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THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

A N N U A L R E P O R T

E.L. 9/66

1976/77

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1. INTRODUCTION

In January 1976 The Mount Lyell Mining & Railway Company Ltd. decided to joint venture its Exploration Licence areas due to a shortage of funds available for exploration. This situation arose due to the prevailing depressed world copper price.

On May 20th 1976 a Joint Venture agreement with Getty Oil Development Co. Ltd. (G.O.D.L.) became effective.

This report includes data from period 13, 1975/76 and periods 1-13, 1976/77.

Expenditure on E.L. 9/66 during 1976/77 was \$141,647 bringing the total direct expenditure on E.L. 9/66 since 1966 to \$1,014,647.

A cost summary for the period is:-

Salaries and Wages	\$ 21,144
Materials, Equipment, Facilities	8,283
Access	7,031
Geophysics	14,945
Geochemistry/Petrography	6,667
Diamond Drilling	73,211
General Costs/Burdens	7,984
TOTAL (including 6½% Indirect Costs)	\$ <u>143,508</u>

1.1 Summary

Between May 1976 and June 1977 exploration on E.L. 9/66 was confined to two major areas (Map 3). These were:-

- (i) Red Hills - Gooseneck grid.
- (ii) White Spur grid.

A three hole diamond drilling programme was initially proposed for the Red Hills area but extended to four holes following the results of R.H.5 (Section 2.1.4). In addition 2600 m (8400') of E.I.P. was undertaken in the southern extension of the Gooseneck grid and further soil sampling carried out to complete the coverage west of Red Hills.

At White Spur E.I.P. coverage of the area north of Line 28N and west of the Henty River was completed up to the Lease boundaries (48 line-Km). A detailed magnetic survey of the western anomalous part of the grid was undertaken using a detailed base station control. Soil geochemistry of anomalous zones outlined by E.I.P. was completed.

Proposed exploration for 1977/78 will focus on diamond drilling at Red Hills (5 holes planned). Additional work will be grid cutting, followed by a reconnaissance E.I.P. gradient array survey in the north-west of the Lease area.

Follow-up work has been planned for the White Spur, Henty Fault Zone, and Howards Anomaly - Zone A areas.

2. WORK COMPLETED 1976/77

2.1 Previous Work and 1976/77 Exploration Objectives

In recent years exploration in the area has been undertaken by both Rio Tinto Australia Exploration and E.Z. Co. A/Asia Ltd. between 1957 and 1962, and by Mount Lyell from 1967. A detailed description of all previous work prior to 1967 is given in the Annual Report E.L. 9/66, 1969/70.

The two main objectives of the 1976/77 planned exploration program were to carry out a three hole diamond drill program in the Red Hills area, and to carry out a reconnaissance E.I.P. gradient array geophysical survey over the White Spur grid.

2.2 Red Hills - Gooseneck Area

2.2.1 1976/77 Exploration Objectives

The diamond drilling program was designed so that, at completion, sufficient data would be available to make a major decision on future exploration priorities in the Red Hills - Gooseneck area. In addition, the area south of the Red Hills grid was given E.I.P. geophysical coverage to more accurately delineate the known anomalous zones.

In the Red Hills - Gooseneck area, two environments were considered to offer the highest potential for the occurrence of economic ore deposits (Map 4). They are:-

- (i) Pyrite-chalcopyrite-magnetite veins and dissemination within the Red Hills altered lavas (previously termed "Darwin-type" rhyolite).
- (ii) Galena-sphalerite mineralisation associated with black shale pyroclastic sequences outcropping up to 300 m west of the Red Hills altered lavas.

Two of the proposed drill holes were designed to each test one of these environments, and the third hole was planned to test the black shales and the altered contact of the lavas.

2.2.2 Access

A sub-baseline from Line 80S 3000E with four additional traverse lines were pegged to the south of the existing Gooseneck grid (Map 3). Pegging involved a total of 6,500 ft. (2000 m) and was completed by Mount Lyell personnel during October 1976.

During the early part of the field season access into the Red Hills - Gooseneck area was severely hampered by logging operations being carried out by Western Distributors, north of the Henty camp (Map 3). Following cessation of these operations at the end of December 1976 road maintenance and some minor reconstruction was necessary to re-establish vehicular access to the area.

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Should further logging be undertaken then some agreement must be reached with the operators to ensure that the road is passable at all times.

2.2.3 Surface Geology

Brief geological mapping was undertaken in specific areas during the field season (Map 4). The main black shale/siltstone horizon exposed on the Gooseneck road and at Red Hills was traced northwards and found to thin out by Line 16S. Southwards the horizon follows a distinct topographic low.

2.2.4 Diamond Drilling

The diamond drilling programme in the Red Hills-Gooseneck area was originally a three hole programme designed to cover the two most prospective mineralisation environments. Drilling was undertaken by Mt. Lyell personnel working two 10 hour shifts and using a F49J Mindrill rig. Four drillers were based at the Henty camp from January 5th to June 1st, 1977, for five days per week, and were supplied and supervised as necessary by drilling foreman R. Ritchens. Five holes were drilled, totalling 1471.4 metres with one hole being abandoned before reaching target depth as a result of excessive flattening.

Drill holes RH4 and RH5 were drilled according to the original programme. However, the mineralisation intersected in RH5 was thought to warrant immediate follow-up drill holes. RH6, RH6R and RH7 were drilled to define the extent of this initial intersection (Map 4).

Total cost of the drilling programme was \$73,211, representing a drilling cost of \$49.76/metre.

DDH RH4 (Fig. 1)

The purpose of RH4 was to test a coincident pole-dipole and gradient array IP anomaly located at Line 8S,2200E. The IP survey (CGG, 1970) also indicated a significant SP anomaly of + 65 mv.

At surface the target zone occurs within the Red Hills altered lava sequence which includes strongly chloritised volcanics with scattered disseminated pyrite. Approximately 150 m north-west, No. 1 North Adit exposed minor disseminated pyrite with isolated veins of chalcopyrite: chip sampling in 1971 included 17 m of 0.36% Cu and 15 m of 0.26% Cu.

Soil geochemistry values on Line 8S 1850-2300E averaged 191 ppm Cu (maximum 334 ppm at 2050E) c.f. a background of usually < 50 ppm over similar rock types.

R.H.4. was collared on 5th January 1977 and completed at 309.6 metres on 8th February 1977. Collar bearing was 246° mag. and collar dip 50° west.

The first 39.5 m were drilled using conventional NX equipment and the remainder with NQ wireline. The hole intersected a sequence of strongly chloritized felsic volcanics which were interpreted as lavas although alteration had obliterated original macroscopic textures. Brecciation was extensive throughout the sequence with fragments of sericitised and chloritised lava in a fine-grained chloritic groundmass. Pyrite occurred throughout as disseminations and as minor veins and was frequently associated with disseminated magnetite, particularly where brecciation was more intense. Chalcopyrite occurred as rare blebs and veins within the volcanics and associated with quartz-carbonate veining. The most significant zone of mineralisation was 1.5 m of semi-massive pyrite and chalcopyrite between 250.0 m and 251.5 m. A summary of relevant assays is given below:-

RH4 49.5 m - 57.0 m (7.5 m)  
 227 ppm Cu 352 ppm Pb 0.29% Zn 1.9% S  
 249.0 m - 252.0 m (3.0 m)  
0.89% Cu 101 ppm Pb 343 ppm Zn  
 262.5 m - 270.0 m (7.5 m)  
0.22% Cu 53 ppm Pb 278 ppm Zn

No problems were encountered with drill hole deviation although accurate bearings could not be determined due to the magnetite.

DDH RH5 (Fig. 2)

RH5 was designed to test the pole-dipole IP anomaly on Line 32S, 1800E caused by the black shale/siltstone outcropping on the road 200 m to the north. These sediments had been intersected by previous drilling to the south by R.T.A.E. and E.Z. between 1957 and 1959 and had recorded values up to 0.4% Pb and 0.15% Zn. Selective chip sampling of the shale horizons had shown values up to 1.2% Zn.

Soil geochemistry results showed some anomalous Pb values over the IP anomalous zone (1800E, 200 ppm Pb; 1950E, 330 ppm Pb), but low Zn values (1800E, 50 ppm Zn maximum).

In addition RH5 was planned to intersect the contact with the Red Hills altered lavas in the vicinity of No. 2W Adit to the east of the sediments. However, due to problems with site preparation, the collar was moved 80 m north.

RH5 was collared on 14th February 1977, and completed on 28th February 1977 at a depth of 237.7 m. Collar bearing 102° (true), collar dip - 50° E. The hole was completed using NQ wireline equipment.

Summary of RH5 log:-

0-30.1 m: medium grained crystal lithic felsic tuff.  
 -66.7 m: carbonaceous and pyritic black shales (cause of pole-dipole EIP anomaly on Line 32S).

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- 122.6 m: altered felsic quartz sericite chlorite tuff.
- 178.6 m: fine grained vitric and/or siliceous, and coarse grained tuffs.
- 195.7 m: brecciated altered lavas.
- 208.2 m: fine grained siliceous sediments including 3 m sphalerite-galena at 196.0 - 199.0 m.
- 221.1 m: coarse grained - agglomeratic tuffs.
- 237.7 m: brecciated altered felsic lavas.

Assay Summary:-

196.0 - 199.0 m: 3 m @ 0.30% Cu  
 11.2% Pb  
 31.8% Zn  
 154 g/t Ag  
 5.8 g/t Au

Very low assay values elsewhere throughout the hole i.e. <0.1% metal. (See Appendix I for detailed assay results).

Lithology and mineragraphy report by Amdel (Service Report MP 3223/77) describes the massive sulphide rocks and the volcanic rocks. (Appendix II).

D.D.H. R.H.6R (Fig. 2)

The drill hole target was the down-dip extension of the mineralisation intersected in R.H.5, approximately 100 m below R.H.5.

Collar co-ordinates: ~2900'S 1000'E; bearing 83°, dip -55°E. The bearing of 83° (c.f. R.H.5 bearing 102°) was chosen in order to drill perpendicular to the shale horizon and general foliation trend. This caused a horizontal displacement of the target of 95 m to the north.

The hole was collared on March 16th and completed on April 28th at a depth of 453.85 m. R.H.6 was drilled to 157.25 m and stopped because of excessive flattening. R.H.6R was commenced from 9.0 m down R.H.6 and was drilled out of the original hole using NX casing equipment. Whole core from R.H.6R was recovered at 26.5 m.

Summary of R.H.6R log:-

- 0-275.8 m: mainly fine grained tuffs to agglomerates, and tuffaceous sediments, with minor felsic lavas, and narrow intermediate intrusives.
- 308.6 m: medium grained tuffs, with minor disseminated sphalerite and galena.
- 315.0 m: fine grained tuffs, sediments and lavas.
- 321.1 m: altered coarse grained tuffs (equivalent to the R.H.5 intersection) with disseminated sphalerite.
- 368.9 m: coarse grained tuffs and agglomerates, with fine grained tuff and tuffaceous sediment horizons.
- 453.8 m: brecciated altered felsic lavas.

Assay Summary:-

- 274.5 - 297.0 m: 22.5 m @ 0.58% Zn, including  
276.0 - 280.5 m @ 1.04% Zn, and  
285.0 - 292.5 m @ 0.87% Pb, 0.66%  
Zn.
- 306.0 - 309.0 m: 3 m at 1.62% Zn.
- 313.5 - 328.5 m: 15 m at 0.81% Zn, including 322.7  
- 328.5 m @ 1.06% Zn.
- 357.0 - 361.5 m: 4.5 m @ 1.05% Zn.

D.D.H. R.H.7 (Fig. 3)

The drill hole target was the northward extension of the mineralisation intersected in R.H.5. The mineralised zone was intersected approximately 245 m (800') north along strike, 49 m (160') below the R.H.5 intersection.

The E.I.P. pole-dipole response over the target zone on Line 24S was moderately strong, and the geochemical soil sampling gave high but erratic Pb values (1300 - 1750E, maximum 285 ppm Pb), but very low Cu and Zn values (the Pb values may be due to a particularly high background level in these rock types).

Collar co-ordinates: Line 2400S 1000E, bearing 91°44', dip - 55°E. The hole was collared on 3rd May and completed on May 30th 1977 at a depth of 322.0 m.

Summary of R.H.7 log:-

- 0- 96.85 m: fine-coarse grained felsic lithic crystal tuffs.
- 123.50 m: alternating black shale and fine-medium grained altered pyritic felsic tuffs.
- 178.25 m: altered fine-coarse grained pyritic felsic tuffs.
- 248.50 m: fine-coarse grained felsic lithic tuffs.
- 255.15 m: altered silica sericite pyritic fine-coarse grained felsic tuffs (equivalent to R.H.5 intersection).
- 285.30 m: coarse grained siliceous tuffs.
- 322.0 m: brecciated altered felsic lavas.

Assay Summary:-

- 248.5 - 254.5 m: 6 m @ 1.87% Zn, 0.04% Pb, 0.25%  
Cu, 3.2 g/t Ag, < 0.2% Au.

Summary of Diamond Drilling at Red Hills

- (1) R.H.4 was drilled to test for pyrite-chalcopyrite-magnetite mineralisation that occurs within the "Red Hills" altered lavas. A negative result was obtained.

A total of 5 diamond, and 26 short percussion drill holes (See Annual Report E.L. 9/66, 1970/71 for PDH data) have now been completed over the area without any significant ore mineral intersections.

The area is known to contain small zones of high and low grade Cu mineralisation, but it appears unlikely that sufficient ore grade material exists to warrant further diamond drilling for this style of mineralisation under the current economic and resource availability conditions.

- (2) The potential for economic Pb-Zn mineralisation remains high after the encouraging intersection of 3 m of massive/semi-massive sphalerite-galena in R.H.5. Two holes drilled to the north (R.H.6R, R.H.7) intersected low Pb-Zn values, and it appears that the mineralised zone weakens to the north.

To the south soil geochemistry shows intermittent high Pb values, but low Cu and Zn values (similar to Line 32S, R.H.5). The CGG and Scintrex Ltd. geophysical surveys show a wide E.I.P. anomalous zone south from R.H.5 to Line 86S (1800 m, 6000' strike length). Further diamond drilling is planned for the area south of R.H.5 (see Section 3.1.1.3).

#### 2.5 Geochemistry

Soil geochemical sampling was undertaken over small sections of the Red Hills grid to complete sampling from previous years. Results from Line 08S 1800-2700E indicated anomalous Cu values (100-600 ppm Cu) coincident with the IP anomalous zone - the target for R.H.4.

The shale horizon intersected in R.H.5 was soil sampled on Lines 24S and 16S, and showed anomalous high Pb values. Line 48S, 2300-3100E was sampled to try and find the soil geochemical expression of the R.H.5 mineralised zone, but no anomalies were located.

Rock chip sampling east of R.H.5 collar position was done to try and find any surface expression of the mineralised zone. A minor Pb-Zn high occurred approximately 100 m east of the major shale horizon intersected in R.H.5, but it is not directly correlatable with the mineralised zone.

#### 2.6 Geophysics

- (1) Diamond drill hole R.H.5 was logged by E.I.P. pole-dipole to determine the geophysical characteristics of the sulphides and country rock (Fig. 4).

A summary of the information is given below:-

		Chargeability		Resistivity
		Value	x B'ground	Value
RH5 30.1-66.7 m	siltstones and shales - carbonaceous + pyrite:	90-160 m V/V	x 3	50-1000 ohm m
22.6-145.3 m	fine grained siliceous vitric tuff:	5-40		6000-25000
** 196.0-199.0 m	semi-massive and massive sphalerite-galena:	225	x 5	50
221.1-237.7 m	brecciated altered lavas:	10		12000-25000

Other rock units were fine-coarse grained variably altered felsic tuffs with no definitive characteristics e.g. chargeability range 10-90 mV/V, resistivity range 400-20000 ohm.m.

The mineralised zone (>70% sulphides) stands out very clearly, and both the shale sequence and the "Red Hills" altered lavas are well defined.

The EIP pole-dipole ground survey (CGG, 1971) picked out the wide shale band (chargeability about 30 m V/V, x 2 background, resistivity 400 ohm m), and the zone of mineralisation (chargeability 60 m V/V, x 3 background, resistivity 200 ohm m). In addition the "Red Hills" altered lavas was characterised by its very high resistivity.

## (2) Red Hills - Gooseneck Grid:

A small gradient array EIP survey was carried out by Scintrex Pty. Ltd. (Report May 1977, Tas 035 A) over Lines 80S, 86S, 92S, 98S. 8400' (2600 m) of line were surveyed over about 3 days. The area is covered with glacial moraine and Owen Conglomerate scree.

A significant EIP response was recorded on Lines 80S and 86S. These anomalies are approximately along strike from the major black shale horizon mapped to the north and intersected in RH5, and therefore may account for the EIP responses.

## 2.3 White Spur Area

### 2.3.1 Previous Work and 1976/77 Exploration Objectives

R.T.A.E. undertook detailed exploration in the White Spur area in 1959-60 which included geological mapping, gridding, ground geophysics (magnetic, turam and gravity techniques) and restricted geochemical sampling. As a result of this programme one diamond drill hole, WSP103 (Collar L 34N, 1000W) was drilled in the White Spur Creek area which intersected a black shale/pyroclastic sequence containing minor disseminated pyrite.

Recent exploration by Mt. Lyell Mining & Railway Company Ltd. commenced in 1971 with a detailed mapping programme. Between 1971 and 1976 a grid was established west of the Henty River and north of Line 28N. The line spacing was 396 m (1300') and in 1975-76 the complete grid was covered by detailed soil geochemistry and geological mapping.

Exploration objectives for 1976-77 were based on the need for a detailed complete exploration coverage of the White Spur area. The sequence is considered similar to those hosting the Rosebery and Hercules orebodies although correlation within specific units has always been a problem between White Spur and the Hercules mine, 5 km to the north.

The main need was to extend the existing grid from the Mt. Read track westwards to the E.L. 9/66 boundary and to cut intermediate lines over the complete area giving a spacing of 200 m (650'). In addition a ground geophysical coverage of the grid was necessary to support the existing geochemical coverage.

#### 2.3.2 Access

Grid cutting was undertaken by Mt. Lyell personnel working from Lake Margaret (Mr. P. Russell, leader). The grid extended from Line 28N to Line 43N and from the lease boundary in the west to the Henty River in the east (Map 3).

Three track cutters worked from 18th August 1976 to 1st October 1976 and cut a total of 29,260 metres (96,000 ft.).

#### 2.3.3 Surface Geology

A summary of the geology of the White Spur grid area is presented in the 1973/74 EL 9/66 Annual Report (N.P. Stevens-Hoare).

No field mapping was done in season 1976/77. However, extensive geochemical soil sampling has provided a large amount of new data on sub-outcrop geology. In general, rock chips from soil augering enables ready differentiation between shale/siltstones, fine grained tuffs and coarse grained felsic crystal tuffs. However, this information has not yet been collated nor interpreted.

#### 2.3.4 Geophysics

A major problem was to first isolate the most suitable ground geophysical system for this environment.

EIP has problems due to the known number of graphitic shale horizons in the area which would be likely to produce a large number of anomalous chargeability responses.

EM systems have doubtful use in environments where lead-zinc mineralisation is known to be at least partly non-conductive.

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Even without this problem, purely ground operated systems produce unreliable data due to excessive topographic variations.

The final decision was to use gradient array E.I.P. in association with detailed ground magnetics and detailed soil geochemistry. The aim of the geophysical survey was to isolate anomalous areas for follow-up geochemical soil sampling. The combination of geophysical and soil geochemical results would then allow a meaningful assessment of each anomaly.

A gradient array reconnaissance E.I.P. survey and detailed total field magnetometer survey were carried out by Scintrex Pty. Ltd. (Report April 1977, Tas-035c). 30 line miles were surveyed over 20 double crew production days.

