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THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

E.L. 21/76

JUKES-DARWIN

DKSG

ANNUAL REPORT

1977/78

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1. INTRODUCTION

1.1 Summary

The Jukes-Darwin lease (E.L. 21/76) covers 144 sq. km of mostly Lower Palaeozoic rocks to the south of, and adjoining, E.L. 10/69 (see Fig. 1). The exploration licence was granted on 1st September, 1976, and the joint venture agreement between The Mount Lyell Mining and Railway Company Limited and Getty Oil Development Company Limited was entered on 7th April, 1977.

Previous work on the area was detailed in the 1976-77 annual report.

Exploration objectives during 1977-78 were to evaluate the mineralization potential of the Cambrian volcanics in the Clark and Garfield River valleys.

Exploration during 1977-78 was divided between two areas separated by Slate Spur, a low ridge trending E-W between Mt. Darwin and Mt. Sorell. The Clark Valley area lies to the south of Slate Spur, between Mt. Sorell and Darwin Plateau. To the north the Garfield River area covers the Garfield and Currie River systems between Mt. Jukes and Mt. Strahan.

In the Clark Valley a 23.5 km grid was cut. Geological mapping, soil sampling and gradient array E.I.P. and total field magnetics surveys were carried out over the grid. Creek exposures and other outcrops were also mapped.

In the Garfield River area, access tracks totalling 28.5 km were cut. Geological mapping and soil sampling were carried out along the tracks. Creek exposures were also mapped. Stream sediment samples were taken where tracks crossed small creeks or where creeks were located while mapping along the major water courses. Rock chip samples, on a 2 m sampling interval, were taken from an old trench on the SW side of Snake Spur.

The proposed 1978-79 exploration program will follow up zones of interest in the Clark Valley with intermediate grid lines, a southern grid extension and diamond drilling. In the Garfield River an 11.2 km grid will be cut, with soil sampling and geophysical work along the grid.

The Andrew River volcanics and a reported limonitic gossan above the Bird River (Moore, 1913) will also be investigated, with mapping and rock chip sampling if necessary.

The 1977-78 program cost $139,336 bringing the total expenditure on E.L. 21/76 to $147,229.

The proposed 1978-79 program will cost $128,020.

1.2 Topography, Vegetation, Climate

E.L. 21/76 covers part of the West Coast Range and includes Mt. Jukes (1,168 m), Intercolonial Spur (650 m), Mt. Darwin (1,031 m), Darwin Plateau (680 m) and South Darwin Peak (760 m). To the west of the main range are the Currie-Garfield river system and the Clark River Valley, separated by Slate Spur (560 m) which trends E-W between Mt. Darwin and Mt. Sorell (1,144 m).

The Clark River Valley is a broad U-shaped valley between Darwin Plateau and Mt. Sorell. The western side is mostly button-grass with patches of eucalypt banksia forest. The eastern side is mostly thick eucalypt banksia tea-tree forest with patches of low button-grass tea-tree scrub.

Most of the Garfield River area is thick eucalypt myrtle forest covering steep hill slopes. Ridge tops are generally less thickly vegetated with occasional tea-tree button-grass scrub. Patches of thick bavera scrub occur in several places and hamper mobility along tracks.

The main range is lightly vegetated on the whole with an abundance of outcrop.

The field season normally extends from November to April when stable weather conditions prevail, allowing use of a helicopter for transport. During winter short periods can be spent in the Clark camp where a corrugated iron hut has been set up.

1.3 Access

Vehicular access is via the Kelly Basin Road which leaves the Lyell Highway about 9 km east of Queenstown. Three four wheel drive tracks provide access to the main range: from Darwin town site to Inter-colonial Spur; from Darwin town site to the East Darwin workings; and from Purgatory Gap, via Ten Mile Hill to Darwin Plateau. Walking tracks link these roads to the Currie, Garfield and Clark camp sites respectively. Helipads have been cut at each camp site as well as on Slate Spur, Snake Spur and the Currie-Garfield divide (see Fig. 2).

