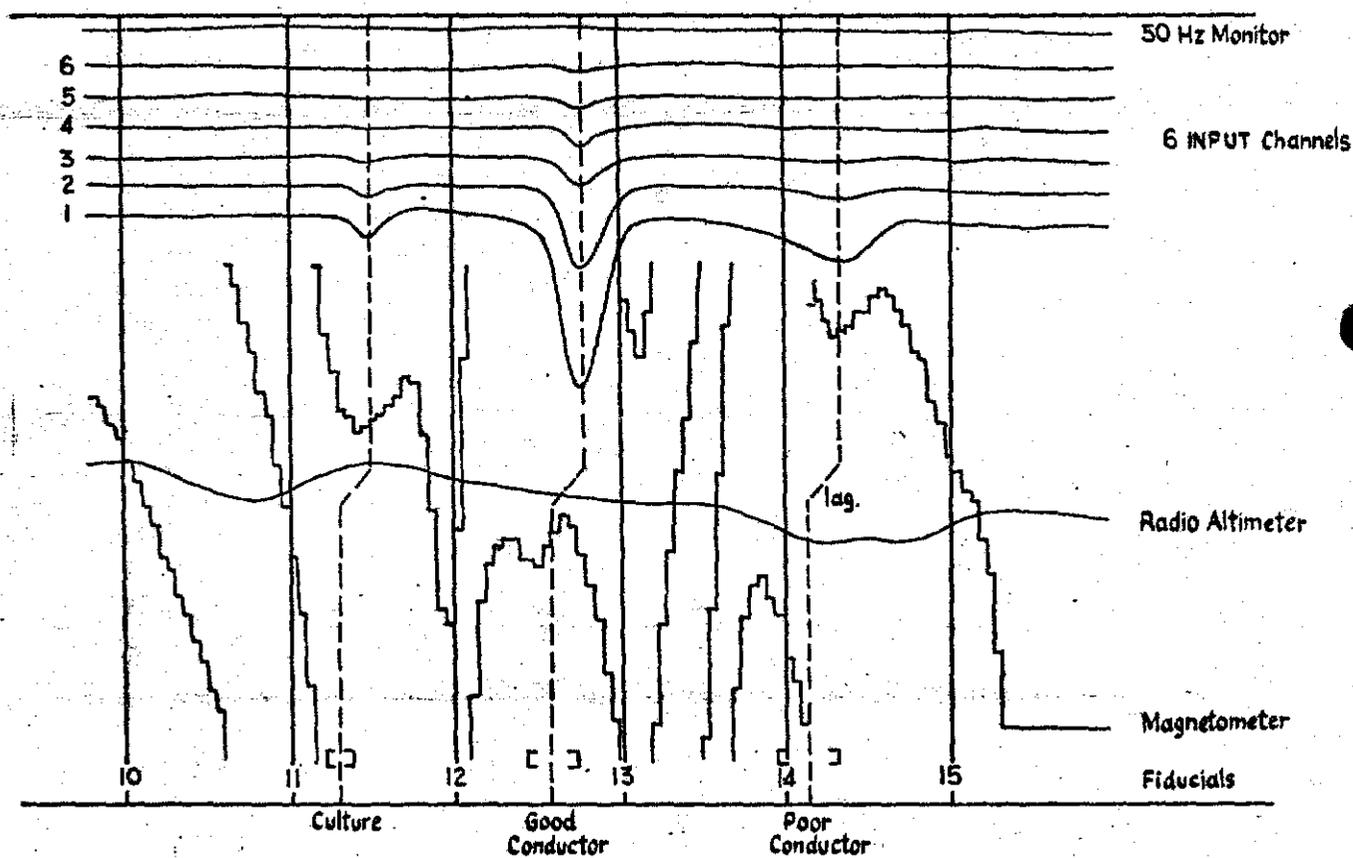
C - PRIMARY AND SECONDARY FIELD



D - SAMPLING OF INPUT SIGNAL



TYPICAL INPUT RECORDING



Other recorded data are:

- Fiducial marks (35 mm Aeropath AS-5 camera)
- Altimeter trace (APN-1)
- Earth's total magnetic field (Geometrics G-803 nuclear precession)
- Hz monitor
- Radiometric levels (optional)

An eddy current is induced in the airframe by the primary field. To compensate for this effect a special device is used which feeds into each channel of the INPUT receiver a signal equal in amplitude and waveform but opposite in polarity to the signal induced by the airframe eddy current. The compensation signal is derived from the voltage induced in the receiving coil by the primary field. It is constantly proportional to the inverse cube of the distance between the bird and the aircraft. Thus, swinging of the bird and changes of coupling are automatically corrected. The compensation adjustment is a simple procedure carried out during flight at a terrain clearance of 2,000 feet (600 metres) to eliminate the interference of ground conductors.

2. PROCEDURES

(a) Field Operations

The flight line spacing is normally in the range of 1/8 mile to 1/4 mile. During survey flights, the altitude of the aircraft is maintained at approximately 400 feet (120 metres) above the ground with the bird flying about 200 feet (60 metres) below the aircraft.

The heading of the aircraft is such that two adjacent lines are normally flown in opposite directions. Visual navigation is based on airphoto mosaics or in some cases on topographic maps of suitable scale.

Just after take-off, the calibration of the altimeter is checked by flying straight and level over the runway at a barometric altitude AGL of 400 feet (120 metres). The compensation adjustment is checked during ferry from the base to the survey area.

(b) Compilation

At the end of each flight, all records and films are developed, edited and all synchronized fiducial marks are checked. Then, the actual flight path recovery is made by picking visible marks common to both 35 mm film and photo mosaics.

U35

Identified points with their fiducial number are plotted on the mosaic. Then, the electromagnetic anomalies are transferred from the records onto the mosaic overlay by interpolation according to their own fiducial number.

The position of the INPUT anomalies must be corrected to take into account the separation between the bird and the aircraft as well as the delay introduced in the integration circuitry. This offset, or lag, is plotted towards the smaller fiducial numbers (to the left on the record).

The INPUT anomalies are represented on a map by means of symbols that condense the most significant characteristics: the location of the centre and half-peak width of the electromagnetic anomaly; the number of INPUT channels affected by a noticeable deflection; the peak amplitudes of the first and fourth channels. Shown also are the altitudes at which the anomalies were recorded, the amplitude of any magnetic features which coincide with INPUT anomalies and any associated response on the Hz monitor.

The only subjective elements introduced by this processing are in the decision as to whether a deflection corresponds to a genuine anomaly or to a noise source (electrostatic atmospheric discharge, compensation noise, etc.) and in the correlation of the anomalies from line to line to delineate a conductive zone.

INPUT INTERPRETATION

1. INTRODUCTION

Although the approach to interpretation varies from one survey to another depending upon local conditions, the following generalizations may provide the reader with some helpful background information.

The main purpose of the interpretation is to determine the probable origin of the conductors detected during the survey and to suggest recommendations for a further exploration programme by taking into account a limited amount of available geophysical data. This is possible through an objective analysis of all characteristics of the different types of conductors and correlating magnetics, if any. Then, the maps of electromagnetic results are compared to the available geological maps. A certitude is seldom reached, but a high probability is obtained in the appreciation of the conductive causes in most cases. One of the most important problems is usually the differentiation between non-economic surface conductors and bedrock conductors.

2. TYPES OF CONDUCTORS

(a) Bedrock Conductors

The different types of bedrock conductors that are normally encountered are the following:

1. Graphites (including a large variety of carbonaceous rocks) occur in the sedimentary formations of the Precambrian as well as in volcanic tuffs, often concentrated in shear zones. They correspond generally to long, multiple conductors lying in parallel bands. They are not magnetic unless associated with pyrrhotite or magnetite. Their conductivity is variable but generally high.
2. Massive sulphides. Syngenetic sulphides often correspond to long multiple conductors and their conductivity, which varies considerably, may be very high, as for graphites. Pyrrhotite, often associated with other sulphides may be the cause of coincident magnetic anomalies. Generally, sulphides are not as frequently encountered as is graphite.

Isolated orebodies of massive sulphides give rise to short conductors of high conductivity. They present quite often a direct magnetic anomaly and are easily recognized. However, some sulphide orebodies are not magnetic, some are not very conductive (discontinuous mineralization), and they can be located among formational conductors so that one must not be too dogmatic in the selection of the prospects.

3. Magnetite and some serpentized ultra-basic rocks are conductive and very magnetic.
4. Manganese oxides may give a weak electromagnetic response.

(b) Surface Conductors

1. Clayey alluvium or residual soils, some swamps and brackish groundwater are usually poorly conductive to medium conductive.
2. In unglaciated areas lateritic formations, residual soils and the weathered layer of the bedrock often cause surface anomalous zones, the conductivity of which is generally low to medium but can occasionally be high. Their presence is often related to the lithology of the underlying bedrock.

037

(c) Man-made Conductors (Cultural)

1. Power Lines. These frequently, but not always produce a conductive type response on the INPUT record. In the case of direct radiation of their field, the anomaly shows phase changes with the different channels which are recognized easily. In the case of a grounded wire, or steel pylon, the anomaly may look very much like a bedrock conductor.
2. Grounded fences or pipelines. These will invariably produce responses much like a bedrock conductor. Whenever they cannot be identified positively a ground check is recommended.
3. General Culture. Metal barns or houses, tailings ponds, dumps, etc., may produce INPUT anomalies. However, their instances are rare and can generally be verified by identification on the path recovery film.

3. ANALYSIS OF THE CONDUCTORS

The apparent conductivity alone is not generally a decisive criterion in the diagnosis, and other factors are also very important:

- the pattern of conductors
- the shape and size
- the associated geophysical parameter (aeromagnetism)
- the position with respect to the direction of structures
- the geological environment
- the local variations of characteristics within conductive zones.

The first objective of the interpretation, then, is to classify each zone under one of three categories, according to its most likely origin. The categories are cultural, surficial, and bedrock. A second objective is to give each zone a rating as either good, fair or poor, according to its potential as a sulphide prospect if it were considered as a bedrock conductor.

For any particular anomaly or zone the criteria used to analyze it are applied as rigorously and consistently as possible in order to establish the correct classification. In the vast majority of zones finally selected, the evidence is never totally conclusive. Consequently, the ultimate class selection is the one which appears to be the most probable, bearing in mind that every zone which is discussed in detail has some chance of being a bedrock conductor.

The experience of handling a large amount of INPUT data and observing the ground followup results over a large portion of this data has confirmed the validity of our interpretational criteria.

030

The criteria considered as favourable pointers to a bedrock conductor are:

1. Intermediate to high conductivity. Channels five and six are generally affected. Where the conductivity drops (i.e. first to fourth channel ratios greater than 15) it is difficult to distinguish narrow surficial conductors from bedrock ones.
2. Good anomaly shape. Narrow, relatively symmetrical, anomalies with well defined peaks are preferred to wider anomalies with rounded peaks. The leading flank should show a gradual increasing response with no abrupt change in slope or tendency to go negative.
3. No serious displacement of anomaly peak position with line direction, i.e. edge effect. Some displacement can be expected from a wide bedrock source or banded bedrock source which is not resolved into more than a single peak. However, major displacements in peak position appears to be associated with surficial conductors only.
4. Small to intermediate amplitude. Large amplitudes do occur but, generally, the amplitude of the response is smaller than for thick, extensive surficial conductors. The amplitude varies according to the depth of the source.
5. A degree of continuity. Maintenance of any, or all, of characteristics 1, 2, 3 and 4 is strong evidence in favour of a bedrock conductor.
6. Associated magnetic response with similar strike. A related magnetic response is usually interpreted as signifying a lithologic unit carrying the magnetic and conductive material.

However, some basic rocks which weather to produce a conductive upper layer will possess this magnetic association. In the absence of characteristics 1, 2, 3 or 4, the related magnetic response does not help to distinguish between surficial conductivity related to a bedrock feature and genuine bedrock conductivity.

Interference, then, with a conductive overburden can make the identification of a bedrock conductor somewhat difficult but a careful and consistent comparison of residual responses to the above criteria results in a high level of success.

Residual anomalies, basically, are those which, in comparison to other deflections, appear to be located "on" rather than "part of" the already deflected traces.

Most obvious bedrock conductors occur in long, relatively monotonous, sometimes multiple zones following formational strike. Graphitic material is usually the most probable source. Massive syngenetic sulphides running for many miles are known in nature but, in general, they are not common.

Other sources of bedrock conductivity are massive magnetite and serpentine. We rely heavily on the amplitude and dimensions of the associated magnetic activity plus the geological setting of the conductor to distinguish these cases.

