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ANNUAL REPORT

75 - 1117

ON

E.L. 10/69

(DORA-HUXLEY AREA)

MICROFILMED

1974-75

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1. SUMMARY

Exploration activity during 1974-75 concentrated on the area south of Queenstown. Between the Lyell Highway and Whip Spur (Area 2) detailed geological mapping was carried out and a further E.I.P. survey undertaken on the northern extensions to the Little Owen grid. Soil geochemistry was attempted but smelter contamination prevented any meaningful interpretations of the results even though an orientation survey has shown that this problem could be overcome in areas where there is adequate soil cover. Sufficient geological and geophysical data is now available to allow identification of specific drilling targets and ten preliminary drill holes have been planned.

Reconnaissance geological mapping was carried out between Whip Spur - Mt. Huxley (Area 3) in order to delineate major stratigraphic units and this has resulted in a clearer definition of areas requiring further detailed exploration. A regional soil sampling programme was undertaken using 61 metre (200 ft.) spacings over the Huxley grid and wherever possible stream sediment samples were also taken. Further work is required in both these areas.

Some comments have been made concerning the general structure of the Mt. Read Volcanics south of Queenstown with particular reference to the Central Lava belt. It is suggested that two separate sequences can be distinguished, one containing exclusively lavas and a second being dominantly pyroclastic. There appears to be a gradational contact between these sequences.

With a budget of $9 400 for 1975-76 the major recommendation is for an E.I.P. gradient array survey over the Huxley grid. Extensions to the grid both southwards and westwards are also proposed enabling a complete coverage of the Central Lava belt. Other mapping projects, in particular the Lake Beatrice - Lake Spicer area, are also recommended.

Expenditure on Exploration Licence 10/69 during 1974-75 was $15 086 bringing the total expenditure since 1969 to $87 266.

2. GENERAL INTRODUCTION

Exploration Licence 10/69 extends from Lake Dora in the north, to the King River Gorge in the south, and has a total area of 117 square kilometres (45.2 square miles). The initial lease was issued in June 1969 although existing boundaries resulted from amalgamation with Exploration Licence 40/70 in December 1970 and the formation of Exploration Licence 41/71 in December 1971.

Active exploration by the Mount Lyell Mining and Railway Co. Ltd. began in 1969 and has continued, on a restricted basis, up to the present time. The basic developments of the exploration programme over the past five years are shown in Appendix I.

Geologically and physiographically the lease can be conveniently divided into three major areas. These are -

(i)	Mt. Sedgwick - Lake Beatrice	-	Area 1
(ii)	Lyell Highway - Whip Spur	-	Area 2
(iii)	Whip Spur - Mt. Huxley	-	Area 3

Area 2 includes the southern section of the Consolidated Mining Lease but for geological reasons this area has been included in the exploration programme for Exploration Licence 10/69.

No work on Area 1 has been undertaken during 1974-75. Existing data on this area is contained within 1970 - 1974 Exploration Licence 10/69 Annual Reports.

No major drilling programme has been carried out on Exploration Licence 10/69, although twelve holes have been drilled within the Consolidated Mining Lease section of Area 2. Of these twelve drill holes, five were drilled by Mount Lyell in the Great Lyell area during 1962 and seven were drilled by Pickands Mather Co. Int. in the South Queenstown area during 1967. Encouraging but sub-economic mineralisation was intersected in four of these diamond drill holes. Further details of drilling results are given in the relevant sections of this report.

3. WORK COMPLETED 1974-75

3.1 LYELL HIGHWAY - WHIP SPUR (AREA 2)

3.1.1 Introduction

Work during the year has been basically aimed at compiling a detailed geological map of the area and relating structures and lithologies to those already recognised on the mine lease north of the Lyell Highway. A general assessment of the mineralisation in the Great Lyell, Duke Lyell Copper Estates and Little Owen areas was undertaken along with an attempt to further define the relationship with the E.I.P. anomalies detailed during the 1974 survey (Scintrex Report Tas-018A). To help in achieving this aim the Little Owen grid was extended northward by two further grid lines and surveyed with E.I.P. to delineate the northward extension of these anomalous zones. Geochemical soil sampling was also carried out but smelter contamination prevented reliable data from being obtained, even though specific efforts were made to overcome the problem.

3.1.2 Access

Major access into the area is shown on Map 1. The Pickands Mather track from Conglomerate Creek to the Little Owen ridge was re-opened by the H.E.C. and extended to the northern limit of the ridge. Vehicular access into the Great Lyell/ Duke Lyell area was not completed due to postponement of the diamond drilling programme. Apart from extensions to the Little Owen grid (Lines 110N, 116N) no new access into this area of Exploration Licence 10/69 was constructed during 1974-75.

3.1.3 Geology

The major aims of the mapping programme in this area were -

(i) To relate five major anomalous zone indicated by E.I.P. surveys to geology and structure in an attempt to define specific drilling targets.

(ii) To correlate the geology of this area with previous mapping carried out on the Consolidated Mining Lease to the north.

(iii) To investigate the nature of the contact between intermediate pyroclastics exposed along the Lyell Highway and the acid volcanics cropping out on Little Owen.

The results of the mapping programme can best be discussed under the following headings -

(i) Intermediate Volcanic Sequence - North and West of Lyell Highway

Mapping had previously been carried out by W. Smyth and C. Hall in the Philosopher's ridge area and by K. Wells in the western section of Conglomerate Creek. This data was compiled and further mapping carried out along Conglomerate Creek and its tributaries in order to present a detailed geological map extending from the present mine area to just south of the Great Lyell/Duke Lyell mineralisation.

North of Conglomerate Creek the sequence is dominantly intermediate in composition with medium to coarse pyroclastics and lapilli tuffs with minor intermediate intrusives and lavas. The intrusives were probably sub concordant sills ranging in thickness from 1 - 25 metres (3 - 80 ft.) although in places it becomes difficult to distinguish between intrusives and lavas. In general however the lavas are considerably thicker, in the range 20 - 100 metres (65 - 330 ft.). Rock analyses (J. Walshe 1971) show these intermediate rocks to be of andesitic composition.

To the west the intermediate sequence is overlain by Ordovician Pioneer Beds and Gordon Limestone and to the east acid lavas and pyroclastics are faulted against the intermediate rocks which, in turn, are overlain by Owen Conglomerate forming a north-west spur from Mt. Owen.

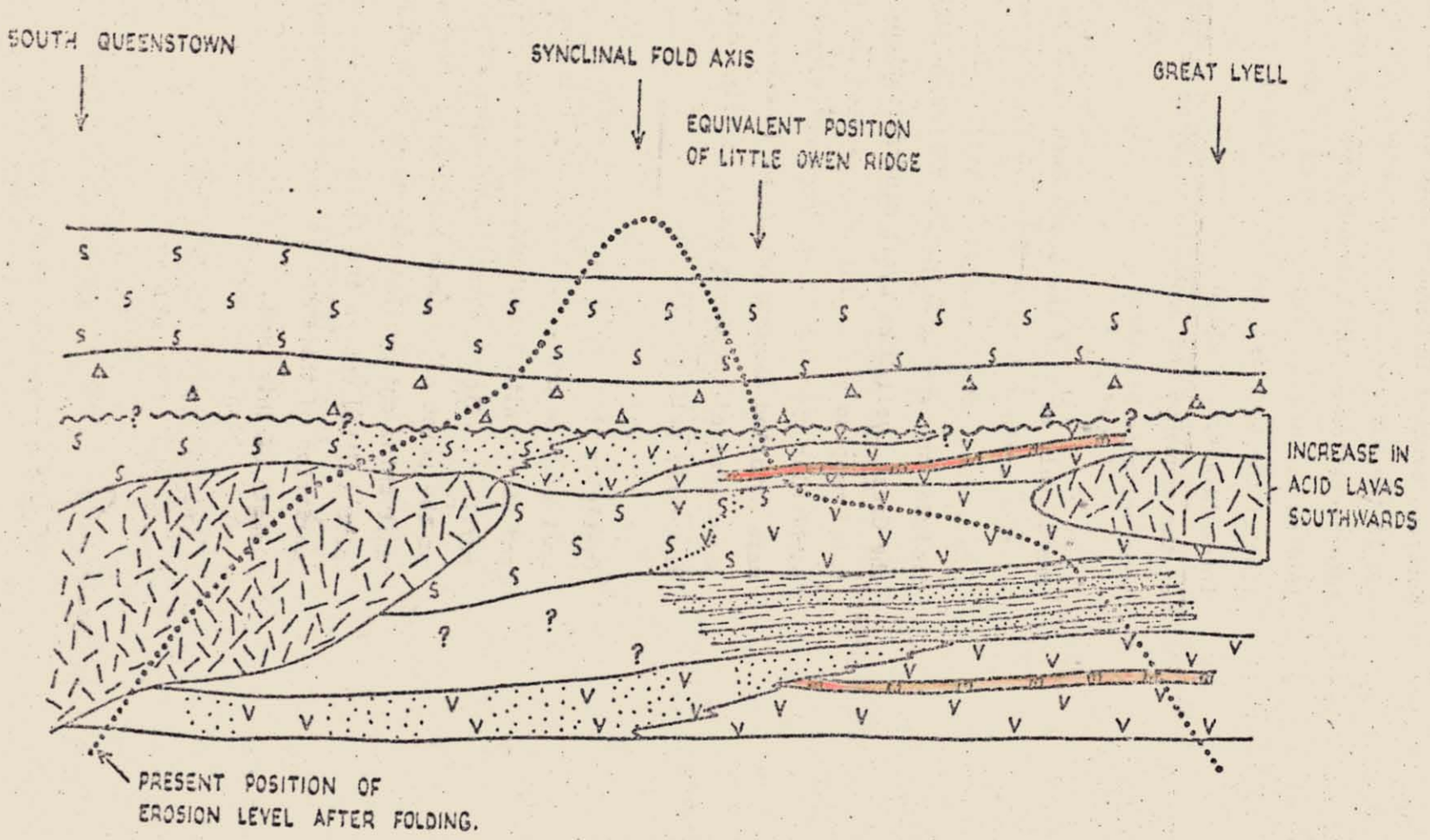
The contact between the intermediate sequence and the acid pyroclastics to the south is essentially an interfingering relationship although in many places faulting has become the major control. Much of the contact is hidden by surface scree but mapping suggests that interfingering can occur over horizontal distances up to 150 - 200 metres (490 - 656 ft.). Where this interfingering relationship exists it is frequently associated with extensive quartz-sericite-pyrite alteration and very minor chalcopyrite-galena mineralisation.

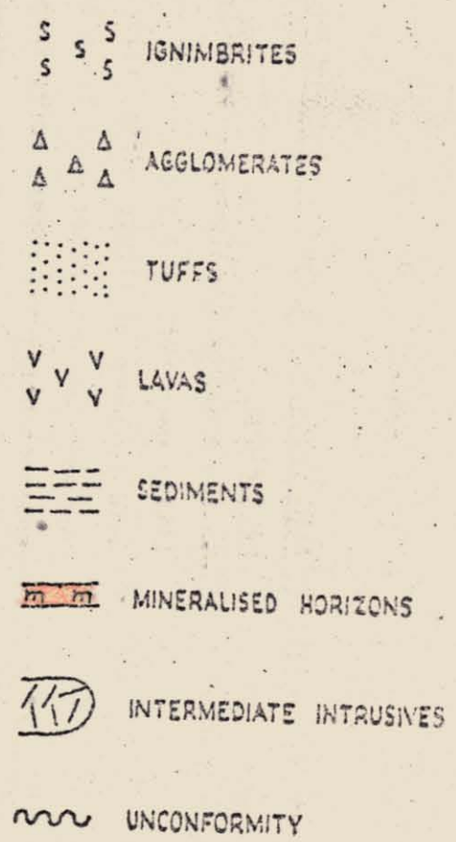
(ii) Acid Volcanic Sequence - East and West of Little Owen Ridge

To the south of Conglomerate Creek and along the Little Owen ridge the rocks become essentially an acid sequence of lithic tuffs, welded tuffs, coarse agglomerates with minor acid lavas and interbedded sediment horizons. These rocks form a major synclinal structure with the approximately N-S striking axis west of the ridge. The structure has been inferred from dips and facings of siltstone horizons exposed in Conglomerate Creek to the east and in the old dam area to the west. A schematic interpretation of the volcanic sequence before folding is shown in Fig. 1. Much of the western limb of the syncline has been intruded by an intermediate body which has resulted in disturbance of the sequence and probable thinning or absence of some volcanic horizons.

Immediately west of the South Owen Fault is a unit of fine grained felspar porphyry lavas with interbedded lithic and vitric tuffs. This unit includes an altered acid lava horizon which hosts the Great Lyell/Duke Lyell mineralisation. Only brief mapping has so far been carried out in this particular area but it is proposed to complete a more detailed mapping programme in conjunction with assessment of the Great Lyell drilling data during the early part of 1975-76.

Overlying these acid lavas and tuffs is a graded unit of fine grained, laminated, siliceous siltstones and shales with interbedded coarse graded tuff horizons. Fig. 2 shows lithologies within this unit at the point of maximum thickness. Northwards the unit thins out against the South Owen Fault and is also faulted out to the south. Considerable variation of thickness is shown throughout the strike length of this unit.





SCHEMATIC CROSS SECTION - LITTLE OWEN AREA

FIG 1

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FIGURE 2

SEDIMENT-PYROCLASTIC UNIT - LITTLE OWEN AREA

	Approx. Thickness
Thin laminated sediments with minor tuff horizons	60 ft.
Medium grained acid tuffs with minor interbedded sediments	150 ft.
Coarse lapilli tuffs grading into fine grained sediments. Individual units 5 metres approx.	90 ft.
Mainly fine grained siliceous shales and siltstones	90 ft.

The pyroclastic-sediment unit is overlain by a sequence of welded tuffs, ash fall lithic tuffs and acid lavas. Strong lateral variation is exhibited with welded tuffs being dominant to the north and acid lavas with interbedded lithic tuffs to the south. Intruded into the acid lavas is a minor intermediate body with associated intermediate pyroclastics. This intrusion appears to be an extension of a major intermediate intrusive to the south west.

All known areas of mineralisation along the Little Owen ridge are found within a unit which overlies the welded tuffs and lavas. This unit contains a strongly altered and sheared acid lava, which is haematite + chlorite + pyrite rich with trace amounts of lead, zinc, copper, barite and ?magnetite. Associated with the mineralised horizon and immediately overlying it is a chloritic tuff horizon which also appears to have been strongly altered and which contains sparse disseminated pyrite. Further thin section work is needed to determine the exact composition of this tuff horizon and its relationship to the underlying altered acid lava.

This sequence is followed by a unit of acid lavas and pyroclastics which appear to show lateral and vertical gradation into ignimbrites. They probably are a continuation of the sequence containing the mineralisation although showing less alteration and greater variation in lithology.

Discordantly overlying these lavas and pyroclastic is a very coarse agglomerate unit which crops out along the top of Little Owen ridge. Associated with agglomerates are minor horizons of medium grained acid tuffs and minor lenses of siltstones. The agglomerates are by far the most dominant lithologic unit and have previously been described as containing flattened acid fragments up to 50 cm (1.5 ft.) in diameter with distinctive cooling cracks suggesting they were plastic when deposited (K. Lee, 1973). The unconformity represents a break in the volcanism during which restricted sedimentation occurred both at the base and within the unit.

The youngest volcanics in this area are a thick sequence of dominantly ignimbrites and medium grained acid tuffs which crop out between Little Owen ridge and the new reservoir dam. They are variable in lithology and contain minor intermediate pyroclastic horizons. Previously it had been reported that these rocks were older than the agglomerates on Little Owen and a synclinal axis coincided with the top of the ridge. However recent mapping has indicated that the axis of this syncline is approximately 300 metres (1000 ft.) west of the ridge since agglomerates have been mapped north west of the new reservoir dam dipping eastward. Further details of structure are given in Section 3.2.

(iii) Acid Volcanic Sequence - East of South Owen Fault

East of the South Owen Fault the volcanics become essentially a sequence of strongly autobrecciated, banded acid lavas. However close to the Ordovician contact a more pyroclastic sequence is dominant with mixed acid and intermediate ash flow and lapilli tuffs. Towards the Mt. Lyell Copper Estates workings the intermediate tuffs become recrystallised and are associated with an extensive zone of hydrothermal alteration.

A narrow lamprophyre dyke was mapped in a cutting on the Lyell Highway and it has been assumed that this dyke is related to similar minor intrusives found in the mine area.

(iv) Intermediate Intrusives

Two intermediate bodies have been intruded into the sequence as concordant/sub-concordant sills. They are characterised by deep brown weathered soils and in outcrop by weathered felspars and pyroxenes in a light brown, fine grained matrix. The only work undertaken during this field season was to re-map the contacts of these felspar-pyroxene porphyries and attempt to identify any contact alteration effects. The northern body was smaller than originally mapped, this being a result of extensive soil wash having masked the contact. Thin section work has been carried out on volcanic rocks adjacent to the contact on Line 68N (Appendix II PB014-017). The results showed a general decrease amount of silica away from the contact accompanied by decrease in the degree of recrystallisation. An increase in leucoxene and zircon in the farthest two specimens is presumed to result from a composition change within the original volcanics. A further detailed description of these felspar-pyroxene porphyries is given in 'Geology of the Southern Mt. Lyell Field' (J. Walshe, 1971).

(v) Queenstown Pyroclastics - South of Queenstown

The Queenstown Pyroclastics are exposed in the western half of the area and show a sharp contact with rocks of the Central Lava belt. This contact dips eastwards and is marked by the presence of frequent minor shale horizons within an acid pyroclastic sequence. South of Queenstown both the Central Lava belt and the Queenstown Pyroclastics are essentially pyroclastic sequences and so problems can occur in distinguishing the two if detailed mapping is not undertaken. The quartz porphyry body mapped to the south-east of Queenstown is assumed to be continuous with those exposed along the Huxley track (Section 3.2.3).

(vi) Acid Volcanic Sequence - Whip Spur Area

No mapping has been carried out in the Whip Spur area. However interpretations of previous mapping has been undertaken in order to identify the massive acid lavas, felspar porphyry lavas and the acid pyroclastic sequences within the Central Lava belt (Section 3.3).

3.1.4 Geophysics

Early geophysical surveys undertaken in various parts of Area 2 are tabulated in Table 1. Detailed interpretations have only been carried out on data obtained from the Little Owen grid since 1973. Re-drafting and re-interpretation of much of the earlier data is now warranted, particularly that carried out by Pickands Mather Co. Int. and attempts should be made to relate this information to the more recent geological data.

TABLE 1

GEOPHYSICS - GREAT LYELL AREA 1957-1975

Operator	Year	Area Covered	Methods Employed
B.M.R.	1957	Great Lyell-Duke Lyell	E.M. (Turam) S.P. Ground Magnetics
McPhar	1959	Great Lyell-Duke Lyell	I.P. (Frequency Domain)
Pickands Mather	1967	Roaring Meg Grid (Queenstown - South of Whip Spur)	E.M. (Broadside) E.M. (In-Line) I.P. Ground Magnetics
Mt. Lyell	1973-74	Little Owen Grid	Ground Magnetics (Total Field)
Scintrex	1973-74	Little Owen Grid	E.I.P. (Time Domain - Gradient + Schlumberger Arrays)
Scintrex	1975	Northern Extensions to Little Owen Grid	(Schlumberger)

A report on the surveys carried out on the Little Owen grid (Howland-Rose, 1974) stated that the magnetic field local variations rarely greater than 1000 gammas and that the more magnetically active rock units included the intermediate intrusive bodies and the synclinal are of pyroclastic rocks on Little Owen. An improved knowledge of the distribution of rock type has now permitted further correlations to be suggested:

(i) Magnetic highs are associated with the haematite-rich mineralised unit east of the Little Owen ridge and shows distinct displacement resulting from movement along the Little Owen Fault.

(ii) Relatively steep magnetic gradients are associated with the outcrop of Darwin Rhyolite, east of Whip Spur. It is not possible to determine whether this is an inherent characteristic of that particular rock type or whether the magnetic response is due to regional variations in magnetic susceptibility at depth.

(iii) North-west of Whip Spur the Tyndall Group rocks exposed close to the Little Owen baseline are characterised by moderate magnetic gradients which is probably a rock type variation within the Tyndall Group.

(iv) Not only the intermediate intrusives but also the associated intermediate pyroclastics appear to be magnetically active.

E.I.P. anomalies detected by Scintrex during the 1973-74 survey have been numbered A1 - A5 (Map 7). As a result of this survey anomalies A1 and A4 were left open to the north-west. During December 1974 two further lines were cut and pegged (Lines 110N, 116N) and surveyed with both gradient and moving Schlumberger array E.I.P. surveys. Because of problems with noise levels (Howland-Rose, 1974) and bad weather conditions the coverage was incomplete. The gradient array was used, where possible, but when noise levels were too high it was replaced by a moving Schlumberger array.

Results indicated that both chargeability and resistivity are compatible with data from the previous surveys. Background chargeabilities were in the order of 10 - 20 milliseconds and background resistivities 300 - 2000 ohm metres. The anomaly of highest priority was at 1350E on Line 110N which was the extension of anomaly A4. The chargeability response was 30 milliseconds above background with an associated 80% reduction in apparent resistivity. Less significant anomalous chargeabilities were recorded at 6050E/6350E on Line 110N and 5250E on Line 116N which represented the northern extensions of anomaly A1.

A1 is by far the most significant and extensive of the five anomalies. On Lines 56N - 74N the E.I.P. response can reasonably be related to the mineralisation in the Great

Lyell/Duke Lyell area even though high chargeabilities were being recorded up to 300 metres (985 ft.) west of the known mineralised horizon. However from Lines 74N - 98N the anomalous zone appears to cross the South Owen Fault to the eastern side where the response reflects the mineralisation seen in the Great Lyell shaft area. Unfortunately much of this area is covered by moraine, but where exposed the rocks indicate that the anomalous response is within a sequence of intermediate tuffs and minor acid lavas. There appears to be three possible causes:

(i) Faulting is responsible for the eastward displacement of the Great Lyell/Duke Lyell mineralisation. It may be significant that the Little Owen Fault, if extended eastward, would cross the South Owen Fault in this area.

(ii) The South Owen Fault has played a role in localisation of the mineralisation (or ?remobilisation) and such controls are responsible for the mineralisation seen in the Great Lyell shaft.

(iii) Mineralisation in the two areas is not directly related and that A1 would best be split into two separate, en echelon anomalies.

The latter alternative seems to best fit the available facts.

The sudden widening of A1 on Line 104N is due to a south-east striking fault which crosses the Little Owen ridge and results in the acid-intermediate volcanic contact being exposed on the north side of the fault. The E.I.P. response appears then to result from the quartz + sericite + pyrite alteration associated with this contact zone. Apart from possible effects on Lines 92N and 98N the pyroclastic-sediment unit, west of the Great Lyell workings, has not caused or contributed to the anomaly as may have been originally thought. (Annual Report 1973-74).

Anomaly A2 is more difficult to interpret. It occurs along a partly sheared contact of agglomerates and welded tuff units on the east side of the Little Owen ridge. The data suggests there are two sources in close proximity at 3980E and 4070E on Line 86N and both with a maximum depth of 18 metres (60 ft.). The sources are considered to be either

disseminated pyrite, which becomes fairly ubiquitous in the northern half of the area, or thin shaly horizons which have been mapped as small lenses within the agglomerates. Although A2 is shown to occur on Lines 86N and 92N the most significant response was recorded on Line 86N using the gradient array. Line 92N was surveyed with a moving Schlumberger array and the response was much weaker and with a reduced surface width.

Anomaly A3 is located on Lines 74N and 68N and relates directly to mineralisation exposed in workings to the south-east of Little Owen.