The survey indicated (Maps 5-8) that the western third of the grid was underlain by rock units striking approximately NNW-SSE and being generally chargeable (30 + 5 milliseconds) and less resistive (700-5000 ohm m) than the eastern two thirds (resistivity 5000-20000 ohm m, abnormally low chargeability of 10 + 2½ milliseconds).

Twenty six significant anomalies were defined in the western part of the grid, and 4 were located in the eastern section. On geophysical grounds, 5 anomalous zones are considered of primary interest, and 8 are of secondary to primary interest.

The detailed magnetic survey gave little assistance to any geological interpretation of the grid area; however it was apparently useful in the interpretation of the E.I.P. data.

Correlation of the geophysical data with soil geochemistry and geological information has not been completed. It is envisaged that intermediate lines may require cutting and further geophysics and geochemical work be conducted over the more encouraging anomalies to more closely define possible diamond drilling targets.

#### 2.3.5 Geochemistry

The western section of the grid has been completely covered by geochemical soil sampling, with 56000' of line sampling being done during 1976/77.

The results have not been fully interpreted, however several geophysical E.I.P. anomalous zones have corresponding Pb and/or Zn soil geochemical anomalies (to 1500 ppm Pb, 300 ppm Zn) usually associated with black shale horizons (Map 9).

The soil sampling programme appears to have isolated potential Pb/Zn mineralisation from the relatively large number of geophysical E.I.P. anomalous zones that occur in the western part of the grid.

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2.4 Exploration Costs B.L. 9/66, 1976/77

P13 3.6.76 - 30.6.76	\$
Salaries	1078
Materials	20
Equipment and Facilities	180
Burden A: direct labour o'heads	245
Burden B: employee benefits	178
	<hr/>
	1700
	<hr/>
TOTAL (+ 6½% Indirect Costs)	\$ 1810
	<hr/> <hr/>

P1 - P13 1.7.76 - 29.6.77

Wages *	109
Salaries *	19957
Materials *	1477
Access *	7031
Geophysics *	14945
Geochemistry/Petrography *	6667
General Costs	912
Equipment and Facilities *	6616
Burden A *	3862
Burden B *	2787
Diamond Drilling	73211
	<hr/>
	137574
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TOTAL (+ 6½% Indirect Costs *)	\$ 141698
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3. PROPOSED EXPLORATION PROGRAMME 1977/78

Three main work programmes are planned for 1977/78:

- (i) diamond drilling at Red Hills - Gooseneck,
- (ii) grid cutting and reconnaissance geophysics in the north west corner of the Lease,
- (iii) follow-up detailed geophysics and soil geochemistry in the western part of the White Spur Grid in order to define possible diamond drill targets.

Other work involves geochemical soil sampling in the Henty Fault Zone, and Howard's Anomaly - Zone A areas, and a re-appraisal of these prospects.

3.1 Red Hills - Gooseneck Area

3.1.1 Access

- (a) Road maintenance will be needed occasionally throughout the year.
- (b) Drill site access and construction will be required as detailed in Section 3.1.3.
- (c) Some grid cutting may be required for geophysical mapping using a down-the-hole electrode. This would be a small footage, and probably carried out by Mt. Lyell employees.

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3.1.2 Geophysics

If it is practicable, on surface delineation of the mineralised zone intersected in R.H.5 using a down-the-hole electrode will be done. This operation may be repeated in subsequent drill holes if necessary.

3.1.3 Diamond Drilling

The diamond drilling programme is designed to test the mineralised pyroclastic-sediment horizon intersected in R.H.5. Refer to Map 4; Fig. 5.

Two exploration phases are outlined below:

- (i) the close testing of the R.H.5 intersection to establish whether close-spaced detailed drilling is warranted,
- (ii) exploration drilling to test the mineralised zone up to 6000' (1800 m) south of R.H.5.

Phase (i)

Collar locations are approximately:-

- A. Line 33S, 1800'E. Length 250 m. Target 120 m south, R.L. + 20 m from R.H.5 intersection.
- B. Line 34.3S, 1120'E. Length 400 m. Target 100 m below R.H.5 intersection.
- C. Line 30.5S, 1800'E. Length 150 m. Target 85 m above R.H.5 intersection.

Phase (ii)

- 1. Line 34.3S, 1120'E. Length 300 m. Target 120 m south, R.L. 100 m below R.H.5 intersection.
- 2. Line 41S, 1900'E. Length 300 m. Target 350 m south of R.H.5 intersection.
- 3. Line 55S, 2600'E. Length 300 m. Target 350 m south of R.H.5 intersection.
- 4. Line 41S, 3100'E. Length 300 m. Target 1340 m south of R.H.5 intersection.
- 5. Line 86S, 3300'E. Length 400 m. Target 1800 m south of R.H.5 intersection.

Two diamond drill rigs will be employed; the first two holes drilled will be Phase (ii) numbers 1 and 2. The results from these two holes will determine the succeeding order of drilling.

Initially five drill holes are planned, with a total length of 1600 m.

Costs:	Drilling (at \$55/m)	\$ 88,000
	Access	1,800
	Assay	600
		<hr/>
	TOTAL	\$ 90,400
		<hr/>

3.1.4 Geochemistry

Soil sampling of the southern section of the Red Hills grid will be completed. Cost: approx. \$100.

3.1.5 Costs

Access	\$ 1,800
Geophysics	-
Geochemistry	700
Diamond Drilling	88,000
	<hr/>
TOTAL	\$ 90,500
	<hr/> <hr/>

3.2 White Spur Grid

3.2.1 Access

- (a) Road access will need upgrading if much work is warranted in the north-western part of the grid.
- (b) Track cutting of intermediate lines over coincident geophysical E.I.P. gradient array and soil geochemical anomalies is anticipated on the western section of the grid. 10 lines, each 1000' long i.e. 10,000' (3000 m). Track cutting by Mount Lyell personnel.

3.2.2 Geophysics

A detailed E.I.P. gradient array survey over anomalous zones outlined in 1976/77 will be done using intermediate lines of 200' or 300' spacing. Approximately 3 line-miles (5 line-Km) of survey will be required. Cost at \$400/Km is \$2000.

3.2.3 Geochemistry

- (a) Completion of the soil sampling program over an E.I.P. anomalous zone in the eastern part of the grid (approx. 70 samples).
- (b) Follow-up geochemistry on the intermediate lines on the western part of the grid, depending on the results of the detailed geophysical survey.

Costs: \$1.35 per sample (a) \$100  
 (b) \$150

TOTAL \$250

3.2.4 Geology

- (a) Interpretation of the geology, geophysics and geochemistry of the western section of the grid to define possible drilling targets and/or areas for further geochemical/geophysical surveys.
- (b) Interpretation of known geology in relation to information to the north of the grid area, including the Hercules Mine area; and possible mapping of selected areas.

017

3.2.5 Costs

Access	Road maintenance part of Red Hills costs; track cutting by Mount Lyell personnel.
Geophysics	\$ 2,000
Geochemistry	\$ 250
<b>TOTAL</b>	<b>\$ 2,250</b>

3.3 Red Hills North

The area north of the Red Hills and Henty Fault Zone grids (Map 3) and extending to the northern Lease boundary is known to contain Mount Read Volcanics. The Cu bearing "Red Hills" altered lavas, the Red Hills - Gooseneck Pb/Zn bearing pyroclastic-sediment sequence, and the two Henty Fault Zone mineralisation styles (Cu in altered tuffs, Cu-Pb-Zn in siliceous altered sediments) all strike north into the new grid area. The area is therefore considered highly prospective. No old workings are known in the area.

3.3.1 Access

- (a) No additional road access is required.
- (b) Grid cutting: the grid numbering is a northern extension of the existing Mount Lyell Red Hills grid. The new grid will extend to the western Lease boundary, and will adjoin the northern line of the Henty Fault Zone grid (Line 66N0.

A grid spacing of 600' (180 m) is used; two western sub-baselines will be cut to provide access to the western section of the grid.

Total length of traverse lines	79400' (24000 m)
Total length of sub-baselines	7400' (2300 m)
<b>TOTAL</b>	<b>86800'</b>

Grid cutting will be contracted to Lake Margaret track cutters (Leader P. Russell) at \$200/Km. Cost \$5,260.

3.3.2 Geophysics

A reconnaissance E.I.P. gradient array survey over the Red Hills north grid is proposed. Approximately 24 Line-Km will be surveyed. Cost at \$400/Line-Km is \$9,600.

3.3.3 Geochemistry

Follow-up geochemical soil sampling of the grid will be carried out, depending upon the results of the reconnaissance geophysical survey. Cost at \$1.35/sample is approximately \$650.

018

3.3.4 Geology

Geological mapping, in conjunction with a total field magnetometer survey will be done on the grid.

3.3.5 Costs

Access	Grid cutting	\$ 5,260
Geophysics		9,600
Geochemistry		500
		<u>TOTAL \$ 15,360</u>

3.4 Henty Fault Zone

Eight diamond drill holes have been drilled in the Henty Fault Zone area, and HFZ 5, 6 and 7 (Lines 49N, 48N and 40N respectively) contained narrow intersections of low grade, but significant Cu-Pb mineralisation (Annual Report E.L. 9/66, 1974/75).

Further work is required, with the aim of:-

- (a) Completing follow-up soil geochemistry coverage over a broad zone of anomalous IP responses from Lines 54N-61N (i.e. 5,600', 1700 m). This zone is known to contain a pyritic sequence of lavas, fine to coarse grained tuffs and minor sediments (Map 3).
- (b) To more closely define drilling targets in the area Line 37N-52N (12,000', 3,650 m strike length) by cutting intermediate grid lines followed by detailed E.I.P. gradient array surveys.
- (c) To more closely define anomalous areas in the region Line 62N-66N (1600', 500 m strike length) by cutting intermediate grid lines followed by detailed E.I.P. gradient array surveys.

This program is a long term scheme. The details are outlined below, however, only section (a) is planned for 1977/78. Some additional work will be done during 1977/78, but sections (b) and (c) will be discussed in Section 3.4.4. (Future Work).

3.4.1 Geophysics

The costean on Line 49N, 1400E revealed semi-massive sulphides up to 8' wide. An E.I.P. survey of this body is necessary to help determine its continuity and geometry. (Two lines  $\pm$  400' from costean, each 1000' long, already cut).

Cost: 1 day at \$400/day, \$400.

3.4.2 Geochemistry

Approximately 350 samples will need to be taken to complete the coverage over the E.I.P. geo-physical anomalous zone on Lines 54N-61N.

Cost: \$1.35/sample, \$500.



020

Geophysics: gradient array E.I.P. survey over the intermediate lines (1200 m).

Geochemistry: soil geochemistry as required, dependant on the geophysical survey results.

3.5 Howards Anomaly - Zone A

A re-appraisal of all existing data will take place and a further program of geophysical and geochemical surveys will be planned if required. A small program is proposed for 1977/78.

3.5.1 Geochemistry

The soil geochemistry sampling coverage of the area will be completed over several geophysical E.I.P. anomalies:

Line 23N	1750W (geophysical grid)	HA3	drilled, but anomaly unexplained.
Line 16N	1000W	TYN3	" "
Line 4N	900W	TYN2	" "
Line 8N	3100W		
Line 7N	800W		

3.5.2 Costs

Geochemistry: 350 samples at \$1.35/sample, \$500.

3.5.3 Future Work

Further geological mapping of interesting zones will be undertaken; costeaning and/or track cutting with detailed geophysical/geochemical surveys may be required to provide more data.

3.6 Exploration Costs 1977/78

Salaries and Wages *	\$ 25,478
Burden A *	5,979
Burden B *	4,100
Access	7,060
Geophysics	12,000
Geochemistry	2,600
Diamond Drilling	88,000
Materials *	2,900
Equipment and Facilities *	1,900
General Costs	1,300
Capital Items	8,500
Indirect Charges (6½% on items *)	2,623
	<hr/>
TOTAL	\$ 162,440

References

- Amdel 1977 Service Report MP 3223/77. Description of Metavolcanic Rocks and some associated sulphides.
- Howland - Rose, A.W. 1977 Comments on Gradient Array E.I.P. surveys over sections of four Lines on the Gooseneck Grid, near Queenstown, West Coast Tasmania. May 1977 Tas-035A.
- McKibben, J.P. 1971 Annual Report, Mt. Tyndall Area, EL 9/66. 1970/71.
- Newnham, L.A. 1970 Annual Report, Mt. Tyndall Area, EL 9/66. 1969/70.
- Omnes, G. 1970 Geophysical Survey on the Eastern Part of Mt. Tyndall Lease (EL 9/66). 1969-Feb. '70. C.G.G.
- Omnes, G. 1971 Geophysical Surveys at Mt. Tyndall (Tasmania) Jan-Feb. '71. Mission 501-18-80. C.G.G.
- Stevens - Hoare, N.P. 1975 Annual Report, Mt. Tyndall Area EL 9/66. 1974/75.

## APPENDIX I

	Cu %		Pb %		Zn %		Ag g/t				Au g/t				Total S %		Hg ppm	Ba ppm	Cd ppm	As ppm	Fe %	Sb ppm	Mn %	Te ppm	Se ppm
	Mount Lyell	Amdel	ML	A	ML	A	ML 1	2C	3C	A	ML 1	2C	3C	A	ML	A	A	A	A	A	A	A	A	A	
194-5	0.07	0.07	0.01	0.04	0.35	0.20	7			6	< 1			<0.1	1.0	0.85	< 0.02	2700	7	35	4.50	8	0.20	< 10	< 2
-6	0.13	0.12	0.09	0.07	.15	.15	12			10	< 1			0.4	3.0	0.68	< 0.02	2700	5	75	4.20	18	0.20	< 10	< 2
-7	.20	.22	8.8	8.90	31.0	32.3	175	147	140	140	10	6.0	1.2	13.5	20.3	21.0	2.1	70	760	10	5.80	50	0.29	10	10*
-8	.35	.36	12.2	11.90	34.5	35.4	170	165	172	155	4	4.9	3.8	21.0	22.1	21.7	2.2	< 20	830	110	4.60	65	0.17	< 10	< 10*
-9	.33	.34	12.3	13.2	28.5	29.1	154	150	150	130	2	9.6	10.8	19.2	19.3	19.3	2.0	60	750	60	4.55	65	0.26	< 10	10*
-200	.51	.59	.07	.09	.25	.26	44	36		50	< 1	0.4		0.3	4.1	4.16	0.02	80	12	200	5.60	60	0.18	< 10	3
-201	.05	.05	.01	.03	.25	.04	6			6	< 1			0.1	2.5	2.56	< 0.02	270	< 1	20	3.80	26	0.11	< 10	< 2
196-199	0.29	0.31	11.1	11.3	31.3	32.27	167	154	154	142	5.3	6.8	5.3	17.9	20.6	20.7									

\* 2C, 3C: Check assays by Mount Lyell assay lab. following the receipt of the Amdel results.

023

APPENDIX II

LITHOLOGY AND MINERAGRAPHY REPORT  
( b22-44 (end) )

BW193; TS37810

Hand Specimen:

A fine-grained, pale yellowish-grey rock with a very weak foliation. There are scattered, leached voids 1 to 2 mm in size some of which contain orange-stained clay.

Thin Section:

The rock contains a high proportion of sericite intergrown with fine-grained quartz with a grain size of less than 0.05 mm and a few small patches of chlorite. In many areas there are poorly preserved and some moderately well preserved relict textures defined mainly by dark staining which show that the rock was originally composed mainly of small fragments of volcanic glass or shards and some pumice. Boundaries between the former fragments are no longer visible and, although some were clearly up to about 1 mm in size most of them were probably smaller.

The leached voids noted in the hand specimen are heavily stained by brown iron oxide and some contain sericite or clay. A few show straight boundaries and these may have been phenocrysts of feldspar which have been completely weathered and leached. Other patches contain chlorite as well as the sericite and goethite and they may have been aggregates of phenocrysts although this suggestion cannot be confirmed from the evidence now available.

Conclusion:

This is a sericitized vitric tuff of acid composition but it may also have had a few crystal fragments.

Sample: RH5 24.2 m; TS37811

Hand Specimen:

A pale greyish-green, fine-grained rock which tends to split along some surfaces parallel to a very weak foliation or schistosity. There are a few poorly defined, darker lenticular patches a few millimetres long elongated in the direction of the weak schistosity.

Thin Section:

The matrix of this rock is composed mainly of intergrown quartz and sericite and most of the quartz has a grain size of slightly less than 0.05 mm. Much of the sericite shows a preferred orientation defining the direction of weak or incipient foliation or schistosity. In some parts of this matrix there are relict textures defined by lines of minute dark particles and the patterns of some of these relict textures are typical of those derived from volcanic shards and pumice fragments.

The rock contains 20 to 30% of elongate, dark aggregates and lenticles most of which are between 0.4 and 2 mm in size but there are a few larger patches up to 5 mm long. These contain varying proportions of plagioclase remnants, chlorite and sideritic carbonate and some of them have small grains or aggregates of leucoxene and one or two small zircon crystals. Only a few of these elongate patches now show evidence of straight boundaries but almost certainly they were phenocrysts or crystal fragments. Some of the larger ones may have been lithic fragments but the texture is not sufficiently well preserved to confirm this.

U24

The rock is cut by one irregular vein which contains chlorite and sideritic carbonate and at one end of the section there is one thin vein of pyrite and also a porous, spongy mass of fine-grained pyrite associated with sideritic carbonate.

**Conclusion:**

A deformed or weakly metamorphosed and sericitized crystal-vitric tuff probably of acid composition. It contains a trace of pyrite some of which is associated with sideritic carbonate.

Sample: RH5 36.5 m; TS37812

**Hand Specimen:**

- Dark grey, fine-grained rock which splits along some parallel cleavage planes and, in general appearance resembles slate.

**Thin Section:**

A very fine-grained rock composed mainly of sericite, chlorite and extremely fine-grained carbonaceous material which stains much of the rock. It contains minor quartz and/or feldspar, probably 10 to 15% of very fine-grained ?sideritic carbonate and at least 10% of disseminated, very fine-grained pyrite. In the thin section it is not possible to accurately determine the proportions of carbonaceous material and pyrite. Much of the chlorite and sericite are oriented parallel to the slaty cleavage and elongate streaks of dark carbonaceous staining are also parallel to this direction. Some of the carbonate occurs as elongate and lenticular aggregates about 0.05 mm long by about 0.02 mm thick and these are also parallel to the slaty cleavage.

The rock contains a few small detrital quartz grains most of which are less than 0.1 mm in size and in the area sectioned there is one small rounded grain of microcrystalline quartz 0.4 mm in size. One prismatic crystal of tourmaline 0.15 mm long was found in the area sectioned and this does not show any evidence of abrasion or rounding.

There are a few very thin veins of carbonate and in one deformed zone there is a triangular mass of turbid, ?sideritic carbonate associated with migratory pyrite and this is connected to a pyrite vein about 0.5 mm thick. Small aggregates of recrystallized pyrite 0.1 to 0.2 mm in size are scattered throughout much of the rock.

**Conclusion:**

This is a weakly metamorphosed, carbonaceous and pyritic shale which would now be classified as a slate.

025

Sample: RH5 73.6 m; TS37813

Hand Specimen:

A pale greenish-grey, fine-grained rock with a weak and uneven foliation or schistosity. There are some elongate, dark patches or fragments a few millimetres in size which are parallel to the weak schistosity.

Thin Section:

The recrystallized matrix of this rock is now composed of fine-grained quartz intergrown with fine-grained muscovite or sericite and at least 10% of chlorite and it also contains scattered, small crystals and crystalline aggregates of sideritic carbonate. The grain size varies from microcrystalline to about 0.1 mm but there are a few elongate aggregates of coarser grained quartz. Although much of the fine-grained mica and chlorite are subparallel to the direction of weak schistosity or foliation this tends to be finely irregular or wavy and there may be some small-scale crenulations. No evidence of original textures was found in the recrystallized matrix. The composition varies in that some bands or poorly defined layers contain higher proportions of sericite or fine-grained mica.