The criteria used for selection of a bedrock conductor which is considered to have a good chance of being due to a massive sulphide are:

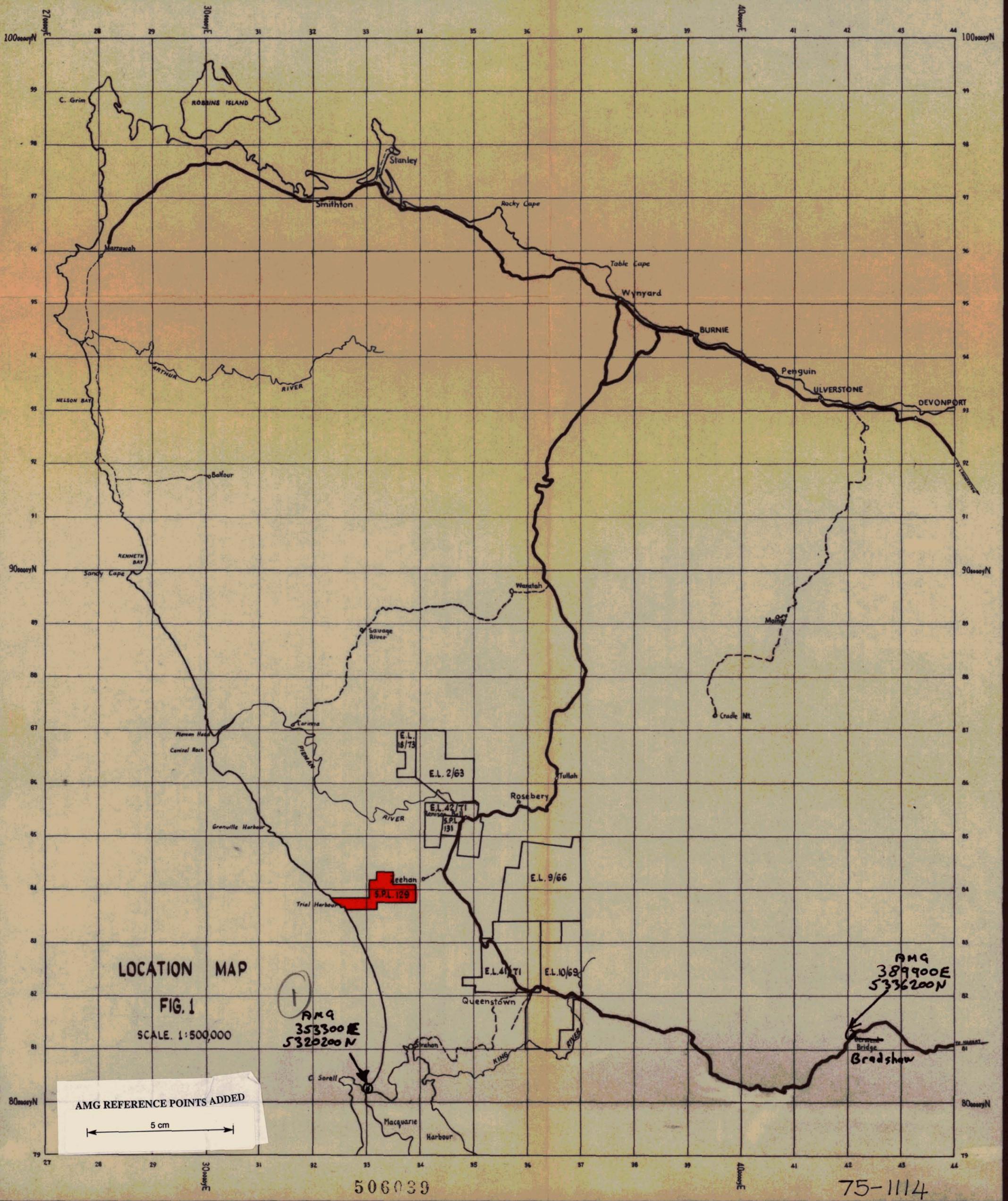
- high conductivity,
- good anomaly shape,
- small to intermediate amplitude,
- isolation,
- short strike length,
- preferable with a localized, small amplitude magnetic anomaly of the same width.

If the magnetic anomaly has similar lateral dimensions, has an amplitude of the order of 20 to 400 gammas, and correlates directly with the EM response, there is a strong possibility of pyrrhotite being present.

We must consider, however, the possibility of localized occurrences of massive sulphides within or near formational conductors. The selection of targets from within these extensive belts is a difficult problem.

They are singled out primarily on the basis of a marked local increase in conductivity and/or amplitude or some evidence for a relatively localized occurrence. Variations within the conductive formations themselves can account for these characteristics so the reliability of this type of selection is considered to be low.

Localized magnetic correlations within long formational conductors can be taken as evidence of pyrrhotite. In some environments, however, this criterion is very difficult to apply due to the prevalent association of conductors to magnetically active rock types. The compilation of the magnetic data into isomagnetic contour maps assists this type of selection.



LOCATION MAP

FIG. 1

SCALE 1:500,000

AMG REFERENCE POINTS ADDED

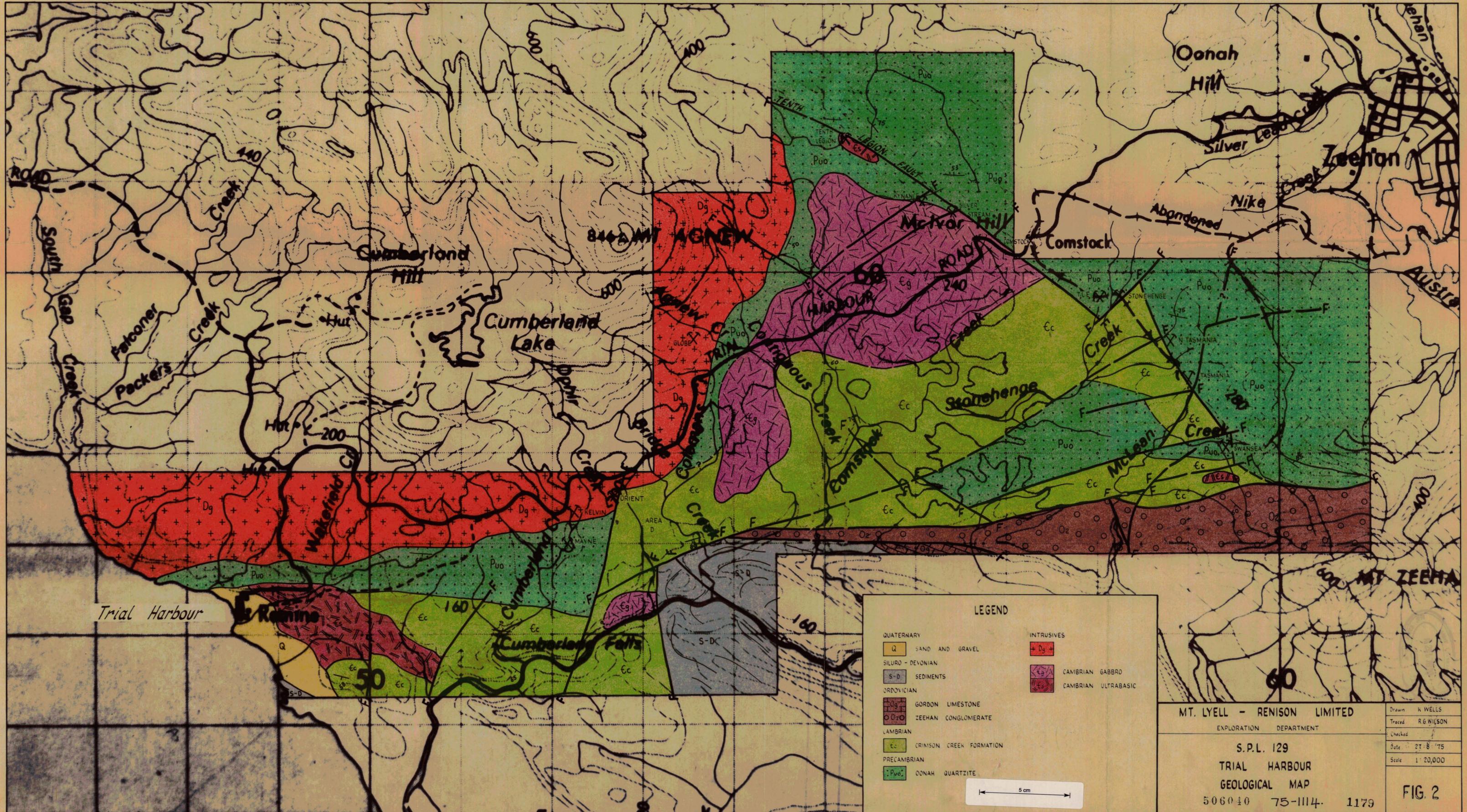
5 cm

①
AMG
353300 E
5320200 N

AMG
389900 E
5336200 N

506039

75-1114



LEGEND

QUATERNARY	INTRUSIVES
Q SAND AND GRAVEL	Dg +
SILURO - DEVONIAN	Eg
S-D SEDIMENTS	U
ORDOVICIAN	
Dg GORDON LIMESTONE	
Oz ZEEHAN CONGLOMERATE	
LAMBRIAN	
Ec CRIMSON CREEK FORMATION	
PRECAMBRIAN	
Puo OONAH QUARTZITE	