Anomaly A4 occurs over the narrow belt of strongly laminated siltstones and black shale within acid pyroclastics which crop out along Reservoir Creek. The sediments were drilled by Pickands Mather Co. Int. and shown to contain a very minor galena-pyrite vein. However it is considered that the black shales are the major cause of the anomaly and consequently it warrants only a low priority rating.

Anomaly A5 consists of five small anomalies all assumed to be associated with the contact of the intermediate intrusive and an inferred sulphide halo. Further mapping of this area shows that four of the five anomalies, A5A, 5B, 5D and 5E, do occur along this contact. However A5C, on Line 56N is at least 150 metres (492 ft.) from the contact and has therefore been interpreted as a response from shale horizons seen cropping out to the north on Line 62N. The maximum width of 10 metres (33 ft.) and maximum depth of 6 metres (20 ft.) suggest a possible stratigraphic source even though there is a minor depression in the resistivity profile. The remaining four anomalies also differ markedly in both chargeability responses and their width/depth dimensions.

Further details of this E.I.P. survey are discussed in the relevant section of Scintrex report Tas-018A (Howland-Rose, 1974) and in the Exploration Licence 10/69 Annual Report 1973-74 (K. Wells, 1974).

3.1.5 Geochemistry

A geochemical soil sampling programme was carried out during December 1974 over certain areas of the Little Owen grid. It was planned to sample anomalies A3, A4 and A5 on 15 metre (50 ft.) spacings with extensions either side of the anomaly of 100 metres (330 ft.). Anomalies A1 and A2 could not be sampled as there are no soils remaining north of Little Owen.

The effects of smelter contamination on various geochemical sampling programmes in this area has been previously discussed (H. Smith, 1967; K. Wells, 1972). A simple orientation survey was undertaken to determine how metal values for various size fractions would change with different sample depths. Earlier work (K. Wells, 1972) had suggested that contamination occurred in the -200 mesh to -300 mesh fraction which is the fraction that contains normal geochemical anomalies. Consequently it was considered that size fractions were not a reliable screening technique.

Four separate sample sites were used, each being progressively further away from the older smelter site - Line 104N 1600E, Line 86N 2000E, Line 68N 1750E, Line 56N 1800 E. Where possible individual samples were taken from various depths within the B Horizon or the top of the C Horizon. Size fractions assayed were -10, -20, -50, -85, -100, -200 and -325 mesh and depth range of the samples was 8 - 80 cm (3 - 32 inches).

Results of this orientation survey indicated that depth of sample was a far more important factor in avoiding contamination than size fraction. Furthermore by sampling below 38 - 40 cm (15 - 16 inches) 70-80% of any surface contamination will, in most cases, be eliminated. More detailed results and survey data are given in Appendix III.

The soil sampling programme over A3, A4 and A5 was severely restricted due to irregular depth of soil cover. The results were very erratic and in general fairly high suggesting that contamination was still causing problems - a result of the restricted soil depths. Background values were not determined because there was no definite levelling off of values at the extremities of the sampled areas. Particular high values in all metals were recorded over A4 and erratic variable values over A3 and A5. No specific correlations were possible with any of the geophysical data.

It was considered that detailed statistical treatment of the data would not be valid. The results in Table 2 however have been calculated of the -80 mesh fraction to show the general range and distribution of the values.

TABLE 2

GEOCHEMICAL DATA - LITTLE OWEN GRID

Element	Fraction	Total Soils ppm			Soils Sampled Below 12"		
		$\bar{x} - \sigma$	$\bar{x}$	$\bar{x} + \sigma$	$\bar{x} - \sigma$	$\bar{x}$	$\bar{x} + \sigma$
Cu	-80#	28	56	125	30	54	105
Pb	-80#	18	38	82	17	38	85
Zn	-80#	11	30	75	9	26	71

Range of all samples : Cu 5 - 690 ppm
Pb 5 -1715 ppm
Zn 5 - 145 ppm

$\bar{x}$ = geometric mean (background)

σ = standard deviation

68.26% of population falls between $(\bar{x} - \sigma)$ and $(\bar{x} + \sigma)$

The -10/+80 mesh fraction showed similar high values and erratic distribution which suggests that contamination occurs in both fractions and not just the finer fractions as reported previously.

It seems meaningless to make specific interpretations on this type of geochemical data and, since any other soil sampling programme undertaken in this area would experience similar problems, it is recommended that drilling targets should be determined on geological, geophysical and rock geochemical data only.

3.1.6 Mineralisation and Diamond Drilling

Within Area 2 mineralisation can be divided into four major zones (Map 8).

Zone 1 Great Lyell/Duke Lyell area which includes workings known as Great Lyell Main No. 1 adits, Great Lyell Shaft (Whim Shaft), Duke Lyell, Duke Lyell Extended and Empress Lyell.

Zone 2 Little Owen area including Great Lyell Lower No. 1 and Upper No. 2 adits and various small workings east of the Little Owen ridge.

Zone 3 Conglomerate Creek area including the Mt. Lyell Copper Estates workings in Waterfall Gully and various adits and shafts within the old Mt. Lyell Reserve leases south of the Lyell Highway.

Zone 4 Small area of mineralisation close to the contact of the northern intermediate intrusive and including the workings known as the 'Haematite Tunnel'.

Original detailed descriptions of all these workings are given in reports by R. Schloesser (1900) and W. Cundy (1901) although recent sampling of a few adits has shown that assay values given in these reports should be disregarded.

In general the mineralisation in Zone 1 and 2 are essentially pyrite + haematite + minor chalcopyrite ± chlorite ± magnetite with accessory quartz and carbonate (siderite) in an altered felspar porphyry lava sequence. Although a brief description of the geological setting is given in Section 3.1.3 further work is required to define the relationships between mineralisation, alteration and stratigraphic setting.

Mineralisation within Zone 3 is dominated by quartz + sericite + pyrite assemblages which outcrop along the Lyell Highway and at the Mt. Lyell Copper Estates workings. This area has previously been interpreted (G. Green, 1971; J. Walshe, 1971) as representing intense hydrothermal alteration of acid volcanic rocks associated with the mineralisation at Mt. Lyell. A small adit between the Lyell Highway and Conglomerate Creek, east of Line 110N gave grab sample assays of 1.07% Cu and 6.3% FeS_2. The workings appeared to be following a small quartz-chlorite-pyrite vein within intermediate volcanics but more work is required to determine the extent of the mineralisation.

Zone 4 contains disseminated pyrite with minor chalcopyrite and specular haematite mineralisation associated with the contact of an intermediate intrusive body. Quartz + sericite + pyrite ± haematite alteration assemblages have also been recorded although the extent of the alteration and of the mineralisation halo appears to be controlled by individual rock units.

During 1961-62 Mt. Lyell Company drilled five holes in the Great Lyell Shaft and Main No. 1 adit areas (Map 8). GL1, GL3, GL4 and GL5 were drilled to test Turam and/or E.I.P. anomalies detected during the B.M.R. and McPhar geophysical surveys during 1957 and 1959. GL2 was drilled to test known mineralisation in the Great Lyell Shaft area. Results were encouraging although mineralisation of economic grade was not intersected.

GL1	110'	- 0.20% Cu	5.5% FeS	(430' - 540')
GL2	120'	- 0.21% Cu	6.0% FeS	(210' - 330')
	40'	- 0.40% Cu	5.5% FeS	(275' - 315')
GL3	30'	- 0.22% Cu	3.0% FeS	(160' - 190')
GL4	30'	- 0.07% Cu	0.75% FeS	(420' - 500')
GL5	Not assayed			

Although these drill cores have yet to be re-logged the original logs suggest the host rock to the mineralisation were acid lavas with associated haematite-chlorite-carbonate alteration.

During 1967 Pickands Mather Co. Int. drilled seven holes in the new reservoir dam area (Map 8). These were drilled to test E.I.P., E.M. and soil geochemical anomalies detailed during a programme over the Roaring Meg prospect in 1966-67. RM201 was the only hole to intersect mineralisation which contained 0.25% Cu over 20 feet. During the year all these holes were re-logged at the Department of Mines in Hobart in order to relate lithologies to surface mapping carried out in that area.

3.2 WHIP SPUR - MT. HUXLEY (AREA 3)

3.2.1 Introduction

Work during the year has been confined to a regional mapping programme and geochemical soil and stream sediment surveys.

Regional mapping of the southern part of E.L. 10/69 has been carried out intermittently over the past three field seasons. Extension of Huxley grid Lines 16S, 48S, and 80S to the walking track east of Miners Slate ridge were remapped along with the Huxley track from Lynch Creek to Mt. Huxley.

Associated with the regional mapping a reconnaissance geochemical soil survey was undertaken over the Huxley grid with stream sediment samples taken where lines crossed major creeks. The stream sediment survey was severely restricted by the abundance of conglomerate boulders in the creeks and the general moraine cover in the area. In all only 15 samples were collected.

3.2.2 Access

Major access into the area is via the Huxley track and by various walking tracks east of Miners Slate ridge. No new access was constructed during the 1974-75 field season.

3.2.3 Geology

Remapping has shown that north of Mt. Huxley and west of the Huxley track the sequence is dominantly acid lavas rather than pyroclastics as had been previously mapped (K. Wells, 1972). Within this sequence three major units can be identified.

(i) Massive pink-red-purple acid lavas (rhyolites?) strongly foliated with amygdaloidal textures, calcite fillings and conspicuous columnar jointing.

(ii) Grey-green-fawn, fine grained, felspar porphyry lava.

(iii) Interbedded felspar porphyry lavas and acid pyroclastics with the pyroclastics varying from medium grained crystal tuffs to agglomerates and welded tuffs.

The acid lava sequence extends westward and exhibits a very sharp contact with the Queenstown Pyroclastics south of Whip Spur.

The Queenstown Pyroclastic sequence contains fine to medium grained acid tuffs with minor interbedded shale and siltstone horizons. Quartz porphyry bodies have been mapped along the contact, within the pyroclastics, and it appears that these bodies are exposed continuously between Queenstown and the King River (Section 3.1.2). Weathering has prevented any detailed interpretation of their contacts but there is evidence to suggest that these have been either intruded as high-level sills or extruded as lavas. One of the two basic intrusives mapped to the west of Whip Spur shows a common contact with the quartz porphyry close to the Huxley track. Thus faulting may also be a significant structural control on these intrusive/extrusive bodies.

No detailed mapping has been carried out east of the Huxley track during this field season. However an extensive sequence of ignimbrites exposed along the track between Lines 3200S and 6400S are considered as pyroclastics within the acid lavas and not a part of the Jukes Formation. There are exposures of Jukes Formation east of the Huxley track but a more detailed mapping programme is required to clarify its relationship with the volcanics.

A further description of the geology is given in the 1971-72, 1972-73 E.L. 10/69 Annual Reports (K. Wells 1972, K. Lee 1973) and general remarks concerning structure and stratigraphy are made in Section 3.3.

3.2.4 Geophysics

The only geophysical technique to have been used on Area 3 was a vertical field magnetic survey undertaken during 1972 (K. Wells, 1972). However Pickands Mather carried out ground E.M. and magnetics in 1967 over the Roaring Meg grid which extends into the northern half of this area. A detailed analyses of this data is now recommended.

3.2.5 Geochemistry

One of the major objectives during 1974-75 was to complete a geochemical soil survey in the area between Whip Spur and Mt. Huxley. Samples were taken at 61 metre (200 feet) spacings over the Huxley grid with -10/+80# and -80# fractions being analysed for copper, lead and zinc. Where possible the base of the B Horizon was sampled but extensive glacials and scree in the eastern half of the grid resulted in 89 of 232 samples being transported rather than residual soils.

Statistical treatment of the data was carried out using log-probability analysis with background values calculated at the 50% probability level ($\bar{x}$). For unimodal distributions threshold values were calculated at $\bar{x} + 2\sigma$ or 97.3% probability (σ = standard deviation), however for bimodal distributions thresholds were calculated according to the partitioning of the two populations. This particular approach to data treatment allows distribution to be made between two separate population distributions and provides information which can (i) provide a better definition of anomalous and background values, (ii) prevent artificial or subjective methods of deciding threshold values, and (iii) present a basic classification or priority rating on anomalies (Parslow 1974, Sinclair 1974, Lepeltier 1969). A description of the processes involved in compiling this data is given in the Annual Report, Mt. Tyndall Area 1974-75, Appendix B.

Results of this survey were calculated for both size fractions and for residual and transported soils and are shown in Table 3.

Copper Backgrounds for different soil types and size fractions show similarities although equivalent thresholds contain marked variations (50 ppm Cu - 110 ppm Cu). For the finer fraction background and thresholds are higher for residual soils but for the coarser fraction they are higher in the transported soils. The probability plot shows the -80# fraction to be slightly negatively skewed, i.e. greater proportion of lower values (Appendix IV).

Lead Background and threshold values show more regularity with a greater separation between the transported and residual soils (Appendix IV). They obviously show a log-normal distribution with backgrounds in the range 70 ppm Pb - 75 ppm Pb.

Zinc This is the only element that could be interpreted as a bimodal distribution. The residual soils show definite partitioning although the transported soils appear to have a simple unimodal distribution. Both sets of results are given in Table 3 and it is significant that if the lower threshold value is taken the total number of anomalous values increase by only 3 to 11 values out of a total of 232. The threshold value used for the data map of the Huxley area was

40 ppm Zn which represents the separation of the two populations since there is apparently no overlap (Appendix IV).

As a general statement high values were recorded on Line 00S and this could possibly represent the southern limit of Mount Lyell smelter contamination. However until further evidence is available it would be safest to consider these values as genuine geochemical anomalies. Other major areas of interest appear to be:

(i) Western section of Line 9600S (Pb + minor Cu) and Line 11200S (Cu + Zn).

(ii) Base line between Lines 3200S - 4800S (Pb + Zn).

(iii) Western extremity of Lines 3200S - 8000S (Cu + Pb).

(iv) Eastern extremity of Lines 4800S - 8000S (Pb + minor Cu). This area containing only minor anomalous values but its geological position warrants further follow-up work. All anomalous values should be checked and re-sampled on 15 metre (50 ft.) spacings.

Since this was essentially a reconnaissance programme it would be wrong to attach too much importance to individual anomalous values or to label as 'no interest' those areas where values were around background. A 61 metre (200 ft.) spacing is too great to be certain that any economic mineralisation would have geochemical expression and consequently these results should be considered as:

(i) Showing only regional geochemical trends.

(ii) Providing background and threshold data that can be used in areas where further sampling is considered warranted.

(iii) High-lighting specific areas which obviously need further detailed work.

For these reasons the three elements analysed have been contoured using only the threshold values and a 30 ppm (Cu, Pb, Zn) contour which divides the remaining values below the threshold into two near-equal groups (Maps 11 - 13). The data used in these maps is from the -80# fraction since this appears to be the most representative and significant fraction size. Threshold values are those calculated for total soils as a more detailed approach was considered unwarranted for a regional programme.

The advantages of using probability analysis for treating geochemical data has been discussed earlier in this section. However it should be emphasised that caution must always be used when using this approach since there are numerous problems that can affect the results. It is reported in the literature that trace element data only approximates to a log-normal distribution. So if a method of analysis is used which itself is open to various different interpretations then a second error parameter is introduced which under certain circumstances could mask true anomalous values. It is suggested that this technique should only be used when there is no reasonable doubt about the distribution pattern since, in some cases, a more simplistic approach can better convey the true value of the data.

TABLE 3

Element	Log-Distribution	Fraction		Assays (ppm)		
				Residual	Transported	Total Soils
Copper	Unimodal	-80#	Background	17	16	16
			Threshold	56	50	54
		-10/+80#	Background	14	16	15
			Threshold	78	110	100
Lead	Unimodal	-80#	Background	16	13	15
			Threshold	115	65	75
		-10/+80#	Background	14	9	12
			Threshold	90	65	70
Zinc	Unimodal	-80#	Background	12	10	11
			Threshold	70	23	60
		-10/+80#	Background	11	8	10
			Threshold	62	26	58
	Bimodal	-80#	Population A	-	-	
				-	-	40
			Population B	-	-	

- Value used as threshold on Maps 9 - 13

3.2.6 Mineralisation

Surface mineralisation is not extensively exposed within the area and apart from a few small gold prospects and some small trenches there are no workings of any significance.

The Mt. Ellen mine, situated close to the confluence of Conglomerate and Diorite Creeks was worked during the late 1890's and early 1900's. Old reports suggest that gold occurred in quartz reefs within a sequence of acid lavas ('porphyry'). Sampling carried out in 1904 indicate that grades were no more than 1 or 2 grams/tonne at best. (Twelvetrees 1901 - 1904, Batchelor 1904 - 1907). Although time did not permit the locating of these workings during the field season, plans show that the mine is close to the extension of Line 4800S and there should be no difficulty in locating the workings during the early part of 1975-76.

Other small gold workings occur to the west in the Lynch Creek area but no detailed mapping has yet been carried out in that area.

Two trenches, located on a spur 1000 metres (3300 ft.) north of Mt. Huxley, expose a 5 metre (16 ft.) thick band of semi-massive pyrite within a sequence of massive acid lavas and associated with a strongly silicified siltstone. Further to the north-west pyrite is exposed in the bed of Conglomerate Creek. It is probable that these two restricted outcrops represent the same horizon within the lava sequence but which have been tightly folded about the Whip Spur - Mt. Huxley synclinal axis (Section 3.3).

Further west along Conglomerate Creek, outcrops of acid lavas showed leached cavities up to 2 cm (0.8 inches) in diameter containing distinctive goethitic boxworks after pyrite.

Minor pyrite and haematite have also been traced north and north-east of Mt. Huxley within the felspar porphyry lavas. Pyrite mineralisation sampled on Line 9600S (500W) gave values of 100 ppm Cu, 10 ppm Pb, 95 ppm Zn and 3.2% FeS_2 although visual estimates suggested that particular zones contained up to 10% FeS_2. To the north along the Huxley track, outcrops showed limonitic material coating small cavities up to 20 mm in diameter. It was not clear whether these were weathered felspar fragments or leached sulphides

but they did occur along strike from the pyritic outcrops described earlier.

3.3 STRUCTURE AND STRATIGRAPHY OF THE MT. READ VOLCANICS, SOUTH OF QUEENSTOWN - DISCUSSION

Within the Mt. Read Volcanics the delineation of (i) Central Lava belt, and (ii) Queenstown Pyroclastics has been clearly defined in the area south of Queenstown. The contact between the two broad stratigraphic units is sharp and during the field season has been mapped from Queenstown to 0.5 km north of the King River. Throughout the area the contact appears to dip steeply eastward which may indicate that it is a structural contact although there is no direct supporting evidence. The sharp contact between the two units is not typical of other areas within the Mt. Read Volcanics.

To the east the Central Lava belt comprises two distinct volcanic sequences. One is composed almost exclusively of acid lavas and includes foliated acid lavas (rhyolites?) and felspar porphyry lavas found north-west of Mt. Huxley (3.2.2). The second sequence, exposed in the Little Owen area and east of the Huxley track, is dominantly an acid pyroclastic sequence but contains some sediment horizons and minor interbedded felspar porphyry lavas. The contact between these two sequences is seen to the north-east of Mt. Huxley where it is gradational and characterised by felspar porphyry lavas with minor interbedded lithic tuff horizons which gradually increase in thickness at the expense of the lavas. Total width of the contact zone is in the order of 100 metres (330 ft.) although this is only based on one continuous exposure.

The structure of the Mt. Read Volcanics is controlled by a syncline striking north-south through the area. The synclinal axis can be recognised at four separate localities - west of Little Owen, Whip Spur, Conglomerate Creek (between Mt. Huxley and Whip Spur) and Mt. Huxley. Although there is some lateral displacement between the last two localities it has been interpreted as a single synclinal structure.

East of Whip Spur an anticline or domal structure has previously been suggested for the outcrop of Darwin-type Rhyolite. A similar structure has been inferred for the pyroclastic sequence exposed in the King River south-east of Mt. Huxley (K. Wells, 1972). If the Cambrian-Ordovician contact is not faulted but dips eastward then an anticlinal axis could be inferred close to the contact and striking parallel to the syncline. This inferred axis is further supported by the outcrop

of Jukes Formation east of Huxley track.

Other anticlinal structures have been mapped along Miners Slate ridge and further west within the Queenstown Pyroclastic in the Lynchford area but further, more detailed mapping is required in these areas.

North of Whip Spur the exposed volcanic belt narrows and structural trends become obscured by Tabberabberan faulting. However in this area the Central Lava belt comprises dominantly pyroclastics but with felspar porphyry lavas increasing eastwards which is in contrast to the sequences south of Whip Spur where acid lavas are dominant and pyroclastics increase eastwards. The overall relationships between these two areas is not yet clear.

4. GENERAL RECOMMENDATIONS FOR FUTURE EXPLORATION

4.1 PROPOSED EXPLORATION PROGRAMME 1975-76

4.1.1 Exploration Activity

A priority for 1975-76 is the postponed mapping programme in the Lake Beatrice - Lake Spicer area where the Cambrian volcanic sequence is still largely undifferentiated.

It is considered that the eastern half of Area 2 has reached the diamond drilling stage and no further exploration work is warranted. Ten diamond drill holes have been planned to test the area (Map 7 and Appendix VI) and these are based on the results of the 1973-74 Scintrex E.I.P. survey and on geological mapping carried out during the year. However this programme has been incorporated into the diamond drilling scheduled for the Consolidated Mining Lease and so there is no provision in this years budget.

The major proposal for 1975-76 is an E.I.P. gradient array survey to cover the acid lava sequence between Whip Spur and Mt. Huxley. To allow a complete coverage Huxley grid lines 3200S and 6400S should be extended to the contact with the Queenstown Pyroclastics. It is also proposed to extend the Huxley grid southwards by two additional lines (12800S and 14400S) to the east of Mt. Huxley. This should enable further delineation of the existing geochemical anomalous zones and cover the minor pyrite-haematite mineralisation exposed on Line 9600S.

Cutting and pegging required for this programme would be:

Line 1600S	1830 metres	(6000 ft.)
Line 6400S	1680 metres	(5500 ft.)
Line 12800S	1130 metres	(3700 ft.)
Line 14400S	1520 metres	(5000 ft.)
Base Line Extension	980 metres	(3200 ft.)
Total	7140 metres	(23400 ft.)

Some areas of the existing Huxley grid would also require clearing. This would entail another 1500 - 1800 metres (5000 - 6000 ft.) giving an overal total of approximately 9150 metres (30,000 ft.) of traverse lines to be cut.

The aim of the E.I.P. would be to cover the area on a reconnaissance basis and for that reason it would be advantageous to use a variable potential dipole. It is suggested that a 61 metre (200 ft.) separation would be suitable for fairly rapid coverage of the grid and this separation could be reduced to 15.2 metre (50 ft.) where specific anomalous zones were encountered. Interpretation of data would be difficult since a line separation of 488 metres (1600 ft.) would severely restrict correlation. However as a reconnaissance technique it would be useful in delineating zones requiring more detailed exploration. It is considered that the results from this survey should be assessed in conjunction with the results of an airborne E.M. survey which has been provisionally planned for this area during 1976-77. The purpose of an airborne E.M. survey would be to cover the Queenstown Pyroclastics to the west on a reconnaissance basis and, at the same time be able to screen any I.P. anomalies detected over the acid lavas.