Scattered through the recrystallized matrix there are some deformed, fractured and partly recrystallized fragments or phenocrysts of plagioclase generally less than 1 mm in size and there are also a few much larger, lithic fragments 4 to 8 mm in size composed of intergrown plagioclase crystals, some which are now leucoxene, some patches of chlorite and some migratory quartz. These lithic fragments also show evidence of fracturing and deformation and they have been locally invaded by the sideritic carbonate and some sulphide. There is one elongated lithic fragment about 5 mm long which is extremely fine-grained and composed mainly of sericite. This has also been invaded by sideritic carbonate, quartz and pyrite.

Porous aggregates of fine-grained sulphide probably mainly pyrite but also including some sphalerite are scattered sporadically through the rock and in general the textures suggest that these sulphides have replaced pre-existing material or have crystallized in interstices and along grain boundaries. As noted above some of the sulphide has invaded deformed aggregates of plagioclase crystals and some occur as elongate aggregates parallel to the weak schistosity. In one of the patches of coarser grained plagioclase and quartz there is some translucent orange sphalerite associated with minor opaque sulphide and some sideritic carbonate. Examination of a polished section would be necessary to accurately identify the opaque sulphide minerals in this rock but the external shape of many small crystals suggest that pyrite probably predominates.

Conclusion:

A metamorphosed, pyroclastic probably a crystal-vitric tuff with some lithic fragments or aggregates of phenocrysts. It contains disseminated sulphide including pyrite and sphalerite and also contains disseminated and migratory, sideritic carbonate.

Sample: RH5 92.2 m; TS37814

**Hand Specimen:**

A very pale greenish-grey to yellowish-grey rock with a weak foliation or schistosity at a moderate angle to the direction of the drill hole. The rock shows a fine streakiness parallel to this direction and there are some paler coloured grains or aggregates 2 to 3 mm in size which could be phenocrysts which have been deformed and elongated in the direction of schistosity or foliation.

**Thin Section:**

The matrix of the rock is composed mainly of intergrown quartz and sericite and in general, the quartz is slightly coarser grained than in many of the other deformed and metamorphosed volcanic rocks. Much of the quartz occurs as equidimensional grains 0.1 to 0.15 mm in size and there are a few quartz aggregates 0.3 mm in size. Some of these could have replaced spherulites in the devitrified volcanic rock. The sericite encloses and curves around these quartz grains and most of it shows preferred orientation but there are two directions of this incipient schistosity. The proportions of quartz and sericite vary and there are a few elongate patches of sericite up to 5 mm long. There are no recognizable relict textures in this recrystallized matrix.

A few deformed and partly altered crystals or phenocrysts of plagioclase 0.5 to 1.5 mm long are scattered through the rock and in the area sectioned there is a larger aggregate of intergrown plagioclase crystals associated with some migratory calcite and quartz, minor sideritic carbonate and some opaque ?pyrite. Small crystals and aggregates opaque (yellowish) sulphide are scattered throughout the rock and probably comprise about 2 to 3% of the rock. Some sericitic bands or zones contain slightly higher concentrations of this opaque sulphide much of which is probably pyrite.

**Conclusion:**

Weakly metamorphosed, acid pyroclastic probably a crystal-vitric tuff.

Sample: RH5 106.5 m; TS37815

**Hand Specimen:**

A pale greenish-grey, fine-grained rock with a weak schistosity or foliation at a moderate angle to the direction of the drill hole. This contains elongated dark patches or aggregates which are much larger than those in the previous specimen and many are about 1 cm long.

**Thin Section:**

This rock has a recrystallized matrix composed of fine-grained quartz, small patches and streaks of sericite and small aggregates of chlorite. Streaks of sericite and chlorite show a preferred orientation but these curve around many small equidimensional and lenticular aggregates of quartz which are up to 0.2 mm across. The general impression is of recrystallization under conditions of tectonic stress possibly with some shearing. The proportions of quartz, sericite and chlorite vary in different zones and there is one finer grained zone rich in quartz which shows traces of relict textures typical of those derived from shards and pumice.

027

The rock contains fragments or phenocrysts of plagioclase 0.5 to 1 mm in size and also some aggregates of intergrown plagioclase crystals up to 2 mm in size. Most of these show some evidence of fracturing and/or deformation and of elongation in the direction of incipient schistosity or foliation. Some of the fractured and deformed phenocrysts have been invaded by migratory calcite and some vein-like patches of calcite have formed in small ?tension gashes. One zone of the rock has been extensively fractured giving a brecciated appearance and this has been invaded by calcite and some pyrite which have filled fractures and interstices. Calcite has also invaded and partly replaced some adjacent areas of rock.

Conclusion:

This was originally a crystal-vitric tuff of acid composition (?dacite) which has partly recrystallized under conditions of tectonic stress and was then extensively fractured and invaded by migratory calcite and pyrite.

Sample: RH5 139.8 m; TS37816

Hand Specimen:

A pale, greenish-grey rock which is similar to the previous specimen in that it has a weak foliation or schistosity at a moderate angle to the direction of the drill hole but the general appearance suggests that it was originally finer grained or contained smaller crystals or fragments than the sample from 106.5 m.

Thin Section:

This has a similar composition to other specimens in that it is now predominantly quartz and fine-grained muscovite or sericite and much of the sericitic material shows a preferred orientation defining the direction of weak foliation or schistosity. Much of the quartz occurs as almost round crystals and aggregates 0.1 to 0.3 mm in size suggesting former spherulites and the streaks of sericitic material curve around these quartz grains and aggregates. Quartz and sericite are not uniformly distributed and there are some elongate and lenticular patches 2 to 3 mm long which are now composed almost entirely of sericite. Some of these have small dark streaks of very fine-grained titaniferous material and also some small, elongate aggregates and streaks of fine-grained, sideritic carbonate. Although at least some of these were probably originally fragments of volcanic glass or pumice the possibility that some may represent completely altered and deformed plagioclase crystals cannot be entirely disregarded.

Small aggregates of finely crystalline, sideritic carbonate are dispersed throughout the rock and probably comprise about 2 to 3%. There are also some dispersed, elongate aggregates of fine-grained, recrystallized leucoxene generally associated with sericite. The area sectioned contains one irregular and poorly defined vein containing sideritic carbonate and quartz but, unlike the previous sample this does not contain pyrite or other sulphide.

Conclusion:

Weakly metamorphosed vitric tuff of acid composition. It could have contained crystal fragments or phenocrysts but, if so, these have been completely obliterated by deformation and replacement by quartz, sericite and leucoxene. Minor, sideritic carbonate is dispersed throughout the rock but there is no evidence of sulphide.

028

Sample: RH5 153.1 m; TS37817

**Hand Specimen:**

A fine-grained, slightly greenish, pale grey rock with very poorly developed schistosity or foliation at a moderate angle to the direction of the drill hole. On a freshly cut surface numerous small pale-coloured veins or fractures can be seen.

**Thin Section:**

The rock is composed mainly of patches and aggregates of sericite intergrown with equidimensional quartz grains or aggregates many of which are between 0.1 and 0.3 mm in size. Some quartz aggregates are almost spherical suggesting the former presence of small spherulites and these are scattered abundantly through a mass of sericite much of which shows preferred orientation defining the direction of weak or incipient schistosity. Relict textures have not been preserved in the mass of sericite and quartz but there are variations in the proportions of these minerals and the rock is more likely to have been a pyroclastic than a lava flow.

Minor constituents include some streaks and elongate aggregates of fine-grained leucoxene, small aggregates of turbid carbonate with a high refractive index which is probably sideritic, trace amounts of chlorite and a few small zircon grains. Aggregates and streaks of leucoxene and also the small aggregates of carbonate are subparallel to the direction of incipient schistosity.

The rock contains some rather irregular veins 1 to 2 mm thick of pale brownish carbonate which have probably formed along fractures almost parallel to the schistosity or foliation. These are cut by smaller, later fractures and veins containing minor amounts of calcite and also some turbid, translucent sphalerite. A trace of pyrite is present in the body of the rock and one small crystal of pyrite is partly surrounded by pressure-shadow quartz indicating that it was present at the time the rock was partly recrystallized under conditions of tectonic stress.

**Conclusion:**

Weakly metamorphosed acid volcanic (quartz-sericite metavolcanic) probably derived from a vitric tuff but, as original textures have not been preserved this cannot be confirmed. It contained at least a trace of pyrite at the time of recrystallization.

The rock contains some disseminated ?sideritic carbonate and also some veins of turbid carbonate which is not calcite and these are cut by latter fractures and small veins containing calcite and minor sphalerite.

Sample: RH5 158.3 m; TS37818

**Hand Specimen:**

A pale greenish-grey rock with a weak schistosity. A freshly cut surface has a finely mottled or slightly speckled appearance in that there are paler coloured aggregates 1 to 2 mm in size which are not very clearly defined.

**Thin Section:**

This is a metamorphosed acid volcanic rock now composed of quartz and sericite with about 10 to 15% of chlorite and traces of leucoxene and ?sideritic carbonate. Some more deformed zones contain opaque sulphide.

This is similar to many of the previous specimens in that grains and aggregates of quartz 0.1 to 0.4 mm in size are scattered through a mass of sericite, much of which shows preferred orientation defining the direction of weak or incipient schistosity. This differs from the previous specimen in that some of the quartz is coarser grained (up to 0.5 mm) and there are numerous elongate patches up to 1 mm long composed predominantly of chlorite. Original textures have not been preserved but it is possible that some of the larger aggregates of quartz could represent deformed and recrystallized quartz phenocrysts.

Small aggregates of fine-grained ?sideritic carbonate are scattered throughout the rock and, although some are apparently preferentially associated with coarser grained or recrystallized quartz some carbonate dispersed among the other minerals.

The section contains two poorly defined, discontinuous bands which contain some deformed and recrystallized, coarser grained quartz associated with minor carbonate and with aggregates of opaque sulphide at least some of which is pyrite. Small grains of sulphide possibly pyrite are also disseminated through parts of the rock.

**Conclusion:**

Metavolcanic of acid composition possibly derived from a vitric tuff but, as original textures are not preserved this cannot be confirmed. It has a trace of ?sideritic carbonate and also minor sulphide probably pyrite some of which is concentrated in more extensively deformed and recrystallized zones.

U30

Sample: RH5 169.3 m; TS37819

**Hand Specimen:**

A pale greenish-grey rock which appears to be finer grained than the previous specimen and shows less evidence of a schistosity.

**Thin Section:**

The rock has a similar composition to the previous specimens in that it is composed largely of quartz and sericite with traces of leucoxene and minor, disseminated ?sideritic carbonate. There are also a few zircon grains and a trace of chlorite.

The sericite in this rock is not strongly oriented and therefore the rock lacks the weak or incipient schistosity. In a few places some patches of sericite have retained the shape of former, subrectangular crystals probably of feldspar 0.5 to 1.5 mm in size but other patches of sericite now have very irregular shapes and their origin cannot be determined. In some aggregates the sericite is associated with turbid, ?sideritic carbonate and with small aggregates of leucoxene.

A few crystals of pyrite 0.3 to 0.5 mm in size are scattered sporadically through the rock and some of these are partly surrounded by pressure-shadow quartz which crystallized against the pyrite when the rock was under conditions of tectonic stress.

Some small fractures contain turbid, sideritic carbonate but no evidence of migratory sulphide.

**Conclusion:**

Quartz-sericite metavolcanic containing minor, disseminated pyrite and traces of sideritic carbonate. Some of the sericite has clearly replaced crystals of feldspar but there is no definite evidence of other relict textures and therefore it is uncertain whether it was derived from a lava flow or a vitric pyroclastic.

The presence of pressure-shadow quartz against small pyrite crystals indicates that the pyrite was present at the time the rock was subjected to conditions of tectonic stress.

Sample: RH5 173.9 m; TS37820

**Hand Specimen:**

A greenish-grey rock with a definite schistosity at a moderate angle to the direction of the drill hole. Slight variations in colour suggest that this was coarser grained than the previous sample and could have been a fragmental rock originally containing fragments a few millimetres in size.

**Thin Section:**

The rock is composed largely of quartz and sericite with 5 to 10% of chlorite, traces of leucoxene and carbonate and some local concentrations of fine-grained sulphide probably pyrite.

Much of the sericite shows preferred orientation parallel to the direction of weak or incipient schistosity and in this respect it is similar to other specimens but in this rock there is a greater variation in the proportions of constituent minerals with some elongate zones being composed predominantly of sericite with minor quartz, others which contain very little sericite and are mainly quartz with minor chlorite and numerous, elongate aggregates composed predominantly of chlorite. These patches of rock of differing composition are up to several millimetres in size suggesting that this was derived from a moderately coarse-grained pyroclastic rock with fragments of ?volcanic glass or pumice and lithic fragments several millimetres in size. In general, original textures are not preserved but some zones containing abundant sericite show a few lines which could be interpreted as having been derived from pumice.

In the area sectioned there is one elongate mass of chlorite about 8 mm long which contains a pyrite crystal about 0.8 mm in size against which there is some pressure-shadow quartz and some ?sideritic carbonate. In another lenticular or elongate zone also about 8 mm long there is a concentration of small pyrite crystals less than 0.1 mm in size and also some crystalline aggregates and these are surrounded by a mass of quartz showing pressure-shadow textures intergrown with some fine-grained, sideritic carbonate. Other sulphides could be present with the pyrite but this cannot be determined from the thin section. A few smaller aggregates of fine-grained pyrite are scattered throughout the rock, some associated with chlorite and some in quartz and/or sericite.

The section is cut by one sharply defined fracture at a high angle to the direction of schistosity and along this fracture there are concentrations of very fine-grained, turbid carbonate, some quartz and a trace of sphalerite.

**Conclusion:**

Metavolcanic very probably derived from a pyroclastic containing fragments a few millimetres in size. It has minor sideritic carbonate and pyrite and is cut by a vein containing a trace of sphalerite.

Sample: RH5 179.0 m; TS37821

**Hand Specimen:**

A pale orange-grey rock which does not show the weak schistosity or foliation noted in the previous specimen. It has a very fine-grained groundmass or matrix through which are scattered a few small dark grains or aggregates and a few paler coloured aggregates or small crystals. This suggests a porphyritic texture.

**Thin Section:**

This is similar to the other specimens in that it is now composed predominantly of quartz and sericite but it does not show the weak or incipient schistosity and in this respect it is similar to the sample from 169.3 metres. It contains little or no chlorite but does have about 10% of disseminated, small aggregates of very fine-grained, sideritic carbonate. There are a few porous aggregates or groups of very fine-grained, recrystallized leucoxene and also traces of opaque sulphide.

Some patches of sericite 1 to 1.5 mm in size have retained or partly retained a subrectangular outline inherited from feldspar crystals and other patches of sericite have almost certainly replaced aggregates of intergrown feldspar crystals. Some of these sericitized aggregates of feldspar phenocrysts also contain aggregates of leucoxene and a few small zircon crystals suggesting that crystals of a ferromagnesian mineral were intergrown with the feldspar crystals.

Relict textures suggest that some small feldspar crystals were probably present in the groundmass or matrix and in a few places there is evidence of former, very small almost acicular crystals in the groundmass.

**Conclusion:**

Metavolcanic of acid composition which contained some phenocrysts of feldspar. If phenocrysts of quartz were present they have been completely recrystallized and are unrecognizable.

It is tentatively suggested that this is more likely to have been a lava flow than a pyroclastic but this cannot be confirmed.

Sample: RH5 191.6 m; TS37822

**Hand Specimen:**

A fine-grained, greenish-grey rock containing numerous, darker coloured grains or aggregates most of which are less than 1 mm in size. Some zones show evidence of weak or incipient schistosity but the rock tends to fracture in a very irregular manner probably along joints.

**Thin Section:**

The bulk of the rock is composed of moderately fine-grained quartz (0.1 to 0.3 mm) which is turbid due to the presence of disseminated, fine-grained sericitic material included within this quartz. Sericite is not as abundant as in some of the other specimens but there are patches in which sericite has pseudomorphously replaced elongate or subrectangular feldspar crystals less than 1 mm long. Small aggregates of chlorite are intergrown with the quartz but these do not show any evidence of relict textures although some contain fine-grained leucoxene

suggesting that they may represent completely altered crystals of a ferromagnesian mineral. Small patches of very fine-grained, sideritic carbonate are also scattered through the rock generally associated with either sericite or chlorite.

One area in the section about 5 mm in size is composed mainly of sericite and chlorite with minor sideritic carbonate and leucoxene and only traces of quartz. This probably had a different composition from the bulk of the rock but boundaries are not clearly defined and original textures are not preserved.

The section contains a few aggregates of coarser grained quartz about 1 mm in size and in some of these euhedral quartz crystals are intergrown with radiating aggregates of chlorite. The origin of these is not clear mainly because of the general deformation and recrystallization of the rock. Some of these aggregates of euhedral quartz and chlorite contain opaque sulphide and, in the area sectioned there is one larger mass of coarser grained quartz extending over a distance of about 4 mm long and this contains some translucent, reddish-brown sphalerite which has crystallized in a void lined by this coarse-grained quartz.

The rock is cut by numerous, small fractures and along some of these there has been some displacement. There are also some veins containing sideritic carbonate which vary in thickness from about 0.1 mm up to 1 mm and some of the smaller of these veins cut the mass of sphalerite associated with coarse-grained quartz. The larger carbonate-bearing veins have a central zone containing coarse-grained quartz and minor chlorite.

**Conclusion:**

This is a metamorphosed and deformed, acid volcanic rock in which original textures have not been preserved but it is more likely to have been a pyroclastic than a lava flow. It contains some disseminated pyrite and also a trace of sphalerite associated with some coarse-grained, possibly migratory quartz. This is cut by a later fracture containing sideritic carbonate.

Sample: RH5 200.4 m; TS37823

**Hand Specimen:**

A very fine-grained, pale grey rock with a "cherty" appearance. It is cut by some fine, intersecting fractures some of which contain very fine-grained, yellow sulphide probably pyrite.

**Thin Section:**

This is a very fine-grained rock composed of sericite intergrown with cryptocrystalline to microcrystalline material much of which is probably quartz but a staining test on the hand specimen with rhodizonate suggests that some plagioclase is also present. Some of the sericite shows preferred orientation but this is only weakly developed and insufficient to impart a schistosity. There are a few small flakes of muscovite and a few grains of quartz less than 0.05 mm in size which may be of clastic, sedimentary origin and there are a few small aggregates of very fine-grained leucoxene.

Small crystals of pyrite 0.01 to 0.05 mm in size are scattered uniformly throughout the rock and there are a few which are almost spherical suggesting derivation from framboidal pyrite.

The rock is cut by some small shearing planes and these in turn are cut by better defined fractures or veins which now contain opaque sulphide associated with minor amounts of migratory quartz and traces of muscovite, chlorite and carbonate. There are also a few segregations of opaque sulphide, quartz and carbonate probably in fractured zones.

**Conclusion:**

This was probably a very fine-grained volcanic ash or tuffaceous sediment which contained some syngenetic iron sulphide. It has been indurated and partly recrystallized and has also been sheared and fractured and some of the pyrite has migrated to the later fractures.

Sample: RH5 203.9 m; TS37824

**Hand Specimen:**

Much of the sample is a moderately fine-grained, grey rock showing evidence of a very weak foliation and this has an irregular contact with a finer grained, paler grey rock similar to the sample from 200.4 m.

**Thin Section:**

The finer grained, paler grey rock is very similar to the sample from 200.4 m except that it contains some scattered, elongate aggregates 0.1 to 0.3 mm long now composed of chlorite and carbonate and there are also some small patches of sericite. From these features it is tentatively suggested that this may have contained some slightly larger fragments of volcanic glass or other tuffaceous material than the sample from 200.4 m. It also differs from that sample in that it contains very little pyrite.