5 cm

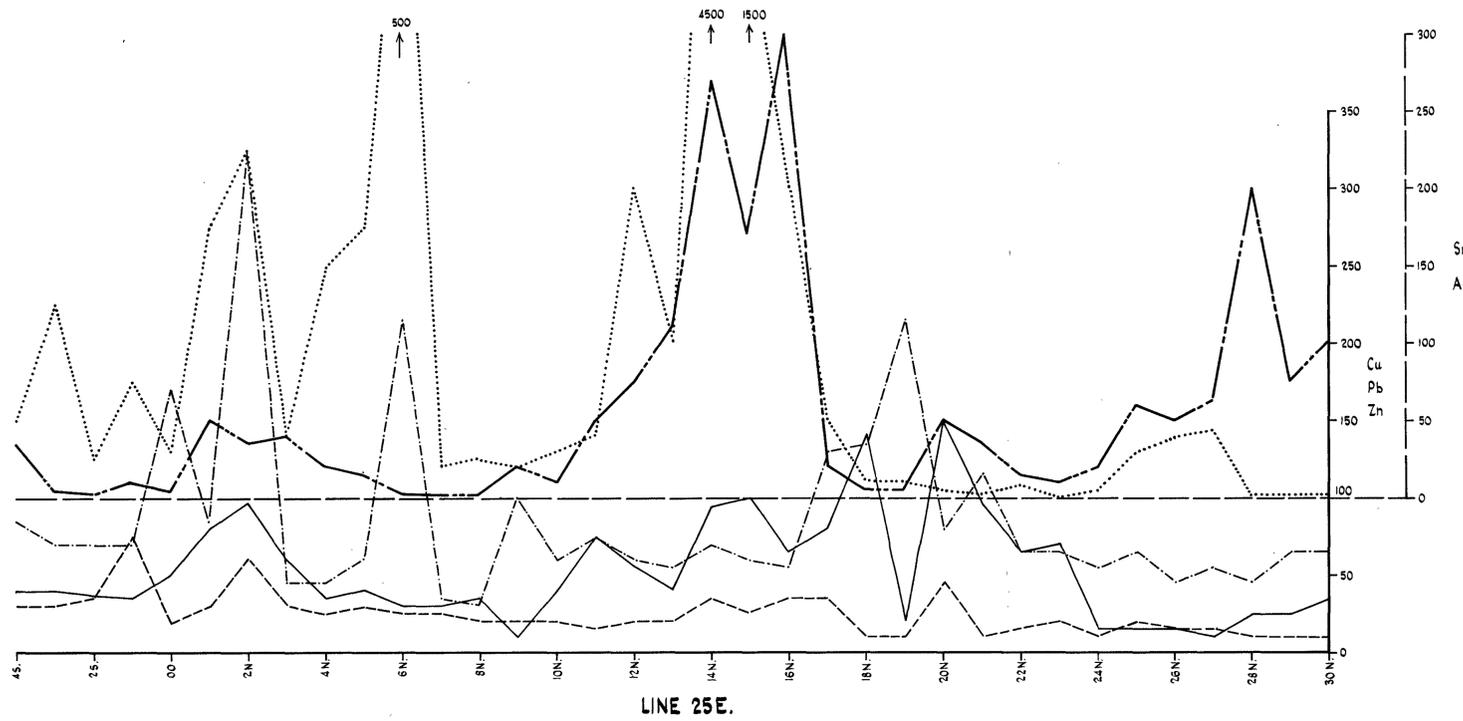
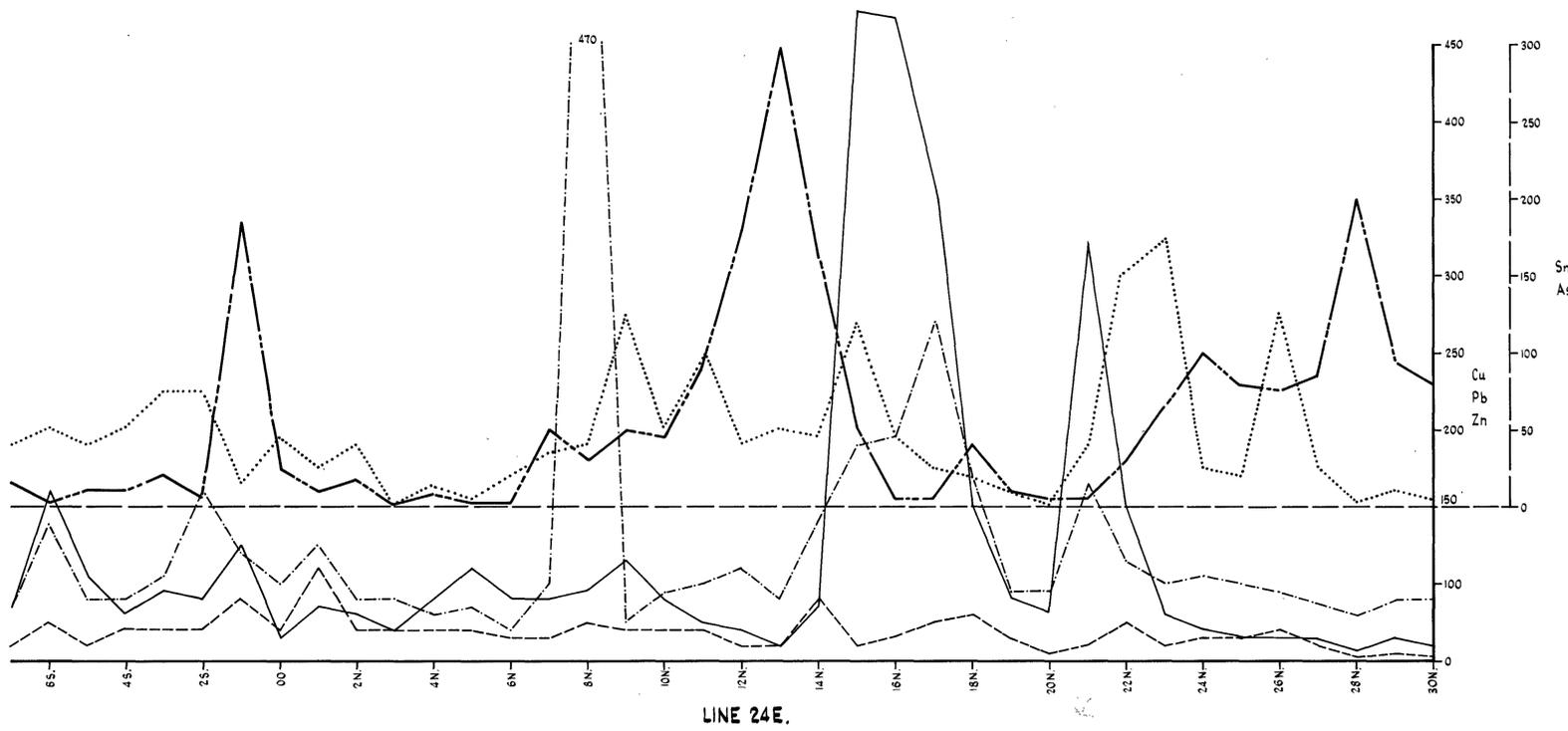
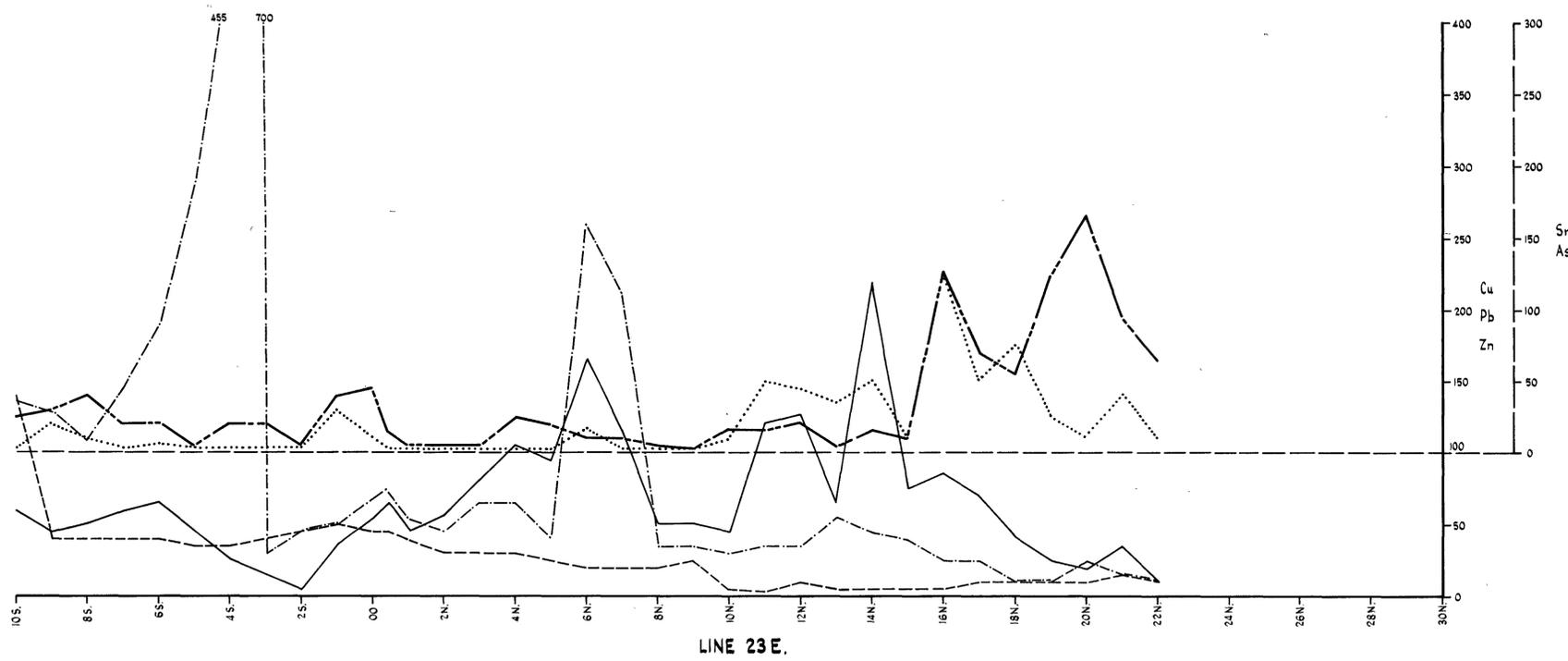
MT. LYELL - RENISON LIMITED
 EXPLORATION DEPARTMENT

S.P.L. 129
 TRIAL HARBOUR
 GEOLOGICAL MAP
 506040 75-1114. 1179

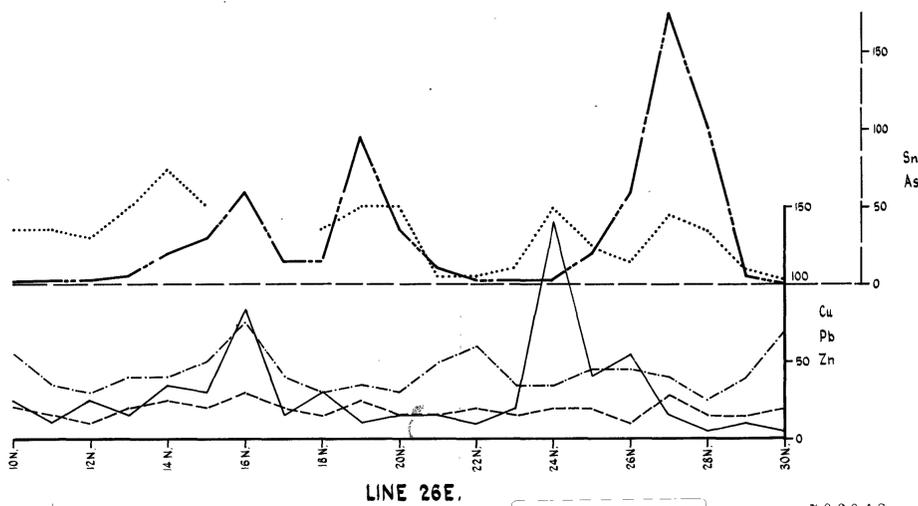
Drawn H WELLS
 Traced R G WILSON
 Checked
 Date 27.8.75
 Scale 1" = 20,000

FIG. 2

(Based on Tas Mines Dept. 1" = 1 mile Zeenon sheet)