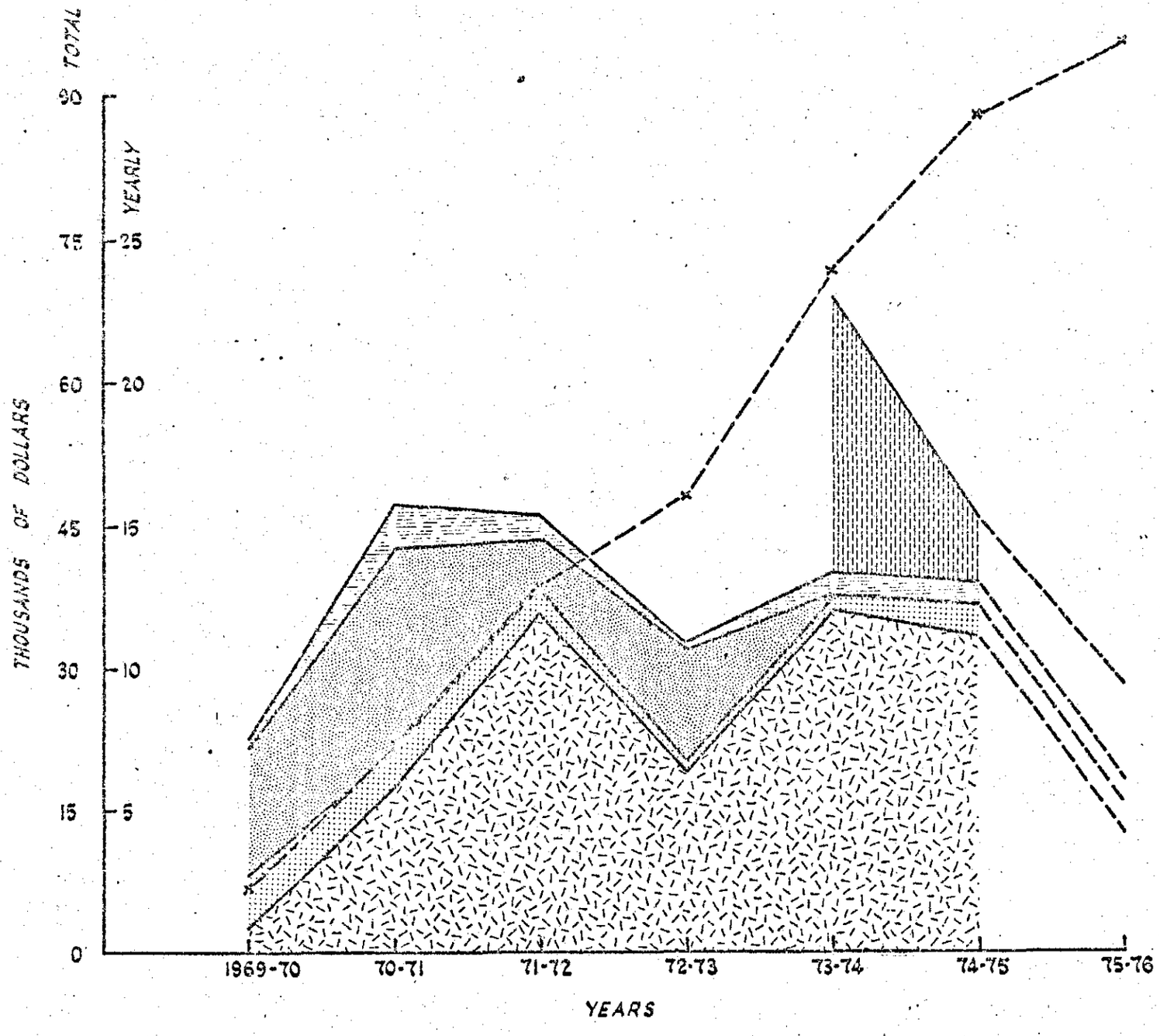
4.1.2 Budget (Fig. 3)

A total budget of $9 400 has been allocated to E.L. 10/69 (Dora-Huxley) for 1975-76. This can be most effectively used by undertaking one or two specific major objectives rather than attempting numerous minor projects which, because of the restricted budget, will render the exploration programme inflexible. For this reason 37% of the budget is taken up with proposed E.I.P. survey.

Budget breakdown is as follows:

Salaries	$4 000
Materials	$1 000
Geophysics	$3 500
General Costs	$ 900
Total	$9 400

Distribution of the budget throughout the year is shown in Table 4.



YEARLY EXPENDITURE

- SALARIES
- MATERIALS
- ACCESS
- GENERAL COSTS
- GEOPHYSICS
- TOTAL CUMULATIVE EXPENDITURE

YEARLY & TOTAL EXPENDITURE 1969-75 E.L. 10/69 (DORA-HUXLEY)

FIG. 3

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FIG. 4

E.L. 10/69 (DORA-HUXLEY)

FUTURE EXPLORATION PLANNING 1975

	1975-76	1976-77	1977
AREA 1	1. Regional Mapping - Lake Beatrice - Lake Spicer + Regional Stream Sediment Survey --- 1 Geologist 4 Man Weeks 1 Field Assistant 4 Man Weeks	1. Detailed Mapping + Detailed Geochemistry/Geophysics? 2. Detailed Appraisal Lake Dora Copper Workings	
AREA 2	-	Exploration Diamond Drilling Great Lyell Little Owen Area 2B (10 holes)	Further Drilling if Warranted
AREA 3	1. Line Cutting of Extensions + Clearing of Huxley Grid 2. Gradient Array E.I.P. Survey --- 2 Field Assistants 6 Man Weeks	1. Airborne E.M. Survey Areas 2A, 3A, 3B 2. Follow-up Geochemistry on Huxley Grid 3. Detailed Geological Mapping (i) King River (ii) Lynch Creek (iii) Roaring Meg Creek	Delineation of Possible Drilling Targets Using Further E.I.P. and/or Ground E.M. + Detailed Geochemistry as Warranted

═══ Major Decision Points

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4.2 FUTURE EXPLORATION

A proposed programme for future exploration has been outlined in Fig. 4 which incorporates the recommended programme discussed in Section 4.1.1. The most significant single project is the proposed airborne E.M. survey which is considered important for a rapid reconnaissance of the Queenstown Pyroclastic sequences, south of Queenstown. This would also supplement the proposed E.I.P. survey between Whip Spur and Mt. Huxley.

At the same time a major priority is exploration in Area 1, since the volcanic sequences are still largely undifferentiated. Until basic exploration mapping has been carried out no detailed planning can be attempted in this area.

AMENDED EXPLORATION PROGRAMME

Due to a reduction in finance available for exploration, the work programme and budget for 1975-76 have been modified as follows:

Exploration Programme

1. Roaring Meg Creek/Miner's Slate Ridge Area - Geological mapping and geochemical sampling in order to outline any areas of further interest.

2. Mt. Sedgwick/Lake Beatrice Area - Reconnaissance mapping and geochemical sampling.

3. Lake Dora/Spicer Area - Detailed geological mapping and geochemical sampling near Lake Dora copper workings.

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

BUDGET 1975 - 76

TABLE 4

DORA HUXLEY PROSPECT

PERIOD NO:	1	2	3	4	5	6	7	8	9	10	11	12	13	
Salaries	1076	1089	1434	1700	1700	1700	1700	1700	300	250	250	1200	300	14400
Materials					200	200	200	200				100		900
Outside Services														
Diamond Drilling														
Geophysics														
Geology														
General Costs				100	100	200	100	200				100	100	900
Hire of Equipment														
TOTAL COST DORA HUXLEY PROSPECT	1076	1089	1434	1800	2000	2100	2000	2100	300	250	250	1400	400	16200

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APPENDICES

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APPENDIX I

SUMMARY OF EXPLORATION DEVELOPMENTS 1969-75

Year	Lease	Access	Geology	Grids	Geophysics	Geochemistry	Budget
1970-71	Present E.L. 10/69 formed 8.12.70 by amalgamation of E.L. 40/70 and E.L. 10/69. Area - 68 square miles.	1) Mt. Huxley track to within 1 mile of Mt. Huxley. 2) Track from Conglomerate Creek to Little Owen re-opened. 3) Lake Dora track extended to north shore of Lake Spicer.	2) Sampling Great Lyell Adits. 3) Regional mapping (1:500) north of Lake Beatrice.	-	-	-	Year: $15 612 Total: $23 006 (Total includes $7 394 from 1969-70)
1971-72	E.L. 10/69 reduced following incorporation of Henty area into E.L. 41/71. Area - 45 square miles.	1) Mt. Huxley track extended to north shoulder of Mt. Huxley. Total distance 5½ miles.	1) Regional mapping. 2) Sampling Duke Lyell Adits. 3) Regional mapping.	1) Mt. Huxley grid cut. No. of lines 8 Total footage 86,000	1) Huxley grid - vertical field magnetics.	1) Huxley grid - Line 48S test sampling.	Year: $15 378 Cumulative Total: $38 384
1972-73	As 1971-72	1) Walking tracks cleared east of Miners Slate ridge. Lines 16S, 48S, 80S (Huxley grid) extended westwards.	1) and 2) + east end of Mt. Lyell - detailed mapping and interpretation.	-	3) East end of Mt. Lyell - Schlumberger depth probe. Inconclusive results.	-	Year: $10 828 Cumulative Total: $49 212

Year	Lease	Access	Geology	Grids	Geophysics	Geochemistry	Budget
1973-74	As 1971-72		2) Detailed mapping on part of Little Owen grid.	2) Little Owen grid cut. No. of lines - Total footage -	2) Gradient array/ Schlumberger array I.P. survey.	-	Year: $22 963 Cumulative Total: $72 180
1974-75	As 1971-72		1) Regional re-mapping. 2) Detailed mapping Great Lyell area.	2) Little Owen grid extended by 2 lines - northward (L. 114 - L. 120).	2) Schlumberger array I.P. over Little Owen grid extensions.	1) Regional soil + stream sediment sampling. 2) Orientation + soil sampling over anomalies.	Year: $15 086 Cumulative Total: $87 266

APPENDIX II

Thin Section Reports - A.M.D.E.L.

(PB/001 - PB/030, Map 8)

Sample:
PB 001

Thin Section:
C13903.

Rock Name:
Metavolcanic of acid composition. Probably a lava flow.

Hand Specimen:
A fine-grained rock showing mottled pink and grey colouration and a few scattered phenocrysts? or fragments. Staining tests show only very minor amounts of potash feldspar and plagioclase in the groundmass and a few phenocrysts containing some plagioclase.

Thin Section:
This rock contains some scattered, partly altered phenocrysts of plagioclase 0.5 - 1.5 mm in size and a few aggregates of these phenocrysts in a turbid groundmass which contains some moderately fine-grained quartz (0.05 - 0.1 mm) associated with abundant sericite and minor amounts of feldspar?. The composition of the groundmass appears to be fairly uniform and no evidence was found to suggest the presence of fragments of differing composition.

There are a few scattered grains and aggregates of opaque oxide and leucoxene 0.1 - 0.4 mm in size and locally these are associated with a few small grains of apatite and of a completely altered mafic? mineral which has been completely replaced by chlorite and leucoxene.

Much of the very fine-grained sericitic material in the groundmass shows a preferred orientation and there are also very numerous streaks of sericitic material parallel to this direction and this imparts a very weak schistosity or foliation to the rock. Some streaks of sericitic material cut through plagioclase phenocrysts and some appear to have been planes of shearing.

This is an acid volcanic rock probably a lava flow of dacitic composition and it has been subjected to some form of tectonic stress and/or shearing.

Sample:
PB 002

Thin Section:
C13904.

Rock Name:
Metamorphosed tuff of intermediate composition.

Hand Specimen:
A greyish-green fine-grained rock with a distinct foliation. It has a streaky appearance due to the presence of small elongate patches and lenses of darker green chloritic material. These are elongated in a direction parallel to the foliation.

Thin Section:
The rock is now composed predominantly of very fine-grained chlorite and sericite with minor quartz, which occurs as scattered grains and aggregates generally less than 0.2 mm in size. Small patches of leucoxene averaging 0.05 mm in size are scattered moderately abundantly throughout the rock and many are elongated in the direction of foliation. Many of these probably represent altered ilmenite and/or titaniferous magnetite crystals present in the original rock. Some may represent altered crystals of a mafic mineral.

Most of the sericitic material and some of the chlorite shows a preferred orientation parallel to the foliation but there are also some lenticular patches composed almost entirely of fine-grained chlorite which does not show preferred orientation. These lenticular patches may represent flattened lithic fragments of more basic composition.

This was very probably a tuffaceous rock of intermediate composition and it has recrystallized under conditions of tectonic stress.

Sample:
PB 003.

Thin Section:
C13905.

Rock Name:
Metamorphosed acid tuff.

Hand Specimen:
A fine-grained greenish-grey rock with a weak foliation.

Thin Section:
The rock is now composed predominantly of quartz and sericite in approximately equal proportions and most of the sericitic material shows subparallel orientation defining a schistosity.

The composition of this rock is not uniform and there are streaks and lenticular patches rich in sericite interspersed with other lenticular patches composed largely of very fine-grained quartz, which is intergrown with varying proportions of sericite. This patchy variation in composition suggests derivation from a pyroclastic rock rather than a lava flow.

There are a few small patches of leucoxene and of chlorite, generally less than 0.2 mm in size and there are also a few voids up to 0.6 mm long, from which an undetermined mineral has been leached. A few very small zircon crystals were found associated with one patch of leucoxene and practically all of these leucoxene patches and leached voids are elongated in the direction of foliation.

This was very probably a tuffaceous rock of acid composition. It has been compacted and recrystallized under conditions of tectonic stress.

Sample:
PB 004.

Thin Section:
C13906.

Rock Name:
Metamorphosed pyroclastic of andesitic or dacitic composition.

Hand Specimen:
A greyish-green fine-grained rock with a moderately strong schistosity. It is composed of paler coloured and darker green grains and fragments up to 2 mm in size which are now elongated in the direction of schistosity.

Thin Section:
The rock is now composed mainly of chlorite and sericite with moderately abundant quartz and 2-3% of opaque oxide and leucoxene grains. Much of the sericite and chlorite shows sub-parallel orientation defining the schistosity and throughout much of the rock these phyllosilicates are closely intergrown with fine-grained quartz and/or feldspar, probably plagioclase.

There are some scattered lenticular and elongate patches of sericite, generally between 1 and 2 mm long, and a few of these show traces of former crystal shapes, strongly suggesting that they were feldspar crystals. There are also very numerous lenticular and elongate patches of chlorite up to 4 mm long, and some of these show very irregular shapes. Probably they represent former lithic fragments of more basic composition. Some remnants of unaltered and partly-altered plagioclase were found in some of these patches of chlorite.

This was a pyroclastic rock, probably of andesitic composition, but it may have been dacitic. It has been comp acted and partly recrystallized under conditions of tectonic stress.

Sample:
PB 005.

Thin Section:
C13907.

Rock Name:
Keratophyre.

Hand Specimen:
The sample appears to be portion of a rounded pebble. It is a fine-grained rock showing irregular white and green mottling and it is cut by a thin white quartz vein.

Thin Section:
The rock containes aggregates or clots 1 - 3 mm in size, composed of intergrown crystals of albitic plagioclase and a few of these aggregates also contain relicts of former mafic mineral grains which have been replaced by

chlorite and leucoxene and also very few crystals of opaque oxide and leucoxene. These plagioclase crystals vary in size, but most are between 0.2 and 0.8 mm, and they are now slightly turbid. The composition as determined by the extinction angle of albite twins is approximately An_8.

The groundmass is now composed predominantly of very fine-grained albite intergrown with varying proportions of fine-grained chlorite. No recognisable relict textures were found in this groundmass and there is no evidence of a foliation. The grain size varies slightly in a patchy manner and there are a few small aggregates of leucoxene or sphene.

Some of the larger aggregates of albite crystals have been fractured and invaded by the fine-grained groundmass and the rock is also cut by a few fractures or veins which now contain quartz, and minor amounts of albite and chlorite. In one zone there is also evidence of a stylolitic seam marked by concentrations of chlorite and leucoxene.

This is a volcanic rock, probably of intermediate composition, which is now composed predominantly of albitic plagioclase and chlorite and could therefore be classified as keratophyre. There is no conclusive evidence to show whether this was a lava flow or a pyroclastic. The patchy variation in composition and grain size is possibly more suggestive of a pyroclastic origin, but it lacks the foliation generally present in tuffaceous rocks.

Sample:
PB 006.

Thin Section:
C13908.

Rock Name:
Crystal-lithic tuff of acid composition.

Hand Specimen:
A pale greenish-grey rock with a fine-grained fragmental texture.

Thin Section:
The rock is composed of closely packed fragments of quartz (up to 15%), plagioclase and numerous fragments of fine-grained volcanic rock, which are composed predominantly of plagioclase. There are also numerous fragments now composed of extremely fine-grained or microcrystalline material and sericite and these are difficult to distinguish from interstitial sericitic material.

Most of the crystal and lithic fragments are between 0.1 and 0.3 mm in size and therefore this volcanic detritus has been moderately well sorted, but there are a few larger and irregularly shaped patches composed largely of sericite, which may represent collapsed fragments of pumice. There are also a few fragments composed mainly of chlorite.

Interstices contain mainly sericite and in places it is difficult to distinguish between this and small fragments composed largely of sericite.

There is some evidence of mild tectonic stress resulting in the development of shearing planes marked by concentrations of sericite, but no consistent direction of foliation has been developed in this sample.

This is a tuffaceous rock composed of moderately well sorted fragments, probably derived largely from acid volcanic rock. It is possible that this was a volcaniclastic rather than a tuff, but this is not certain.

Sample:
PB 007.

Thin Section:
C13909.

Rock Name:
Metamorphosed tuff of intermediate composition.

Hand Specimen:
A dull green rock containing very numerous pale pinkish-yellow grains, 1-2 mm in size. There are also a few elongate patches of darker green chloritic material up to a few millimetres long. The rock shows a very weak foliation.

Thin Section:
The paler coloured grains noted in the hand specimen are plagioclase crystals which have been very extensively, to almost completely, replaced by sericite. These are scattered through a matrix composed mainly of sericite and chlorite, intergrown with minor amounts of fine-grained quartz and a few scattered small crystals of plagioclase. There is also some fine-grained leucoxene.

The rock contains some irregular patches of green chlorite and a few of these contain small phenocrysts of plagioclase and very probably they represent fragments of more basic volcanic rock. Some are elongated in the direction of weak foliation.

As in many of the other samples, the rock has developed a very weak foliation due to sub-parallel streaks of sericitic material.

This is a tuffaceous rock of overall intermediate composition, and it shows some evidence of tectonic stress.

Sample:
PB 008.

Thin Section:
C13910.

Rock Name:
Sericitized acid volcanic.

Hand Specimen:
A very pale grey, fine-grained rock with scattered paler coloured grains or patches which have been partly leached.

Thin Section:
The paler coloured grains or spots probably represent completely altered feldspar crystals or phenocrysts and these have been replaced by sericite or fine-grained muscovite, which is slightly coarser-grained that than comprising the bulk of the rock. The hand specimen also showed very few grains or phenocrysts of quartz, but these were not included in the thin section.

The groundmass or matrix is now composed almost entirely of very fine-grained sericitic material with scattered small quartz grains generally less than 0.05 mm in size. There are also a few grains of leucoxene up to 0.1 mm in size. No relict textures were found in the groundmass or matrix, and it is not possible to determine whether this was a lava flow or pyroclastic. The relatively uniform composition of the groundmass is more suggestive of a lava flow, but this is by no means conclusive.

The rock is cut by one poorly-defined vein, along which there is a higher concentration of quartz and some coarser-grained mica, much of which is stained yellow to orange.

This is a sericitized volcanic rock of acid composition which does not show any definite textural evidence to indicate whether it was a lava flow or a pyroclastic.

Sample:
PB 009.

Thin Section:
C13911.

Rock Name:
Lapilli tuff of dacitic or andesitic composition.

Hand Specimen:
A mottled green rock containing fragments of differing colour up to several millimetres in size. Many of these are elongated in a direction of weak foliation.

Thin Section:
This rock originally contained fragments of fine-grained volcanic rock up to 5 mm long, which appear to have been mainly of dacitic or andesitic composition. There are also a few fragments or phenocrysts of plagioclase and also patches of sericite.

The rock is now composed mainly of sericite, chlorite, plagioclase and probably some fine-grained quartz, and the boundaries of many fragments are very indistinct, possibly indicating a welded or ignimbritic tuff. Some fragments are visible only because of variations in colour, and some have probably merged completely with the matrix. Some fragments are porphyritic in that they contain phenocrysts of plagioclase and some show textures which could be interpreted as having been fragments of pumice.

The tuff has been compacted and many fragments are now elongated in a direction of very weak foliation and locally there are streaks of sericite approximately parallel to this direction.

This is a compacted and partly recrystallized tuff of either dacitic or andesitic composition. It may have been ignimbritic or it could have been an ash-flow tuff.

Sample:
PB 010.

Thin Section:
C13912.

Rock Name:
Probably ignimbritic or ash-flow tuff, of acid composition.

Hand Specimen:
A fine-grained, greyish-green rock showing patchy and mottled colouration and containing a few scattered pale pink coloured phenocrysts or crystals of feldspar.

Thin Section:
The rock now contains scattered crystals and fragments of plagioclase 0.2 to 2 mm in size, and very few corroded quartz grains or phenocrysts up to 0.8 mm in size. There are also a few aggregrates of plagioclase phenocrysts associated with some opaque oxide and leucoxene, some chlorite, a few small zircon grains and some finer-grained plagioclase.

The groundmass or matrix is very fine-grained and composed of varying proportions of quartz, plagioclase and chlorite, with sericite in some zones. It shows a very patchy variation in colour and grain size, suggesting the former presence of numerous fragments which have become welded. Flow structures defined by lines of brown staining are visible in many places, but these are not continuous and the direction varies. Locally, there are some sharp discontinuities in flow structure at the edge of fragments, some of which are defined by very thin lines of brown staining. These fragments appear to have been originally composed of vitrious material, which has now crystallized. Locally, there are some relict textures defined by brown staining and by chlorite, which could be interpreted as volcanic shards, but in general this appears to have been composed of larger fragments, at least 1 - 2 mm in size.

This is a welded ignimbritic or ash-flow tuff, which was probably originally composed mainly of vitric material. The overall composition is probably acidic.

Sample:
PB 011.

Thin Section:
C13913.

Rock Name:
Recrystallized and partly sericitized vitric lava or ash-flow tuff.

Hand Specimen:
A dark greyish-red fine-grained rock showing patchy and mottled coloration and containing scattered paler coloured, pink fragments or grains, which may be feldspar.

Thin Section:
The rock is now composed mainly of sericite, quartz and chlorite, but the proportions of these minerals vary in some zones which may be up to several millimetres in size. Many highly irregular and elongate patches are composed almost entirely of sericite.

Very fine-grained opaque to dark red ferric oxide defines many complex flow lines and swirl markings which were originally in vitrious material, and locally these curve around some fragments or phenocrysts of extensively sericitized plagioclase.

The material forming this rock has clearly flowed while it was in a viscous condition, but whether it represents a glassy lava flow or an ash-flow tuff which moved while it was hot, cannot be determined with certainty. The overall composition was probably acidic and the presence of ferric oxide staining suggests oxidising conditions.

Sample:
PB 012.

Thin Section:
C13914.

Rock Name:
Metavolcanic of acid composition.

Hand Specimen:
A fine-grained grey rock containing numerous small elongate paler coloured patches, most of which are parallel to a very weak foliation. In a weathered zone, the rock is stained orange to pale brown.

Thin Section:
The rock is now composed mainly of fine-grained quartz intergrown with sericite and relatively minor chlorite and much of this sericite and chlorite shows sub-parallel orientation, defining a weak schistosity or foliation. Quartz grain size varies up to 0.1 mm and there are a few almost spherical grains suggesting the former presence of some spherulites.

Scattered through this fine-grained rock, there are some remnants of plagioclase phenocrysts which have been fractured and extensively replaced by sericite, and at least some of these appear to have been drawn out or elongated in the direction of foliation. There are also a few aggregates of these phenocrysts associated with some grains now composed of leucoxene and a few of leucoxene and chlorite. These aggregates are also elongated in the direction of foliation.

This is an acid volcanic rock which has partly recrystallized under conditions of tectonic stress. Conclusive evidence of origin was not found, but it was probably a lava flow.