The coarser grained rock has a similar matrix which however shows more evidence of a schistosity or foliation in that much of the sericite shows preferred orientation. It contains a much higher concentration of elongate aggregates of chlorite up to 0.5 mm long, a few quartz fragments, some leucoxene and a fragment of zircon. There are traces of sideritic carbonate and opaque sulphide.

Both rock types are cut by very small veins of sideritic carbonate and another, slightly larger fracture contains chlorite, carbonate, pyrite, traces of muscovite and quartz. All of these minerals were probably derived from the host rock and havenot migrated any great distance.

**Conclusion:**

This sample shows an irregular contact between weakly metamorphosed, fine-grained volcanic ash or tuffaceous sediment and a slightly coarser grained tuffaceous sediment. The general appearance in the drill core sample suggests that the finer grained phase may have occurred as a clast within the coarser grained material suggesting some contemporaneous erosion or disturbance of bottom sediments but the true relationship between these two rock types cannot be reliably determined from the relatively small length of drill core.

Sample: RH5 209.8 m; TS37825

**Hand Specimen:**

A fine-grained, greenish-grey rock with a suggestion of a very weak or incipient schistosity. The rock shows some very fine fractures and a few fine, pale-coloured veins.

Staining with cobaltinitrite shows some scattered grains of potash feldspar.

**Thin Section:**

This is a compacted or deformed and weakly schistose rock containing some fragments of potash feldspar, plagioclase and quartz 0.1 to 0.6 mm in size and moderately abundant, elongated or flattened fragments now composed of chlorite. There are a few former ?lithic fragments containing phenocrysts of feldspar in a deformed groundmass now composed mainly of chlorite and it is possible that there were other lithic and/or vitric fragments which cannot now be recognized. The matrix is very fine-grained and composed mainly of chlorite intergrown with microcrystalline to cryptocrystalline quartz and/or feldspar. There are a few very small aggregates of leucoxene, some thin streaks of sericite and traces of very fine-grained, sideritic carbonate. The area sectioned contains a few small pyrite crystals up to 0.3 mm in size.

The veins noted in the hand specimen are mainly of sideritic carbonate with minor quartz.

**Conclusion:**

A weakly metamorphosed, tuffaceous sediment or crystal-vitric tuff. It contains minor pyrite.

Sample: RH5 211.9 m; TS37826

**Hand Specimen:**

A fine-grained rock showing very irregular and diffuse mottling in salmon-pink and greenish-grey. Staining with cobaltinitrite shows that it contains abundant potash feldspar particularly in the pink zones.

**Thin Section:**

Most of the rock is very fine-grained and is composed of a slightly turbid mass of microcrystalline potash feldspar, quartz, chlorite and sericite, with small (0.1 mm) patches of very fine-grained, sideritic carbonate. There is no evidence of preferred orientation of the minerals or schistosity nor is there any definitely recognizable evidence of relict textures.

The rock contains some irregularly shaped to oval and round segregations in which there is some coarse-grained quartz associated with slightly pink-stained potash feldspar crystals 0.2 to 0.6 mm long. Some of these segregations also contain opaque sulphide and/or sideritic carbonate. These segregations have almost certainly formed after consolidation and recrystallization of the rock, possibly under the influence of heat and/or hydrothermal activity. The rock is also cut by some veins containing sideritic carbonate and others containing quartz.

036

**Conclusion:**

This is very probably a recrystallized, fine-grained tuff or volcanic ash which has been subjected to some form of heat and/or hydrothermal activity resulting in the development of segregations containing quartz, potash feldspar, sideritic carbonate and minor sulphide.

Sample: RH5 213.2 m; TS37827

**Hand Specimen:**

A greenish-grey rock containing elongate and/or lenticular patches a few millimetres long of darker material suggesting that it once contained fragments a few millimetres to 1 cm in size. The rock now shows a weak schistosity or foliation parallel to the direction in which the fragments are elongated. Small aggregates of yellow sulphide probably pyrite are scattered throughout much of the rock.

**Thin Section:**

The matrix of this rock is now composed predominantly of sericitic material which shows a preferred orientation defining the direction of schistosity noted in the hand specimen. There are some elongated aggregates of chlorite up to about 1 mm long and elongate patches containing dark opaque and semi-opaque material probably including both leucoxene and pyrite. These dark minerals are associated with chlorite and a few also contain some very small grains of zircon. Some of the dark aggregates probably represent deformed and recrystallized ferromagnesian minerals whereas others may represent former iron-titanium oxide crystals.

In the area sectioned there is portion of one of the larger, darker fragments or zones and this contains more chlorite and less sericite and also some fragments or clasts now composed of quartz aggregate and some elongated fragments now composed of sericite which may have been derived from pumice. The rock also contains 10 to 15% of quartz fragments or phenocrysts most of which now show undulose extinction and strain lamellae. Some have been fractured and the fragments displaced in the direction of schistosity. There are also fragments or phenocrysts of potash feldspar 1 to 2 mm in size which show more extensive alteration and partial replacement by matrix material than the quartz fragments or phenocrysts. Many of the fractured and deformed feldspar phenocrysts have been invaded and partly replaced by sideritic carbonate, chlorite and some of the matrix sericite. A few fractured and partly altered feldspar crystals have also been invaded by opaque sulphide, locally associated with traces of sphalerite.

**Conclusion:**

This is a deformed and/or metamorphosed, acid volcanic rock probably derived from a crystal-vitric tuff. The rock contains minor sulphide including pyrite and traces of sphalerite, some of which now occur in fractured, deformed and partly altered feldspar fragments. Some sulphide occurs preferentially in deformed chloritic fragments.

037

Sample: RH5 215.0 m; TS37828

**Hand Specimen:**

A fine-grained, grey rock in which variations in colour suggest that it was composed of fragments of varying composition a few millimetres in size. These have now been elongated in a common direction parallel to that of a weak foliation or schistosity and some are now about 1 cm long. Aggregates of fine-grained, yellow sulphide mainly pyrite are scattered through parts of the rock.

**Thin Section:**

This is a deformed and recrystallized, fragmental rock which originally contained clasts or fragments of varying composition, many of which were probably between 1 and 6 mm in size. These have now been elongated or drawn out in a common direction and at least some now merge with the fine-grained matrix composed mainly of microcrystalline quartz and sericite.

Some of the clasts are now composed of fine-grained quartz associated with, or containing inclusions of very fine-grained sericitic material and these could represent former lithic fragments. Some of the fragments were possibly of feldspar now replaced by sericite and some are of quartz phenocrysts. There are also flattened and/or elongated fragments now composed predominantly of sericite with a few small quartz grains and these almost certainly represent flattened and recrystallized fragments of pumice.

Opaque sulphide probably mainly, if not exclusively pyrite is moderately abundant in this sample and some of it occurs as separate minute crystals 0.01 to 0.03 mm in size scattered throughout the very fine-grained matrix and also in some of the patches or fragments now composed of sericite. One of these deformed ?pumice fragments does not contain sulphide but is encrusted with very fine-grained opaque sulphide around its boundary. There are numerous larger aggregates of coarser grained, cubic pyrite crystals scattered through many parts of the rock and some of these are partly surrounded by pressure-shadow quartz containing elongate to almost fibrous quartz crystals which are parallel to the general direction of schistosity. Fine-grained, sideritic carbonate is associated with some of this recrystallized pyrite but is not invariably associated with it. Traces of turbid, fine-grained sphalerite are associated with a few aggregates containing pyrite, sideritic carbonate and quartz.

**Conclusion:**

This is a deformed and recrystallized pyroclastic which probably contained crystal, vitric and lithic fragments some of them a few millimetres in size. Fine-grained pyrite is dispersed throughout much of this pyroclastic and some has migrated and recrystallized in slightly coarser grained aggregates which also contain sideritic carbonate and/or quartz. There is also a trace of sphalerite.

038

Sample: RH5 231.4 m; TS37829

**Hand Specimen:**

A very fine-grained, greenish-grey rock with some moderately large, pink zones 1 to 2 cm in size which have diffuse boundaries. Staining with cobaltinitrite shows that these pink zones contain high concentrations of potash feldspar.

The rock contains a few small crystals of pyrite.

**Thin Section:**

Most of the rock is very fine-grained and is composed of varying proportions of microcrystalline quartz, turbid potash feldspar and lesser sericite and chlorite. There are also small aggregates containing very fine-grained, sideritic carbonate. Original textures have not been preserved but probably this was derived from a fine-grained tuff or volcanic ash.

In one zone in the rock there is evidence of extensive fracturing forming a small-scale breccia in which the interstitial matrix contains higher concentrations of chlorite and sericite and probably also of carbonate.

In some parts of the rock there are coarser grained segregations similar to those in the sample from 211.9 m and these contain mainly turbid and pink-stained, potash feldspar with locally, some sideritic carbonate.

Pyrite crystals 0.1 to 0.3 mm in size are dispersed through parts of the rock but in general are not associated with the segregations of coarser grained feldspar.

Small fractures containing sideritic carbonate and trace amounts of opaque sulphide probably pyrite cut both the earlier brecciated zone and the coarser grained segregations.

**Conclusion:**

This is a completely recrystallized rock probably originally a fine-grained volcanic ash or tuff but original textures are not preserved. It contains disseminated pyrite which has migrated and recrystallized. The rock has been subjected to more than one period of fracturing and also to some form of heat and/or hydrothermal alteration which has resulted in the development of some segregations containing coarser grained, potash feldspar. In this respect it is similar to the sample from 211.9 m. The most recent fractures contain minor amounts of sideritic carbonate and some migratory sulphide probably pyrite.

039

Sample: RH5 1; PS25598

**Hand Specimen:**

The sample appears to be a breccia or is an extensively fractured, pale greyish-orange siliceous rock with brown to grey sulphide in interstices.

**Polished Section:**

The area sectioned contains about equal proportions of non-opaque minerals (?quartz) and sphalerite with very minor pyrite. Some of the sphalerite occurs as massive aggregates over 5 mm across and these contain scattered inclusions of the non-opaque mineral and also some inclusions of pyrite which vary in size from 0.01 mm to 0.3 mm. There are also a few small inclusions of carbonate up to 0.05 mm in size and there are a few inclusions composed of intergrown ?quartz and carbonate.

Other areas in the section are composed predominantly of non-opaque ?quartz with traces of carbonate and pyrite and in these areas sphalerite has invaded many interstices and has penetrated along many grain boundaries, isolating some patches of quartz.

The section contains a minute trace of galena found in one area only where sphalerite and galena occur in some interstices in a porous mass of non-opaque ?quartz. The small, angular patches of galena are about 0.02 mm in size.

**Conclusion:**

This is a fractured, siliceous rock or breccia which now contains a moderately high concentration of sphalerite, minor pyrite and a trace of galena. The sphalerite and galena have clearly migrated and recrystallized in this rock, probably partly replacing pre-existing minerals but it is possible that the pyrite was present in the rock at an earlier stage and may also have been partly replaced by sphalerite.

Sample: RH5 2; PS25599

**Hand Specimen:**

The sample contains abundant orange-brown sphalerite with some finely disseminated other sulphides and subparallel streaks of white ?carbonate and probably also some quartz. Some of the white carbonate and ?quartz bands or veins have been displaced by microfaulting.

**Polished Section:**

A visual estimate of the minerals present is as follows:-

	<u>%</u>
Sphalerite	50-60
Galena	10-15
Pyrite	2-3
Non-opaque minerals	20-30

Much of the sample is composed of a massive aggregate of sphalerite through which the other minerals are dispersed as small crystals less than 0.1 mm in size and as irregularly shaped aggregates. Polysynthetic twinning is faintly visible through much of the sphalerite and this shows that the grain size of the sphalerite varies from about 0.1 mm to about 0.4 mm.

Galena occurs as very irregularly shaped crystals from about 0.02 mm in size up to about 0.3 mm and most of it has smooth and slightly curved boundaries against the sphalerite. Where crystal boundaries of sphalerite are visible because of the twinning it can be seen that the galena occurs in interstices and along some grain boundaries in the massive aggregate of sphalerite. In one small area there are some very fine intergrowths of sphalerite and galena suggesting replacement of one sulphide by another and the presence of some very small grains (or remnants) of sphalerite in some of this galena suggests that it was the galena which has partly replaced some sphalerite. Throughout most of the section however these two sulphides are intergrown with smooth, curved boundaries which do not show evidence of replacement.

Most of the pyrite occurs as scattered, isolated euhedral to subhedral crystals commonly 0.02 to 0.06 mm in size included within, or intergrown with the massive aggregate of sphalerite. There are a few larger crystalline aggregates of pyrite up to 0.3 mm in size but these are not common. A few of the pyrite crystals contain small inclusions of non-opaque mineral and a few contain inclusions of, or have been penetrated by galena. In one area there are traces of extremely fine-grained pyrite disseminated through some sphalerite probably occurring mainly along grain boundaries.

Non-opaque minerals (?mainly quartz) occur as small grains less than 0.1 mm in size and as porous, spongy aggregates 1 to 2 mm in size. Variations in the concentration of this fine-grained quartz and also in the concentrations of pyrite and galena suggest some very indistinct banding or layering and many of the aggregates of quartz and elongate masses of galena are parallel to this direction. The rock also contains some veins and vein-like patches of much coarser grained carbonate and in some places these carbonate veins have been fractured and microfaulted and the fractures invaded by sphalerite and galena. Films of galena have also penetrated along a few crystal boundaries in some of the fractured carbonate veins.

One small particle of chalcopyrite about 0.05 mm in size was found in the area sectioned, enclosed by, or intergrown with a mass of sphalerite. No other evidence of chalcopyrite was found in the area sectioned.

#### Conclusion:

A silicate or quartz-bearing rock showing some evidence of banding has been extensively replaced by a mass of sphalerite and galena. Minor pyrite has also migrated and recrystallized but it is possible that at least some of the pyrite was present in the rock at an earlier stage. At some time the rock has been veined by migratory carbonate and textural evidence suggests that these carbonate veins were fractured and invaded by the sphalerite and galena.

041

Sample: RH5 3; PS25600

**Hand Specimen:**

The drill core sample contains a high proportion of brownish sphalerite associated with some very fine-grained galena. Other details cannot be determined.

**Polished Section:**

A visual estimate of the minerals present is as follows:-

	<u>%</u>
Sphalerite	70-75
Galena	15-20
Pyrite	2-3
Chalcopyrite	trace-1
Non-opaque minerals	5-10

This is similar to sample RH5 2 in that it is composed largely of a massive aggregate of sphalerite through which the other minerals are distributed in varying concentrations. The sphalerite is similar to that in the previous sample in that polysynthetic twinning is faintly visible and this enables grain boundaries to be determined showing that the grain size of the sphalerite varies up to about 0.3 mm. Galena is similar to that in sample RH5 2 and occurs as very irregularly shaped crystals and aggregates mainly in interstices between sphalerite crystals. Pyrite is also similar to that in the previous sample and it occurs as scattered euhedral to subhedral crystals generally less than 0.1 mm in size but there are a few larger, irregularly shaped aggregates up to 0.3 mm in size.

This differs from sample RH5 2 in that chalcopyrite is slightly more abundant and it is concentrated in a few areas where small grains 0.02 to 0.05 mm in size occur in interstices in the massive sphalerite. Two areas about 2 to 3 mm in size contain an estimated 3 to 5% of chalcopyrite but throughout most of the area sectioned there is little or no evidence of chalcopyrite.

Small grains and aggregates of non-opaque, fine-grained quartz are dispersed throughout the rock and in one band there are also small flakes of a micaceous mineral. Variations in the concentration of non-opaque minerals, pyrite and galena suggest very indistinct or relict banding or layering and the micaceous flakes tend to be parallel to this direction which could have been a direction of weak foliation or schistosity.

There are a few small carbonate veins about 0.1 mm thick which have been locally fractured or displaced and appear to have been invaded by the sphalerite and galena.

**Conclusion:**

This is similar to sample RH5 2 and the evidence suggests that it was a foliated or weakly schistose rock composed of quartz and a fine-grained mica cut by some small carbonate-bearing veins. It may have contained some pyrite. It has been extensively replaced by massive aggregates of sphalerite and galena with trace amounts of chalcopyrite.

042

Sample: RH5 4; PS25601

**Hand Specimen:**

A brownish-grey rock composed largely of fine-grained sulphide similar to that in the previous specimens however this is cut by some carbonate veins containing chalcopyrite and one fractured (?joint) surface also shows a concentration of chalcopyrite.

**Polished Section:**

A visual estimate of the minerals present is as follows:-

	<u>%</u>
Sphalerite	50-55
Chalcopyrite	3-5 (more locally)
Pyrite	10-15
Galena	trace
Non-opaque minerals	25-30

Much of the rock is composed of massive sphalerite and fine-grained quartz which are very similar to those in samples RH5 2 and RH5 3. Much of the sphalerite shows faint twinning and has a common grain size of about 0.05 to 0.1 mm and much of the quartz has a similar grain size. Textures suggest that much of the sphalerite may have replaced a mineral intergrown with the quartz and some sphalerite contains few small inclusions of a fine-grained, micaceous silicate.

This differs from the previous two samples in that there is practically no galena but chalcopyrite occurs as irregularly shaped grains and aggregates commonly 0.02 to 0.1 mm in size intergrown with the sphalerite. There are a few coarser grained zones particularly along carbonate-bearing veins where aggregates of chalcopyrite are up to 0.5 mm in size.

Pyrite is more abundant than in the two previous specimens and much of it is concentrated along a few subparallel bands where there are irregularly shaped aggregates 0.1 to 0.5 mm in size as well as high concentrations of euhedral to subhedral crystals 0.02 to 0.05 mm in size. Much of the chalcopyrite is preferentially associated with the larger aggregates of pyrite and some of these are partly surrounded by masses or aggregates of chalcopyrite up to 1 mm long. Traces of galena are intergrown with some of this more massive chalcopyrite, surrounding or encrusting the large aggregates of pyrite.

Minor carbonate is associated with some of the fine-grained quartz scattered throughout the rock and some also occurs along small, discontinuous or deformed veins.

**Conclusion:**

This is a fine-grained rock probably composed mainly of quartz and fine-grained mica which has been extensively replaced by sphalerite, pyrite and chalcopyrite. There is some evidence of banding and it is possible that at least some pyrite may have been present before the other sulphide minerals. Much of the chalcopyrite is preferentially associated with concentrations of pyrite along some bands or layers.

043

Sample: RH5 5; PS25602

**Hand Specimen:**

A fine-grained rock now composed largely of brownish sulphide and very fine-grained galena. It has a patchy, mottled appearance with some scattered, small patches or aggregates of pale-coloured silicate or carbonate.

**Polished Section:**

A visual estimate of the minerals present is as follows:-

	<u>%</u>
Sphalerite	50-55
Galena	20-25
Pyrite	2-3
Non-opaque minerals	20-25

This is similar to other sulphide-bearing specimens in that much of it is now composed of a massive aggregate of sphalerite through which are distributed varying concentrations of the other minerals. The sphalerite is similar to that in other specimens in that it shows evidence of twinning and has a grain size of about 0.05 to 0.1 mm. It encloses numerous grains and aggregates of quartz some of which is associated with, or intergrown with carbonate. Some of the sphalerite contains small inclusions of a micaceous silicate showing subparallel orientation and these are concentrated along some wavy or deformed bands less than 1 mm thick.

Galena occurs in varying concentrations intergrown with the sphalerite generally with smooth to curved grain boundaries and textural evidence suggests that much of the galena occurs in interstices between sphalerite crystals. There are some porous, massive aggregates of galena up to 3 mm in size which enclose grains and small aggregates of sphalerite, some small pyrite crystals and also some quartz grains. Some galena has filled interstices in a crystalline mass of carbonate 2 to 3 mm in size and some has partly replaced small, corroded pyrite crystals and crystalline aggregates.