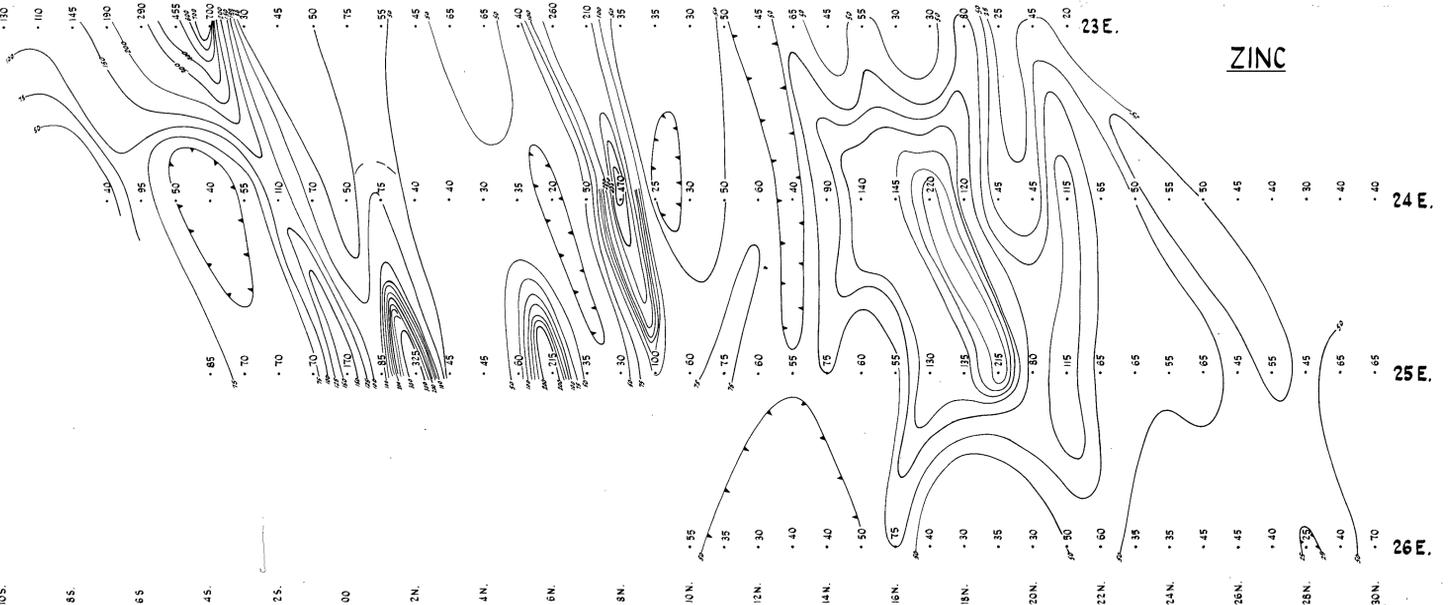
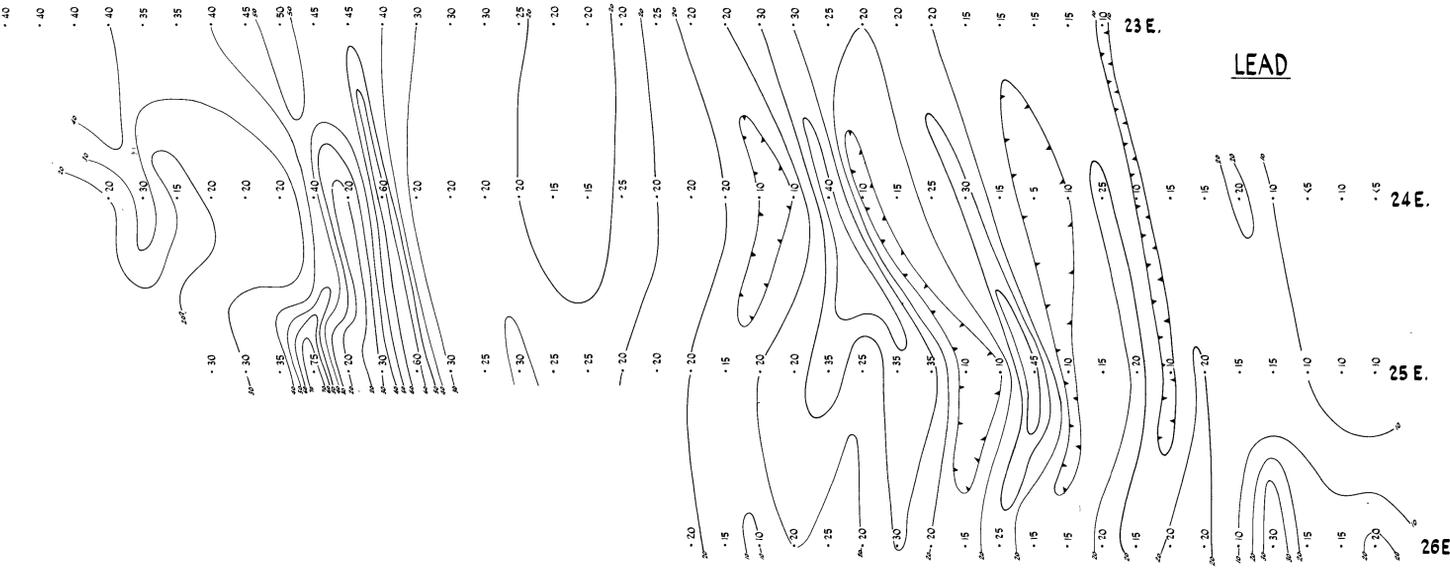
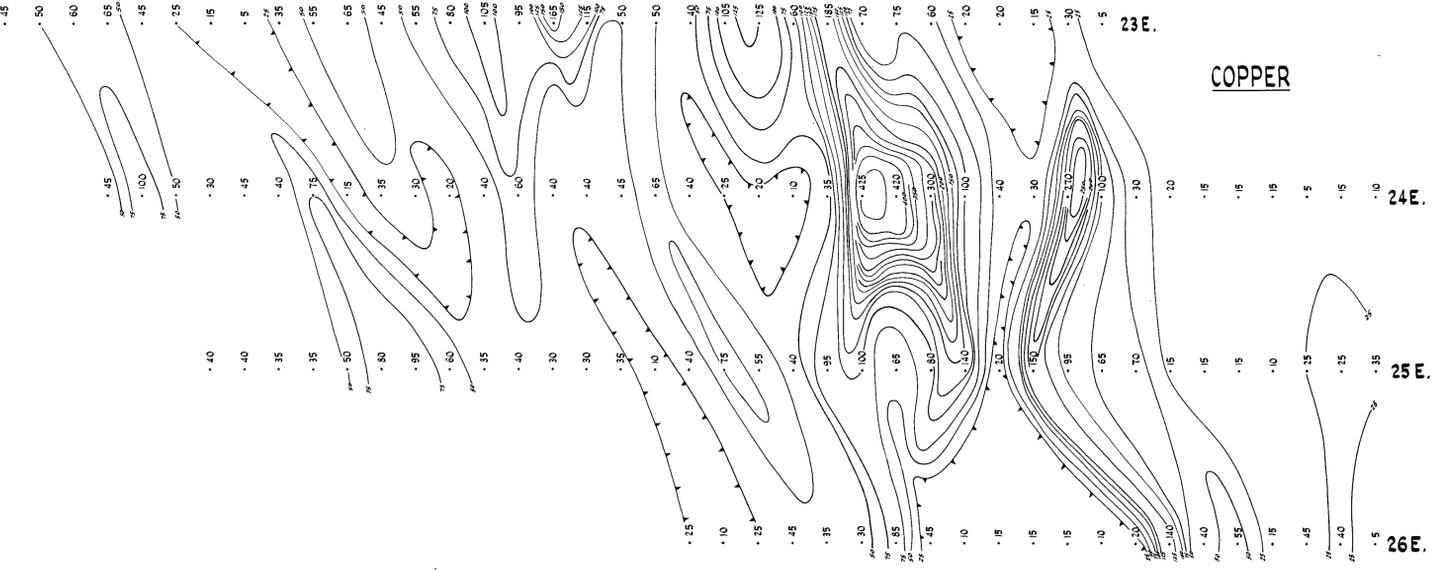
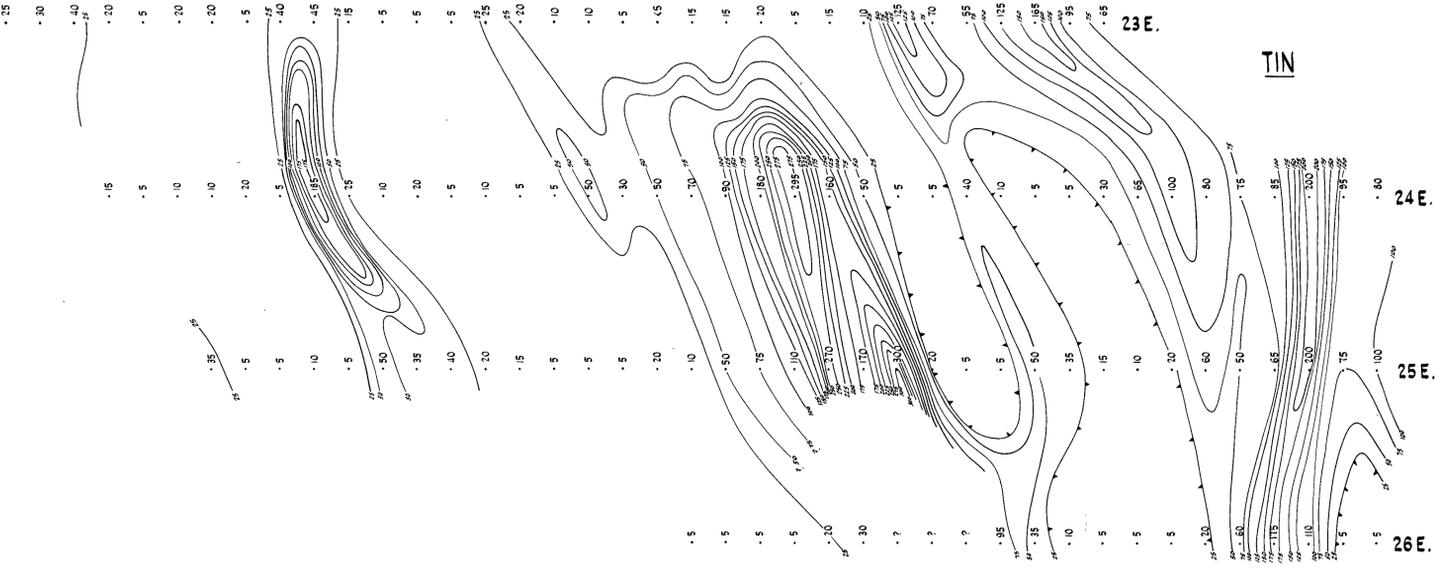
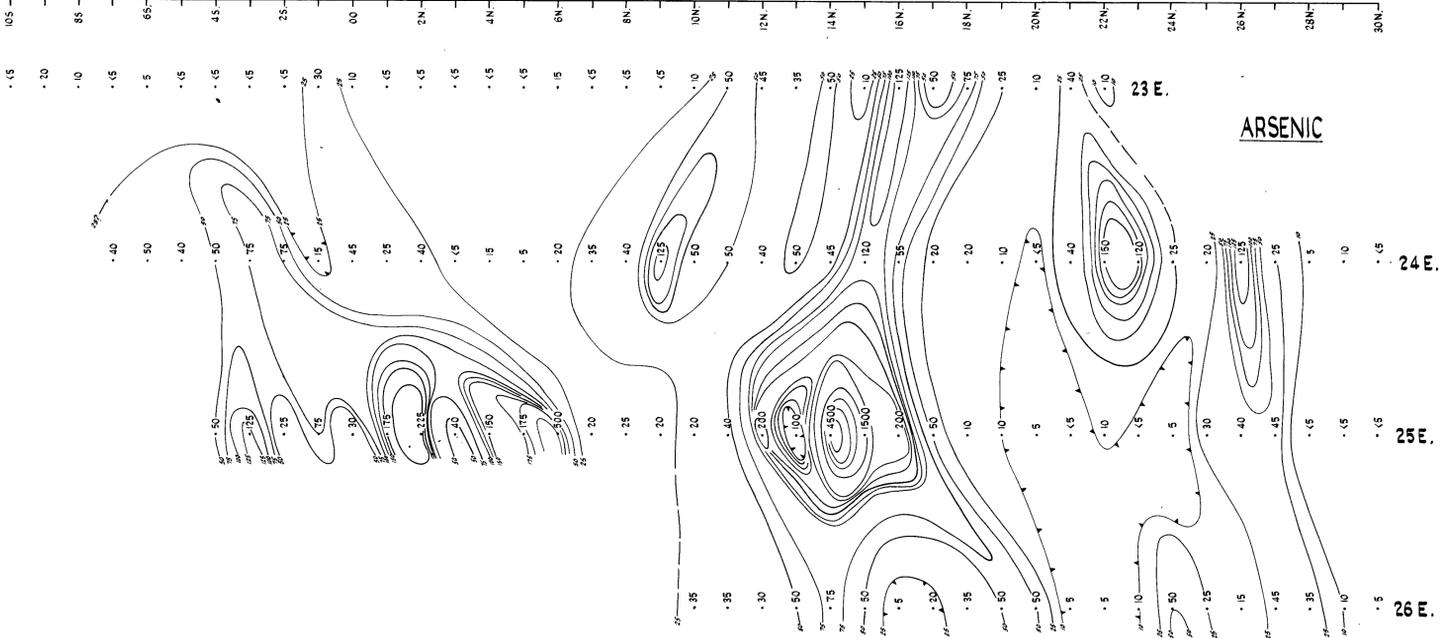
— TIN
 - - - ARSENIC
 — COPPER
 - - - LEAD
 - - - ZINC



5 cm

506042
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MT. LYELL - RENISON LIMITED EXPLORATION DEPARTMENT		DRAWN: N. WELLS. TRACED: R. G. WILSON.
TRIAL HARBOUR S.P.L. 129 AREA D SOIL GEOCHEMISTRY LINE PROFILES		CHECKED: DATE: 6-10-75 SCALE: 1:2400
1181		FIG. 4A



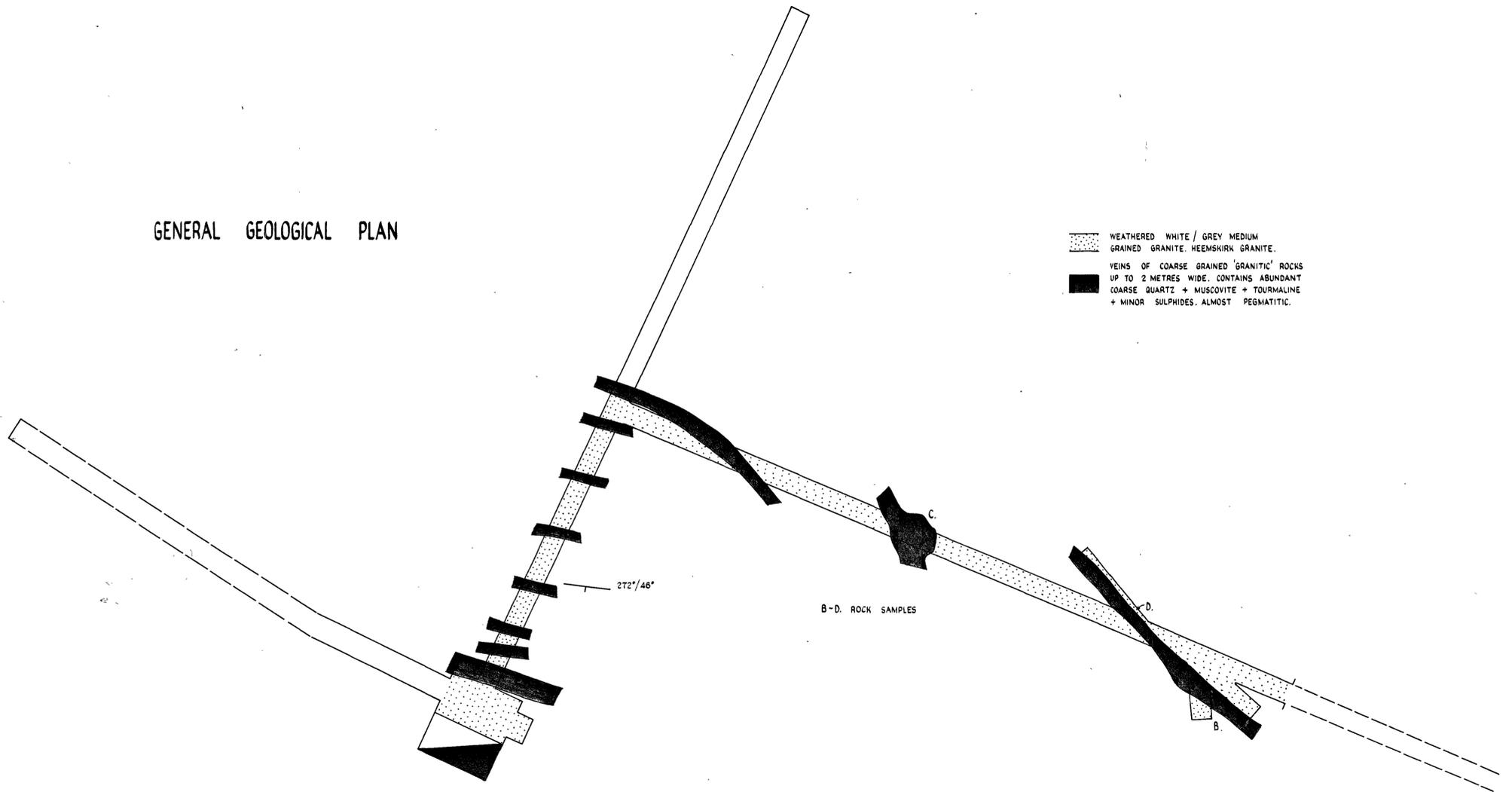
506043

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MT. LYELL - RENISON LIMITED		DRAWN: K. WELLS
EXPLORATION DEPARTMENT		TRACED: R.G. WILSON
TRIAL HARBOUR S.P.L. 129		CHECKED:
AREA D		DATE: 28-9-75
SOIL GEOCHEMISTRY		SCALE: 1:2400
CONTOURS		1182
		FIG. 4B

GENERAL GEOLOGICAL PLAN

WEATHERED WHITE / GREY MEDIUM GRAINED GRANITE, HEEMSKIRK GRANITE.
 VEINS OF COARSE GRAINED 'GRANITIC' ROCKS UP TO 2 METRES WIDE. CONTAINS ABUNDANT COARSE QUARTZ + MUSCOVITE + TOURMALINE + MINOR SULPHIDES, ALMOST PEGMATITIC.