Sample:
PB 013.

Thin Section:
C13915.

Rock Name:
Recrystallized tuff of intermediate composition.

Hand Specimen:
A fine-grained greyish-green rock with a very weak foliation.

Thin Section:
The rock is now composed mainly of very fine-grained chlorite and sericite with some patches or former fragments containing a little quartz and/or feldspar, and locally there is some clay. Much of the sericite shows sub-parallel orientation defining a very weak schistosity.

This rock was originally composed of fragments which varied in size up to 6 mm and some of these are still moderately sharply defined by variations in colour and composition and relict textures. Many fragments contain an abundance of green chlorite, but locally sericite is abundant. Some fragments were vesicular and show numerous spherical voids 0.1 - 0.2 mm in size, which have been filled mainly by quartz?

In very few zones where sericite and some very fine-grained quartz? are more abundant, relict textures marked by thin lines of brown staining show some clearly defined volcanic shards less than 0.1 mm in size, but in general these textures have been obliterated by recrystallization.

This is a partly recrystallized tuff of intermediate composition and some recrystallization has apparently occurred under conditions of mild tectonic stress.

Sample:
PB 014.

Thin Section:
C13916.

Rock Name:
Partly silicified pyroclastic, probably of acid composition.

Hand Specimen:
A fine-grained greenish-grey rock with a confused fragmental texture shown mainly by variations in composition. Many of the fragments appear to have been between 2 and 5 mm in size.

Thin Section:
The composition varies and in some zones the rock has been replaced by medium-grained quartz which is associated with remnants of sericite and chlorite. Other zones in the rock are composed of varying proportions of chlorite and sericite and there are a few former crystals or phenocrysts

of feldspar 1 - 2 mm in size, which have been extensively replaced by sericite. The section contains one irregularly shaped fragment, 1 x 2 mm in size, which is composed predominantly of chlorite and minor leucoxene and sericite and this appears to have a more basic composition than the remainder of the rock. There are a few grains now composed of leucoxene, a few of chlorite associated with leucoxene and there are very few crystals of zircon.

Very little evidence of relict textures was found, but in a few patches of secondary quartz, there are fine lines and markings which could be interpreted as having been derived from collapsed pumice. This suggestion is very tentative.

This is a recrystallized pyroclastic rock, probably of overall acid composition, which has been partly replaced by fine- to medium-grained quartz.

Sample:
PB 015.

Thin Section:
C13917.

Rock Name:
Quartz-sericite metavolcanic derived from acid pyroclastic.

Hand Specimen:
A fine-grained yellowish-grey rock in which some variations in colour suggest the presence of fragments up to 1 cm long. The rock is partly stained yellow to orange by iron oxides due to weathering.

Thin Section:
This is now composed of a confused mass of sericite intergrown with varying proportions of fine- to medium-grained quartz, and through this there are a few scattered remnants of plagioclase and of sericitized feldspar crystals and also a very few corroded phenocrysts of quartz. The composition, texture and grain size varies in different zones, some of which are several millimetres in size and although boundaries are no longer clearly defined, these probably represent former fragments of differing composition and grain size. There is one very irregular patch of sericite which was probably originally pumice, and there are some silicified zones similar to those noted in sample PB 014.

The rock is porous and partly leached due to weathering.

This is a recrystallized pyroclastic rock, probably of acid composition.

Sample:
PB 016.

Thin Section:
C13918.

Rock Name:
Metavolcanic probably derived from an acid pyroclastic.

Hand Specimen:
A fine-grained pale greenish-grey rock showing a weak foliation defined mainly by sub-parallel streaks. It shows a patchy variation in colour, suggesting a former fragmental rock.

Thin Section:
The rock is now composed mainly of fine-grained quartz and sericite with patches containing fine-grained turbid feldspar, probably mainly plagioclase and some zones contain chlorite. There are a few scattered grains of leucoxene and very few zircon crystals. Most of the sericite shows sub-parallel orientation and there are also numerous streaks of sericitic material parallel to this direction.

Original textures are not well preserved, but there is evidence that the rock contained lithic fragments up to 3 mm in size and also some plagioclase crystals or phenocrysts. Most of the lithic fragments are now elongated in the direction of foliation and they show some variation in composition, texture and grain size, and some may have been vitrious fragments.

This was a tuffaceous rock of an overall acid composition which has partly recrystallized under conditions of tectonic stress.

Sample:
PB 017.

Thin Section:
C13919.

Rock Name:
Metavolcanic derived from a pyroclastic rock of acid composition or grading to intermediate composition.

Hand Specimen:
A moderately fine-grained, pinkish and greenish grey rock with a foliation defined by parallel elongate dark streaks and elongated small fragments.

Thin Section:
The rock is composed mainly of quartz, chlorite and sericite with minor opaque oxide and leucoxene and it differs from the three previous samples (PB 014, 015 and 016) in that quartz is less abundant (up to 15%) whereas chlorite and leucoxene are more abundant. This suggests a more basic composition possibly tending towards andesite, but because of the quartz, it has been classified as acid.

There are some phenocrysts of plagioclase 0.5 - 2 mm in size, and most of these have been extensively altered. There are also numerous small lenticular patches of chlorite, some containing opaque oxide and leucoxene grains and there are a few patches or former fragments? composed mainly of fine-grained quartz and/or feldspar with relatively minor chlorite. In general, however, original textures have not been preserved and most of the constituents have clearly been flattened and/or drawn out in a direction of foliation.

This was very probably a pyroclastic rock of more basic composition than samples PB 014-PB 016, and it has partly recrystallized under conditions of mild tectonic stress.

Sample:
PB 018.

Thin Section:
C13920.

Rock Name:
Partly recrystallized pyroclastic probably of acid composition.

Hand Specimen:
A fine-grained greenish-grey rock with a weak foliation defined mainly by some elongated dark fragments and streaks up to a few millimetres long. The rock is weathered and has been partly leached.

Thin Section:
This contains very numerous crystals or phenocrysts of plagioclase of very variable size from 0.2 mm to 2 mm and also many aggregates of intergrown plagioclase crystals. The matrix through which these plagioclase crystals are scattered varies in composition and appears to have been composed at one time of fragments generally less than 1 mm in size. Some of these patches are now composed of fine-grained quartz with minor chlorite, some are largely fine-grained plagioclase with chlorite and some elongate and irregular darker patches contain more abundant chlorite with very fine-grained feldspar, probably plagioclase. Boundaries between these patches or former fragments are very irregular and not always sharply defined, but it is clear that many former fragments have been either flattened and/or elongated in the direction of foliation. Aggregates of plagioclase crystals are also elongated in this direction. Streaks of sericite, some of them containing dispersed, fine-grained leucoxene, are parallel to the general foliation that has developed but these occur only in some zones in the rock.

This was a pyroclastic rock, probably of overall acid or dacitic composition which has been subjected to mild tectonic stress. The matrix has recrystallized, but plagioclase phenocrysts have remained largely unaltered.

Sample:
PB 019.

Thin Section:
C13920A.

Rock Name:
Acid lava showing evidence of shearing or tectonic stress.

Hand Specimen:
A fine-grained dull-pink rock with numerous small streaks or shearing planes? defined by dull-grey sericitic? material.

Thin Section:
The rock is now composed mainly of fine-grained quartz, sericite and chlorite and in the pink zones there are some clouds of minute ferric oxide particles. Some of the quartz grains are almost spherical and appear to have replaced small spherulites, generally less than 0.1 mm in diameter, and there are very few which still show evidence of radial structure. These quartz grains are

Hand Specimen:
A dark greyish-purple or purplish-grey fine-grained rock. The sample includes two phases, one is extremely fine-grained and shows no recognisable texture, whereas the other phase contains abundantly scattered paler coloured spots less than 0.5 mm in size. A very weak foliation or incipient schistosity has developed at a moderate angle to the contact between these two phases.

Thin Section:
This is an extremely fine-grained rock composed of microcrystalline and/or cryptocrystalline, sericite, chlorite and quartz. The composition appears to be uniform throughout the very fine-grained phase, but in the other phase there are small round to oval patches or segregations containing some very fine-grained carbonate and less sericite and chlorite.

Throughout both phases there are relict textures marked by concentrations of minute particles of iron oxide and these textures suggest that this rock was originally composed predominantly of very small volcanic shards less than 0.1 mm in size. These show apparently random orientations and there is no evidence of compaction.

A very weak or incipient foliation defined by subparallel orientation of some of the sericite has been superimposed on the original structureless rock and this curves around the small oval to spherical patches or concretions of unknown origin in the second phase.

This rock was probably composed of very small volcanic shards which have devitrified or been replaced by sericite, chlorite and quartz, with some extremely fine-grained iron oxide. The reason for the small spots containing some carbonate and/or quartz in one phase is not clear.

Sample:
PB 023.

Thin Section:
C13924.

Rock Name:
Recrystallized vitric tuff with a few crystal fragments.

Hand Specimen:
A greyish-purple fine-grained rock similar to Sample PB 022, but containing a few randomly scattered paler coloured grains up to 1 mm in size. There is a very weak or incipient foliation.

Thin Section:
The bulk of the rock is composed of very fine-grained sericite and chlorite with minor quartz, and it is similar to Sample PB 022 in that relict textures marked by concentrations of minute iron oxide particles suggest that it was originally composed largely of volcanic shards less than 0.1 mm in size.

This differs from Sample PB 022 in that it contains 10-15% of scattered small fragments of plagioclase and a few of quartz, most of them between 0.1 and 0.4 mm in size, but there are a few up to 0.6 mm. Some variations in colour and texture suggest that there were also a few larger fragments or bodies up to 2 mm in size, but it is possible that the largest of these may also have been composed of very fine-grained vitric material, although they do not show any evidence of concentric structures such as are found in accretionary lapilly. There are a few patches averaging 0.5 mm long which are composed of sericite with a little dark opaque material and at least some of these appear to have been of pumice.

The fragments included in this rock do not show any evidence of preferred orientation and there is no evidence of bedding. There is some evidence of very weak or incipient foliation due to subparallel orientation of some sericite, but this is not very apparent in the thin section.

This was originally a vitric tuff, probably composed largely of small volcanic shards, but it differed from Sample PB 022 in that it also contained a small proportion of fragments of plagioclase and possibly a few lithic fragments.

Sample:
PB 024.

Thin Section:
C13925.

Rock Name:
Recrystallized tuff. The overall composition may have been dacitic or andesitic.

Hand Specimen:
A greenish-grey fine-grained rock with a patchy and mottled coloration suggesting that it originally contained fragments a few millimetres in size.

Thin Section:
The rock is now composed of very fine-grained quartz, intergrown with varying proportions of very fine-grained chlorite and sericite. The relatively high proportion of quartz suggests that the overall composition of this rock is acidic, but the possibility of some silicification must be considered. There are a few scattered grains of opaque oxide and leucoxene up to 0.3 mm in size, but there is very little opaque material in the matrix or groundmass.

The rock varies in composition, texture and grain size, and it appears to have been originally composed of fragments, some of which were several millimetres in size. Some patches now composed entirely of sericite were very probably fragments of volcanic glass, and these appear to have been deformed, possibly while they were still soft. There are also some

patches replaced by sericite and quartz which show evidence of relict textures, suggesting former pumice, and very probably much of the material in this rock was originally vitreous. Boundaries between former fragments are no longer clearly defined and it is possible that they may have been welded before the rock recrystallized.

This is a recrystallized tuff which probably contained a significant amount of vitreous material and may have had an overall composition corresponding to dacite, but this is difficult to determine.

Sample:
PB 025.

Thin Section:
C13926.

Rock Name:
Metavolcanic derived from an acid pyroclastic.

Hand Specimen:
A pale greyish-green fine-grained rock with a foliation defined by parallel orientation of dark streaks and dark lenticular patches several millimetres long.

Thin Section:
The rock is now composed of sericite, chlorite and quartz, with 2-3% of small leucoxene grains. Most of the sericite and some chlorite show subparallel orientation defining a schistosity and there are numerous lenticular masses of chlorite which are also elongated in this direction. These chloritic patches were probably fragments with a more basic composition. There are a few scattered quartz grains and aggregates up to 0.4 mm in size.

Most of the original textures have been obliterated by recrystallization and the development of a schistosity, and it is therefore not possible to determine whether this was an ignimbritic tuff. However, the boundaries of the chlorite patches are sharply defined, which does not suggest that they were welded.

This is a metavolcanic rock derived from a relatively coarse-grained pyroclastic which has recrystallized under conditions of tectonic stress.

Sample:
PB 026.

Thin Section:
C13927.

Rock Name:
Recrystallized coarse pyroclastic, probably of intermediate composition.

Hand Specimen:
A greyish-green fine-grained rock with a foliation defined by parallel streaks and elongated fragments of differing colour, and some of these elongated patches are now over 1 cm long. The rock is slightly friable and tends to split in a direction parallel to the foliation.

Thin Section:
The rock is now composed largely of chlorite, fine-grained plagioclase and some very fine-grained quartz? Minor fine-grained leucoxene is unevenly distributed and there are very few grains or corroded phenocrysts of quartz up to 0.5 mm in size.

The rock contains numerous irregular elongated and lenticular patches of pale green fine-grained chlorite, with and without scattered grains of leucoxene and minor amounts of fine-grained plagioclase. These are interspersed with, or separated by paler coloured patches of rock composed of microcrystalline chlorite and quartz? and some coarser grained patches of plagioclase. Some of these small plagioclase crystals show albite twinning and the composition appears to be that of olioclase.

Many finer details of original features have been obliterated by recrystallization under tectonic stress and there is now insufficient evidence to determine whether this was an ignimbritic tuff. Because of the high proportion of chlorite associated with at least moderately abundant plagioclase, this has been classified as probably intermediate in composition.

Sample:
PB 027.

Thin Section:
C13928.

Rock Name:
Rhyolite (lava flow).

Hand Specimen:
A pale orange-brown fine-grained rock with scattered paler coloured phenocrysts of feldspar. Staining tests showed that the groundmass contains abundant potash feldspar.

Thin Section:
The rock contains a few phenocrysts of plagioclase generally less than 1 mm in size, very few aggregates of quartz which may represent recrystallized phenocrysts and very few opaque oxide grains and leucoxene up to 0.2 mm in size. These are scattered through a rather turbid groundmass composed of fine-grained potash feldspar intergrown with very fine-grained chlorite and some coarser-grained quartz, and locally there are patches containing some fine-grained plagioclase. Some small prismatic plagioclase crystals are still visible in the groundmass and there are also a few partly recrystallized spherulites, 0.1-0.2 mm in size. No evidence of flow structure was found in the groundmass,

but there are a few parallel elongated quartz aggregates of undetermined origin. There are also a few elongated aggregates of plagioclase phenocrysts aligned in this direction.

This is a lava flow of rhyolitic composition.

Sample:
PB 028.

Thin Section:
C13929.

Rock Name:
Probably acid lava flow which has been brecciated.

Hand Specimen:
A yellowish-grey fine-grained rock which is extensively and finely veined by dark material giving it a fragmental or brecciated appearance.

Thin Section:
The least altered parts of the rock contain some phenocrysts of partly altered plagioclase with a groundmass which contains some small prismatic plagioclase crystals associated with some interstitial turbid potash feldspar. There is also some fine-grained chlorite and minor amounts of fine-grained opaque oxide and leucoxene. This composition and texture occurs throughout the section wherever the rock does not appear to be extensively altered and suggests that it was a lava flow of acid composition, possibly a rhyodacite.

The rock now has very numerous branching and intersecting, thin vein-like masses of pale green chlorite and although these veins vary in thickness, most of them are less than 0.3 mm thick. Locally they intersect and merge to partly replace some of the rock. The presence of the numerous fractures and/or veins gives the rock a fragmental appearance.

Most of the plagioclase phenocrysts have been at least partly altered, and many have been extensively replaced by sericite and chlorite.

This is an acid lava flow which appears to have been extensively fractured and partly chloritized along the numerous fractures.

Sample:
PB 029.

Thin Section:
C13930.

Rock Name:
Chert.

Hand Specimen:
A slightly yellowish-grey fine-grained rock showing mottled and patchy coloration or staining. Staining tests show that it does not contain either potash feldspar or plagioclase.

Thin Section:
The rock is now composed predominantly of microcrystalline quartz through which there are scattered some acicular or platy altered minerals which have been either leached or replaced by limonite. These are 0.1-0.5 mm long and very thin, and it is not possible to establish their identity from available evidence. These acicular crystals had apparently random orientation in the chert.

There are a few lenticular patches distinguishable from the remainder of the rock by the fact that they are finer-grained and do not contain the altered acicular crystals. These may represent vitric or lithic fragments of differing composition, but these suggestions are very tentative. In other places there is a higher concentration of small leached voids and limonitic pseudomorphs and a number of these have rhomb-shaped sections typical of small carbonate crystals. Some zones contain traces of very fine-grained chlorite.

Because of its composition this rock would now be classified as chert, but it is possible that it represents a silicified tuffaceous rock.

Sample:
PB 030.

Thin Section:
C13931.

Rock Name:
Acid lava, possibly rhyodacite.

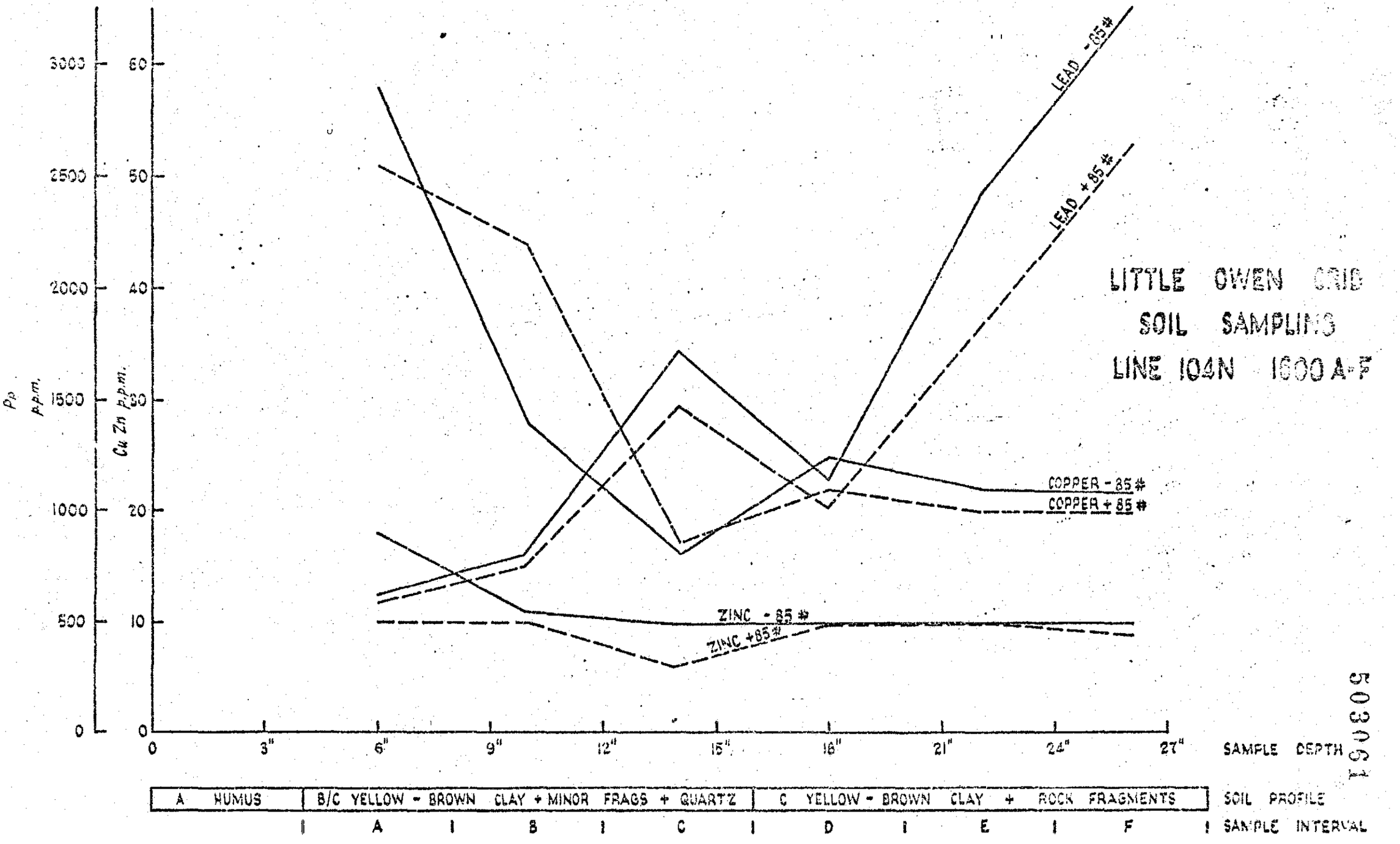
Hand Specimen:
A brownish-grey fine-grained rock with a few scattered paler coloured phenocrysts. It has a weathered zone which is bleached to a paler colour.

Thin Section:
This contains numerous phenocrysts of plagioclase up to 1.5 mm long and most of these occur as aggregates of intergrown crystals. There are also a few opaque oxide grains generally less than 0.5 mm in size, but varying up to 0.8 mm, and most of these are associated with plagioclase phenocrysts in some of the large aggregates. The groundmass is turbid and is composed of some prismatic crystals of plagioclase intergrown with moderately fine-grained quartz and probably some interstitial potash feldspar. There is very little chlorite and minor amounts of fine-grained opaque oxide. Some plagioclase has been replaced by sericite.