1.4 Regional Geology

The stratigraphic sequence of the Jukes-Darwin area is summarised below:

Quaternary - Moraine, boulder scree, alluvial deposits (West Clark Valley, North Garfield River area)

Tertiary - Non-marine sediments (Macquarie Harbour)

Siluro-Ordivician - Quartz sand-stone siltstone, shale and limestone sequences of the Eldon and Junee Groups (South of Clark Valley, along Kelly Basin Road, North of Garfield River)

Cambro-Ordivician - (1) Owen Conglomerate correlate (Mt. Jukes, Mt. Sorell, South Darwin Peak, Snake Spur)
(2) Jukes Conglomerate correlate (E flank Mt. Sorell, South Darwin Peak, Mt. Jukes)

Cambrian - (3) Andrew River Volcanics (E flank of main range)
(4) Clark River Volcanics (Clark-Garfield areas)
(5) Central Lava Belt (main range)
(6) Darwin Granite - intrudes C.L.B. (Darwin Plateau)

Units (2), (3), (4), (5) and (6) are part of the Mt. Read Volcanics, the host rock unit for several base metal deposits along the West Coast (e.g. Mt. Lyell, Rosebery, Que River). Units (3) and (4) are probable correlates and interfinger with rocks of the Central Lava Belt. Unconformities exist at the base of units (1) and (2).

The West Coast Range corresponds with the core of a major broad N-S anticlinorium, the West Coast Anticlinorium. Superimposed upon this structure are several smaller NW-trending folds and faults which are quite prominent in the area between Mt. Lyell and Macquarie Harbour and which extend towards the SE into Precambrian quartzites of the Tyennan Block.

2. WORK COMPLETED 1977-78

2.1 Introduction

Lack of vehicular access to the work areas meant that tent camps, serviced by a helicopter, were constructed on the Clark, Garfield and Currie Rivers (see Fig. 2). A Hookways Aviation Bell Jetranger 206B was used to transport equipment and personnel. The total helicopter usage was 82.07 hours flying time for a total cost of $26,053.

Each camp consisted of two sleeping tents (15' x 12'), one kitchen tent (21' x 11') and one store tent (11' x 9') each with wooden flooring sections constructed at Mt. Lyell. Because of instability in high winds the tents were modified to allow the use of more secure ridge poles made out of $1\frac{1}{4}$" water pipe. Early in January a corrugated iron shed, previously used by B.H.P., was flown from Darwin Plateau to Clark Camp and used instead of a kitchen tent.

Other major items of camp equipment used during the season were two L.P. gas fridges (one large, one small), one large kero fridge, four L.P. gas stoves (two with ovens), two Honda E1000 generators (for electric lighting), two Kawasaki water pumps and two 500 gallon water tanks with stands. Three AWA SS70 radios were used for communication between the camps and Base at Mt. Lyell on a frequency of 3761.5 kHz (Channel 1). The two camp radios were also fitted with crystals for the OTC Hobart emergency frequency, 4125 kHz (Channel 2). Reception at Base was generally poor due to interference caused by electrical equipment around the mine.

Field parties consisted of one geologist and two field assistants. Towards the end of the season two parties were in the field simultaneously to complete the programme before bad weather set in. Contract track cutters and geophysical parties were also accommodated in the camps.

Field work was commenced on 5th December, 1977, and completed on 19th April, 1978. Altogether 309 man days were spent in the field among nine field sessions. 133 man days (43% of total) were spent engaged in soil sampling, mapping or track cutting, the remainder engaged in setting up, moving or dismantling the camps. To minimize helicopter use, each field session was planned to last about 10 days followed by a 4 day "weekend". The actual average length of the field sessions was eight days.

Most equipment was transported in thick rope nets slung beneath the helicopter. For large loads two nets were connected together. Small loads and fragile equipment were packed inside the helicopter cabin. On most occasions the equipment was trucked to loading points on Intercolonial Spur or Darwin Plateau. A fuel dump for the helicopter was established on Darwin Plateau.

2.2 Clark Valley

2.2.1 Access

From the Darwin Plateau a walking track cut by E.Z. Company in 1974 leads down into the Clark Valley to near the Clark camp. Another E.Z. track runs N-S along the eastern side of the valley between grid lines CV04N and CV32N.