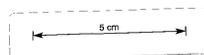
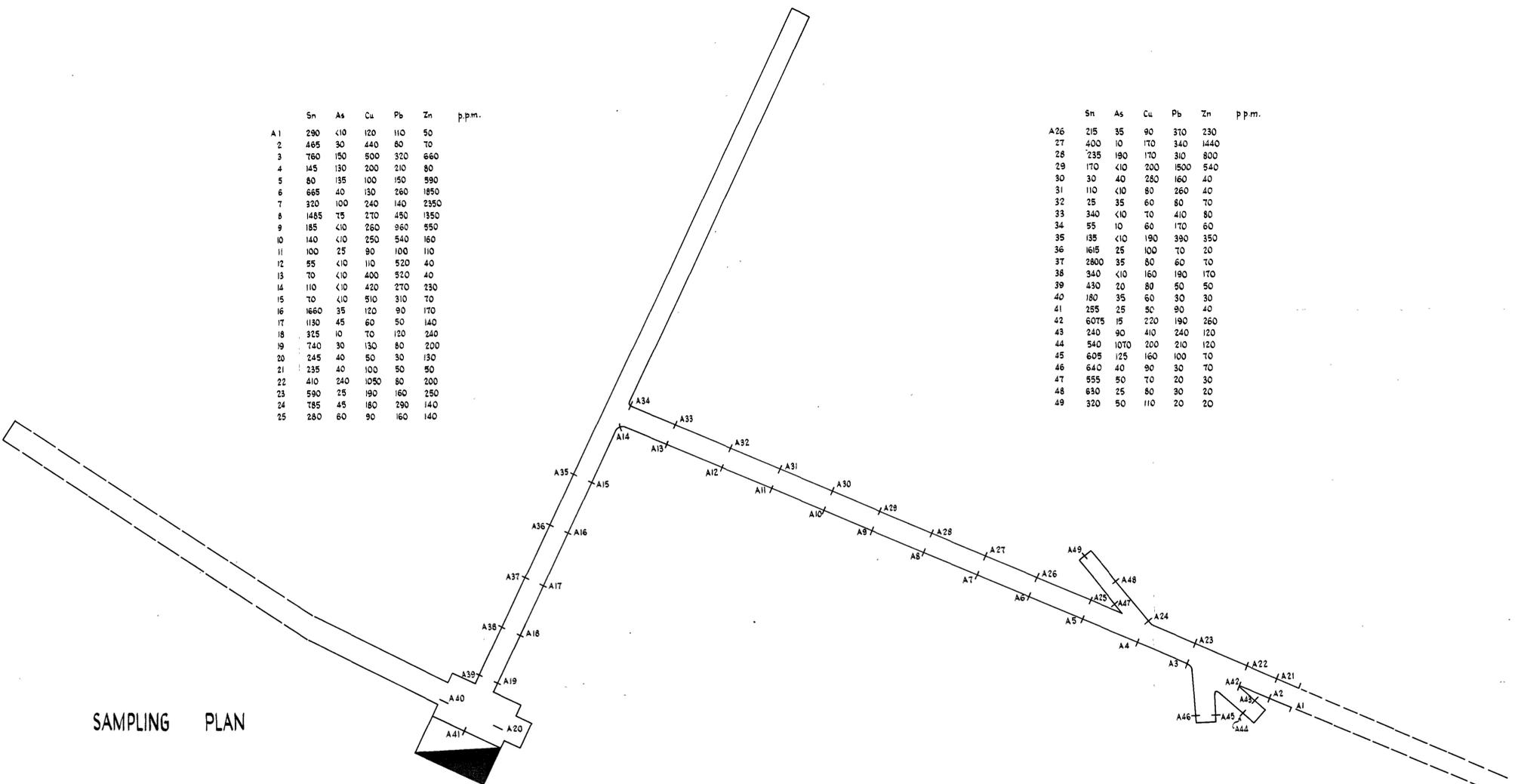


B-D. ROCK SAMPLES

	Sn	As	Cu	Pb	Zn	ppm.
A1	290	<10	120	110	50	
2	465	30	440	80	70	
3	760	150	500	320	660	
4	145	130	200	210	80	
5	80	135	100	150	590	
6	665	40	130	260	1850	
7	320	100	240	140	2350	
8	1485	75	270	450	1350	
9	185	<10	260	960	550	
10	140	<10	250	540	160	
11	100	25	90	100	110	
12	55	<10	110	520	40	
13	70	<10	400	520	40	
14	110	<10	420	270	230	
15	70	<10	510	310	70	
16	1660	35	120	90	170	
17	1130	45	60	50	140	
18	325	10	70	120	240	
19	740	30	130	80	200	
20	245	40	50	30	130	
21	235	40	100	50	50	
22	410	240	1050	80	200	
23	590	25	190	160	250	
24	785	45	180	290	140	
25	280	60	90	160	140	

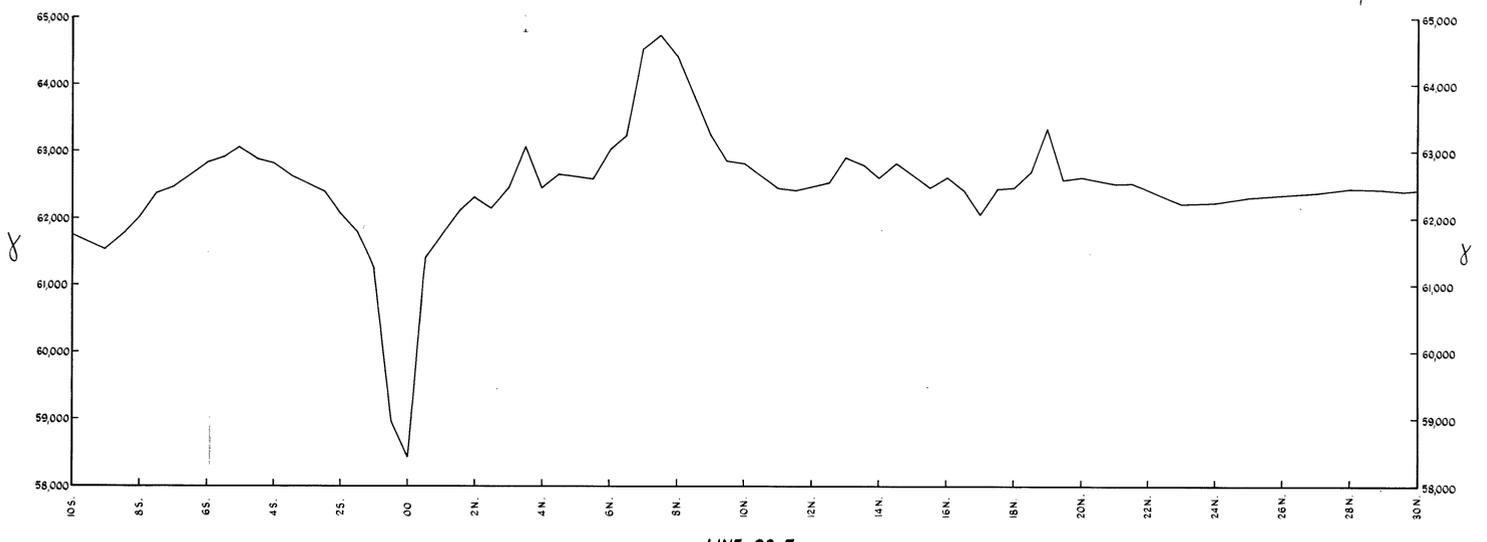
	Sn	As	Cu	Pb	Zn	ppm.
A26	215	35	90	370	230	
27	400	10	170	340	1440	
28	235	190	170	310	800	
29	170	<10	200	1500	540	
30	30	40	260	160	40	
31	110	<10	80	260	40	
32	25	35	60	80	70	
33	340	<10	70	410	80	
34	55	10	60	170	60	
35	135	<10	190	390	350	
36	1615	25	100	70	20	
37	2800	35	80	60	70	
38	340	<10	160	190	170	
39	430	20	80	50	50	
40	180	35	60	30	30	
41	255	25	50	90	40	
42	6075	15	220	190	260	
43	240	90	410	240	120	
44	540	1070	200	210	120	
45	605	125	160	100	70	
46	640	40	90	30	70	
47	555	50	70	20	30	
48	630	25	80	90	20	
49	320	50	110	20	20	

SAMPLING PLAN

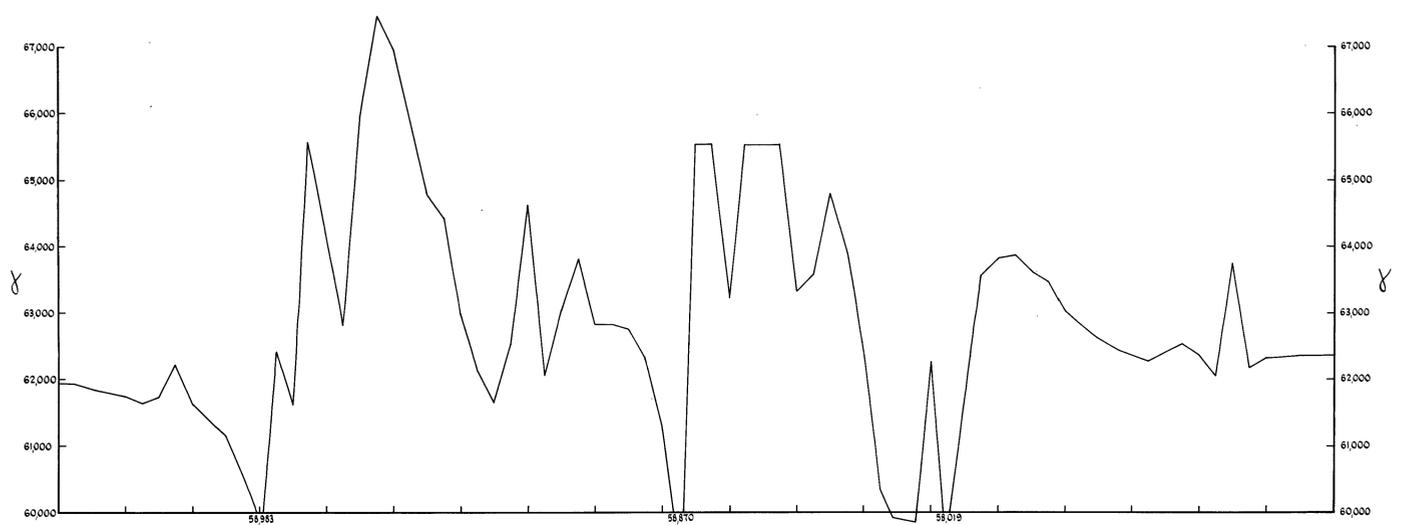


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 75-1114
 MT. LYELL - RENISON LIMITED
 EXPLORATION DEPARTMENT
 TRIAL HARBOUR S.P.L. 129
 AREA D
 ORIENT MINE 1183
 GEOLOGICAL MAPPING & GRAB SAMPLING
 DRAWN. P. BROPHY.
 TRACED. R.G. WILSON.
 CHECKED.
 DATE. 17/19/75
 SCALE. 1:100
 FIG. 5