Pyrite occurs as scattered crystals about 0.05 mm in size and as small groups or crystalline aggregates. It is similar to that in samples RH5 2 and 3 but in a few zones there is more conclusive evidence to show that some pyrite has been partly replaced by galena.

No chalcopyrite was found in the area sectioned.

**Conclusion:**

This was probably a moderately fine-grained rock composed of quartz, carbonate and a micaceous silicate. Preferred orientation of the micaceous silicate suggests at least a weak foliation or schistosity. The rock has been extensively replaced by sphalerite and galena and it also contains minor pyrite at least some of which may have been present before the other sulphides.

044

Sample: RH5 6; PS 25603

**Hand Specimen:**

A fine-grained, pale grey rock has been fractured and is now cut by numerous, intersecting veins containing yellow sulphide. Some sulphide has encroached on, and replaced the rock adjacent to the veins and some of this appears to be cut by small, later sulphide-bearing veins.

**Polished Section:**

A zone containing abundant sulphide was selected for sectioning and a visual estimate of the minerals present in this zone is as follows:-

	<u>%</u>
Pyrite	60-70
Chalcopyrite	5-10
Sphalerite	1-2
Chalcocite	trace
Non-opaque minerals	20-30

Much of this zone of the rock has been replaced by a mass of medium-grained pyrite probably with a common grain size of 0.05 to 0.1 mm but there are at least a few larger crystals about 0.2 mm in size. In general crystal faces are not developed except around interstices or patches of non-opaque mineral. Many zones in the pyrite are finely porous strongly suggesting that this pyrite replaced a pre-existing mineral or minerals and some of these spongy, finely porous zones form subparallel, elongate streaks.

Chalcopyrite is distributed sporadically throughout the rock and occurs in interstices and along grain boundaries between many of the pyrite crystals. Much of the chalcopyrite is fine-grained with a common grain size of less than 0.1 mm but where it is present in higher concentrations there are some larger crystals and/or aggregates of chalcopyrite up to 0.3 mm in size. Much of the coarser grained chalcopyrite occurs along poorly defined veins cutting the more massive pyrite and in these veins the chalcopyrite is associated with some sphalerite and some carbonate. Chalcopyrite along one of these veins contains a few small patches of chalcocite. Some chalcopyrite has penetrated the finely porous, spongy patches of pyrite and may have partly replaced some pyrite in these zones.

As noted above, sphalerite occurs with chalcopyrite in small veins about 0.1 to 0.2 mm thick which cut the more massive pyrite but in general, these are not very clearly defined. Some sphalerite also occurs in a few interstices between pyrite crystals.

Small aggregates of non-opaque mineral probably mainly carbonate are scattered throughout the mass of pyrite and most of these are less than 0.1 mm in size. There are a few larger areas of non-opaque quartz and some containing a softer, micaceous silicate and these are probably remnants of the pre-existing rock.

**Conclusion:**

A fine-grained, siliceous rock has been fractured and extensively replaced by pyrite with lesser amounts of chalcopyrite. The massive

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44.

pyrite is cut by later veins which contain mainly chalcopyrite and sphalerite with some carbonate.

301047

RIVER

TULLAH

PIEMAN

ROSEBERY

MURCHISON RIVER

RENISON BELL

Mt. Murchison

Mt. Read

MT. TYNDALL  
Red Hills

AREA

E.L. 9/66

Mt. Heemskirk

Mt. Agnew

ZEEHAN

TRIAL HARBOUR

HENTY-YOLANDE AREA  
E.L. 41/71

DORA-HUXLEY AREA  
Mt. Sedgwick  
Mt. Lyell  
Mt. Owen

QUEENSTOWN

GORMANSTON

THE MT. LYELL M. & R. CO. LTD.  
CONSOLIDATED MINING LEASE.

E.L. 10/69  
Mt. Huxley

STRAHAN

Mt. Jukes

JUKES -

DARWIN

AREA

Mt. Darwin  
Mt. Sorell  
South Darwin Peak  
E.L. 21/76

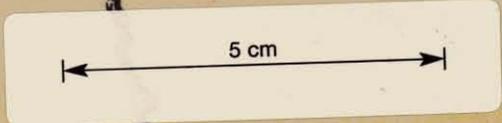
CAPE SORELL

MACQUARIE

HARBOUR

KING RIVER

SOUTHERN OCEAN



MAP 1

THE MOUNT LYELL M. & R. CO. LTD.  
EXPLORATION DEPARTMENT.

EXPLORATION LICENCES  
LOCALITY PLAN

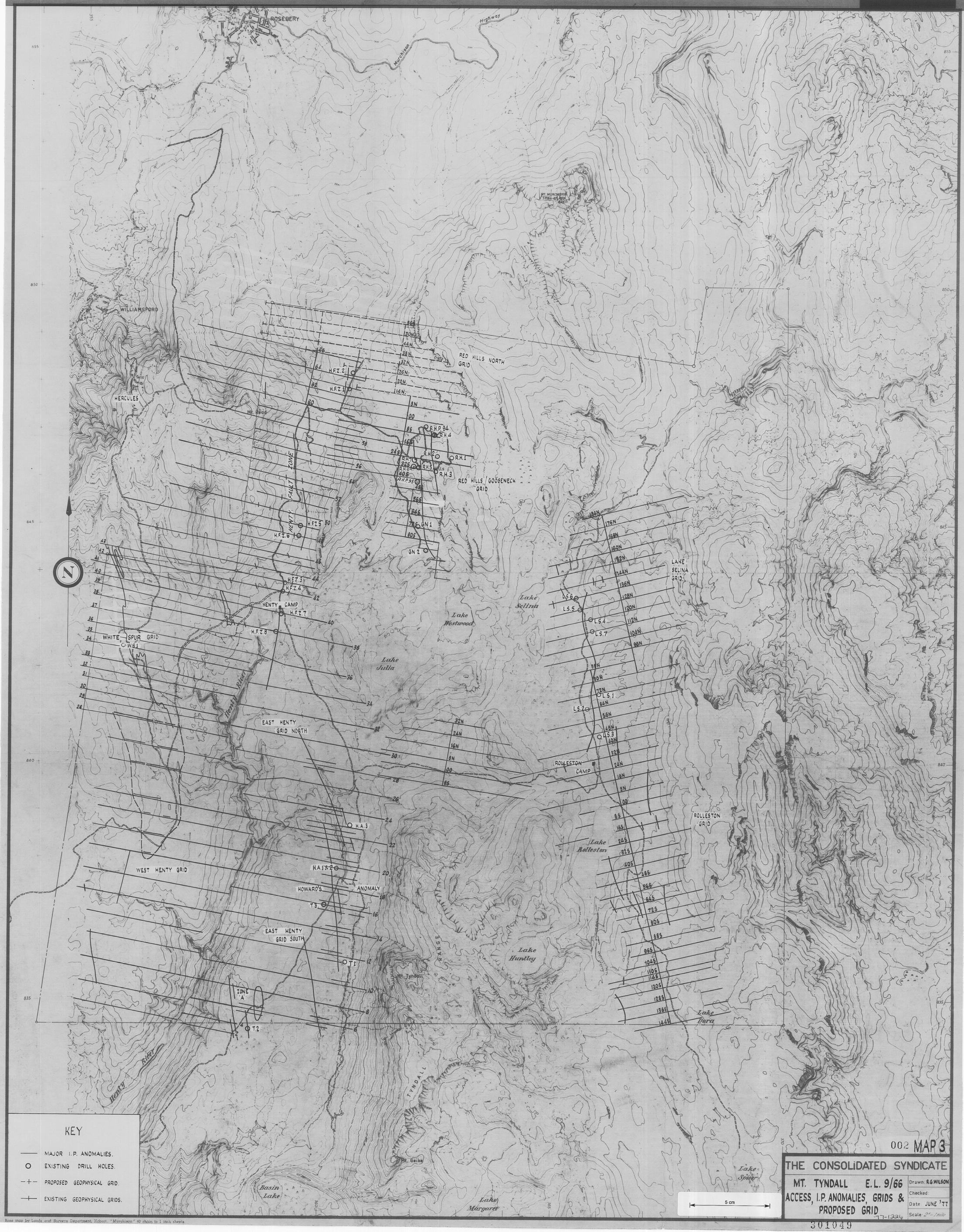
046

77-1224

Drawn: A.G.W.
Checked:
Date: April '77
Scale: 1:250,000



<p><b>NORTH OF HENTY FAULT</b></p> <p><b>DUNDAS GROUP</b>          Dg SHALE, SILTSTONE, GREYWACKE, MINOR CRYSTAL TUFF.</p> <p><b>PRIMROSE VOLCANICS</b>          Pv-a ACID CRYSTAL FELDSPAR LITHIC TUFFS, OCCASIONALLY WELDED.          Pv-b SHALES, SILTSTONES, FINE GRAINED TUFFS.          Pv-c ACID QUARTZ FELDSPAR LITHIC TUFFS, OCCASIONALLY WELDED AGGLOMERATES.          Pv-d PHYRIC BLACK SHALES.          Pv-e SHALES, GREYWACKES, FINE TUFFS.          Pv-f ACID WELDED TUFFS.          Pv-g BASIC INTRUSIVES.          Pv-h ACID LAVAS, FELDSPAR PHYRIC.          Pv-i ACID WELDED TUFFS.          Pv-j BASIC TO INTERMEDIATE INTRUSIVES AND EXTRUSIVES.          Pv-k VOLCANIClastic SEDIMENTS.</p>	<p><b>SOUTH OF HENTY FAULT</b></p> <p><b>TYNDALL GROUP</b>          Tm-i (JUKES) VOLCANIClastic SEDIMENTS (CONISTON TUFFS) CRYSTAL TUFFS, AGGLOMERATES, BANDED TUFF SHALES.          Tm-ii QUARTZ ROSOPHYR AUTOBRECCiated LAVAS, HEMIATITIC CARBONATES, CRYSTAL TUFFS, CARBONATE SEDIMENTS, MAGNETITE RICH LAVAS.          Tm-iii QUEENSTOWN PYROCLASTICS.          Tm-iv INTERMEDIATE PYROCLASTICS, SILTSTONES, SHALES, CARBONATES, MINOR ACID VOLCANICS.          Tm-v INTERMEDIATE LAVAS AND INTRUSIVES, QUARTZ, FELDSPAR, HORNBLende PHYRIC TYPES.          Tm-vi INTERMEDIATE PYROCLASTICS, GREYWACKES, SHALES, MINOR ACID VOLCANICS.          Tm-vii ACID PYROCLASTICS, MINOR LAVAS AND SEDIMENTS.          Tm-viii PHYRIC BLACK SHALES.</p> <p><b>DUNDAS GROUP</b>          Dg GREYWACKES, SILTSTONES AND SHALES.          Di MARL AND ULTRABASIC INTRUSIVE.</p>	<p><b>RED HILLS - GOOSENECK</b></p> <p><b>TYNDALL GROUP</b>          Tm-i (JUKES) VOLCANIClastic SEDIMENTS, CRYSTAL TUFF AND AGGLOMERATES.          Tm-ii CENTRAL LAVAS.          Tm-iii FELSIC PYROCLASTICS, CRYSTAL LITHIC TUFFS (AGGLOMERATES), INTERBEDDED LAVAS AND PYROCLASTICS, AGGLOMERATES PLUS MINOR LITHIC TUFFS, SHALES.          Tm-iv FINE GRAINED SILICEOUS FELSIC LAVAS.          Tm-v ACID FELDSPAR PHYRIC LAVAS.          Tm-vi ACID QUARTZ PH LAVAS.          Tm-vii FINE GRAINED PINK FELSIC LAVA (E "DARWIN TYPE" RHYOLITE).</p>	<p><b>SELINA - ROLLESTON</b></p> <p><b>QUATERNARY</b>          Sw SWAMP.          Ms MORaine AND SCREE.          Oc OWEN CONGLOMERATE.          Cb CAMBRIAN.</p> <p><b>TYNDALL GROUP</b>          Tm-i UNDIFFERENTIATED TUFFS, LAVAS AND AGGLOMERATES.          Tm-ii UNDIFFERENTIATED CAMBRIAN VOLCANICS.          Tm-iii AGGLOMERATES.          Tm-iv STICHT QUARTZITE.</p>	<p><b>LEGEND</b></p> <p>— FAULT          — ANTICLINE          — SYNCLINE          — STRIKE AND DIP OF BEDDING          — STRIKE OF SCHISTOSITY AND DIP          — OLD WORKINGS</p> <p><b>THE CONSOLIDATED SYNDICATE</b>  <b>MT. TYNDALL AREA</b>          001048 E.L. 9/66 001  <b>GEOLOGICAL MAP</b>          1:15,000          MAP 2</p> <p>DRAWN: P.B.          TRACED: R.S.W.          CHECKED:          DATE: JULY '77          SCALE: 1:15,000</p>
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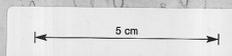
**KEY**

- MAJOR I.P. ANOMALIES.
- EXISTING DRILL HOLES.
- + PROPOSED GEOPHYSICAL GRID
- EXISTING GEOPHYSICAL GRIDS.

002 MAP 3

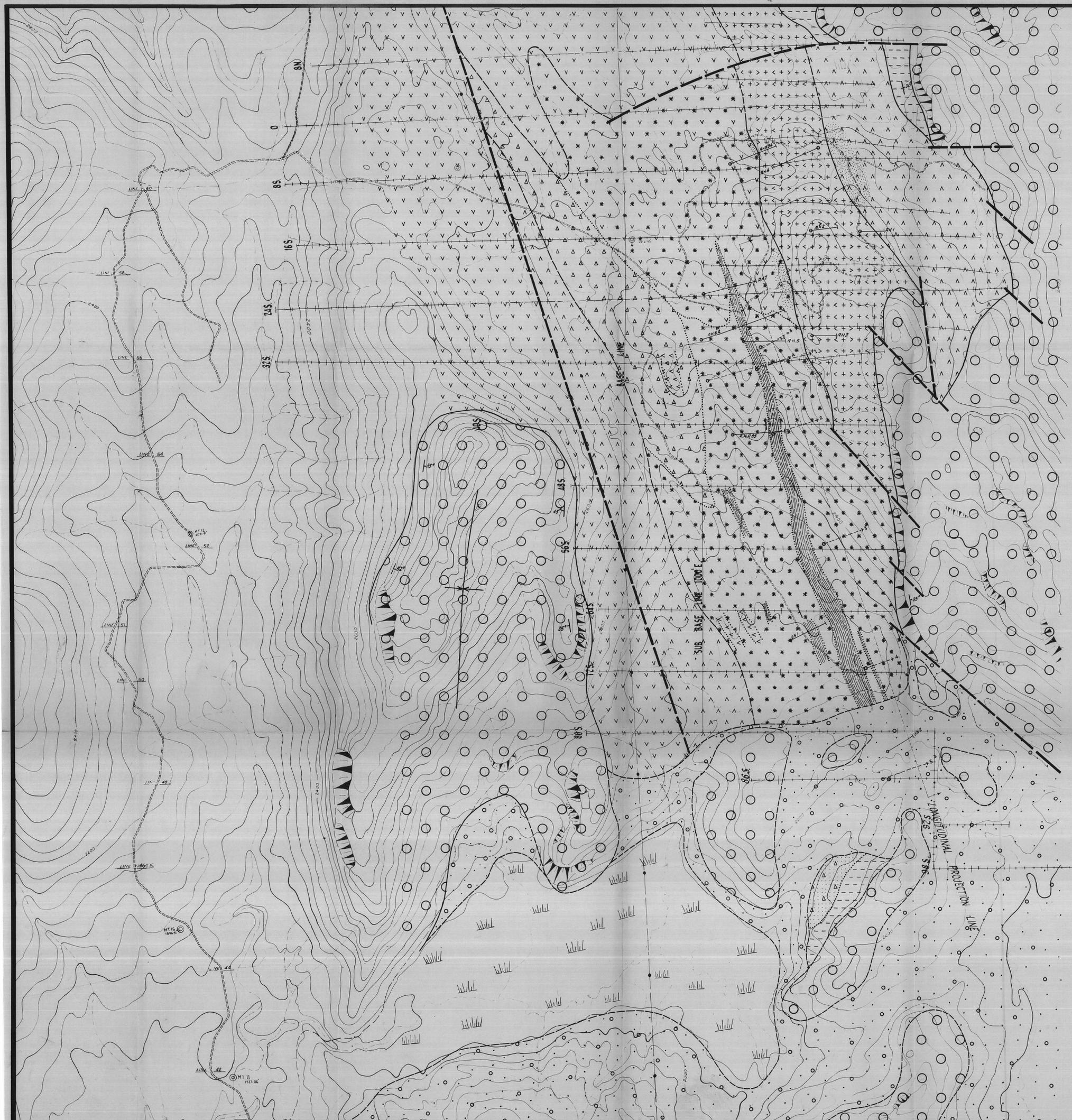
**THE CONSOLIDATED SYNDICATE**  
 MT. TYNDALL E.L. 9/66  
 ACCESS, I.P. ANOMALIES, GRIDS & PROPOSED GRID

Drawn: R.G. WILSON  
 Checked:  
 Date: JUNE '77  
 Scale: 2" = 1 mile



301049

Rose made by Lands and Surveys Department, Hobart. "Murchison" 40 chain to 1 inch sheets.



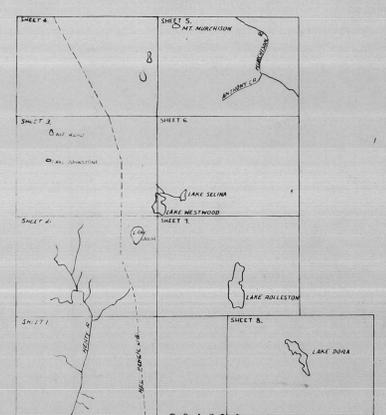
LEGEND

- RECENT
  - ALLUVIUM.
  - MORAINE AND CONGLOMERATE SCREE.
- ORDOVICIAN
  - OWEN CONGLOMERATE.
- CAMBRIAN
  - VOLCANOCLASTIC SEDIMENTS. (JUKE'S)
  - CRYSTAL TUFFS AND AGGLOMERATES.
- MT. TYNDALL VOLCANICS
  - QUARTZ PORPHYRITIC LAVAS.
  - DOMINANT AGGLOMERATES + MINOR LITHIC TUFFS.
  - PYROCLASTIC SEQUENCE INCLUDING MEDIUM-COARSE CRYSTAL LITHIC TUFFS + MINOR AGGLOMERATES.
  - SHALES AND/OR TURFACIOUS SILTSTONES.
  - INTERBEDDED LAVAS AND PYROCLASTICS.
  - FELDSPAR PORPHYRITIC LAVAS.
  - FINE GRAINED PINK FELSIC LAVA, STRONGLY BRECCIATED AND ALTERED THROUGHOUT. } DARWIN TYPE RHYOLITE.
  - CHLORITISATION + PYRITE - HAEMATITE / MAGNETITE - MINOR CHALCOPYRITE MARGINAL TO FINE GRAINED FELSIC LAVAS.
- SYMBOLS
  - BEDDING.
  - SYNCLINE AXIS - MT. GOOSENECK.
  - FAULT.
  - DIAMOND DRILL HOLES.
  - DEFINITE GEOLOGICAL BOUNDARY.
  - APPROXIMATE GEOLOGICAL BOUNDARY.
  - INFERRED GEOLOGICAL BOUNDARY.

MAP COMPILATION - P. BROPHY 1977.  
 DATA FROM:  
 1. R. POLTOCK 1970/71.  
 2. N. STEVENS - HOARE 1976.  
 3. P. BROPHY 1977.