The Clark Valley grid covers an area of approximately 7.2 sq. km with its northern extremity along Slate Spur (CV44N). Contract track cutters cut a 4.5 km base line (magnetic bearing 343°) and 12 grid lines (magnetic bearing 075°) at a spacing

of 400 m and totalling 17.5 km. Mt. Lyell personnel cut a further 1.5 km as line extensions, making a grid total of 23.5 km. The grid lines were pegged on a 25 m interval.

To avoid confusion between eastings and westings the base line has been designated 3,000 m E as reference.

Most water courses in the Clark valley were easily negotiated due to E.Z.'s stream sediment sampling program in 1974-75 during which the creeks were cut out. The Clark River, however, is not negotiable after periods of heavy rain.

2.2.2 Geology

A. Lithologies

(a) Central Lava Belt

Lithologies representative of this unit were located along the eastern extremities of the Clark Valley grid and continuing up onto the Darwin Plateau. Two major lithologies are present:

(i) massive pink-stained siliceous feldspar-quartz porphyry known as "Darwin-type Rhyolite", found on Darwin Plateau and constituting the bulk of Mt. Darwin,

(ii) pale green, sometimes locally foliated, coarse-grained quartz-feldspar porphyry which Ruddock (1973) termed "Sedgwick-Huxley Rhyolite", found mostly along the western flank of Darwin Plateau.

Both rock types are strongly fractured, well jointed and locally chloritised. Quartz, magnetite, and hematite veins are common and often contain small amounts of pyrite ± chalcopyrite.

Although the majority of rocks within this unit are thought to be lava flows the lack of conclusive evidence, due to deformation and hydrothermal alteration, cannot rule out the possibility of large volumes of ash flows being present.

(b) Clark River Volcanics

Rocks in this unit can be divided into three broad types:

(i) pale green, sericitized, commonly foliated, medium to fine-grained quartz porphyry, found mostly in the western half of the Clark Valley,

(ii) interlaminated silstones and black shales, found along the upper Clark River, in a small creek N of CV08N/3350 and in creeks on both sides of CV12N/2775,

(iii) mixed varieties of felsic and siliceous lavas and tuffs which interfinger with rocks of the Central Lava Belt and the quartz porphyries of (i) above. Commonly these rocks contain phenocrysts of quartz and/or feldspar in a sericitic quartz-feldspar groundmass. Pyrite is common. A basalt flow has been found in the NE portion of the valley, just east of the Clark River.

In most cases alteration and deformation has clouded textural evidence for the origins of the rocks but both lavas and ash flows appear to be present in roughly equal amounts.

(c) Jukes Conglomerate

A mauve-brown volcaniclastic conglomerate that occurs along the eastern flank of Mt. Sorell.

Detailed descriptions of specimens from the Clark Valley are given in Amdel Report GS 19/79.

B. Structure

The most obvious structures in the Clark Valley are a series of NW-trending faults which are marked by linear creeks along the eastern side of the valley. It is inferred that some dextral slip has occurred along these faults although the evidence is tentative. At CV08N/3375 and 3400 soil samples contain large mica flakes which are attributed to shear zones. Another shear zone was found in black shales at CV28N/4100 and at a prominent right-hand bend in the Clark River to the north.

The fold structure is indistinct due to the lack of extensive marker beds and the lack of widespread bedding readings. In most cases bedding strikes N to NW with dips ranging from about 65°E, to vertical, to about 50°W. Facing is mostly to the west apart from one outcrop in the Clark River between CV32N and CV36N where possible eastward facings were determined in black shales.

Slaty cleavage within the shales and foliations in the volcanics strike NNE to NW and are generally vertical to subvertical.

2.2.3 Geochemistry

A. Soils

On the Clark Valley grid soil sampling was carried out on a 25 m interval, with follow up sampling on a 12.5 m interval over zones of anomalous geochemical or geophysical response. The samples were sieved to -10#+80# and -80# fractions and assayed by AAS for Cu, Pb, Zn, Ag and Mn.

In most areas the C-horizon was sampled but in areas of obvious scree, moraine or alluvium, the lower A-horizon was sampled.

Assay results show no marked variation between the two fractions, and all Cu, Pb and Zn populations have roughly log-normal distributions (see Figures 13 and 14 in Appendix I). Background values are fairly low compared with other areas along the West Coast Range. The reason for this is not obvious but it could be that soils in the Jukes-Darwin area have been exposed to weathering and leaching for a longer period of time than those of other areas.