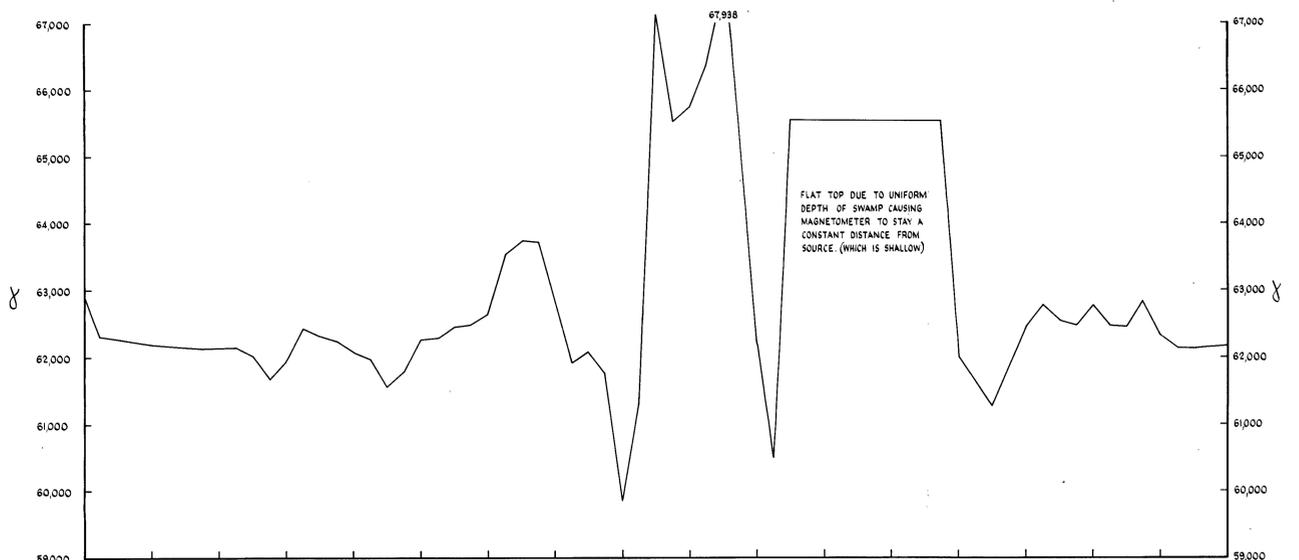
1184



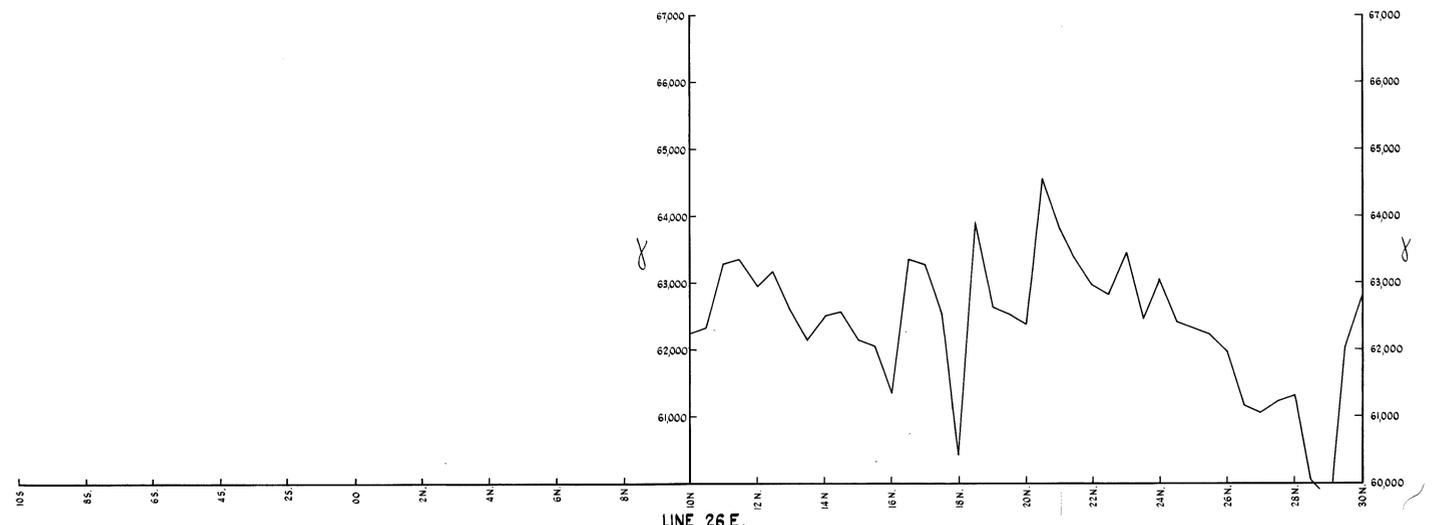
LINE 23 E.



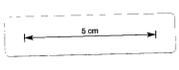
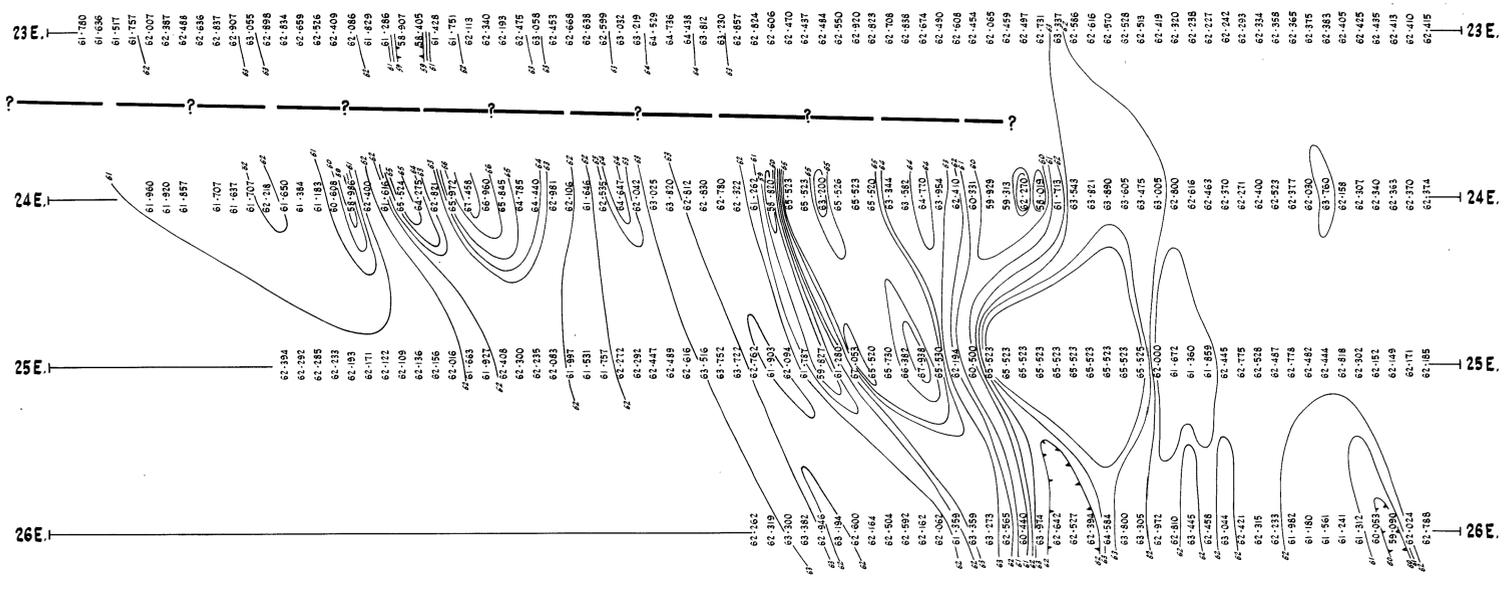
LINE 24 E.



LINE 25 E.

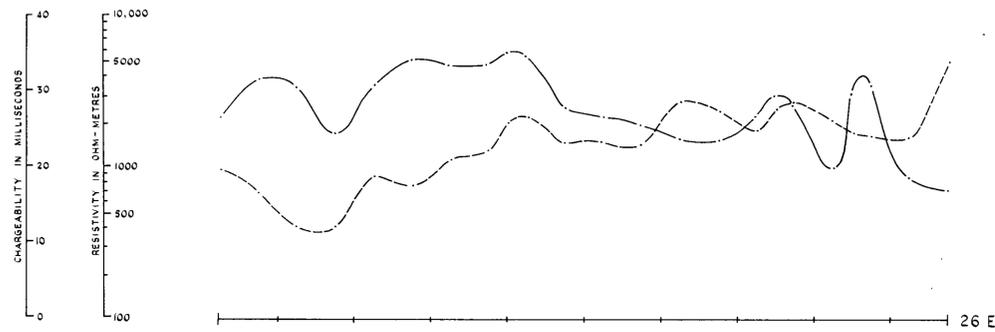
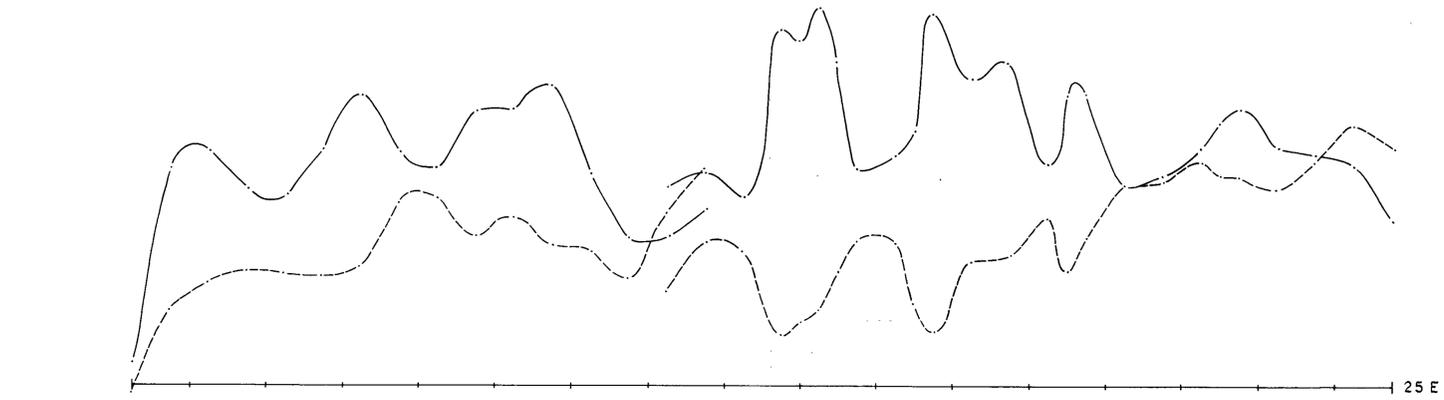
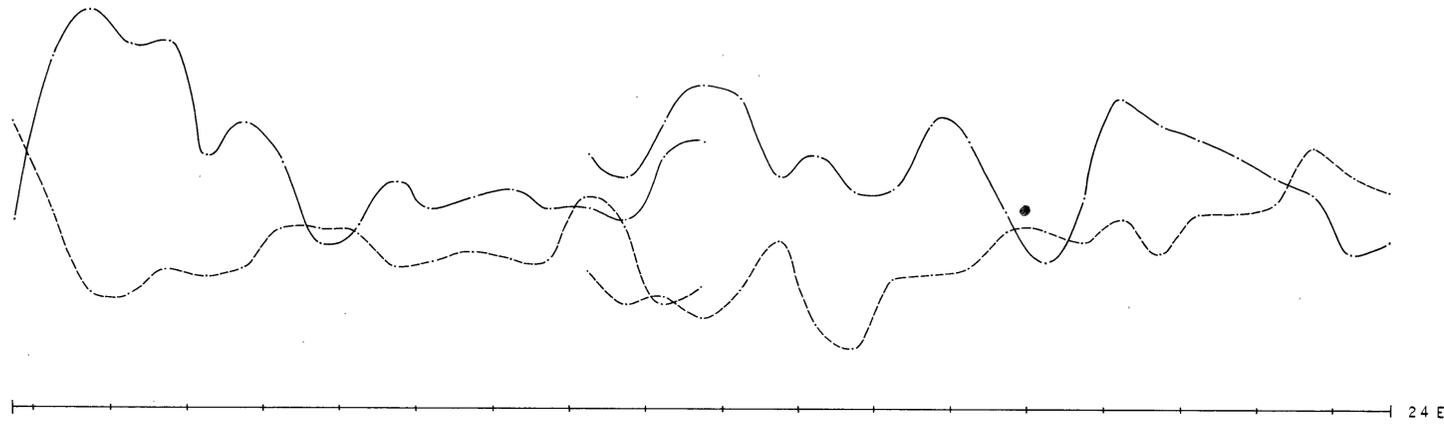
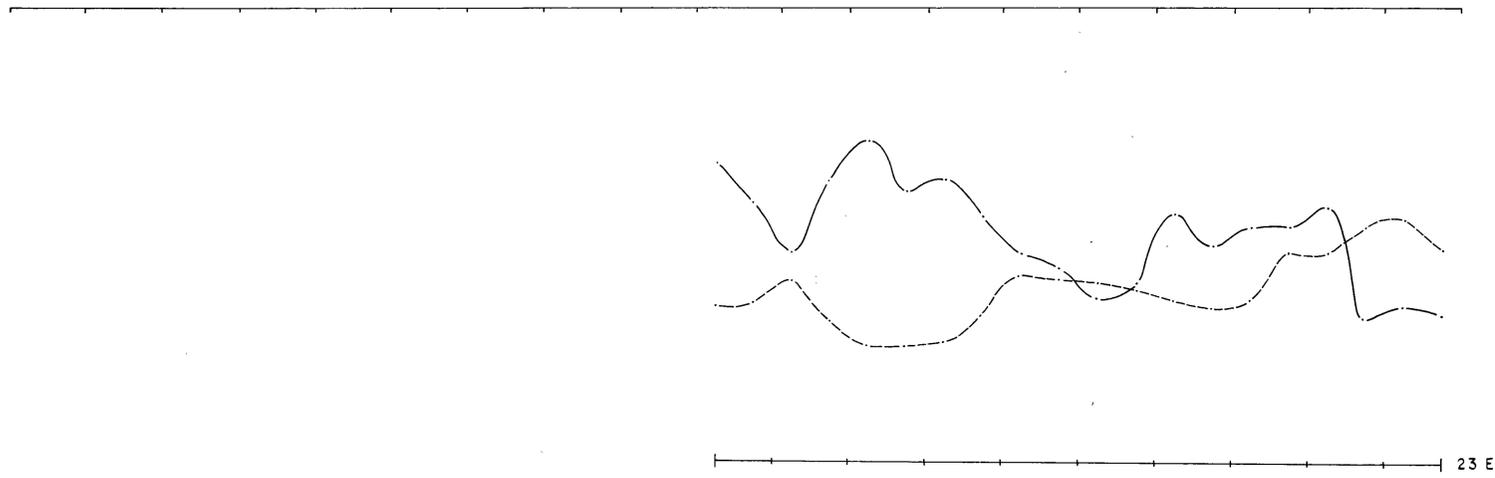


LINE 26 E.