R.H.P. - E.Z. CO. LTD. 1959-60.  
 G.N. - R.T.A.E. 1960.  
 R.H. - MT. LVELL 1971 & 1977.  
 O -> PROPOSED - MT. LVELL - G.O.D.L. 1977/78.

LOCATION DIAGRAM  
 SCALE 1" = 16 MILES



301050

**THE CONSOLIDATED SYNDICATE**

GEOLOGICAL MAP & PROPOSED D. DRILLING 1977/78

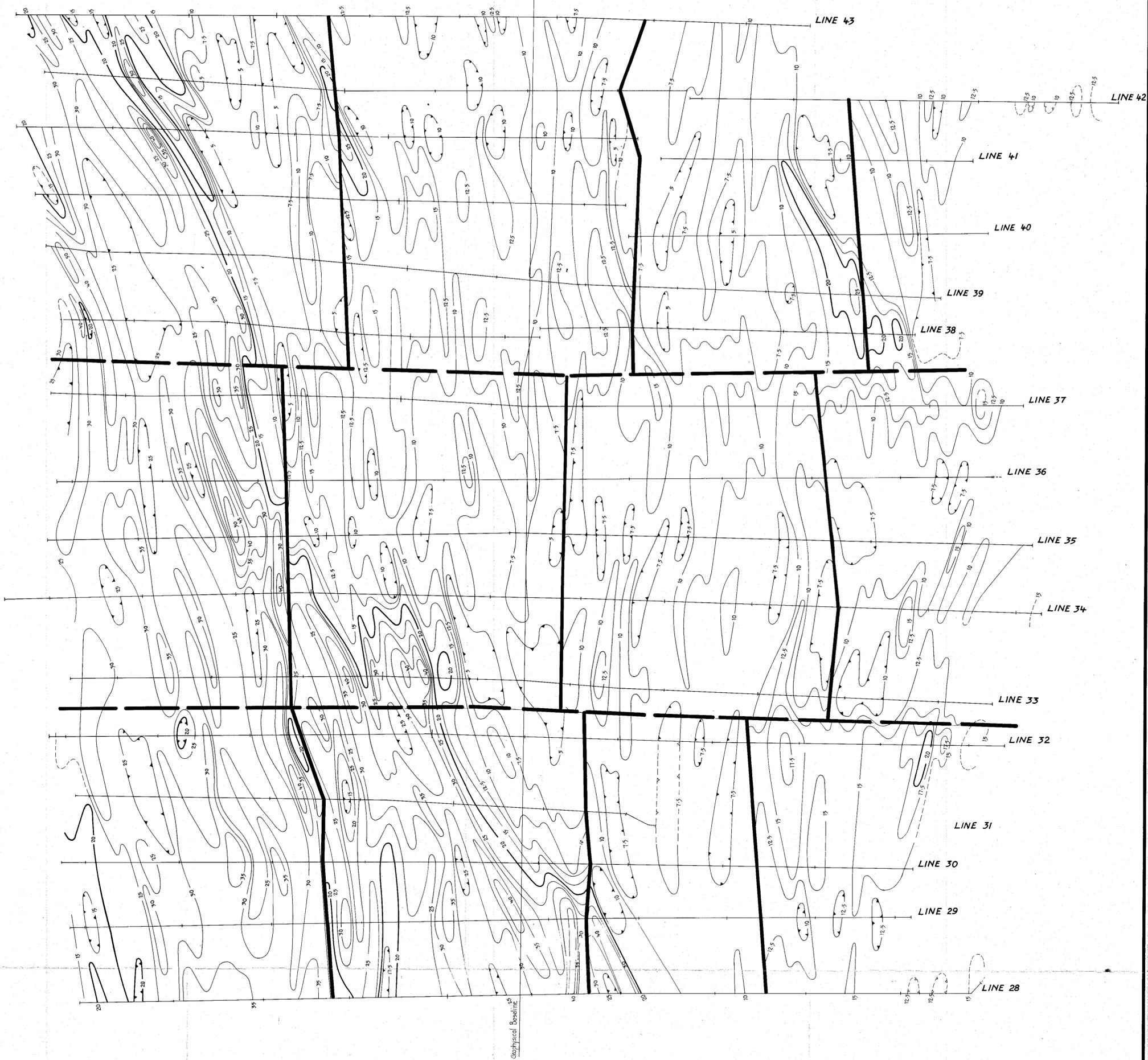
**MT. TYNDALL AREA**  
 EL. 9/66

Sheet 3 003

77-1224

DRAWN BY P. BROPHY.  
 TRACED BY R.B. WILSON.  
 CHECKED BY:  
 DATE JULY 1977  
 SCALE 1" = 500'

MAP 4



**LEGEND**

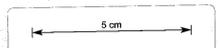
Chargeability contours in milliseconds  
 Gradient block boundary

**MOUNT LYELL MINING & RAILWAY  
 COMPANY LTD.**

WHITE SPUR

(NR) QUEENSTOWN - WEST COAST - TASMANIA

ELECTRICAL INDUCED POLARIZATION SURVEY  
 GRADIENT ARRAY  
 CHARGEABILITY CONTOUR PLAN

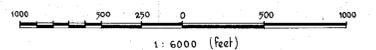


SURVEYED & COMPILED BY  
 SCINTREX PTY. LTD

NOVEMBER - JANUARY 1977



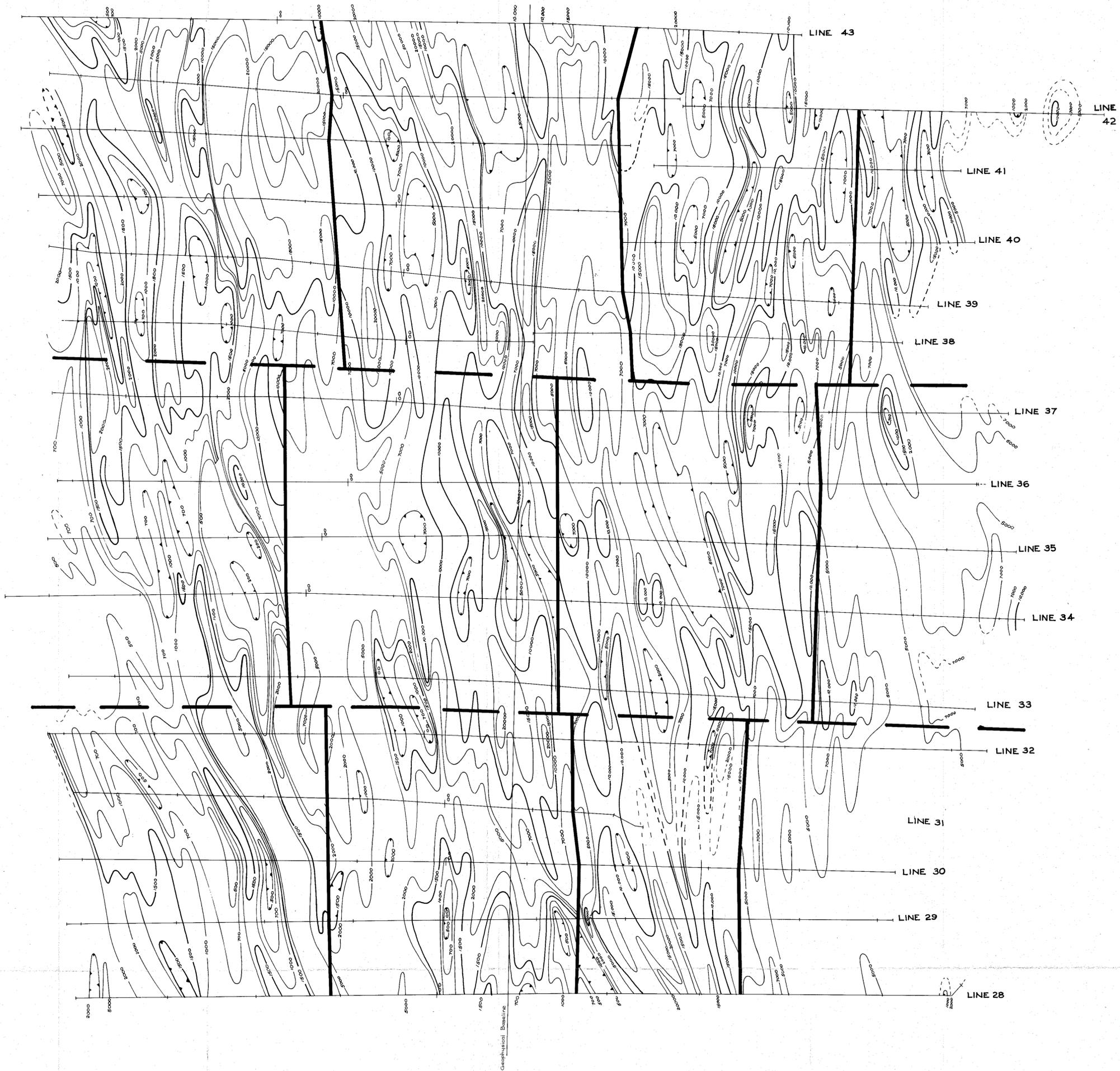
301051



1:6000 (Feet)

004  
 MAP 5

77-1224



**LEGEND**

Resistivity contours in ohm-metres  
 Gradient block boundary ———

**MOUNT LYELL MINING &  
 RAILWAY COMPANY LTD**  
 WHITE SPUR  
 (NR) QUEENSTOWN - WEST COAST - TASMANIA

**ELECTRICAL INDUCED POLARIZATION SURVEY  
 GRADIENT ARRAY  
 RESISTIVITY CONTOUR PLAN**

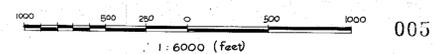


SURVEYED & COMPILED BY  
 SCINTREX PTY. LTD

NOVEMBER - JANUARY 1977



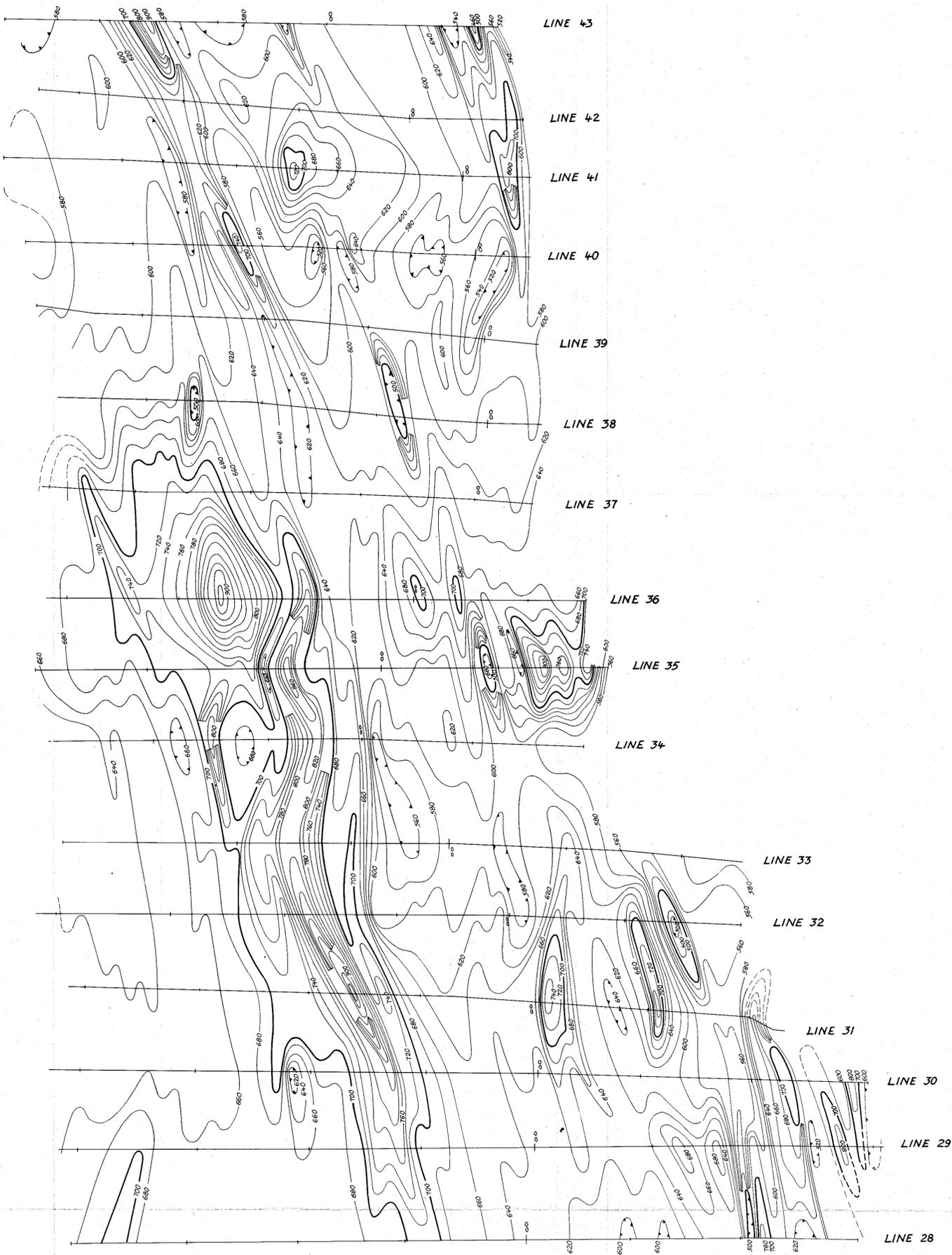
301052



1:6000 (feet)

MAP 6

77-1224



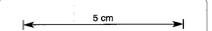
Note: For correct total field, add 62,000 gammas to all values.

**MOUNT LYELL MINING &  
RAILWAY COMPANY LTD.**

WHITE SPUR  
(NR) QUEENSTOWN - WEST COAST - TASMANIA

TOTAL FIELD MAGNETOMETER SURVEY  
CONTOUR PLAN

301053



SURVEYED & COMPILED BY  
SCINTREX PTY. LTD.

NOVEMBER - JANUARY 1977

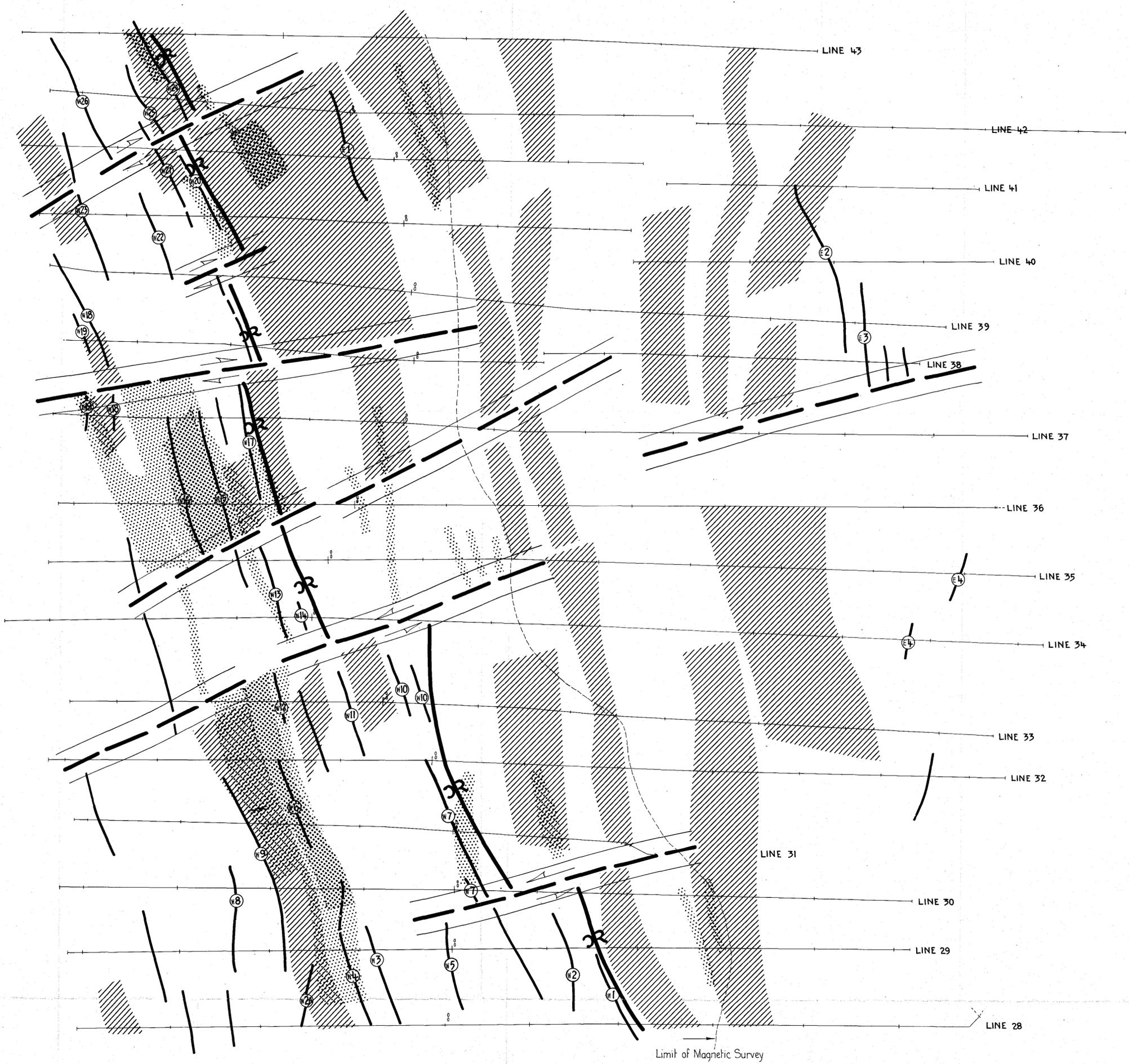


1000 500 00 250 500 1000 (Feet)  
1 : 6000

006

MAP 7

77-1224



**LEGEND**

- Relative Induced Polarization Highs
- Major Physical Property Boundary
- Dislocation (Faults or Flexures)
- Direction of Movement
- Area of Uncertainty
- Weakly Magnetic Units
- More Intensely Magnetic Units
- Relatively Resistive Units

**MOUNT LYELL MINING & RAILWAY COMPANY LTD.**  
**WHITE SPUR**  
 (NR.) QUEENSTOWN - WEST COAST - TASMANIA

**INTERPRETATION PLAN**

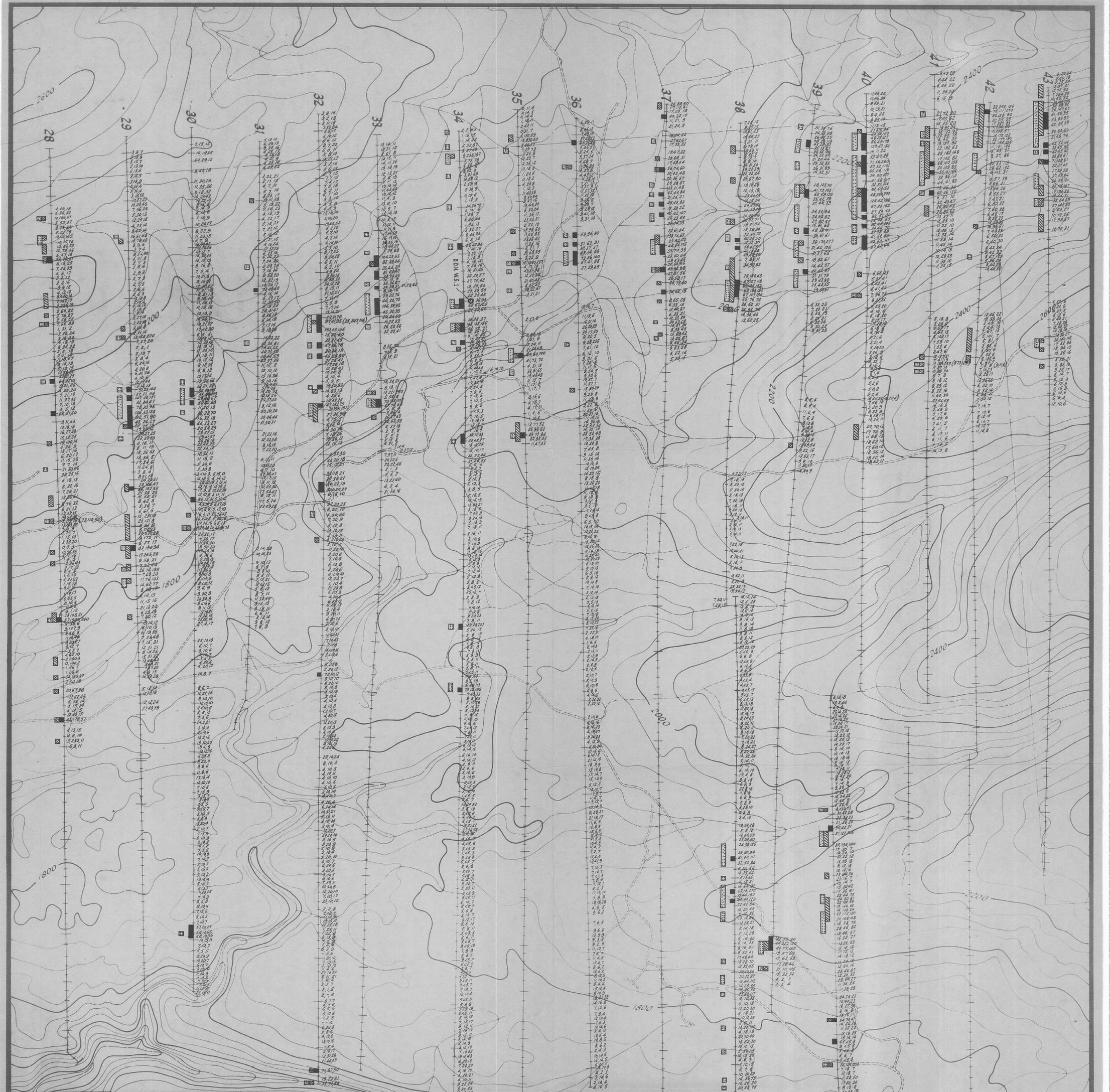
301054

5 cm

SURVEYED & COMPILED BY  
 SCINTREX PTY. LTD.