Threshold values have been estimated at 30 ppm of Cu, 50 ppm for Pb and 30 ppm for Zn (see Figures 13 and 17 in Appendix I). Samples with greater than threshold values have been plotted on Figure 11.

Seven major zones of geochemical interest are detailed in Table 1.

B. Rock Chips

Forty-five rock chip samples from the Clark Valley were assayed for Cu, Pb, Zn, Ag and Mn. One sample (CV24N/4127) containing pyrite mineralization was assayed for Cu (0.07%) and S (2.2%). The results are given in Appendix I. Table 2 summarizes these results, according to rock types.

2.2.4 **Geophysics**

Scintrex Pty. Ltd. were contracted to carry out E.I.P. gradient array and total field magnetics surveys over the Clark Valley grid between 23rd January and 8th February, 1978.

Zones of primary interest located during this programme are as follows:

Zone C - CV08N/3330-3400. A strong chargeability peak (65 mV/V) associated with a resistivity low (2,500 ohm-metres, less than 50% of background) and a slight drop in magnetics. This zone corresponds with a 30 m thick unit of pyritic black shales and several geochemical anomalies. At 3400 a NW-trending fault truncates the zone against felsic volcanics.

Zone I - CV28N/4100-4150. A very strong chargeability (74 mV/V) and resistivity (1,500 ohm-metres, 25% of background) anomaly, with a peak at 4112, which also corresponds with black shales anomalous in Pb.

Zone L - CV40N/4200-4325. A broad series of chargeability highs (43 mV/V peak at 4212) and resistivity lows (1,200 ohm-metres at 4212, less than 50% of background) which corresponds with a complex of black shales and felsic volcanics. Three geochemical peaks occur at 4175, 4237 and 4300. Iron oxide veins are common in the lavas (Darwin-type rhyolites) and may have contributed to the geophysical responses, although the black shales are the most likely sources.

Zone M - CV44N/3975-4100. A chargeability peak at 4012 (42 mV/V). Within this zone resistivity drops from 4,600 ohm-metres at 3975 to 1,400 ohm-metres at 4100. The underlying lithology is dominantly a fine-grained tuff but shales may occur at depth. No geochemical anomalies were recorded in this zone.

Zones of secondary/tertiary geophysical interest which may be of geological and/or geochemical significance:

Zone D - CV12N/2750-2800. A chargeability peak at 2775 (28 mV/V) with a broad resistivity low (5,000 ohm-metres, 50% of background) corresponds with a narrow black shale unit and an anomalous geochemical zone (2762-2812).

Zone P - CV16N/3562. A sharp chargeability peak (26 mV/V) with a resistivity low (4,000 ohm-metres, 50% of background) corresponds with a narrow geochemical anomaly. In nearby outcrops veins of Fe-oxides and minor pyrite have been found and may be the source for both the geophysical and geochemical anomalies.

TABLE 1

Zones of Soil Geochemistry Anomalies

NUMBER	LOCATION	Cu ppm AVE; RANGE	Pb ppm AVE; RANGE	Zn ppm AVE; RANGE	Mn ppm AVE; RANGE	REMARKS
ZONE 1	CV00/3337-3450	29; 14-57	50; 36-77	81; 19-162	343; 37-830	Thick orange clay soils. Float of Chloritic intermediate tuffs.
ZONE 2	CV04N/3325-3375	43; 7-91	68; 54-90	191; 25-372	68; 0-234	Orange clay soils. Intermediate tuffs.
ZONE 3	CV08N/3262-3400	32; 2-156	79; 13-189	45; 7-220	51; 0-310	Felsic tuffs and black shales. Shear zones at 3375 and 3400 have mica and 3 ppm Ag.
ZONE 4	CV12N/2762-2812	16; 2-35	92; 43-154	50; 6-165	8; 0-40	Black shales.
ZONE 5	CV28N/4075-4150	13; 1-36	206; 32-500	20; 9-53	10; 3-29	Felsic tuffs and black shales (4100-4155). Shear zone at 4100.
ZONE 6	CV40N/4162-4312	15; 6-60	81; 22-390	36; 7-137	922; 10-4700	A complex zone of black shales and felsic volcanics. Geochemical peaks at 4237 and 4300.
ZONE 7	CV44N/4325-4425	6; 2-11	74; 50-136	27; 7-93	58; 18-265	Darwin-type rhyolites. Line trends at a low angle to strike.