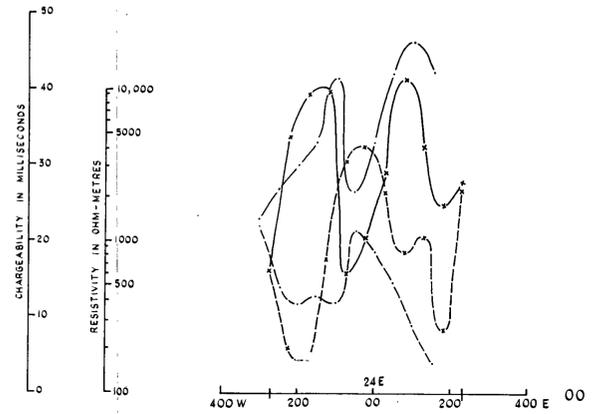


506015
75-1114

MT. LYELL - RENISON LIMITED EXPLORATION DEPARTMENT		DRAWN: K.WELLS. TRACED: R.G.WILSON.
S.P.L. 129 TRIAL HARBOUR AREA D		CHECKED: DATE: 22/9/75 SCALE: 1:2400
1184 GROUND MAGNETICS - PROFILES & CONTOURS		FIG. 6



GRADIENT ARRAY

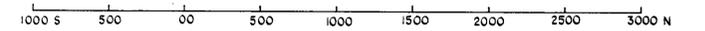
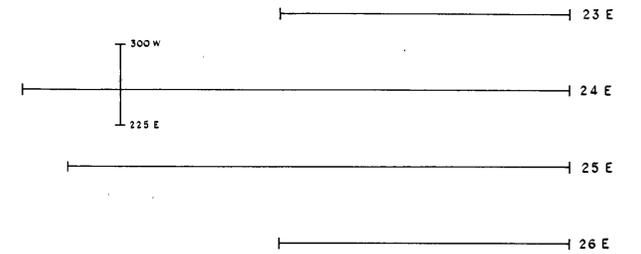


POLE - DIPOLE

(THREE ARRAY)

a = 50' ————

a = 100' - - - -

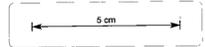


GRID MAP
1" = 500'

LEGEND

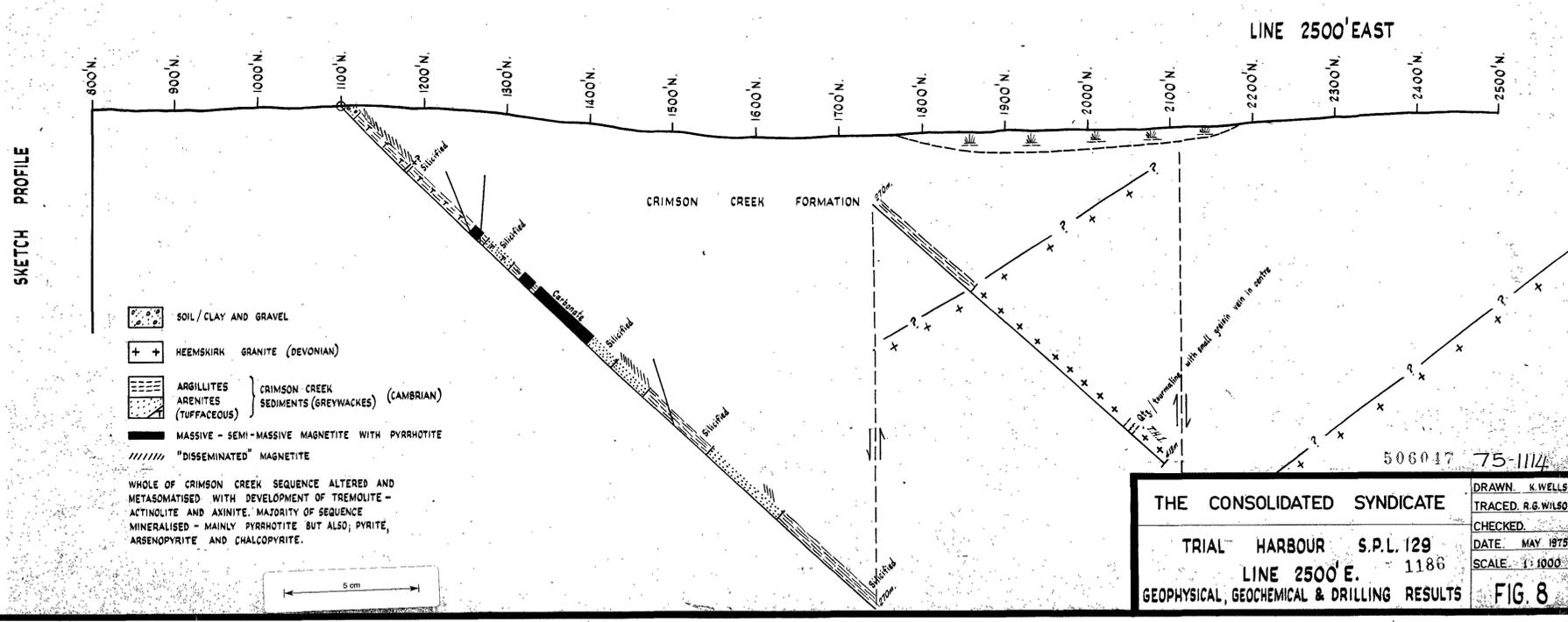
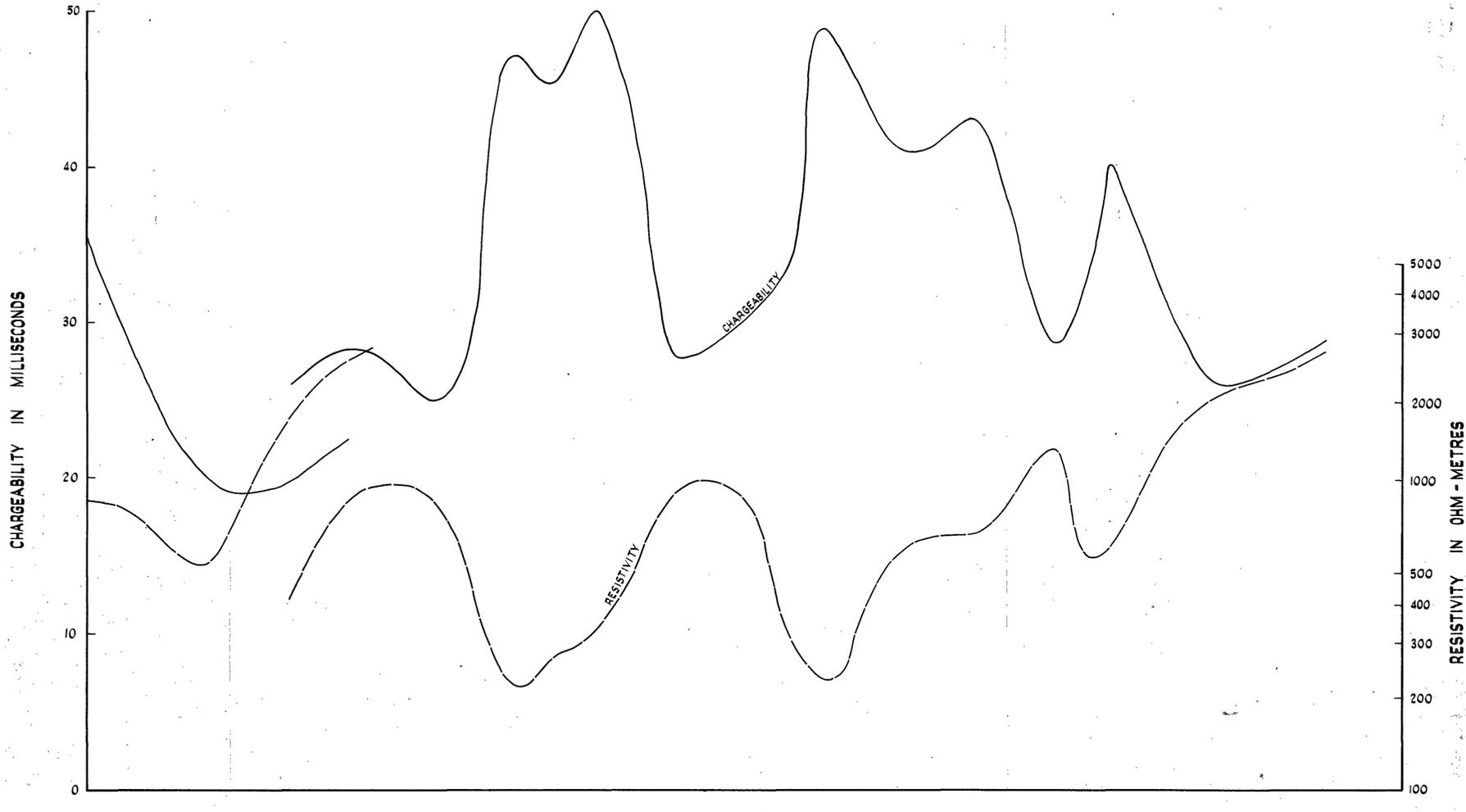
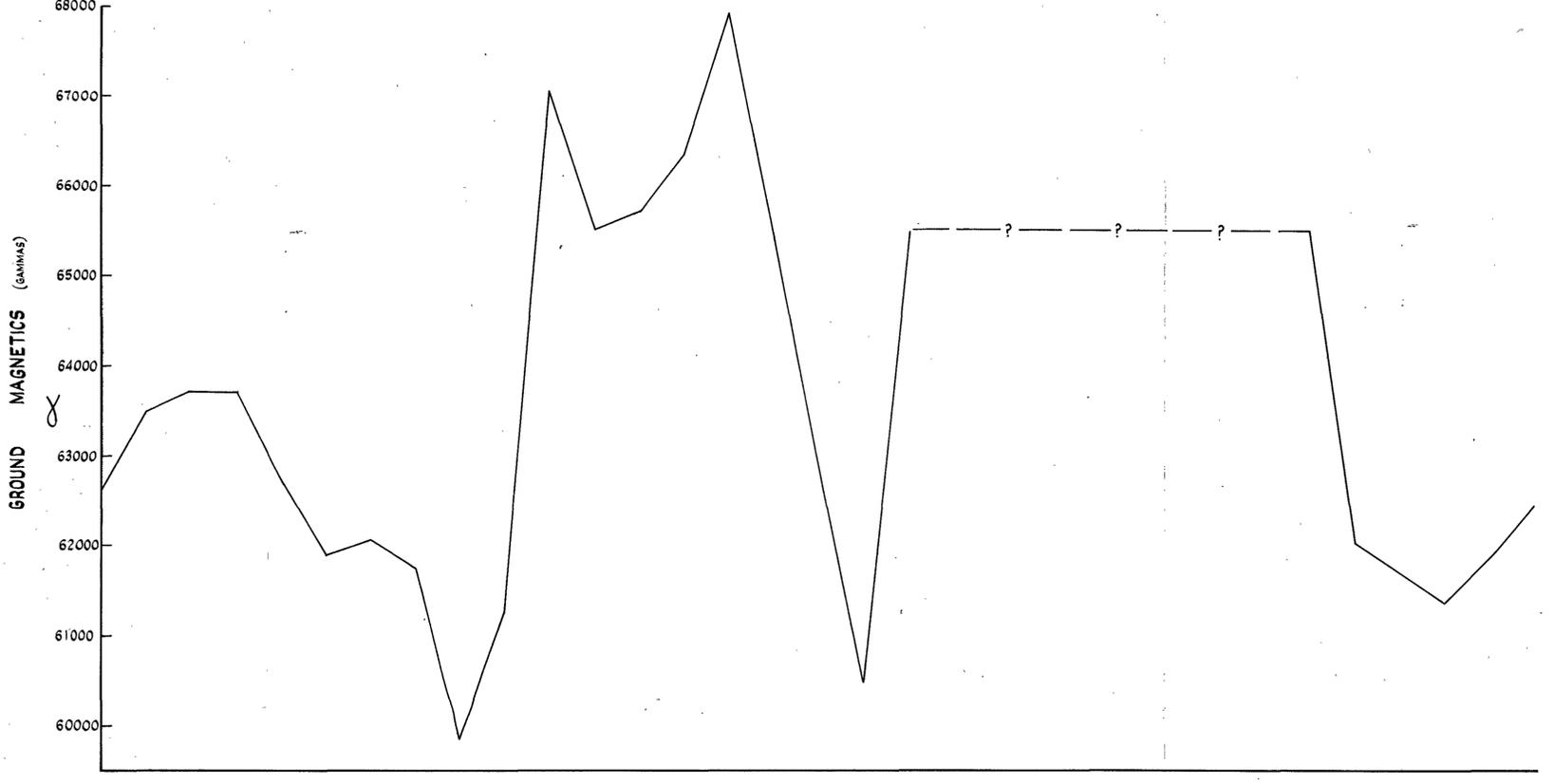
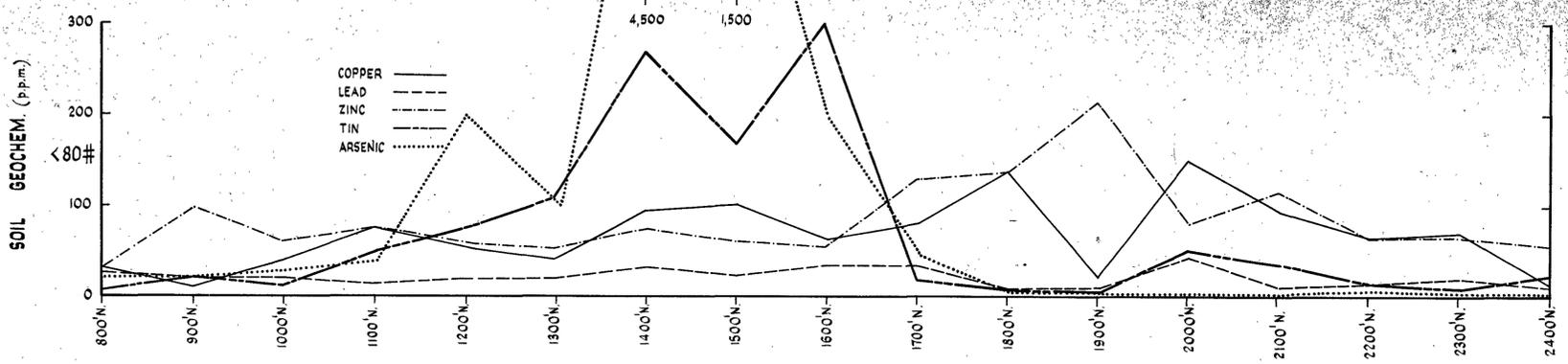
- Chargeability, 1" = 10 milliseconds
- Base level = 0
- Symbol = ————