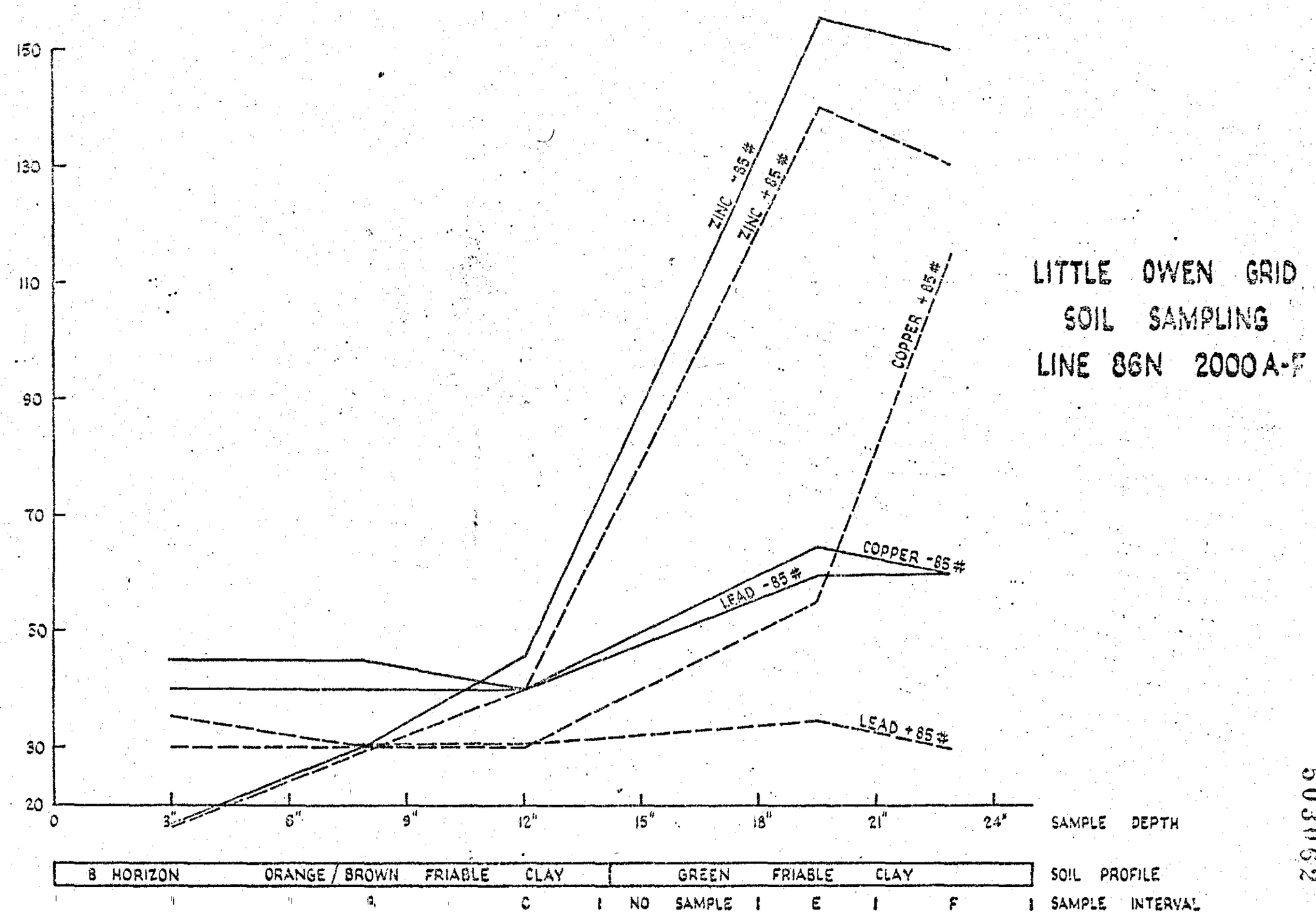
APPENDIX III

Little Owen Grid

Soil Orientation Survey

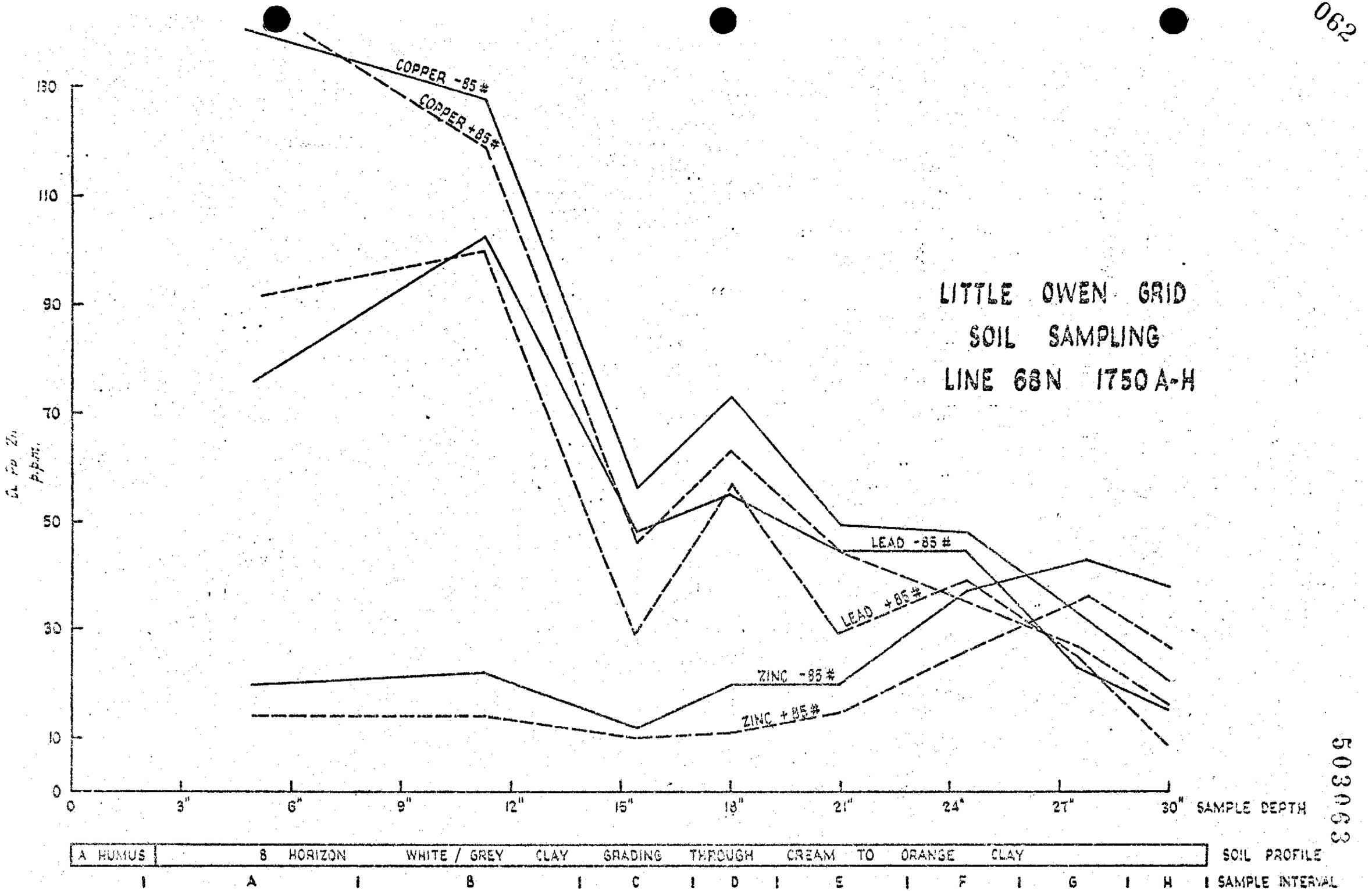

Pb p.p.m.
Cu Zn p.p.m.
3000
2500
2000
1500
1000
500
0
60
50
40
30
20
10
0
0
3"
6"
9"
12"
15"
18"
21"
24"
27"
SAMPLE DEPTH
LEAD -85 #
LEAD +85 #
COPPER -85 #
COPPER +85 #
ZINC -85 #
ZINC +85 #
LITTLE OWEN GRID
SOIL SAMPLING
LINE 104N 1600 A-F
A HUMUS
B/C YELLOW - BROWN CLAY + MINOR FRAGS + QUARTZ
C YELLOW - BROWN CLAY + ROCK FRAGMENTS
SOIL PROFILE
A
B
C
D
E
F
SAMPLE INTERVAL

50306

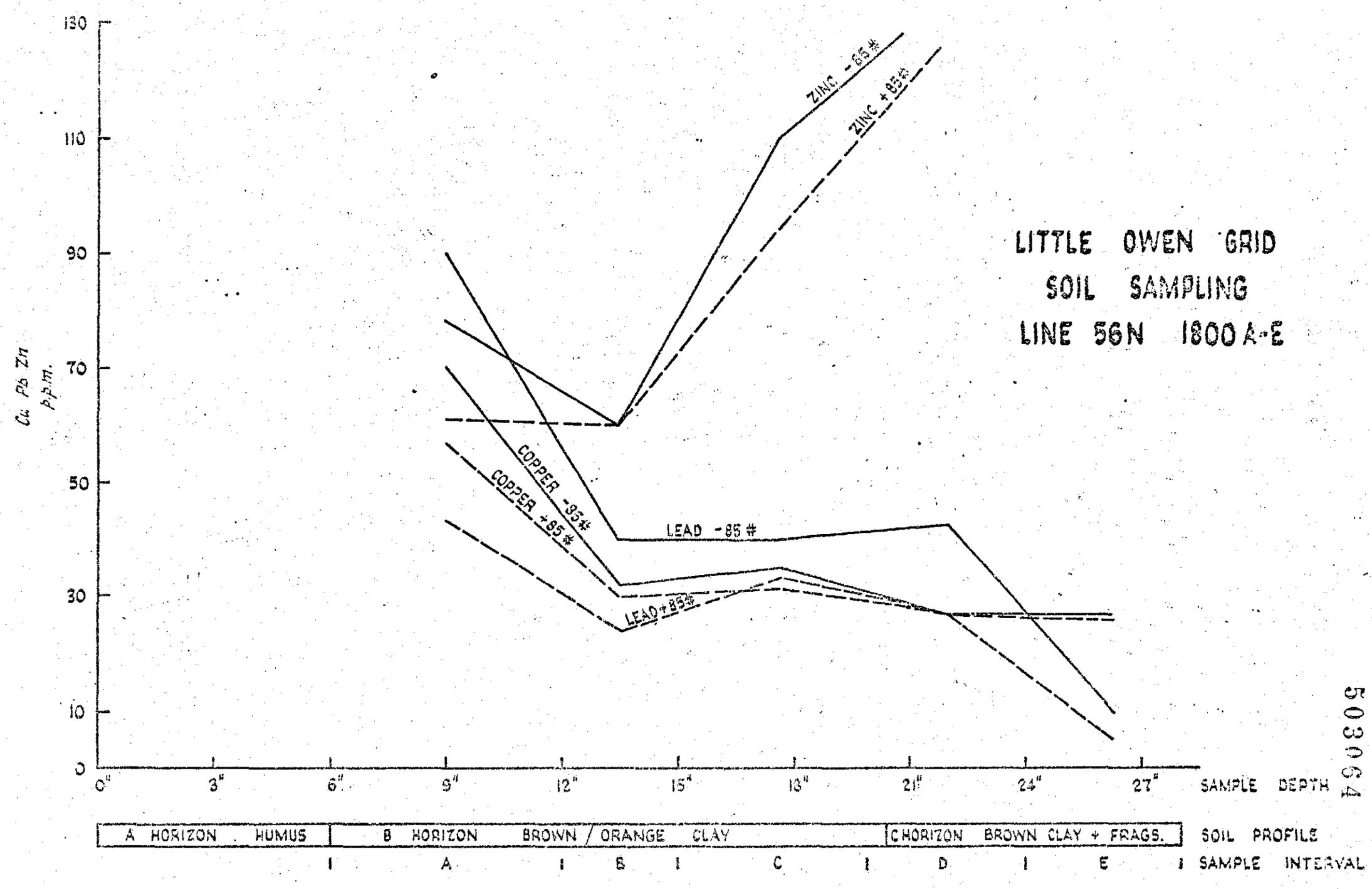


LITTLE OWEN GRID
SOIL SAMPLING
LINE 86N 2000 A-F
ZINC -85 #
ZINC +85 #
COPPER +85 #
COPPER -85 #
LEAD -85 #
LEAD +85 #
150
130
110
90
70
50
30
20
0
3"
6"
9"
12"
15"
18"
21"
24"
SAMPLE DEPTH
B HORIZON
ORANGE / BROWN FRIABLE CLAY
GREEN FRIABLE CLAY
SOIL PROFILE
C
NO SAMPLE
E
F
SAMPLE INTERVAL

503062


LITTLE OWEN GRID
SOIL SAMPLING
LINE 68N 1750 A-H
COPPER -85 #
COPPER +85 #
LEAD -85 #
LEAD +85 #
ZINC -85 #
ZINC +85 #
Cu, Pb, Zn p.p.m.
130
110
90
70
50
30
10
0
0
3"
6"
9"
12"
15"
18"
21"
24"
27"
30"
SAMPLE DEPTH
A HUMUS
B HORIZON WHITE / GREY CLAY GRADING THROUGH CREAM TO ORANGE CLAY
SOIL PROFILE
A B C D E F G H
SAMPLE INTERVAL

503063


LITTLE OWEN GRID
SOIL SAMPLING
LINE 56N 1800 A-E
Cu Pb Zn p.p.m.
130
110
90
70
50
30
10
0
ZINC -65 #
ZINC +85 #
COPPER -35 #
COPPER +85 #
LEAD -85 #
LEAD +85 #
0"
3"
6"
9"
12"
15"
18"
21"
24"
27"
SAMPLE DEPTH
A HORIZON HUMUS
B HORIZON BROWN / ORANGE CLAY
C HORIZON BROWN CLAY + FRAGS.
SOIL PROFILE
A
B
C
D
E
SAMPLE INTERVAL

50306A

APPENDIX IV

LOCATION OF PERMANENT MARKERS

(Co-ordinates quoted in metric since grid location on Sheet 15 1-6000 scale is inaccurate).

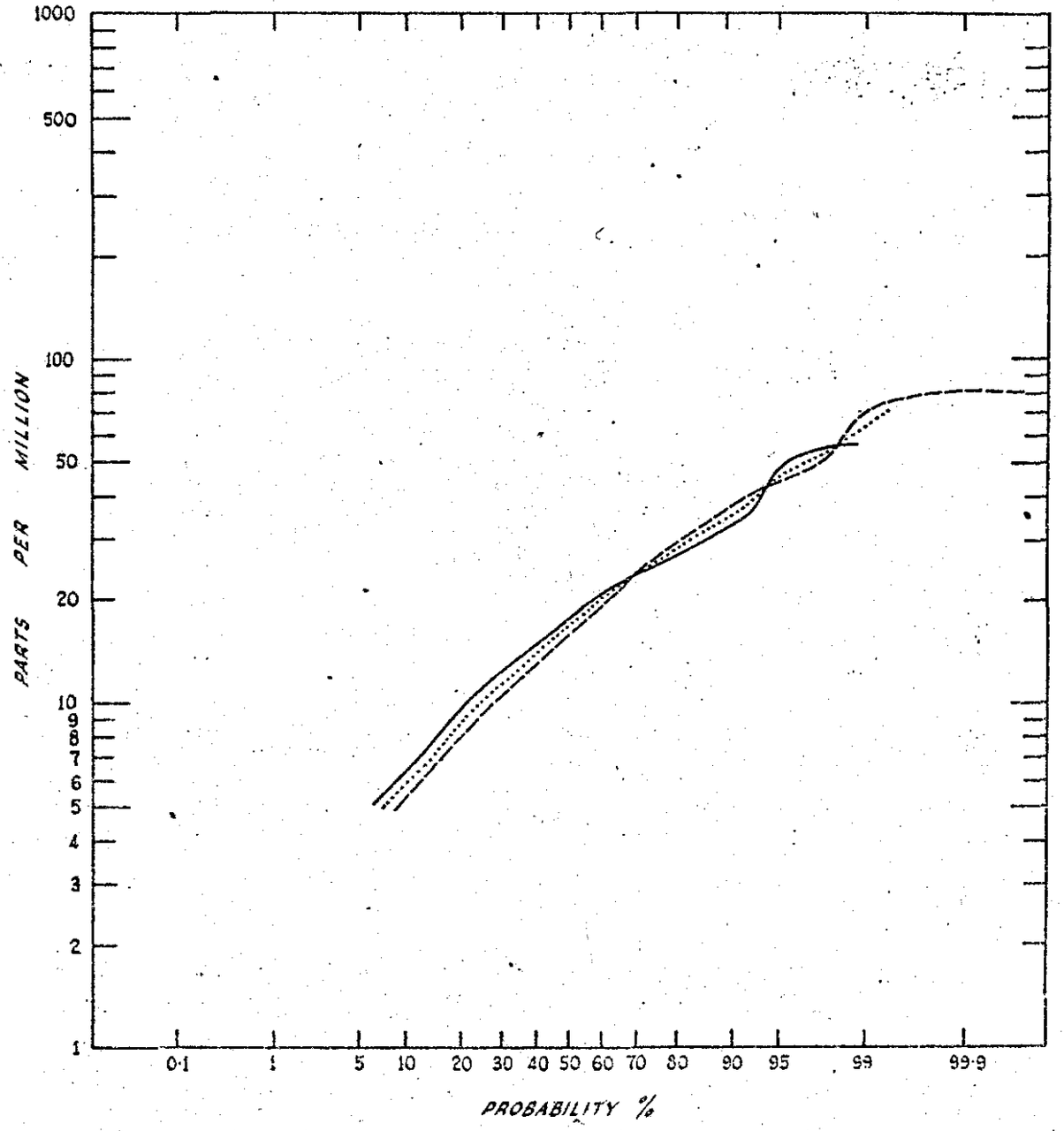
Peg No.	Geological Grid Position	Co-ordinates North	Co-ordinates East	Reduced Level	Remarks
GEO.102	104/6800+17 m	3243.087	5610.678	344.732	
x 1	110/1100	2183.046	4262.706	219.790	
x 2	104/1600-28 m	2065.009	4439.676	249.308	
x 3	98/1000	1841.155	4469.425	294.756	
x 4	92/700+8 m	1654.284	4546.796	311.250	Road is at 92/900+8 m
x 5	86/400+20 m	1488.666	4639.372	359.120	Peg is 3 m north of line
x 6	80/800-7.8 m	1435.266	4833.043	345.259	
x 7	74/600+11 m	1272.454	4943.019	355.870	
x 8	68/1500+12 m	1345.530	5234.742	393.635	
x 9	116/2900	2609.564	4441.346	254.516	
x 10	110/2400+1 m	2435.493	4520.253	267.279	
x 11	104/5100	2875.797	5239.017	384.692	
x 12	98/5000	2734.096	5294.604	397.007	
x 13	92/4700-13.4 m	2514.263	5356.646	406.824	
x 14	86/4200	2306.051	5404.198	439.943	
x 15	80/3900+3 m	2072.704	5437.526	473.912	
x 16	74/3100+14.7 m	1828.470	5430.964	479.295	
x 17	68/3100+2.6 m	1670.690	5532.090	467.487	
x 18	62/2900	1523.208	5647.497	493.412	
x 19	56/2900+7.7 m	1417.158	5759.830	520.075	
x 20	50/2800	1264.398	5912.221	503.945	
x 21	44/2900	1160.446	6056.977	505.953	
x 22	44/3100	1212.524	6090.464	509.601	
x 23	92/5500	2639.704	5588.295	291.982	
x 24	56/4600	1798.426	6116.623	395.432	
x 25	68/5200	2148.787	5991.040	338.575	
x 26	74/5600+1 m	2336.390	5973.374	338.576	
x 27	80/5800+18 m	2478.350	5850.273	319.690	
x 28	44/4000+80 m	1482.174	6349.351	478.876	
x 29	98/6100	2917.064	5581.795	259.285	
x 30	Line 98?	3101.258	5836.098	373.582	On edge of highway
x 31	86/5900-6 m	2660.361	5771.122	293.192	
x 32	110/7000	3367.960	5478.955	330.953	
x 33	116/6900+21 m	3408.151	5250.762	313.500	
x 34	Base Line @ 8500N	1367.348	4567.036	348.919	
x 35	Base Line @ 800N	198.031(S)	6171.452	567.920	
x 36	Base Line @ 3100N + 9.5 m	262.466(N)	5716.654	391.407	
x 37	62/4400	1849.980	5959.648	372.389	

APPENDIX V

Huxley Grid

Geochemical Log-Probability Graphs

503067



		(TOTAL SOILS)		
Nº OF SAMPLES n = 232	1ST ORDER THRESHOLD ·····	54	p.p.m.	I – POINT OF INFLECTION
METAL ····· Cu	2ND ORDER THRESHOLD ·····		p.p.m.	A – POPULATION A
SAMPLE TYPE ····· SOIL	3RD ORDER THRESHOLD ·····		p.p.m.	B – POPULATION B
HORIZON ····· B	BACKGROUD MEDIAN ·····	16	p.p.m.	C – POPULATION C
FRACTION ····· -80#				95% CONFIDENCE LIMIT

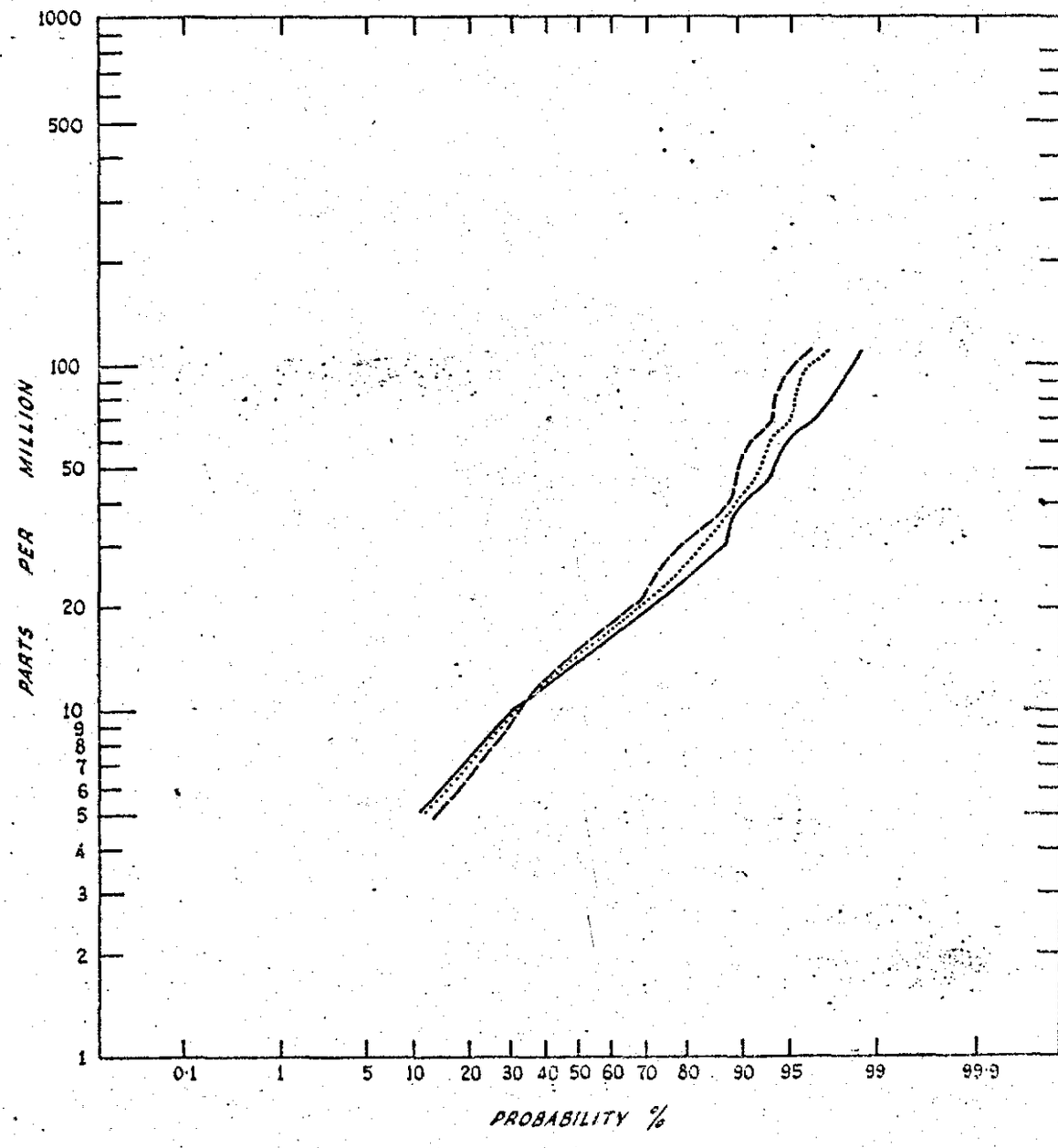
——— RESIDUALS (143 SAMPLES)

– – – – TRANSPORTED (89 SAMPLES)

····· TOTAL SOILS

THE MT. LYELL M. & R. Coy LTD.	TRACED R.G.W.
DORA - HUXLEY AREA E.L. 10/69	CHECKED P.B.
	DATE Oct./70
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID	APPENDIX V

503068



N° OF SAMPLES n = 232	1ST ORDER THRESHOLD (TOTAL SOILS) ····· 100	p.p.m.	I — POINT OF INFLECTION
METAL ····· Cu	2ND ORDER THRESHOLD ·····	p.p.m.	A — POPULATION A
SAMPLE TYPE ····· SOIL	3RD ORDER THRESHOLD ·····	p.p.m.	B — POPULATION B
HORIZON ····· B	BACKGROUD MEDIAN ····· 15	p.p.m.	C — POPULATION C
FRACTION ····· -10#/+80#			95% CONFIDENCE LIMIT

——— RESIDUALS (143 SAMPLES)