TABLE 2

Rock Chip Samples

Rock Type	Samples	Cu ppm Ave; Range	Pb ppm Ave; Range	Zn ppm Ave; Range	Mn ppm Ave; Range	Remarks
Black Shales	10	98; 28-180	306; 9-2550	53; 13-125	109; 0-280	F470 (CV28N/4125): 2550 ppm Pb, 3 ppm Ag F469 (CV28N/4100): 3 ppm Ag
Quartz Porphyry Tuffs	12	92; 17-200	48; 3-187	59; 15-165	143; 14-780	
Felsic lavas and Tuffs	19	76; 14-220	12; 3-34	36; 7-78	205; 10-1380	
Basalt	2	148; 120-175	42; 18-65	61; 40-83	362; 348-375	Both 1 ppm Ag
Intermediate Tuff	1	50	30	150	580	2 ppm Ag
Magnetite	1	59	35	34	33	2 ppm Ag
Total	45	87; 14-220	89; 3-2550	50; 7-165	179; 0-1380	

The postulated extension of Zone P on CV20N/3662 shows no geochemical response above background.

Zone A - CV00/3125. A small chargeability high (24 mV/V) in a zone of felsic volcanics. Anomalous Pb and Zn values were recorded from 3100, 3112 and 3137.

Zone I - CV20N/4087-4137. A significant chargeability (35 mV/V) and resistivity (2,000 ohm-metres, 40% of background) anomaly coincident with increases in the magnetic field (up to 10,000 gammas above background). Magnetite-hematite veins occur in the underlying lavas and are the likely source for the geophysical and geochemical anomalies within this zone.

Zone I - CV24N/4125-4187. A significant chargeability (34 mV/V) response with no appreciable decrease in resistivity and only a minor change in the magnetic field. At 4127 a brecciated volcanic contains abundant pyrite veins (0.07% Cu, 2.2% FeS_2) which are the likely source for the anomaly.

On geological evidence the postulated correlation of Zone I on lines CV24N, CV20N and CV28N (Scintrex report) is not valid.

2.2.5 Conclusions

From the data gained during the 1977-78 field programme three major zones of interest have been delineated in the Clark Valley:

Zone I: CV08N/3350 to CV00/3375, open to the south.

Zone II: CV12N/2775, with probable extensions towards CV08N.

Zone III: CV28N/4125 to CV40N/4200-4325 with possible extensions north to Slate Spur.

All three zones are characterised by the presence of black shales which are the main reason for geophysical anomalies. However, in Zone I on CV04N and CV00 geochemical anomalies are associated with intermediate tuffs which do not give anomalous geophysical responses. The geochemical responses may be due to high background values in soils weathered from the shales although rock chip assays do not indicate that these rocks are significantly higher than the volcanics (apart from CV28N/4125 which has 2,550 ppm Pb).

The association of geochemical and geophysical anomalies with units containing black shales is common along the West Coast (e.g. Beatrice grid, E.L. 10/69; Henty River grid, E.L. 41/71; Red Hills area, E.L. 9/66), and Cu-Pb-Zn mineralization at Rosebery is closely associated with black shales.

2.3 Garfield River

2.3.1 Access

Two camp sites were cleared in the Garfield River area, one near the Currie River and the other near the upper Garfield River (Fig. 2). Access to Currie Camp is via a four wheel drive track from Darwin town site to the East Darwin workings then by a 4.5 km walking track over the northern end of Mt. Darwin (Findons track, GR F).

Contract line cutters cut approximately 25 km of tracks, designed to provide access to most of the Garfield-Currie system for geological mapping and geochemical sampling. Mt. Lyell personnel cut an extra 3.5 km of tracks specifically to provide access from Currie Camp to an old trench on the south-western side of Snake Spur for detailed sampling (Fig. 7).

Due to the rugged terrain and thick vegetation, helipads were cut in a few places to facilitate access to more remote parts of the area. Helipad sites are on Snake Spur, above the old trench, at GR D/250, at GR Q/1200, at the junction of GR Q, GR B and GR C, and at the two camp sites. Other naturally cleared areas, such as the gravel bars on the lower Garfield River, are easily accessible by helicopter.