- Resistivity, 2" = 1 logarithmic cycle
- Base level = 100 ohm-metres
- Symbol = - - - -



50604G
75-1114

MT. LYELL - RENISON LIMITED		DRAWN: SCINTREX PVT. LTD.
EXPLORATION DEPARTMENT		TRACED: R.G. WILSON
TRIAL HARBOUR S.P.L. 129		CHECKED:
AREA D		DATE: 12/9/75
1185		SCALE: 1: 2400
INDUCED POLARIZATION PROFILES		FIG. 7

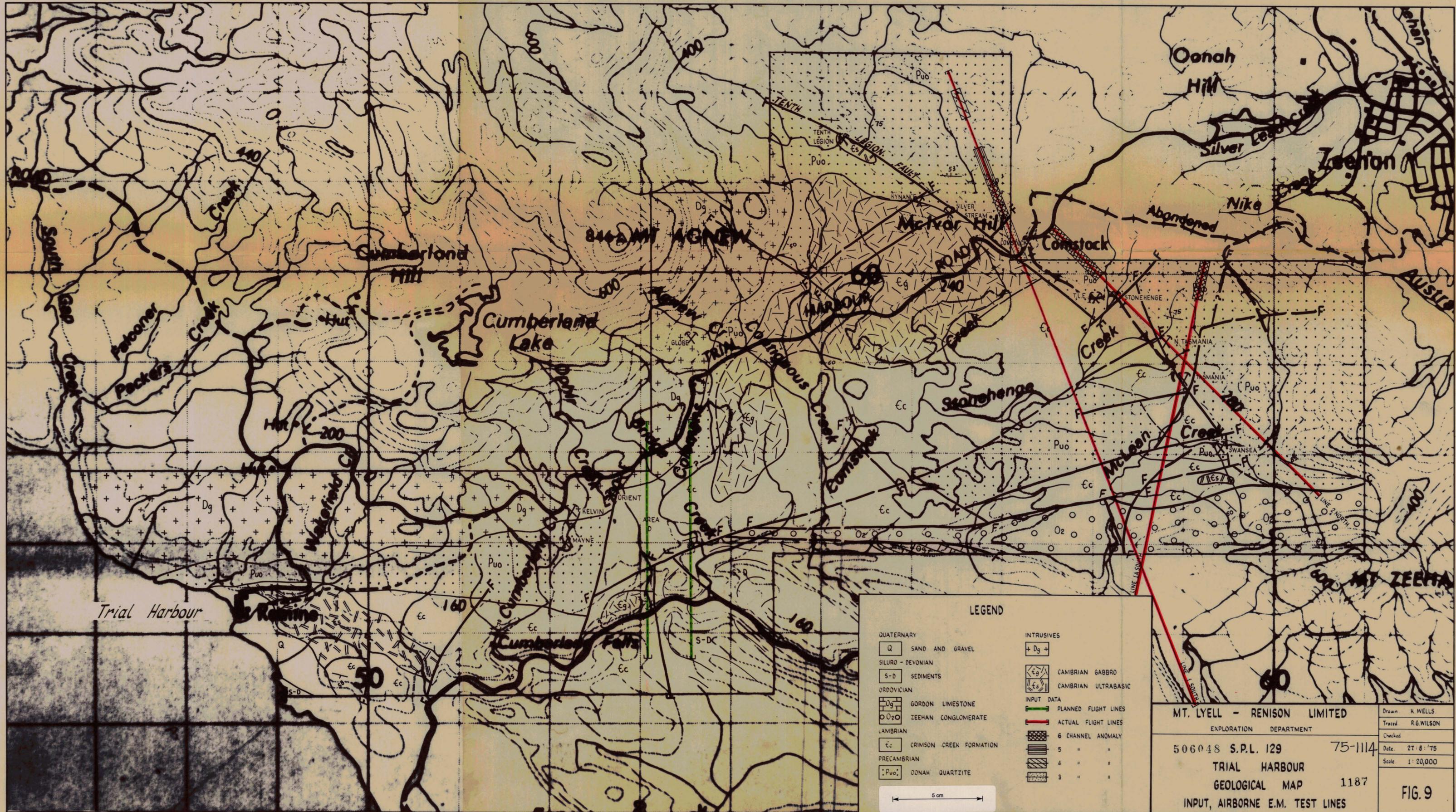


506017 75-1114

THE CONSOLIDATED SYNDICATE
 TRIAL HARBOUR S.P.L. 129
 LINE 2500' E. 1186
 GEOPHYSICAL, GEOCHEMICAL & DRILLING RESULTS

DRAWN: K. WELLS
 TRACED: R. G. WILSON
 CHECKED:
 DATE: MAY 1975
 SCALE: 1:1000

FIG. 8



LEGEND

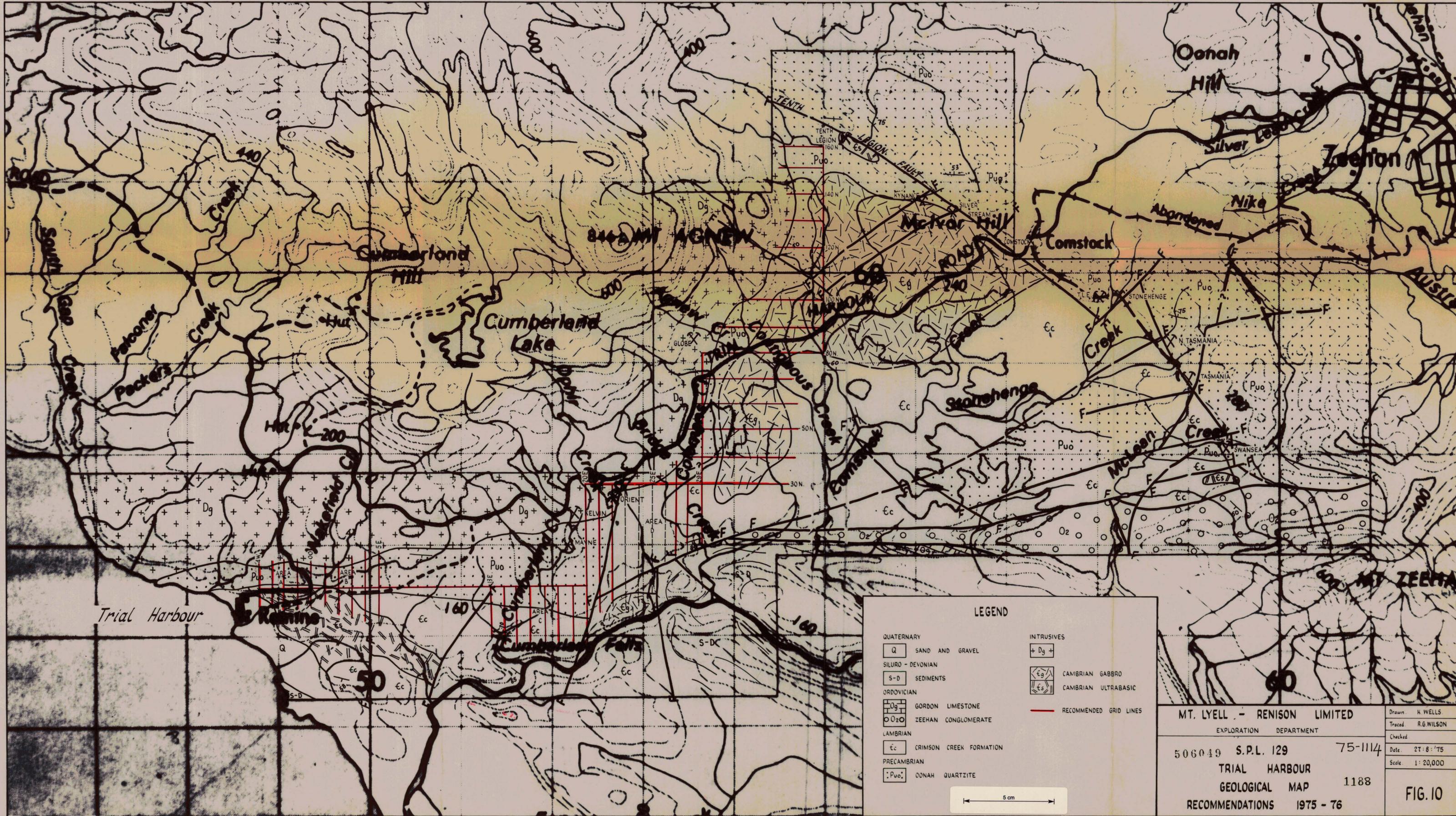
- | | |
|----------------------------|------------------------|
| QUATERNARY | INTRUSIVES |
| Q SAND AND GRAVEL | + Dg + |
| SILURO - DEVONIAN | εg CAMBRIAN GABBRO |
| S-D SEDIMENTS | εs CAMBRIAN ULTRABASIC |
| ORDOVICIAN | INPUT DATA |
| Dg GORDON LIMESTONE | — PLANNED FLIGHT LINES |
| Oz ZEEHAN CONGLOMERATE | — ACTUAL FLIGHT LINES |
| LAMBRIAN | 6 CHANNEL ANOMALY |
| εc CRIMSON CREEK FORMATION | 5 " " |
| PRECAMBRIAN | 4 " " |
| Puo OONAH QUARTZITE | 3 " " |

5 cm

MT. LYELL - RENISON LIMITED
 EXPLORATION DEPARTMENT
 506048 S.P.L. 129 75-1114
TRIAL HARBOUR
 GEOLOGICAL MAP 1187
 INPUT, AIRBORNE E.M. TEST LINES

Drawn K WELLS
 Traced R.G. WILSON
 Checked
 Date 27.8.75
 Scale 1:20,000
FIG. 9

(Based on Tas. Mines Dept. 1" = 1 mile Zeehan sheet.)



LEGEND

QUATERNARY	INTRUSIVES
Q SAND AND GRAVEL	+ Dg +
SILURO - DEVONIAN	Eg CAMBRIAN GABBRO
S-D SEDIMENTS	Es CAMBRIAN ULTRABASIC
ORDOVICIAN	— RECOMMENDED GRID LINES
Dg GORDON LIMESTONE	
O2o ZEEHAN CONGLOMERATE	
LAMBRIAN	
Ec CRIMSON CREEK FORMATION	
PRECAMBRIAN	
Puo OONAH QUARTZITE	

5 cm

MT. LYELL - RENISON LIMITED		Drawn: K. WELLS
EXPLORATION DEPARTMENT		Traced: R.G. WILSON
506049 S.P.L. 129	75-1114	Checked:
TRIAL HARBOUR		Date: 27.8.75
GEOLOGICAL MAP		1188
RECOMMENDATIONS 1975 - 76		Scale: 1:20,000
		FIG. 10

(Based on Tas. Mines Dept. 1" (mile) Zeehan sheet.)