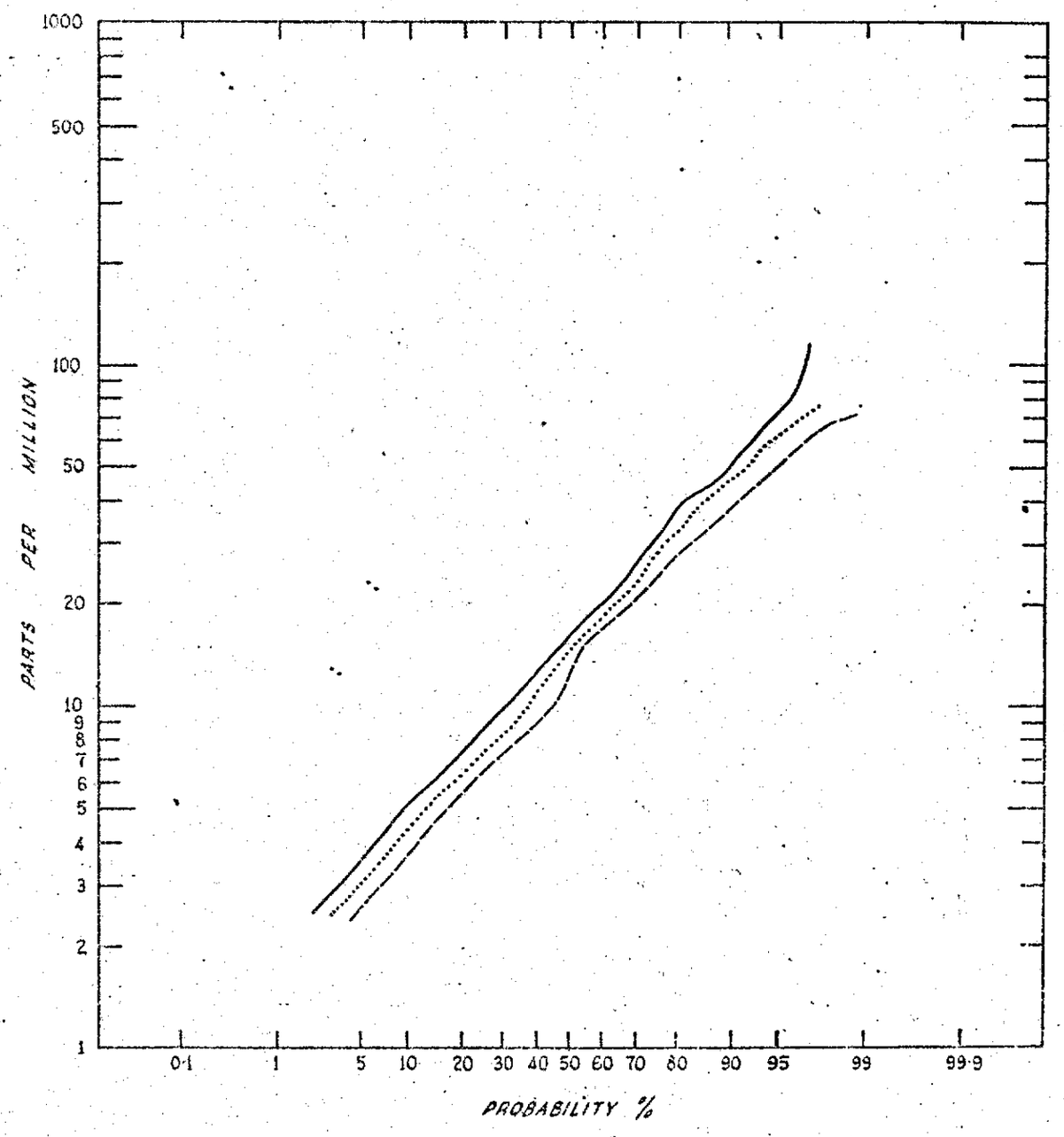
– – – – TRANSPORTED (89 SAMPLES)

····· TOTAL SOILS

THE MT. LYELL M. & R. Coy. Ltd.	TRACED. R.G.W.
DORA-HUXLEY AREA E.L. 10/69	CHECKED. P.B.
	DATE. Oct. '75
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID	APPENDIX V

068

503069



Nº OF SAMPLES n = 232

METAL ..... Pb

SAMPLE TYPE ..... SOIL

HORIZON ..... B

FRACTION ..... -80#

——— RESIDUALS (143 SAMPLES)

– – – – TRANSPORTED (89 SAMPLES)

..... TOTAL SOILS

(TOTAL SOILS)

1ST ORDER THRESHOLD ..... 75 p.p.m.

2ND ORDER THRESHOLD ..... p.p.m.

3RD ORDER THRESHOLD ..... p.p.m.

BACKGROUD MEDIAN ..... 15 p.p.m.

I – POINT OF INFLECTION

A – POPULATION A

B – POPULATION B

C – POPULATION C

95% CONFIDENCE LIMIT ═══

THE MT. LYELL M. & R. Coy. LTD.

DORA-HUXLEY AREA
E.L. 10/69

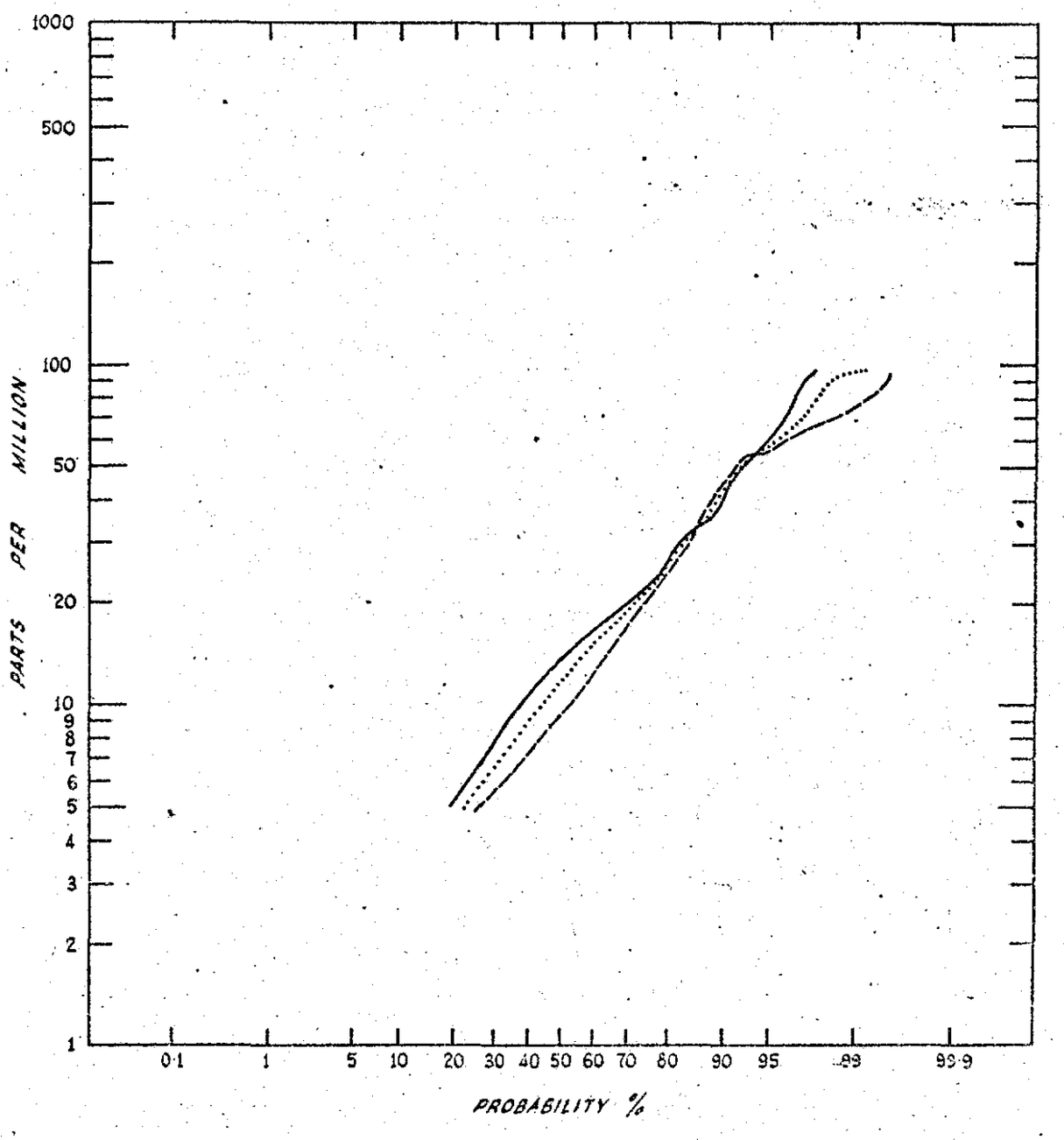
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID

TRACED R.G.M.

CHECKED P.B.

DATE Oct. '69

APPENDIX V



(TOTAL SOILS)

Nº OF SAMPLES n = 232

METAL ..... Pb

SAMPLE TYPE..... SOIL

HORIZON ..... B

FRACTION ..... -10#/+60#

1ST ORDER THRESHOLD ..... 70 p.p.m.

2ND ORDER THRESHOLD ..... p.p.m.

3RD ORDER THRESHOLD ..... p.p.m.

BACKGROUD MEDIAN ..... 12 p.p.m.

I – POINT OF INFLECTION

A – POPULATION A

B – POPULATION B

C – POPULATION C

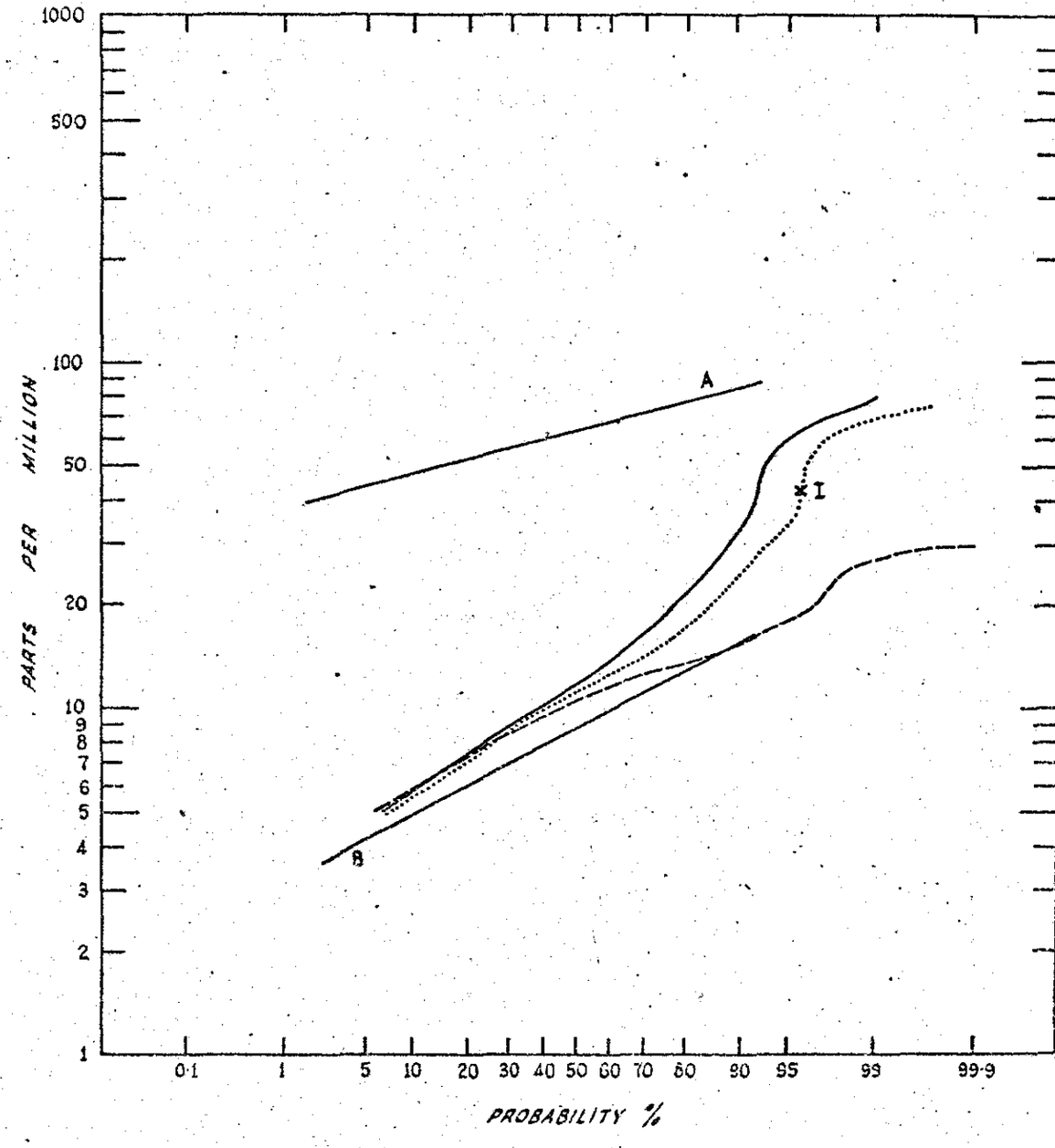
95% CONFIDENCE LIMIT

——— RESIDUALS (143 SAMPLES)

– – – – TRANSPORTED (89 SAMPLES)

..... TOTAL SOILS

THE MT. LYELL M. & R. Coy LTD.	TRACED. R.C.W.
DORA-HUXLEY AREA E.L. 10/69	CHECKED. P.B.
	DATE. Oct. '75
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID	APPENDIX V



(TOTAL SOILS)

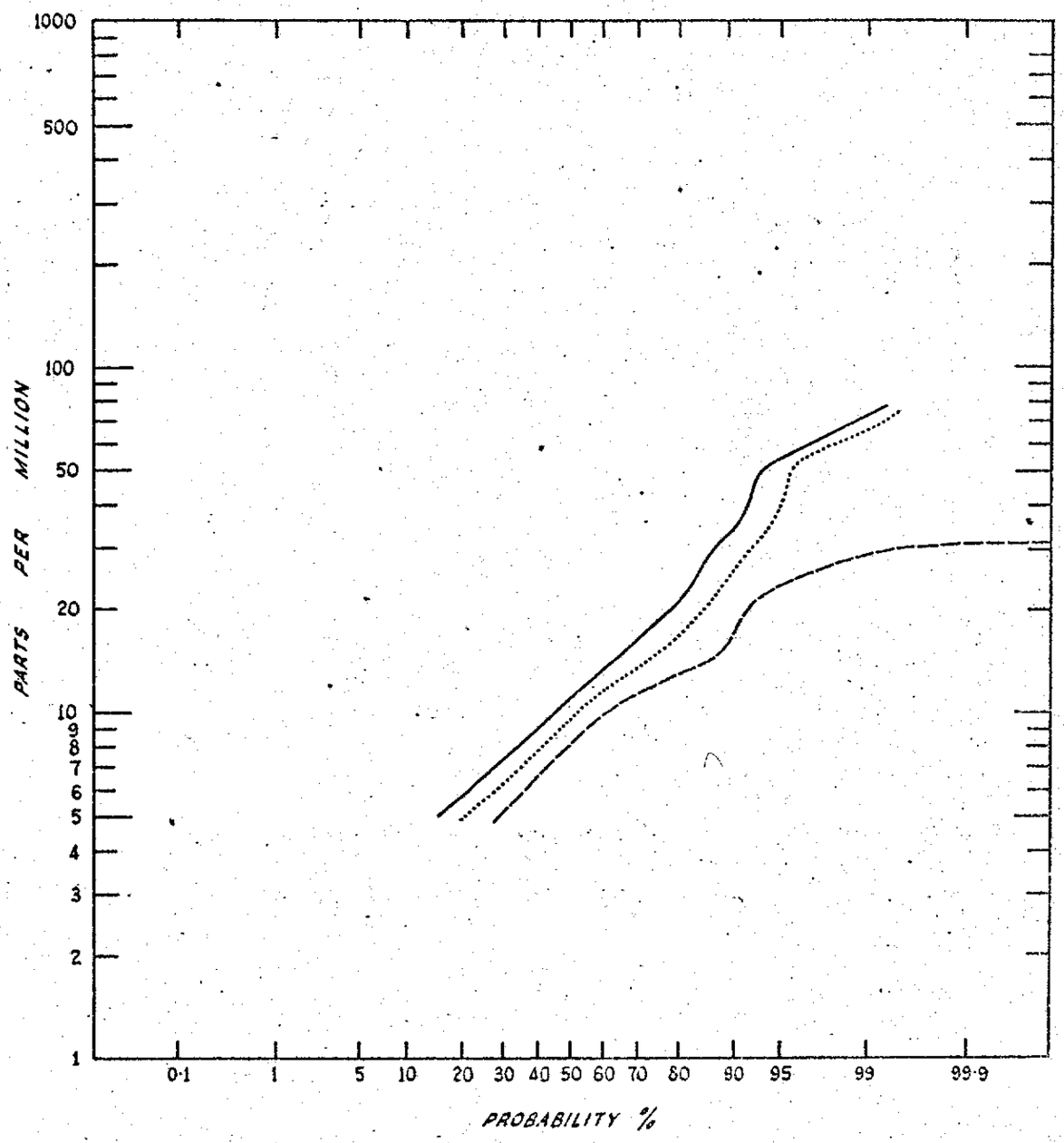
N° OF SAMPLES n = 232	1ST ORDER THRESHOLD ····· 40 p.p.m.	I – POINT OF INFLECTION
METAL ····· Zn	2ND ORDER THRESHOLD ····· p.p.m.	A – POPULATION A
SAMPLE TYPE ····· SOIL	3RD ORDER THRESHOLD ····· p.p.m.	B – POPULATION B
HORIZON ····· B	BACKGROUD MEDIAN ·····	C – POPULATION C
FRACTION ····· -80#		95% CONFIDENCE LIMIT

——— RESIDUALS (143 SAMPLES)

– – – – TRANSPORTED (89 SAMPLES)

····· TOTAL SOILS

THE MT. LYELL M.& R Coy. Ltd.	TRACED R.G.W
DORA-HUXLEY AREA E.L. 10/69	CHECKED P.B.
	DATE Oct./73
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID	APPENDIX V



(TOTAL SOILS)

N° OF SAMPLES n = 232	1ST ORDER THRESHOLD ..... 58 p.p.m.	I – POINT OF INFLECTION
METAL ..... Zn	2ND ORDER THRESHOLD ..... p.p.m.	A – POPULATION A
SAMPLE TYPE ..... SOIL	3RD ORDER THRESHOLD ..... p.p.m.	B – POPULATION B
HORIZON ..... B	BACKGROUD MEDIAN ..... 10 p.p.m.	C – POPULATION C
FRACTION ..... -10#/+80#		95% CONFIDENCE LIMIT

——— RESIDUALS (143 SAMPLES)

– – – – TRANSPORTED (89 SAMPLES)

..... TOTAL SOILS

THE MT. LYELL M. & R. Coy. LTD.	TRACED. R.G.W.
DORA-HUXLEY AREA E.L. 10/69	CHECKED. P.S.
STATISTICAL ANALYSIS OF GEOCHEMICAL DATA HUXLEY GRID	DATE Oct.'75
	APPENDIX V

APPENDIX VI

ROCK CHIP AND GRAB SAMPLING 1974-75 - ASSAY DATA

Sample No.	Cu ppm	Pb ppm	Zn ppm	Au ppm	Ag ppm	FeS_2 %	Location
DH 1	3300	130	180			0.1	Shaft Dump - Little Owen Ridge
DH 2	3100	70	55			0.1	" " " " "
DH 3	125	30	40			0.1	Adit Dump - Little Owen Ridge
DH 4	600	60	45			11.8	" " " " "
DH 5	10700	20	295	0.1	3.0	6.3	Adit Conglomerate Creek - Lyell Highway
DH 6	635	10	90	0.8	6.4	83.2	" " " "
DH 7	530	10	110	0.3	1.2	7.7	N. End - Little Owen Ridge
DH 8	100	10	95	0.1	0.2	3.2	Huxley Grid L. 9600S 500W
DH 9	55	10	20	0.1	0.1	0.2	" " L. 3200S 800W
DH 10	85	10	35	0.1	2.0	24.1	Sample H55 Mt. Huxley - Whip Spur
DH 11	65	10	15	0.1	0.3	0.1	Sample G59 " " " "

N.B. Sample locations shown on map.

073

APPENDIX VII

503074

PROPOSED DRILLING PROGRAMME - AREA 2

D.D.H. 1

Aim:	To test mineralisation 250' below existing Duke Lyell workings
Collar Co-ordinates and R.L.:	Line 62N 4950E (200' south of line)
Collar Dip:	-50°
Collar Bearing:	060° (magnetic)
Approximate Length:	350 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 2

Aim:	To test mineralisation 750' below existing Duke Lyell workings
Collar Co-ordinates and R.L.:	Line 62N 4500E (100' south of line)
Collar Dip:	-50°
Collar Bearing:	060° (magnetic)
Approximate Length:	750 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 3

Aim:	To test the zone between Duke Lyell and Great Lyell between Line 62N and Line 68N
Collar Co-ordinates and R.L.:	Line 62N 4900E (250' north of line)
Collar Dip:	-55°
Collar Bearing:	042° (magnetic)
Approximate Length:	1250 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 4

Aim:	To test the southerly extension of mineralisation previously drilled in the Great Lyell Main No. 1 Adit
Collar Co-ordinates and R.L.:	
Collar Dip:	-50°
Collar Bearing:	042° (magnetic)
Approximate Length:	600 ft.
Dip Deviation:	2°/100 ft.

D.D.H 5

Aim:	To test mineralisation 500' below Great Lyell shaft
Collar Co-ordinates and R.L.:	Line 80N 5800E
Collar Dip:	-55°
Collar Bearing:	042° (magnetic)
Approximate Length:	1250 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 6

Aim:	To test E.I.P. anomaly on Line 104N (5000E - 6800E)
Collar Co-ordinates and R.L.:	Line 104N 4900E
Collar Dip:	-65°
Collar Bearing:	042° (magnetic)
Approximate Length:	2000 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 7

Aim:	To test E.I.P. anomaly on Line 68N (3400E - 3650E and 4150E)
Collar Co-ordinates and R.L.:	Line 68N 3300E
Collar Dip:	-60°
Collar Bearing:	042° (magnetic)
Approximate Length:	1500 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 8

Aim:	To test mineralisation 700' below Great Lyell Lower No. 1 and Upper No. 2 Adits and E.I.P. anomaly Line 86N (3980E - 4070E)
Collar Co-ordinates and R.L.:	Line 86N 3900E (100' north of line)
Collar Dip:	-55°
Collar Bearing:	064°
Approximate Length:	1250 ft.
Dip Deviation:	2°/100 ft.

D.D.H. 9

If warranted from results of D.D.H. 7

D.D.H. 10

Anomaly considered to be caused by shales with minor disseminated pyrite.

Pickands Mather drilled RM 20 in this area with negative results.

Further drilling may be warranted.

355,000yE. 360,000yE. 365,000yE. 370,000yE.

830,000yN.

825,000yN.

820,000yN.

815,000yN.

810,000yN.

Henty River

Mt Geikie

Basin Lake

Lake Margaret

Lake Dora

Lake Spicer

Eldon Peak

Eldon River North

Lake Beatrice

Mt Sedgwick

AREA 1

South Eldon River

TO ZEHAN

King River

Comstock Creek

Mt. Lyell

MURCHISON HIGHWAY

AMG
379200E
5342500N

AERODROME

TO STRAHAN

QUEENSTOWN

GORMANSTON

1600N. 1000N. 1400N. 800N. 1200N. 600N. 1000N. 400N. 800N. 200N. 600N. 400N. 200N.