2.3.2 Geology

A. Lithologies

The Cambrian rocks of the Garfield River area have similar lithologies to those of the Clark Valley.

The dominant rock type is a foliated fine to medium-grained sericitic quartz porphyry, similar to the quartz porphyries along the western side of Clark Valley. Along the Currie-Garfield Divide it is a pale-green to grey colour with common quartz veins. On GR E, between Intercolonial Spur and the Sailor Jack's Creek crossing, Fe-oxide veins have stained the rock a patchy red colour. Both lavas and tuffs are present.

Along the Garfield River, between the junction with Flannigan's Creek and line GR J, there is a mixture of interbedded tuffs, lavas, cherty shales and black shales. The tuffs range from coarse to fine-grained, commonly porphyritic with several lithic units containing clasts of shale. On line GR J immediately east of Garfield River the tuffs are dark-green chloritised crystal-lithic tuffs and yield orange clayey soils.

The rocks encountered in the Snake Spur costean resemble the cherty shales, fine-grained tuffs and lavas of the Garfield River succession with some hematitic volcanics similar to those found on GR E. Stitt (c. 1900) reports a pyritic black shale unit in a small trench on the western side of Snake Spur just north of Currie Camp.

Black shales were also found on line GR F, at 875 and 1325, and in a creek about 200 m south of GR F/1325. These shales are not as pyritic as those found in the Clark Valley.

Outcrops of Jukes Conglomerate were found in the Currie River about 200 m north of Currie Camp, on the Garfield-Flannigan's Divide (GR B/1480) and at GR H/1125.

B. Structure

Superimposed upon the major N-S fold structure are several minor NW-trending fold axes which can be detected in air photos (see Fig. 3). The nature of these folds is not clear because of the paucity of bedding readings.

One conclusion that can be drawn from analysis of the fold structure is that the mineralised fine-grained tuffs and lavas found in the Snake Spur costean can be correlated with similar rocks found in the Garfield River.

As in the Clark Valley most bedding readings strike N to NW with near-vertical foliations and cleavages striking NNE to NW.

C. Mineralization

The only base metal mineralization located in the Garfield River area is in the Snake Spur costean where chalcopyrite and pyrite occur along joints, bedding planes and cleavage in foliated fine-grained tuffs and lavas. The results of rock chip sampling indicate 8 m at 0.96% Cu (see Appendix I and Fig. 7).

2.3.3 Geochemistry

A. Soils

In the Garfield River area access tracks running N-S (along strike) were sampled on a 50 m interval whilst those running E-W (across strike) were sampled on a 25 m interval. Detailed sampling along tracks near the Snake Spur costean was carried out at 5 m and 10 m intervals, depending upon the proximity of the track to the costean. -80# and -10# +80# fractions were assayed for Cu, Pb, Zn, Ag and Mn.

The results show no significant difference between the two fractions and only slight differences between the Clark and Garfield distributions (see Appendix I) despite the differences in topography and vegetation cover.

Threshold values were taken to be 30 ppm for Cu, 50 ppm for Pb and 30 ppm for Zn to comply with the Clark Valley results.

Zones of anomalous geochemical response are:

GR C/00-100	Cu max 126 ppm at 100
	Pb max 200 ppm at 100
	Zn max 42 ppm at 100

These samples were all A horizon over moraine/boulder scree derived from the western side of Mt. Jukes/Intercolonial Spur. The results are suspect and may be due to surface concentrations.

GR J/850-1225	Cu max 57 at 1175
	Pb max 123 at 1175
	Zn max 174 at 1175

Soils in this zone are mostly sticky orange clays overlying chloritised felsic/intermediate tuffs and have high Mn values (max 1370 ppm at 1150).

Costean 2/90-190	Cu max 53 at 95
	Pb max 10 at 180
	Zn max 11 at 105

This track was cut alongside the Snake Spur costean. Although the Cu values are low they are distinctly above background adjoining the zone of mineralization.

The two shale horizons on line GR F gave very low base metal values (at 875 - 1 ppm Cu, 1 Pb, 1 Zn; at 1325 - 6 ppm Cu, 0 Pb, 0 Zn) which indicates that the black shales are not significantly higher than volcanics in background values, as may be suspected from the Clark Valley results.