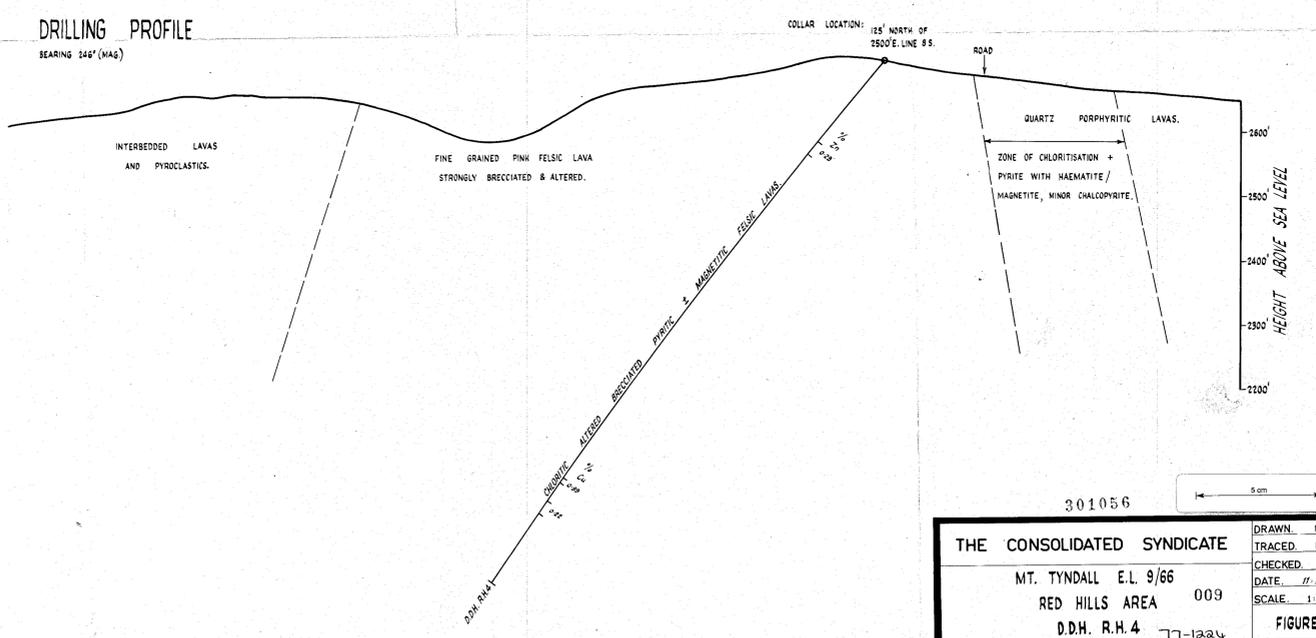
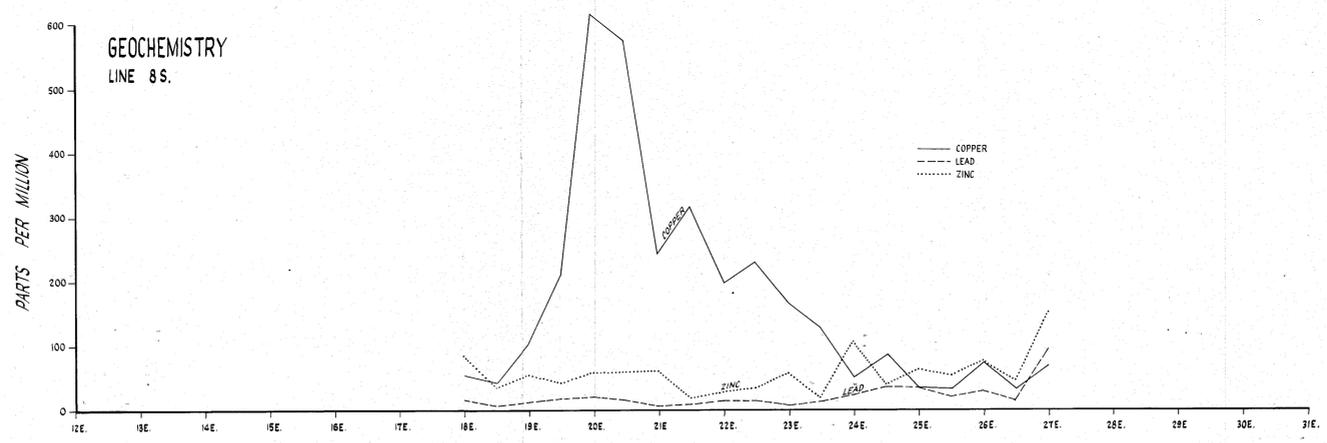
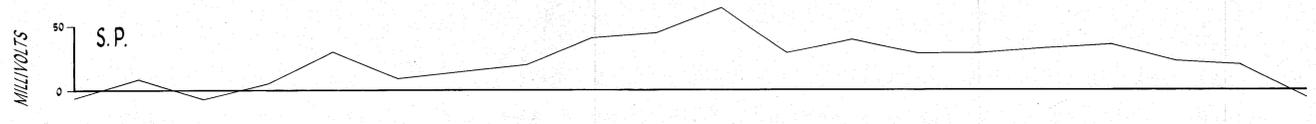
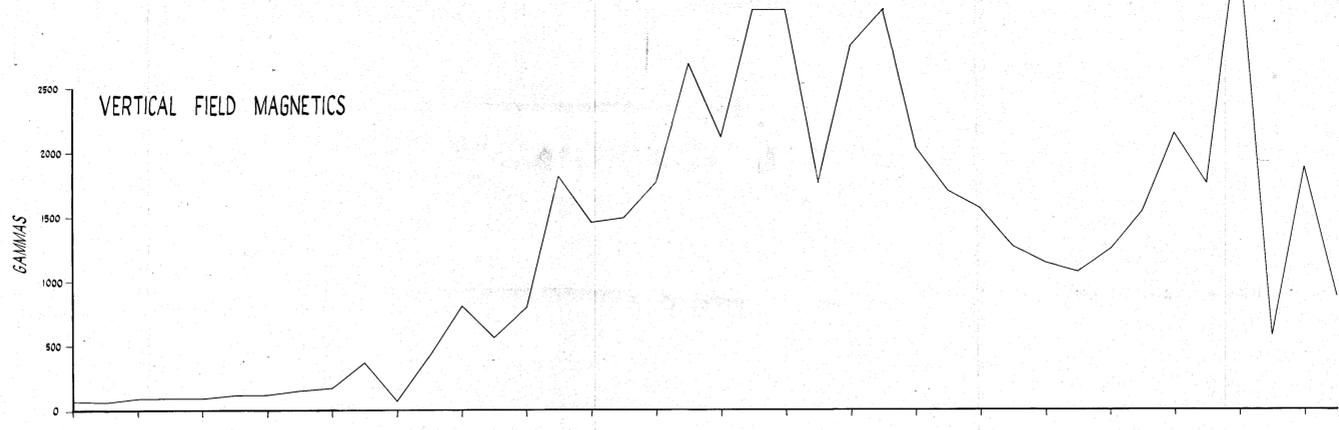
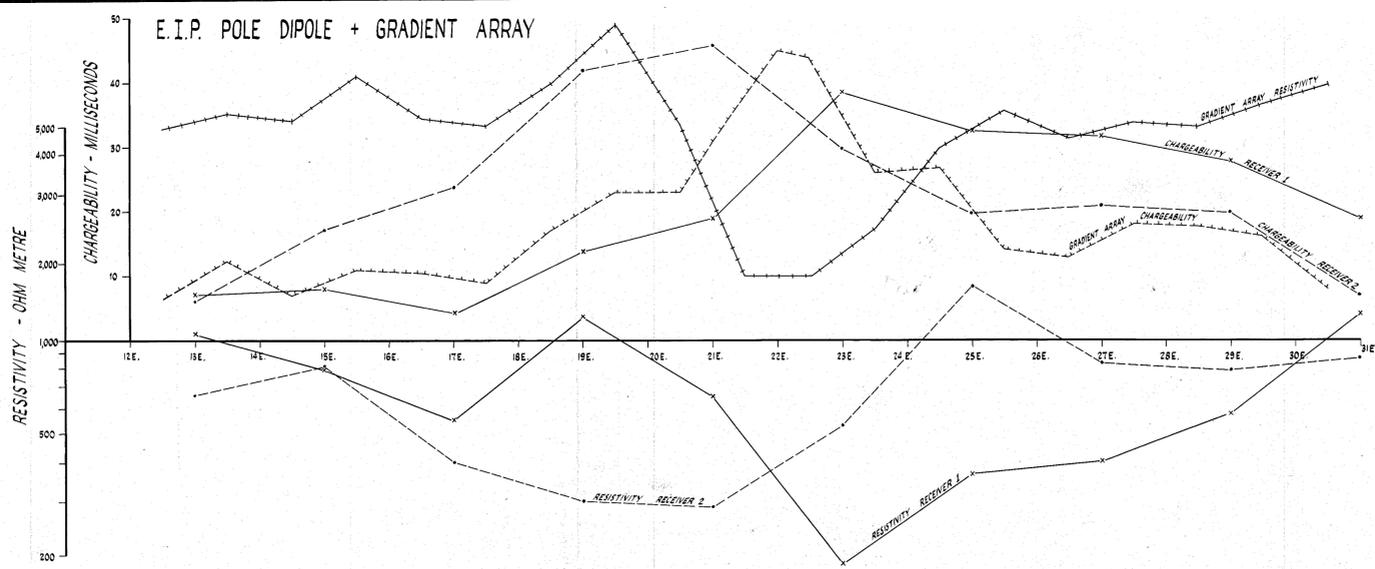
NOVEMBER - JANUARY 1977

1000 500 0 250 500 1000 (Feet)  
 1 : 6000



THE MT. YELL M. & R. CO. LTD.  
 MT. TYDALL E.L. 9/66  
 WHITE SPUR AREA  
 SOIL GEOCHEMISTRY - ANOMALOUS ZONES  
 -80# FRACTION  
 DRAWN: R. H. MILSON  
 CHECKED:  
 DATE: 15-8-77  
 SCALE: 1:6000

301053  
 MAP 9  
 5 cm  
 Cu, Pb, Zn (ppm) -80# FRACTION  
 10, 20, 30



301056

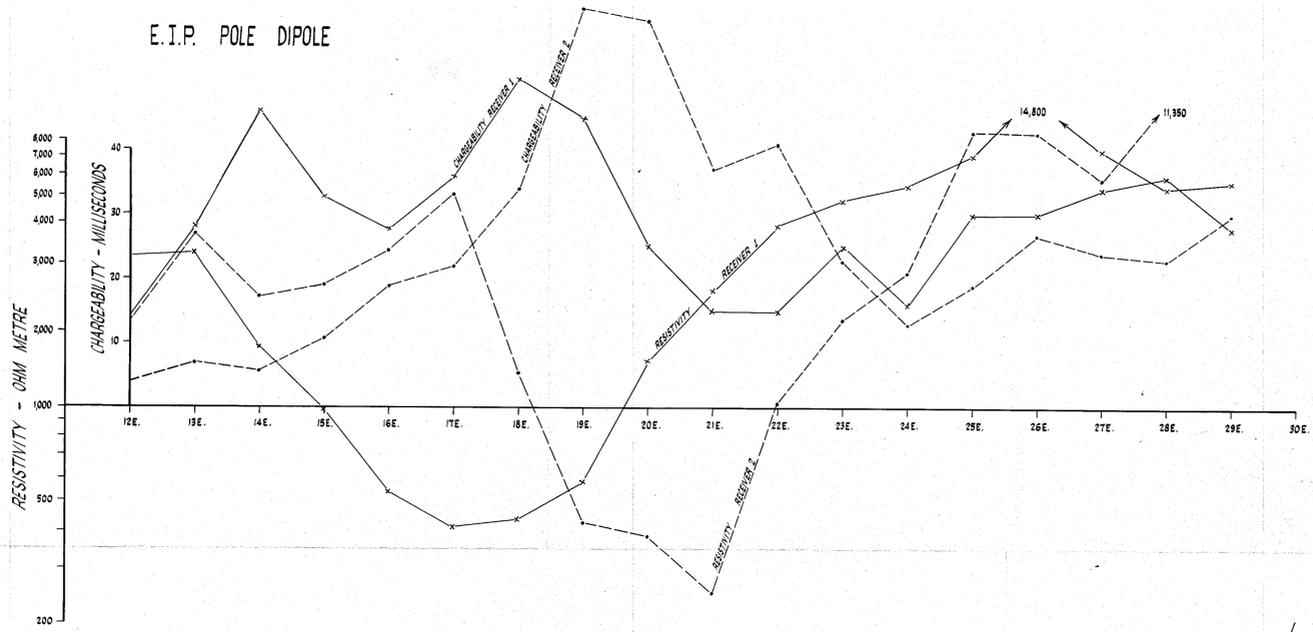
THE CONSOLIDATED SYNDICATE

MT. TYNDALL E.L. 9/66  
 RED HILLS AREA 009  
 D.D.H. R.H. 4

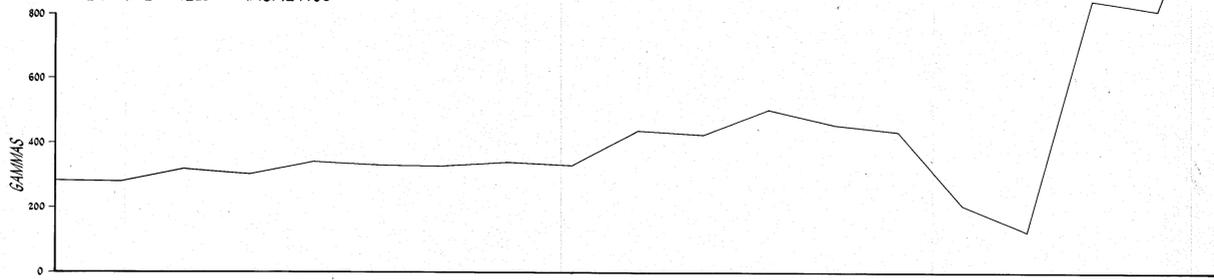
DRAWN P.B.  
 TRACED R.B.W.  
 CHECKED  
 DATE 11.7.77  
 SCALE 1:1200