2A

2B

AREA 2

Mt. Owen

LYELL HIGHWAY

3A

3B

AREA 3

Mt Huxley

AMG
383500E
5323500N

Queen River

Davey River

AMG REFERENCE POINTS ADDED

5 cm

KEY 75-1117

- E.L. 10/69 LEASE BOUNDARY
- CONSOLIDATED MINING LEASE
- SUB DIVISIONS
- AREA COVERED BY EXPLORATION 1974/75

ACCESS

- MAJOR ROADS
- DRIVEABLE TRACKS
- WALKING TRACKS
- GRID LINES

503076

TRUE NORTH
MAGNETIC NORTH

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

DORA - HUXLEY AREA
MAP 1 001
LOCATION AND ACCESS

Drawn: R.G.W.
Checked:
Date: 13·8·'75
Scale: 2" = 1 mile

Base map by Lands and Surveys Department, Hobart. 40 chains to 1 inch sheets.

Co-ordinates on State Grid.

002

357,000 YDS.E.
360,000 YDS.E.
365,000 YDS.E.
370,000
834,000 YDS.N.
830,000 YDS.N.
825,000 YDS.N.
820,000 YDS.N.
815,000 YDS.N.
810,000 YDS.N.

Henty River
Basin Lake
Mt Geikie
Lake Dora
Lake Spicer
Lake Margaret
Mt. Sedgwick
Lake Beatrice
Comstock Open Cut
Cape Horn
West Lyell Open Cut
Mt Lyell
Zeehan Highway
Strahan Highway
Lyell Highway
Comstock Creek
King River
Queen River
East Queen River
Great Lyell
Whip Spur
Mt Owen
Mt Huxley
Miner's Slate Ridge
Roaring Meg Creek
Lynch Creek
Queen River
Toft River
AERODROME
QUEENSTOWN
GORMANSTON

PYROCLASTIC SEQUENCE ??
SEDIMENTARY SEQUENCE ?
JURASSIC DOLERITE
PERMIAN TILLITE
SEDGWICK TYPE RHYOLITE (QUARTZ PORPHYRIES)
MASSIVE PINK FINE GRAINED RHYOLITE (DARWIN TYPE)
UNDIFFERENTIATED CAMBRIAN VOLCANICS
GRADED UNIT COARSE BRECCIAS TO FINE GRAINED SEDIMENTS
UNDIFFERENTIATED VOLCANICS
SILURIAN
COMSTOCK TUFF (BASAL UNIT OF TYNDALL GROUP)
SMALL LENSES OF IGNIMBRITES
AUTOBRECCIATED FLOW BANDED LAVAS
WHIPSPUR TUFFS REPEATED GRADED UNITS (10'-15')
HYALOPILITIC ANDESITE MAY BE AUTOBRECCIATED IN PART
QUEENSTOWN PYROCLASTICS
PORPHYRY CONTAINS FRAGMENTS OF QUARTZ PORPHYRY AND SLATE. SHEAR CONTACT
UNDIFFERENTIATED POST-CAMBRIAN - LOWER PALAEOZOIC SEDIMENTS
SANDSTONES AND BLACK SHALES
INCREASING PERCENTAGE OF SEDIMENTS PART OF HENTY-YOLANDE GREYWACKE SEQUENCE?
TUFFS AND SEDIMENTS
GREYWACKES
UNDIFFERENTIATED CAMBRIAN VOLCANICS
PYROCLASTIC SEQUENCE
OWEN FAULT
KING RIVER FAULT
NORTH LYELL FAULT
SOUTH LYELL FAULT
GREAT LYELL FAULT

75-1117

QUATERNARY
- ALLUVIUM / MORAINE.

JURASSIC
- DOLERITE.

PERMIAN
- TILLITE.

SILURO - DEVONIAN
- UNDIFFERENTIATED SEDIMENTS - ELDON GROUP.

ORDOVICIAN
- GORDON LIMESTONE.
- OWEN CONGLOMERATE.
- PIONEER BEDS.
- } JUNEE GROUP

CAMBRIAN
- JUKES CONGLOMERATE EQUIVALENT TO NEWTON CREEK SANDSTONES.
- COMSTOCK TUFF.
- } TYNDALL GROUP
- ANDESITE INTRUSIVE.
- QUARTZ PORPHYRY INTRUSIVE.
- QUEENSTOWN PYROCLASTICS, INTERMEDIATE - ACID, FINE - COARSE PYROCLASTICS. MINOR SEDIMENTS?
- INTERMEDIATE VOLCANIC SEQUENCE.
- ACID LAVAS AND PYROCLASTICS.
- ACID PYROCLASTIC SEQUENCE.
- MASSIVE PINK ACID LAVAS.
- GREY GREEN FELDSPAR PORPHYRY LAVAS.
- SEDGWICK / HUXLEY TYPE RHYOLITES, DACITES, MINOR PYROCLASTICS.
- DARWIN RHYOLITE.
- } CENTRAL LAVA SEQUENCE
- UNDIFFERENTIATED CAMBRIAN.
- SEDIMENTARY SEQUENCE WITH MINOR PYROCLASTICS.

PRECAMBRIAN
- QUARTZITE AND METAMORPHOSED SEDIMENTS.
- STRIKE AND DIP OF BEDDING.
- STRIKE OF SCHISTOSITY AND DIP.
- SYNCLINE
- ANTICLINE
- FAULT
- FAULT - INFERRED

503075

5 cm

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

DORA – HUXLEY AREA
E.L. 10/69

002

GEOLOGICAL MAP

DRAWN:	P. BROPHY
TRACED:	R.G.WILSON
CHECKED:	
DATE:	Oct. '75
SCALE:	1:15840

MAP 2

LEGEND

QUATERNARY

- MORAINE AND/OR SCREE.

ORDOVICIAN

- GORDON LIMESTONE.
- PIONEER BEDS. } OWEN CONGLOMERATE
- CONGLOMERATE AND SANDSTONE. } OWEN CONGLOMERATE

CAMBRIAN

- GRADED TUFF UNITS, AGGLOMERATES AND MINOR FELDSPAR PORPHYRY LAVAS. } TYNDALL GROUP
- MEDIUM GRAINED, ACID, LITHIC TUFFS WITH MINOR BLACK SHALE HORIZONS. } QUEENSTOWN PYROCLASTICS
- INTERMEDIATE LAVAS AND MINOR INTRUSIVES. MEDIUM COARSE GRAINED INTERMEDIATE PYROCLASTICS. } INTERMEDIATE VOLCANIC (MINE LEASE) SEQUENCE
- DOMINANTLY IGNIMBRITES WITH MINOR ACID TUFF HORIZONS.
- AGGLOMERATES CONTAINING COARSE ELONGATED ACID LAVA BLOCKS. MINOR INTERBEDDED SEDIMENT HORIZONS.
- ALTERED CHLORITIC TUFF.
- ALTERED ACID LAVAS WITH VARIABLE SULPHIDES, BARITE AND HAEMATITE MINERALISATION.
- FINE GRAINED SOMETIMES LAMINATED SILICEOUS SILTSTONES AND SHALES WITH MINOR INTERBEDDED GRADED TUFF UNITS.
- THINLY BEDDED GREY SHALES.
- ACID TUFFS MAINLY CRYSTAL LITHIC.

} PYROCLASTIC SEQUENCE (LITTLE OWEN) } CENTRAL LAVA BELT

- GREY GREEN FELDSPAR PORPHYRY LAVAS.
- MASSIVE PINK - PURPLE ACID LAVAS. BRECCIA. DARWIN TYPE RHYOLITES.

} ACID LAVA SEQUENCE

- QUARTZ PORPHYRY, DOMINANTLY INTRUSIVE.
- INTERMEDIATE INTRUSIVES - PYROXENE FELDSPAR PORPHYRY.
- QUARTZ - SERICITE - PYRITE ALTERATION.

- FAULT
- POSSIBLE FAULT
- GEOLOGICAL BOUNDARY
- POSSIBLE GEOLOGICAL BOUNDARY
- BEDDING AND FACING
- FOLIATIONS
- UNCONFORMITY
- SYNCLINE AXIS
- ANTICLINE AXIS
- OLD ADITS AND WORKINGS

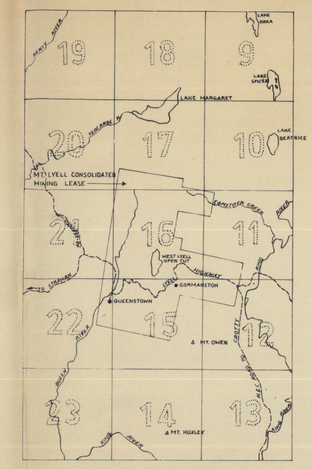
SECTION 1

SECTION 2

T M

N

LOCATION



5 cm

503078 75-1117

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN. P. BROPHY.
	TRACED R.G.WILSON.
	CHECKED.
DORA – HUXLEY AREA	DATE. 21·8·75
E.L. 10/69 003	SCALE. 1" = 500' 1:6000
SHEET 15	MAP 3
GEOLOGICAL MAP	



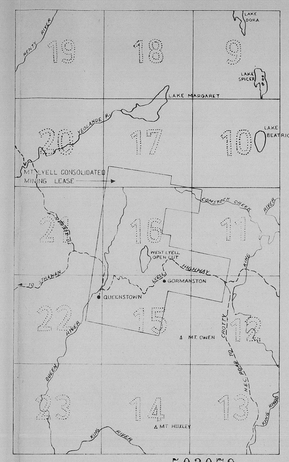
LEGEND

- MORAINE AND/OR SCREE.
- OWEN CONGLOMERATE.
- UNDIFFERENTIATED VOLCANICS.
- JUKES CONGLOMERATE AND EQUIVALENTS WITH TUFFS GREYWACKES, WELDED TUFFS AND MINOR SEDIMENTS. — TYNDALL GROUP
- COMSTOCK TUFF. — TYNDALL GROUP
- FINE - MEDIUM GRAINED ASH-FALL TUFFS WITH INTERBEDDED SILTSTONE AND SHALE HORIZONS. — QUEENSTOWN PYROCLASTICS
- ACID PYROCLASTIC SEQUENCE INCLUDING CRYSTAL TUFFS, AGGLOMERATES AND MINOR WELDED TUFFS. — EAST OF MT. HUXLEY — CENTRAL LAVA BELT
- GREY - GREEN FELDSPAR PORPHYRY LAVAS. — ACID LAVA SEQUENCE — CENTRAL LAVA BELT
- MASSIVE PINK - PURPLE ACID LAVAS. — ACID LAVA SEQUENCE — CENTRAL LAVA BELT
- BASIC INTRUSIVE.
- QUARTZ PORPHYRY, DOMINANTLY INTRUSIVE.
- STRIKE AND DIP OF BEDDING.
- STRIKE AND DIP OF FOLIATION.
- SYNCLINE.
- ANTICLINE.
- FAULT.
- UNCONFORMITY.
- Py ZONE OF PYRITE.
- Hm HAEMATITE.

T M

N

LOCATION



503079

5 cm

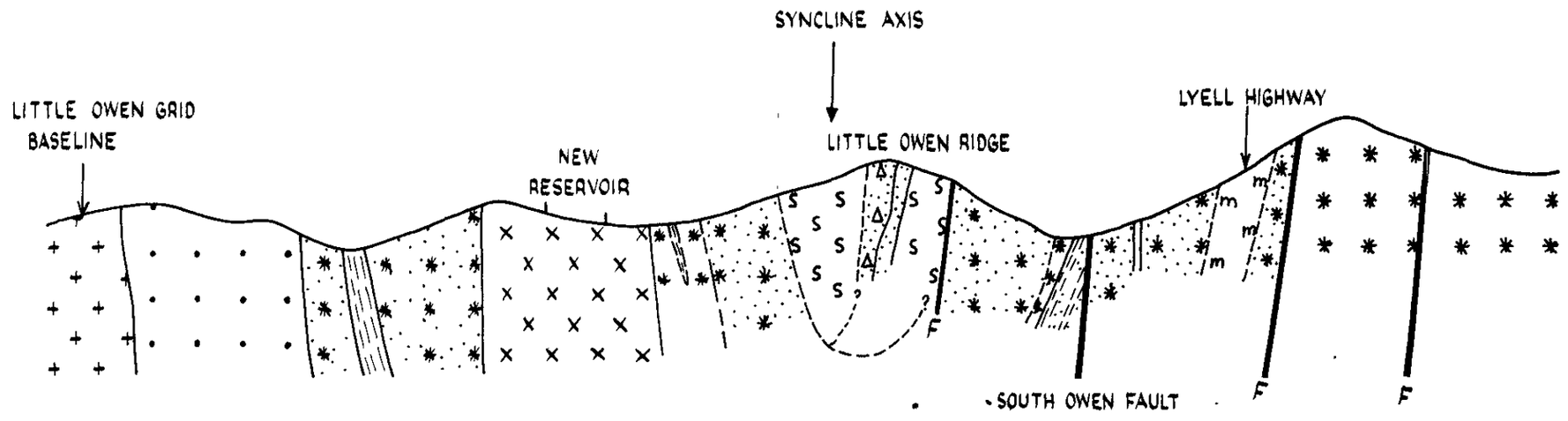
75-1117

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN. P. BROPHY.
	TRACED. R.G. WILSON.
DORA — HUXLEY AREA	CHECKED.
EL 10/69	DATE. 27:10:'75
SHEET 14 004	SCALE. 1" = 500' 1:6000
GEOLOGICAL MAP	MAP 4

S.W.

LITTLE OWEN AREA
SECTION 1

N.E.

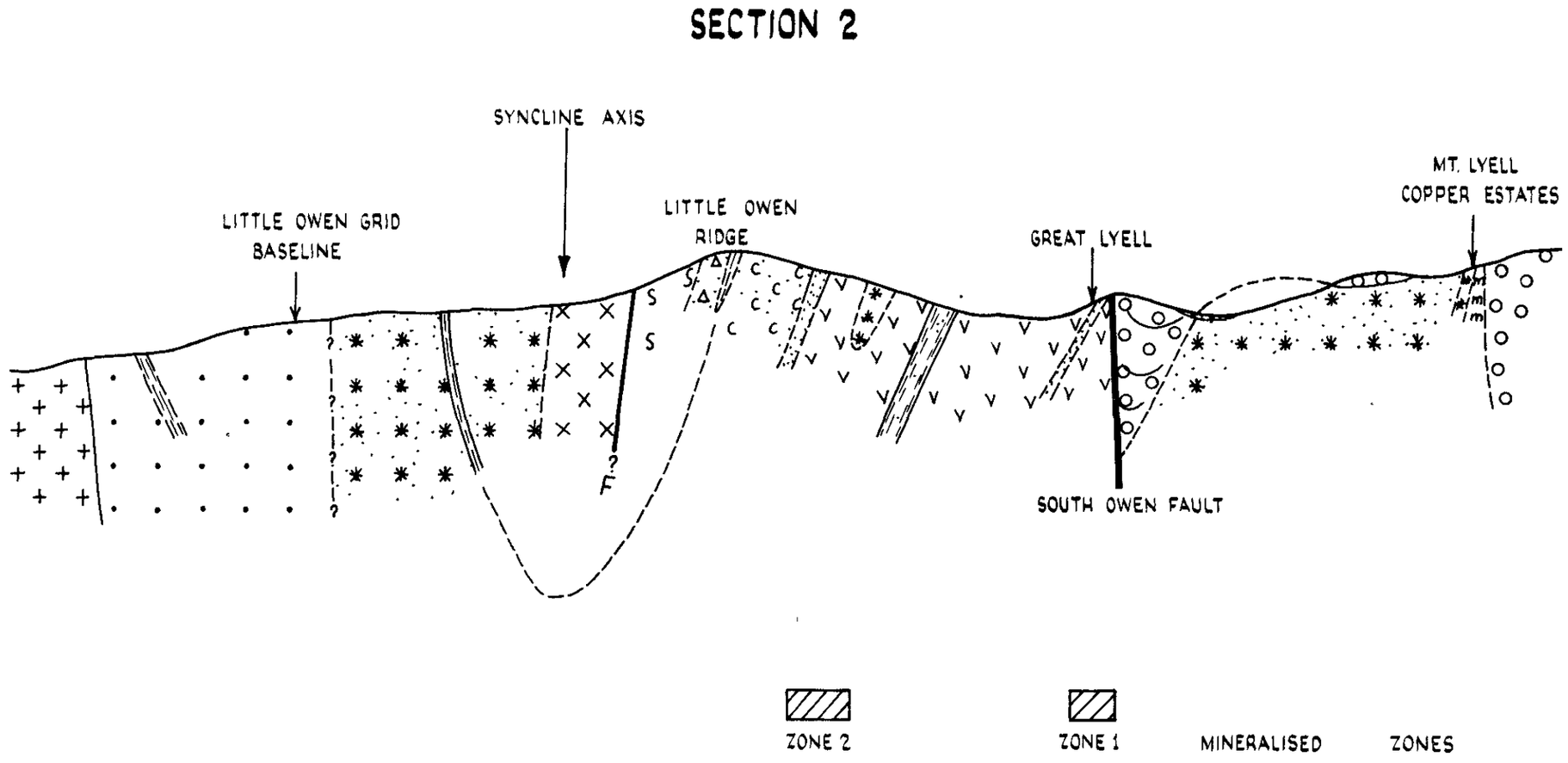


ZONE 4 ZONE 3 MINERALISED ZONES

S.W.

LITTLE OWEN AREA
SECTION 2

N.E.

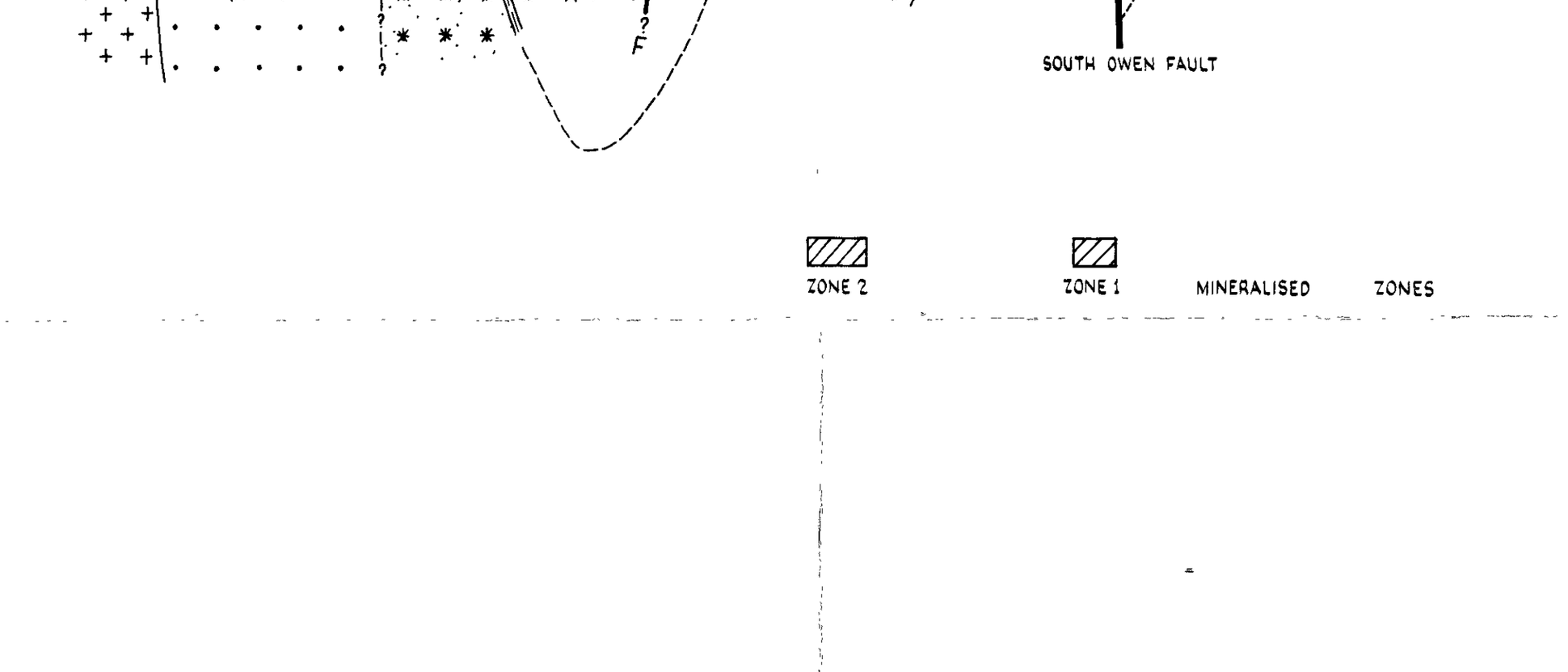


ZONE 2 ZONE 1 MINERALISED ZONES

S.W.

WHIP SPUR AREA
SECTION 3

N.E.