B. Stream Sediments

Forty stream sediment samples were collected, mostly from small creeks draining the Currie-Garfield Divide, sieved to -80# and -10#+80# fractions and assayed for Cu, Pb, Zn, Ag and Mn. The -80# was also assayed for Au. The population is too small to draw any statistical conclusions from the results but three samples are worth noting.

SS3: W-flowing creek from Currie-Garfield Divide to Garfield River, GR J/1010.
Cu - 35 ppm, Pb - 46, Zn - 23, Mn - 590.

This stream flows through the high soil geochemical zone along GR J.

SS8: E-flowing creek from Garfield-Flannigan's Divide to Garfield River, sampled at junction with Garfield River.
Cu - 4 ppm, Pb - 50, Zn - 8, Mn - 60.

SS20: W-flowing creek from Mt. Jukes to Currie River, GR C/1190.
Cu - 10 ppm, Pb - 330, Zn - 23, Mn - 26,000.

C. Rock Chips

The Snake Spur costean was sampled over 16 m of visible mineralization at a 2 m interval and assayed for Cu and S. An 8 m section averaged 0.96% Cu, 1.75% S. A shale sample from the Garfield River was also assayed to give 17 ppm Cu, 200 ppm Pb, 31 ppm Zn, 1 ppm Ag and 200 ppm Mn.

2.3.4 Conclusions

The main areas of interest in the Garfield River area are:

(i) between the Currie-Garfield Divide and the Garfield-Flannigan's Divide (i.e. the valley of the Garfield River),

(ii) the south-western side of Snake Spur,

(iii) the area between Mt. Darwin and the upper Garfield River.

All three areas contain units of shale which are possible mineralization horizons.

Of minor importance is the area covered by scree between Mt. Jukes and Currie River where soil anomalies and a stream sediment anomaly were detected.

2.4 Other Areas

2.4.1 Andrew River Volcanics

The Andrew River Volcanics lie to the east of the Main Range and were briefly studied along the Intercolonial Spur, East Darwin and Darwin Plateau four wheel drive access tracks. Pale-green sericitic quartz porphyries, similar to those in the western Clark Valley, appear to be the most abundant rock type. At Darwin town site a thick sequence of tuffaceous shales were found in a creek exposure.

The Andrew River Volcanics are interpreted to be correlates of the Clark River Volcanics and therefore possess an equal probability for mineralization.

2.4.2 Bird River Gossan

A limonitic gossan between the Bird River and Kelly Basin track was located by T. B. Moore in March, 1913. The position of the gossan (Fig. 3) has been deduced from descriptions in his report dated 10th March, 1913: "On the low divide at the source of the 6 mile creek, distant nearly half a mile by horizontal measurement from the railway line .... a large gossan formation has been discovered and traced 5 chains (100 metres) in a direct line S 25° E (155°? magnetic)". In the report dated 24th March, 1913, the formation is further described: "the limonite lies between walls of Silurian slate and sand-stone and the hematite noticed is on the hanging wall side of the lode".

A similar limonite body was discovered by Moore on Cawthorn's track about 600 m SE from the 5 mile peg on the Kelly Basin railway.

A brief reconnaissance was made of the Kelly Basin road as far as the Bird River. Near the 6 mile creek a rough overgrown track was found and followed for about 200 m before it faded. The ground cover was sparse under myrtle forest and access should not prove too difficult. Cawthorn's track was not located.

2.4.3 Intercolonial Spur

Near Turair Anomaly 28 (I.N.A.L., 1973), on the eastern side of I.C.S., I.N.A.L. located a piece of mineralized "gossanous float" which assayed 6.1% Cu. This locality was investigated and samples collected of some loose chalcopyrite-bearing rock (the shattered remains of the I.N.A.L. sample?) and a 20 cm wide magnetite-hematite vein outcropping nearby. In the wall-rock volcanics around the vein small blebs of pyrite were noted. The "gossanous float" assayed 2.24% Cu, 30 ppm Pb, 108 ppm Zn, 12 ppm Ag and 350 ppm Mn. The magnetite vein assayed 1,000 ppm Cu, 75 ppm Pb, 160 ppm Zn, 1 ppm Ag and 2,100 ppm Mn. Chalcopyrite mineralization associated with magnetite veins is common in the Central Lava Belt and consequently this occurrence does not warrant further work.