FIGURE 1

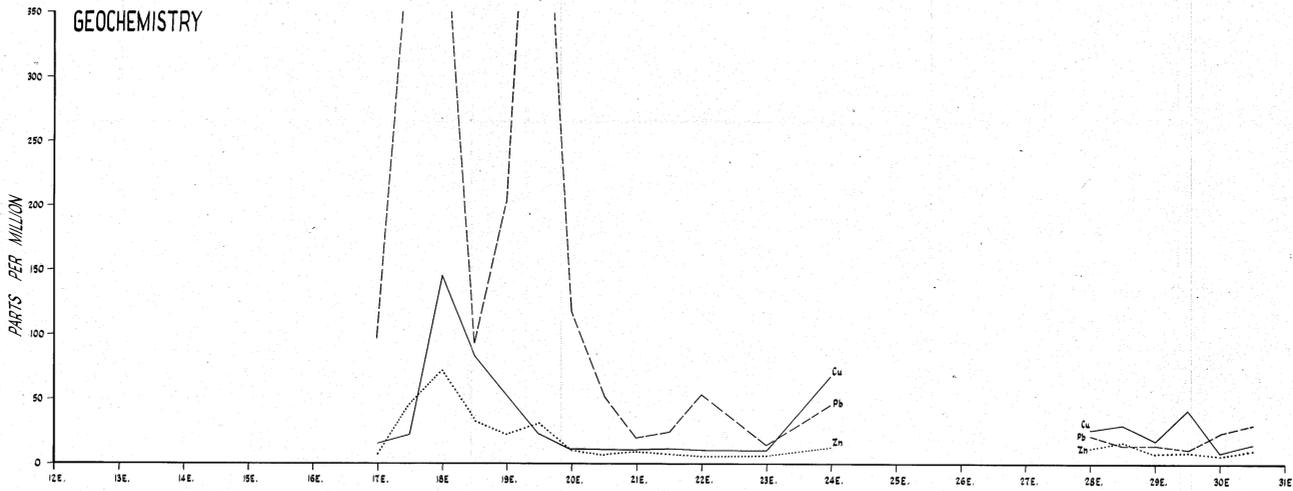
E.I.P. POLE DIPOLE



VERTICAL FIELD MAGNETICS

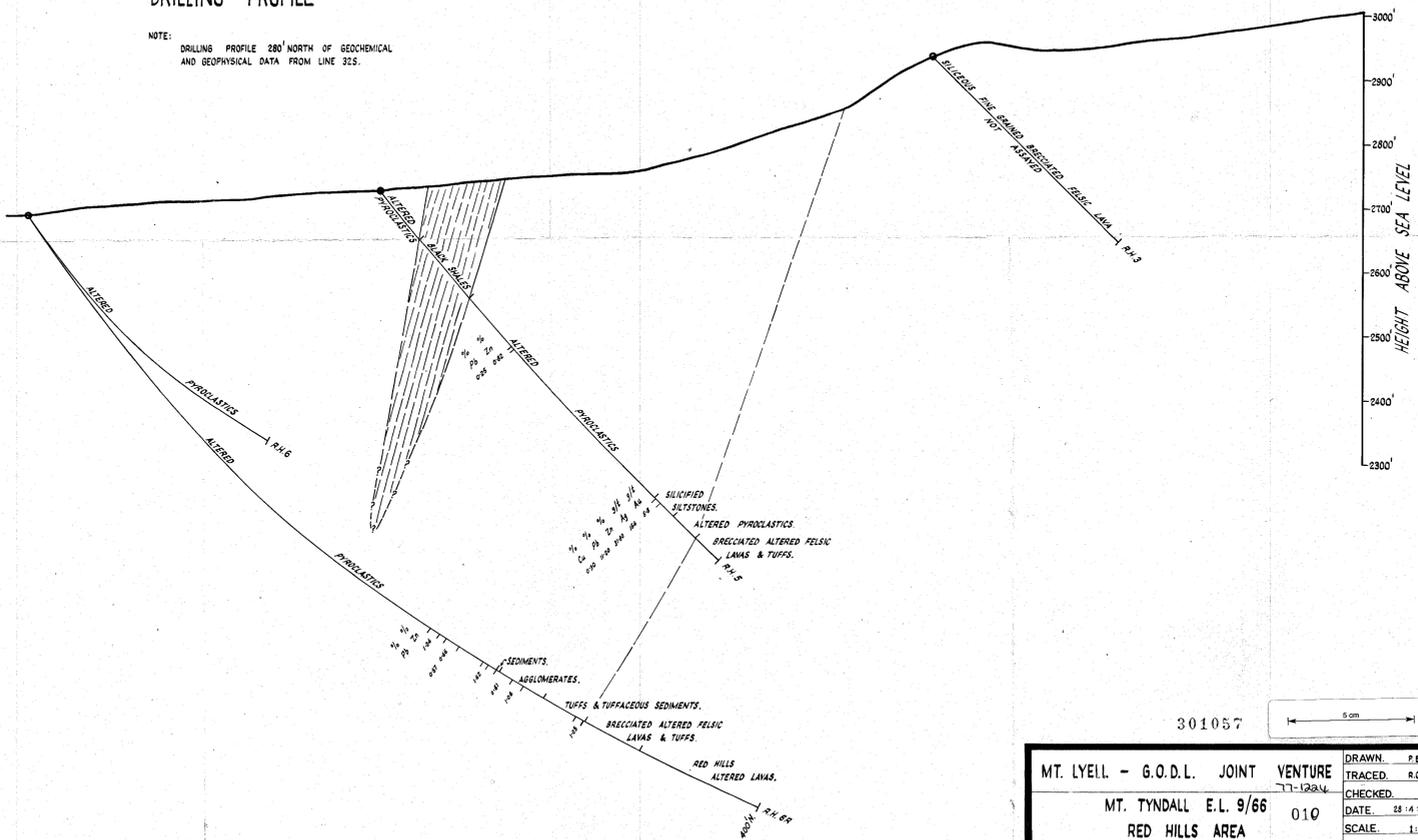


GEOCHEMISTRY



DRILLING PROFILE

NOTE: DRILLING PROFILE 280' NORTH OF GEOCHEMICAL AND GEOPHYSICAL DATA FROM LINE 325.

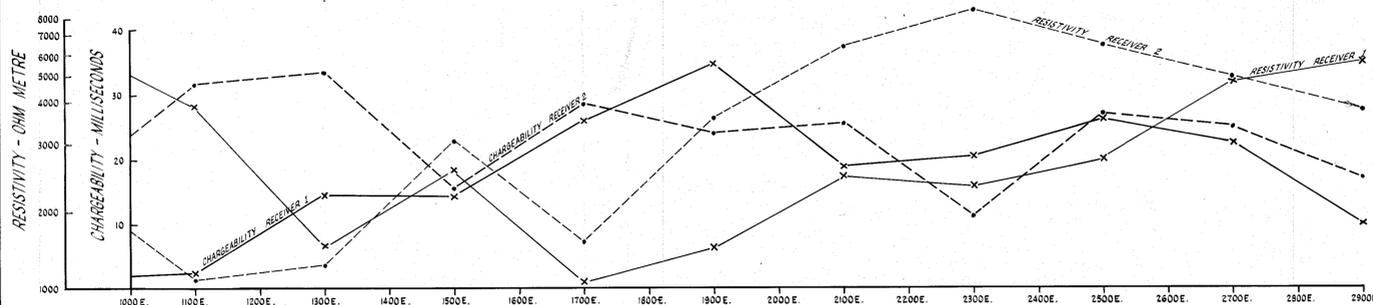


301057

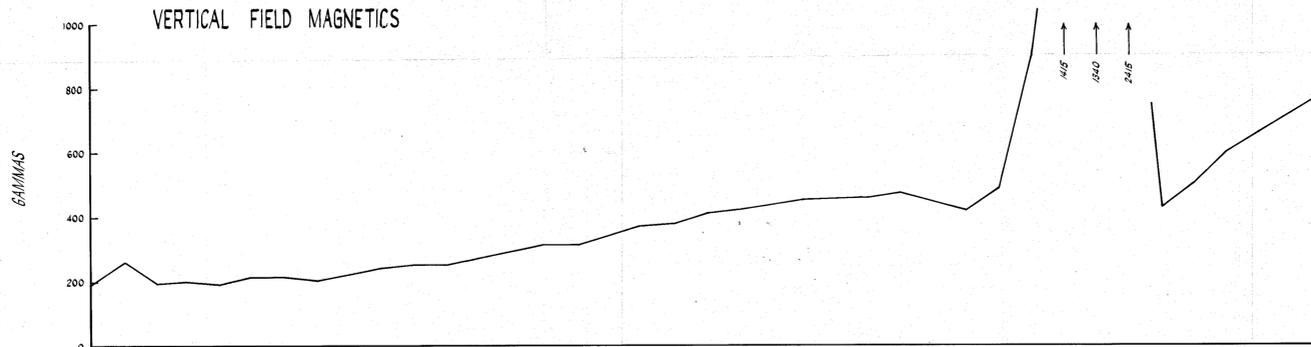
MT. LYELL - G.O.D.L. JOINT VENTURE  
 MT. TYNDALL E.L. 9/66 010  
 RED HILLS AREA  
 DIAMOND DRILL HOLES R.H. 3, 5, 6 & 6R. FIGURE 2

DRAWN: P.B.  
 TRACED: R.G.W.  
 CHECKED:  
 DATE: 28.11.77  
 SCALE: 1:1200

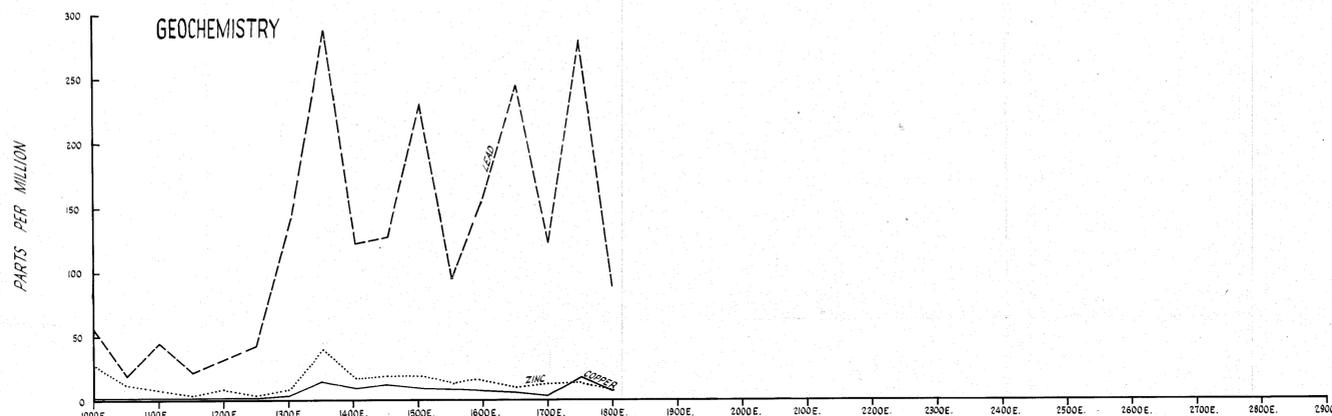
E.I.P. POLE DIPOLE



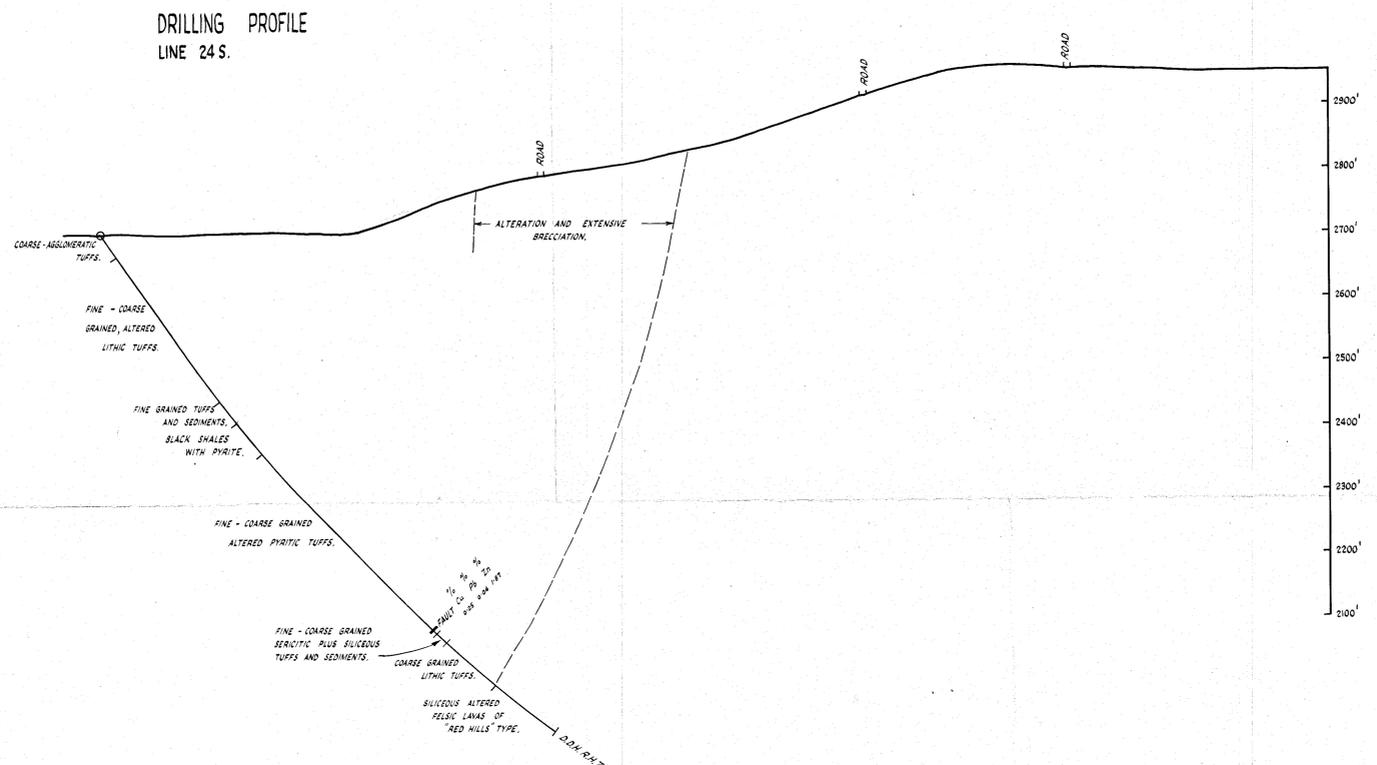
VERTICAL FIELD MAGNETICS



GEOCHEMISTRY



DRILLING PROFILE  
LINE 24 S.



301058



THE CONSOLIDATED SYNDICATE		DRAWN: P.B.
MT. TYNDALL E.L. 9/66		TRACED: R.G.W.
RED HILLS AREA		CHECKED:
D.D.H. R.H.7		DATE: 30.12.77
		SCALE: 1:1200
		FIGURE 3

7-12-50

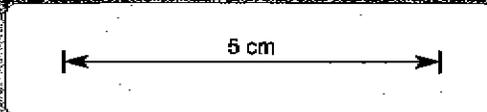
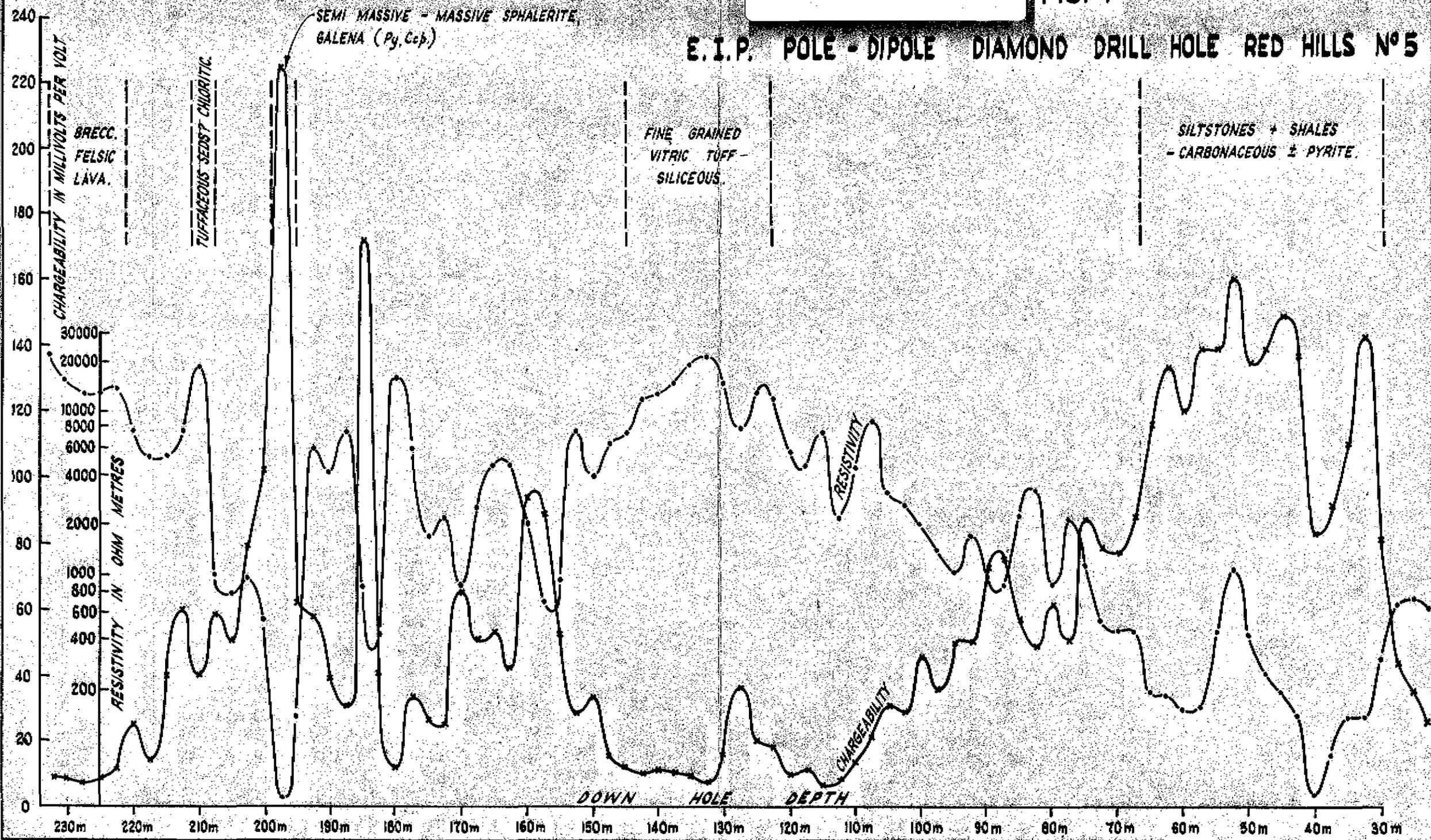


FIG. 4

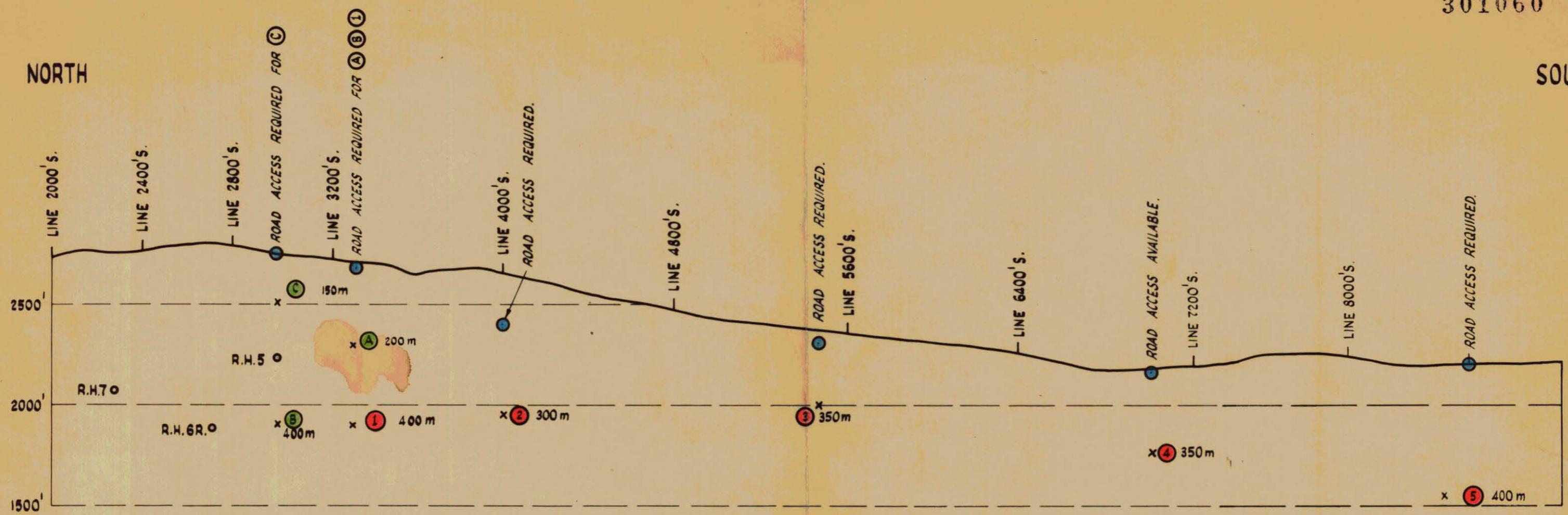
301059 047

E. I. P. POLE - DIPOLE DIAMOND DRILL HOLE RED HILLS N° 5



NORTH

SOUTH



R.H. 5	3m	- 0.3% Cu
		11.2% Pb
		31.8% Zn *
		154 g/t Ag
		5.8 g/t Au
R.H. 6R	3m	- 1.62% Zn
	6m	- 1.06% Zn *
	4.5m	- 1.05% Zn
R.H. 7	6m	- 1.87% Zn *

\* EQUIVALENT MINERALISED ZONE

PROGRAM 1 : PRELIMINARY EXPLORATION (1) - (5)  
 PROGRAM 2 : FOLLOW - UP OF R.H. 5 RESULT (A) - (C)  
 ● DRILL HOLE COLLAR SITE.  
 x 300m DRILL HOLE TARGET ZONE AND LENGTH.

**RED HILLS LONGITUDINAL PROJECTION**  
**PROPOSED DIAMOND DRILLING 1977/78**

BEARING: 353°  
 SCALE: 1" = 500'

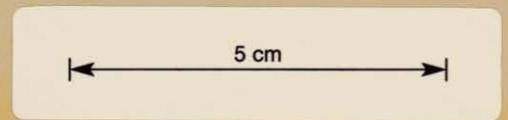


FIG. 5

77-1224