5 cm

SCALES: VERTICAL 1 : 12,000
HORIZONTAL 1 : 12,000

503080

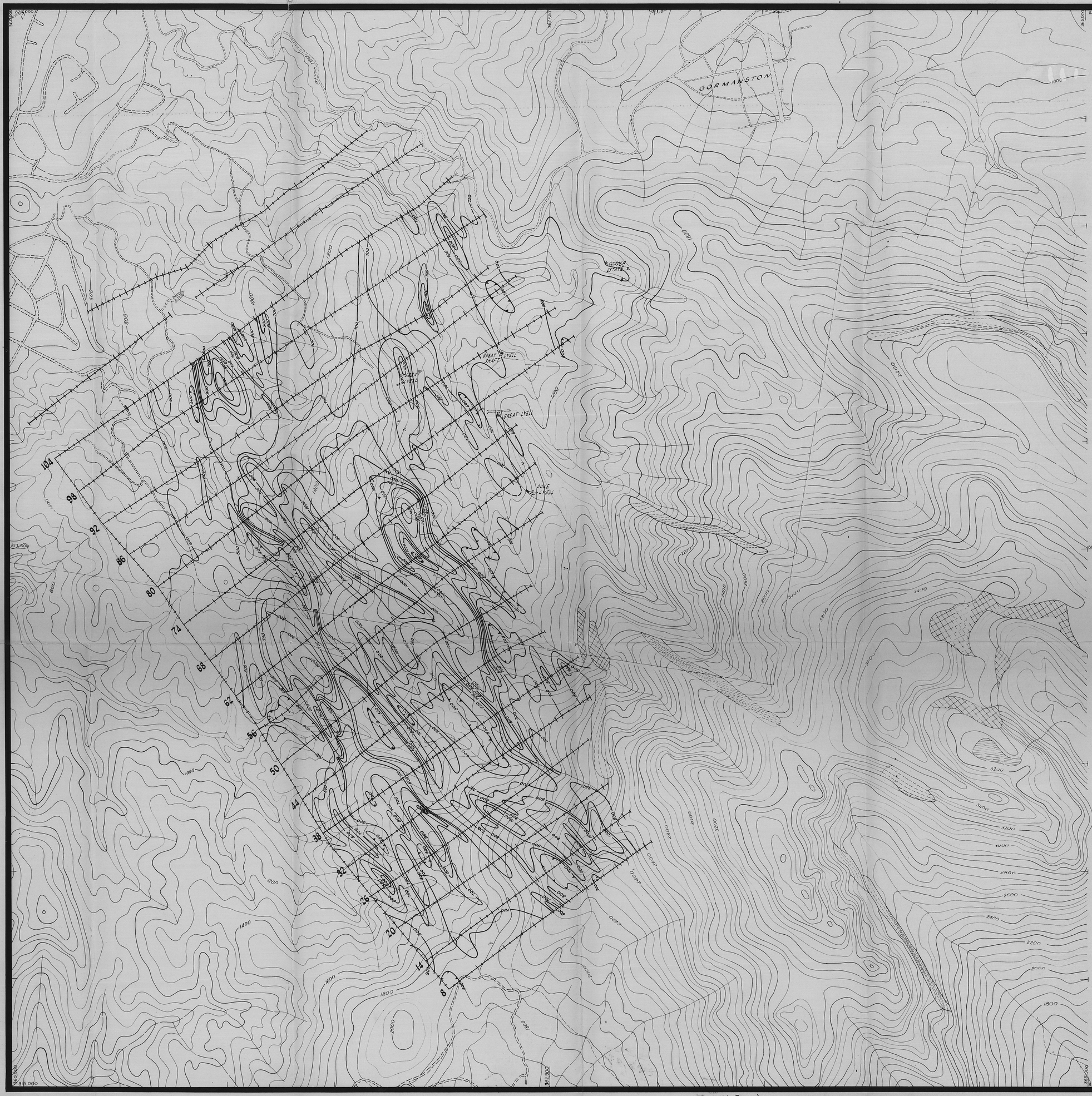
75-1117 MAP 5

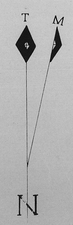
NOTE: REFER TO MAPS 9 & 10 FOR SECTION LOCATIONS

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

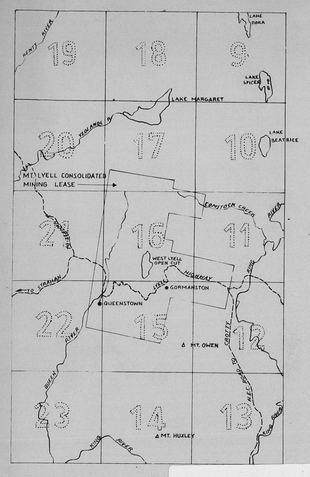
DORA - HUXLEY AREA
E.L. 10/69 005
GEOLOGICAL CROSS SECTIONS

Drawn: P BROPHY
Checked:
Date: 29:10:'75
Scale: AS SHOWN





LOCATION



503081

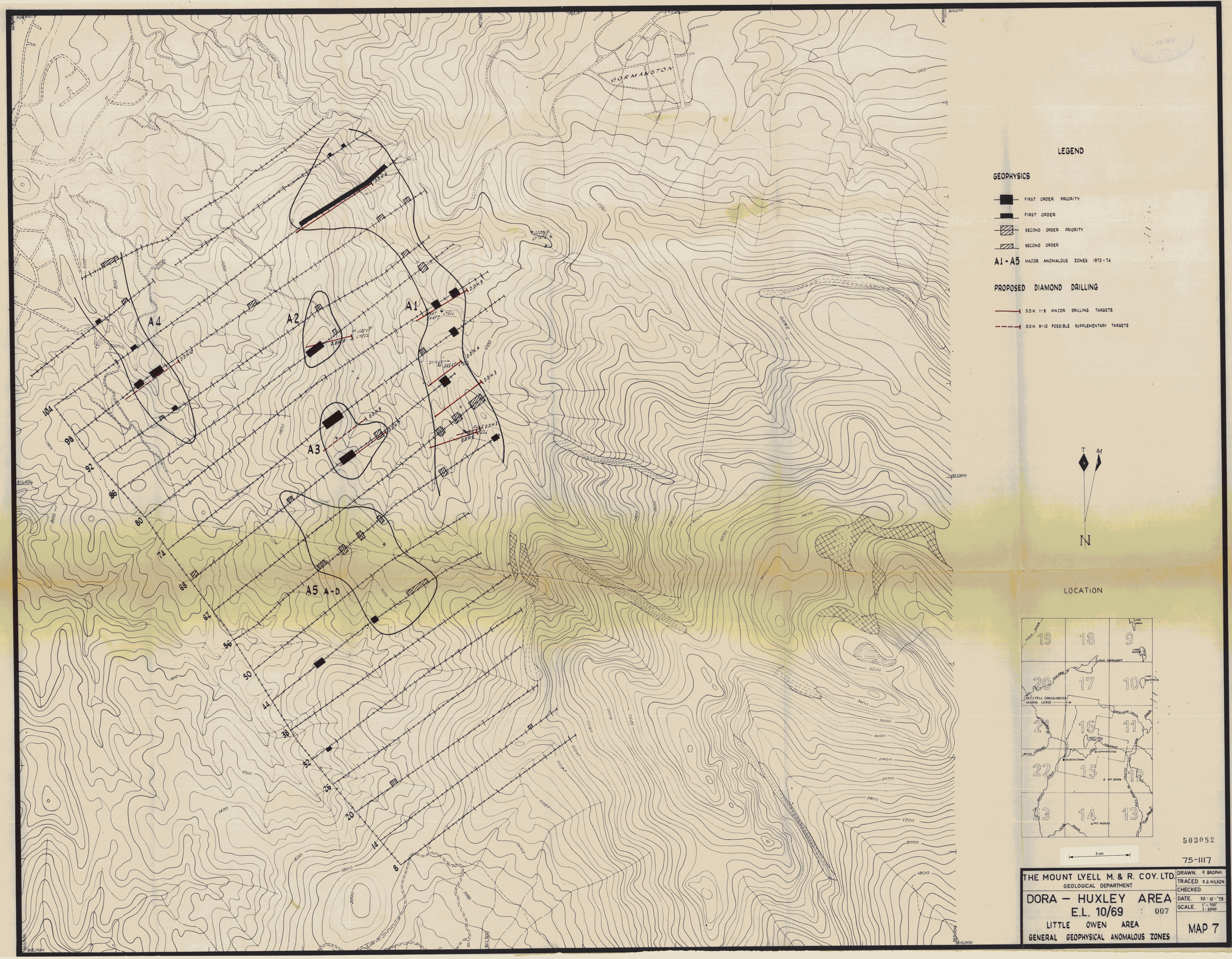
5 cm

NOTE:
ADD 62,000 ⅌ TO VALUES SHOWN.

75-1117

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN. SCINTREX
	TRACED. R.G.WILSON
DORA – HUXLEY AREA	CHECKED.
E.L. 10/69	DATE. 19:5:'75
SHEET 15	SCALE. 1" = 500' 1:6000
MAGNETIC CONTOUR PLAN	MAP 6

006


GORMANSTON
A1
A2
A3
A4
A5 A-D
D.D.H. 1
D.D.H. 3
D.D.H. 4
D.D.H. 5
D.D.H. 6
D.D.H. 8
D.D.H. 9
D.D.H. 10
GREAT LYELL
104
98
92
86
80
74
68
62
56
50
44
38
32
26
20
14
8
LEGEND
GEOPHYSICS
FIRST ORDER PRIORITY
FIRST ORDER
SECOND ORDER PRIORITY
SECOND ORDER
A1 - A5 MAJOR ANOMALOUS ZONES 1973 - 74
PROPOSED DIAMOND DRILLING
D.D.H. 1-8 MAJOR DRILLING TARGETS
D.D.H. 9-10 POSSIBLE SUPPLEMENTARY TARGETS
T
M
N
LOCATION
19
18
9
20
17
10
21
16
11
22
15
12
23
14
13
LAKE MARGARET
MT. LYELL CONSOLIDATED MINING LEASE
QUEENSTOWN
GORMANSTON
MT. OWEN
MT. HUXLEY
5 cm
503082
75-1117
THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT
DORA – HUXLEY AREA
E.L. 10/69 : 007
LITTLE OWEN AREA
GENERAL GEOPHYSICAL ANOMALOUS ZONES
DRAWN. P. BROPHY.
TRACED. R.G. WILSON.
CHECKED.
DATE. 30 : 10 : '75
SCALE. 1" = 500' 1 : 6000
MAP 7

GORMANSTON

KEY

MINERALISED ZONES 1-4

OLD ADITS

ASSAY DATA

0·43 (21) BULK COPPER ASSAY OF ADIT SAMPLING (N° OF SAMPLES)

+ DH ROCK CHIP SAMPLE ASSAYS (1975)

DRILLING DATA

OLD DRILL HOLES
RM (PICKANDS MATHER 1967)
GL (MT. LYELL 1957)

GEOPHYSICAL DATA

AREA COVERED BY B.M.R. GEOPHYSICAL SURVEY 1957

AREA COVERED BY McPHAR GEOPHYSICAL SURVEY 1959

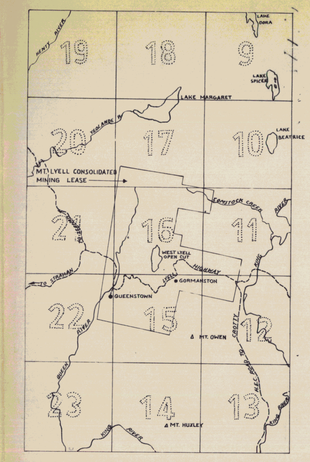
THIN SECTION DATA

- 39 THIN SECTIONS BY J. WALSHE (1970)
- PB/ ANDEL THIN SECTION DESCRIPTIONS (APPENDIX II)
- ML THIN SECTIONS BY MT. LYELL (1975)

T M

N

LOCATION



5 cm

503033

75-1117

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN. P. BROPHY.
	TRACED. R.G.WILSON.
	CHECKED.
DORA – HUXLEY AREA E.L. 10/69 LITTLE OWEN AREA GENERAL DATA 008	DATE. 31 : 10 : '75
	SCALE. 1" = 500' 1 : 6000
	MAP 8

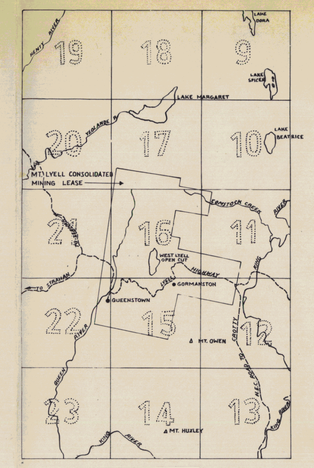


KEY

Cu Pb Zn
10 20, 30



LOCATION



5 cm

503084

75-1117

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN. P. BROPHY
	TRACED. R.G. WILSON
DORA – HUXLEY AREA E.L. 10/69	CHECKED.
	DATE. 30 : 10 : '75
	SCALE. 1" = 500' 1 : 6000
LITTLE OWEN AREA 009 GEOCHEMICAL DATA	MAP 9

KEY

Cu Pb Zn p.p.m.

10 — 20 15

(-80 #)

Cu / Pb Zn ANOMALOUS VALUES

Cu 1 INCH = 100 p.p.m. > 50 p.p.m.

Pb 1 INCH = 100 p.p.m. > 75 p.p.m.

Zn 1 INCH = 100 p.p.m. > 40 p.p.m.

● STREAM SEDIMENT SAMPLES

G - GLACIAL SOILS

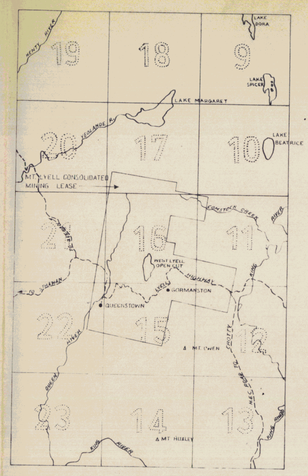
RBAC - RESIDUAL SOILS A,B OR C HORIZON

/12 DEPTH OF SOIL SAMPLE IN INCHES

T M

N

LOCATION



5 cm

503055

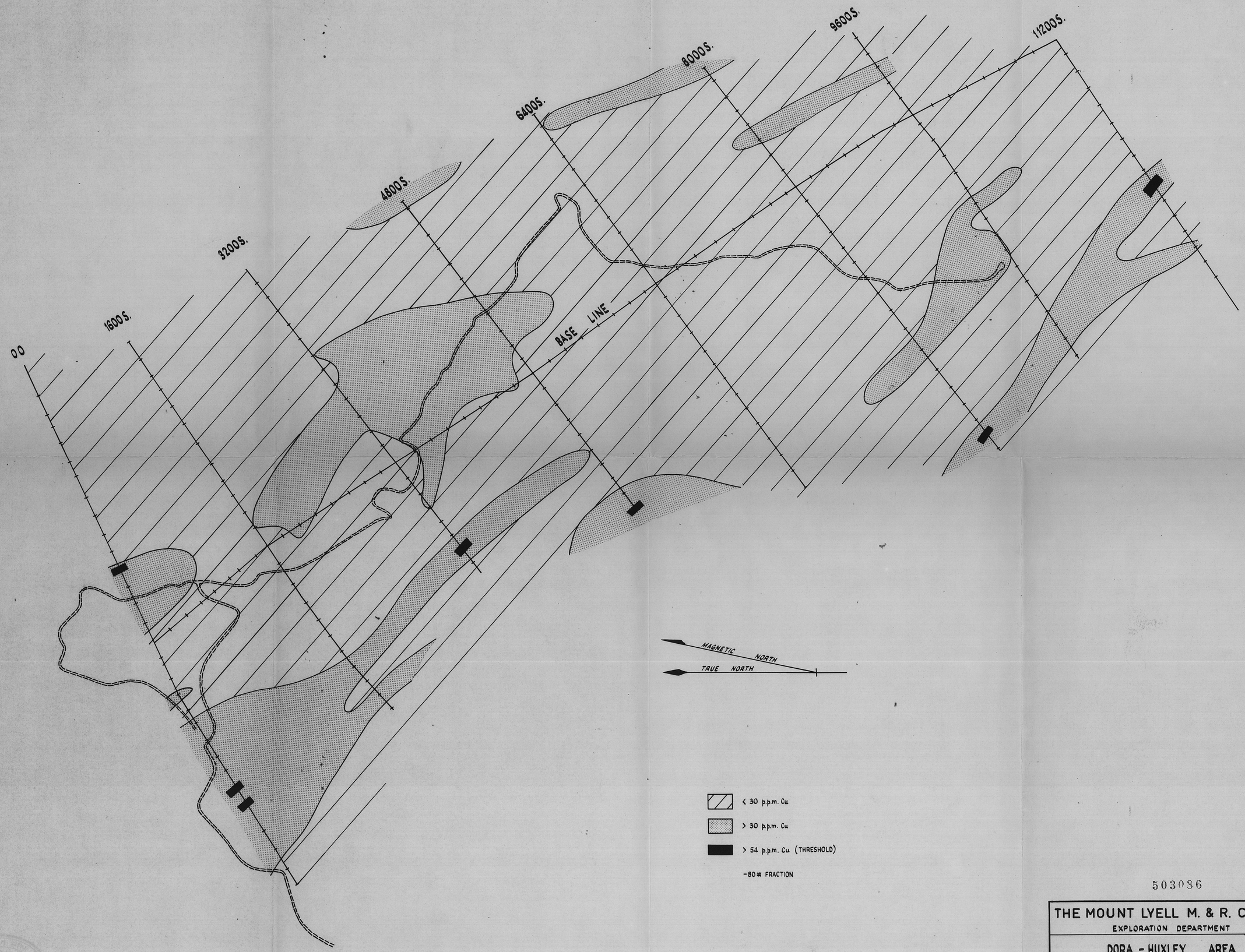
75-1117

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

DORA - HUXLEY AREA
EL 10/69
MT. HUXLEY AREA 010
GEOCHEMICAL DATA

DRAWN P. BROPHY.
TRACED R.G.WILSON.
CHECKED
DATE 30:10:75
SCALE 1" = 500' 1:6000

MAP 10



503086

75-1117

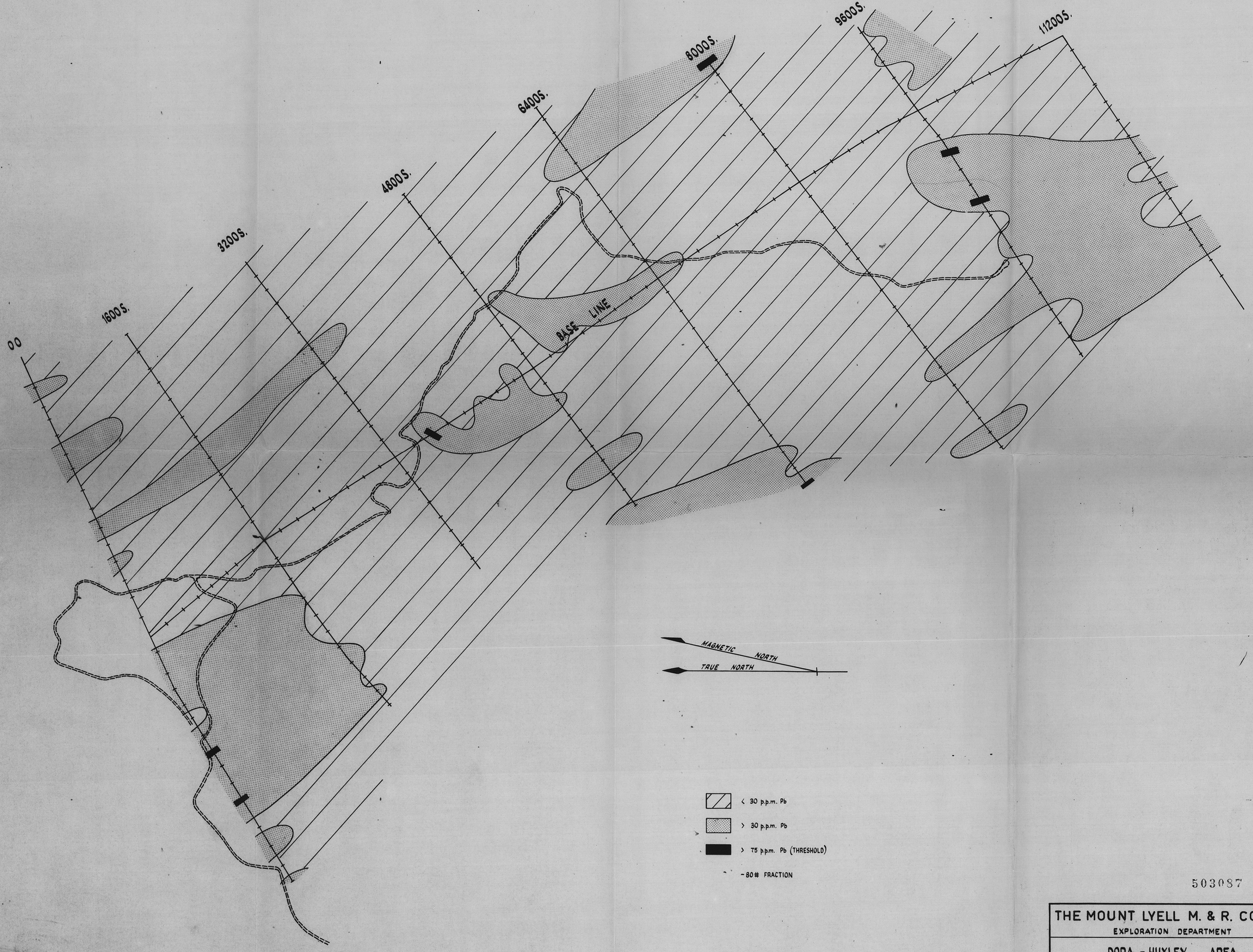
THE MOUNT LYELL M. & R. COY. LTD.
EXPLORATION DEPARTMENT

DORA - HUXLEY AREA
E.L. 10/69
HUXLEY GRID
SOIL SAMPLING - COPPER

011

DRAWN BY.	P.B.
TRACED BY.	R.G.W.
CHECKED BY.	
DATE.	13:8:'75
SCALE.	1:6000

MAP 11



MAGNETIC NORTH

TRUE NORTH

< 30 p.p.m. Pb

> 30 p.p.m. Pb

> 75 p.p.m. Pb (THRESHOLD)

-80# FRACTION

5cm

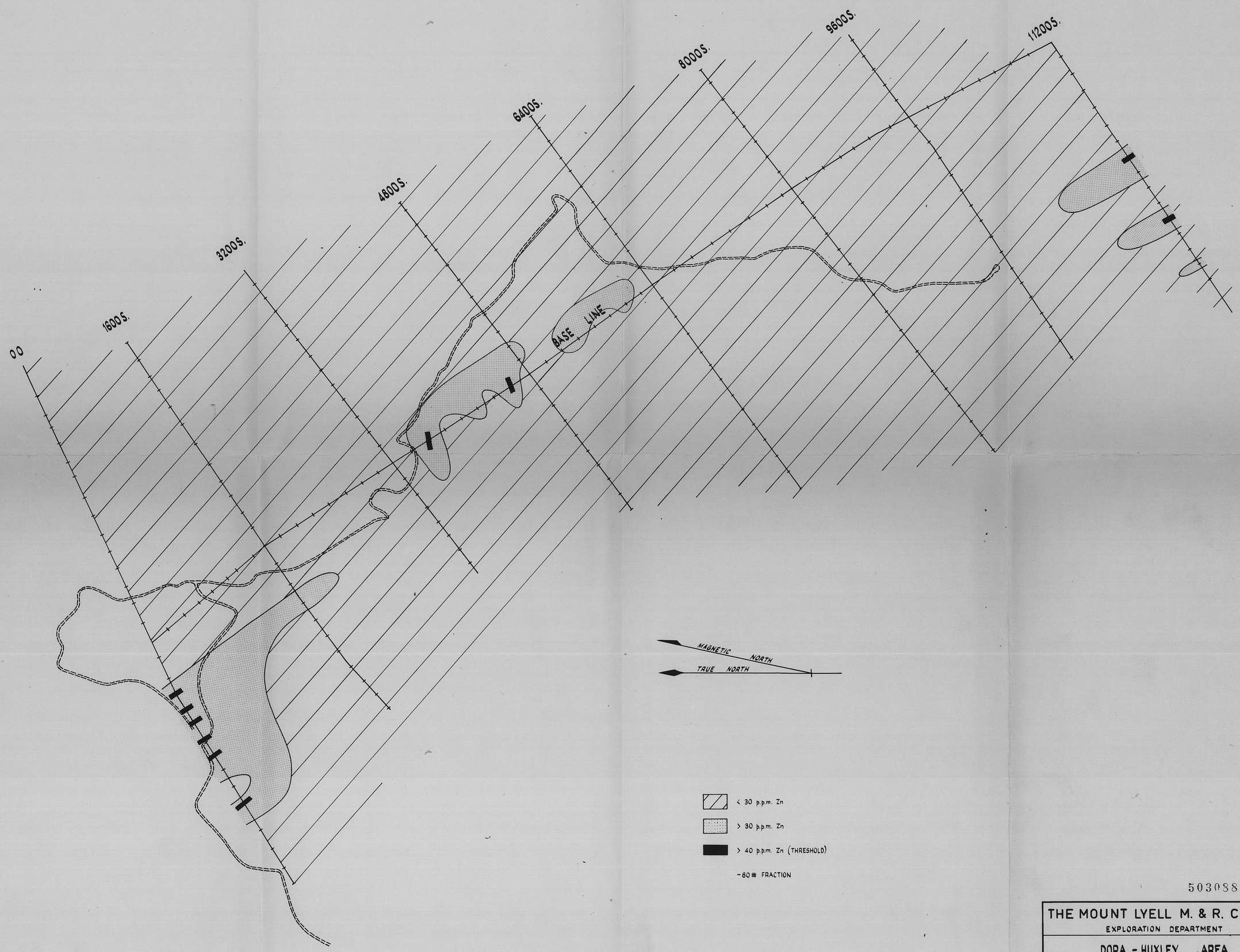
503087

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

DORA - HUXLEY AREA
E.L.10/69
012
HUXLEY GRID
SOIL SAMPLING - LEAD

DRAWN BY. P.B.
TRACED BY. R.G.W.
CHECKED BY.
DATE. 13·8·'75
SCALE. 1:6,000

MAP 12



503088 75-1117

THE MOUNT LYELL M. & R. COY. LTD. EXPLORATION DEPARTMENT	DRAWN BY. P.B.
	TRACED BY. R.G.W.
	CHECKED BY.
	DATE. 13:8:'75
	SCALE. 1:6,000
DORA - HUXLEY AREA E.L. 10/69 HUXLEY GRID SOIL SAMPLING - ZINC 013	MAP 13