2.5 Exploration Expenditure 1977-78

*	Salaries, Wages	$ 35,338
*	Burden Charges	11,280
*	Materials	23,317
	Access	45,139
+	Geophysics	4,955
* +	Geochemistry and Petrology	8,532
	General Costs	264
*	Equipment and Facilities	5,081
	Indirect Costs, 6½% of *	5,430
		$139,336

\+ Parts of the geophysical program and petrographic work will be charged to the 1978-79 expenditure.

Total expenditure on E.L. 21/76 since 1976 is $147,229.

3. PROPOSED EXPLORATION PROGRAM 1978-79

3.1 Introduction

The proposed 1978-79 Jukes-Darwin exploration program will concentrate on favourable zones in the Clark Valley. In Section 3.5 the programme has been itemised showing costs for each stage of the programme. Some of these sections may be postponed or cancelled depending upon budgetary priorities amongst the exploration areas being worked by Mt. Lyell. A separate report will present exploration programmes and budgets covering all four exploration licences.

The prime objective of the 1978-79 programme will be the evaluation of coincident geochemical and I.P. anomalies associated with shale horizons in the three major zones of interest in the Clark Valley as detailed in 2.2.5. This will be done by fill-in grid lines, soil sampling, E.I.P. and diamond drilling.

In the Garfield River area a 400 m grid geochemical soil sampling and an E.I.P. geophysical survey are proposed for the area between the Currie-Garfield Divide and the Garfield-Flannigan's Divide. Further geological mapping and E.I.P. are proposed for the Snake Spur costean region, and mapping and stream sediment sampling are proposed for the area between Mt. Darwin and the upper Garfield River.

General mapping and sampling are proposed for the Andrew River Volcanics and the Bird River Gossan.

Unit costs for various exploration techniques used in the 1978-79 budget are presented in Table 6.

The 1978-79 programme will once again be based upon use of a helicopter. At this stage a road from the southern end of Darwin Plateau up the Clark Valley is not considered a viable alternative for the following reasons.

(1) As yet the only known mineralization is the Cu show in the Snake Spur costean. Anomalous responses in the Clark Valley may be due solely to the black shales with little or no mineralization.

(2) The terrain is difficult with several steep sided creeks which would need to be crossed. The Clark River in particular is known to rise at least 2 m above its normal flow level after heavy rainfalls. To cross these creeks would require expensive bridgeworks.

(3) A helicopter will be more flexible in terms of access to more remote parts of the work areas. The cost of use of the helicopter will be reduced by using it on other leases.

(4) The estimated costs for a road are: to Clark Camp - $10,000; to Slate Spur - $18,000; to Garfield Camp - $26,000; to the ridge above Currie Camp - $36,000. The estimated cost for helicopter hire (including use of the helicopter in the drilling programme) is $20,000 for the entire programme. The road costs will be substantially increased by bridgeworks as mentioned in (2) above.

3.2 Clark Valley

3.2.1 Access

Twenty hours of bulldozer hire is proposed to upgrade the road onto Darwin Plateau. At $30/hour this work will cost $600.

Additions and extensions to the Clark Valley grid, totalling 12.6 km, should allow a more thorough investigation of the three zones of interest. The proposals for the 1978-79 programme are presented in Table 3.

TABLE 3

Proposed Additions to Clark Valley Grid

Purpose	Line	Interval	Length (m)
Fill-in Zone I	02N	3000-3600	600
	06N	3000-3700	700
	10N	3000-3600	600
	Access track	10N/3600-00/3600	1,000
			2,900 m
Fill-in Zone II	02N	2400-3000	600
	06N	2600-3000	400
	10N	2600-3000	400
	14N	2600-3000	400
			1,800 m
Fill-in Zone III	26N	3900-4300	400
	30N	4000-4300	300
	34N	4000-4400	400
	38N	4000-4400	400
	42N	4000-4400	400
	Access track	32N/4175-44N/4000	1,200
			3,100 m
Southern Extension	Baseline	00-06S	600
	02S	2400-3600	1,200
	04S	2400-3600	1,200
	06S	2400-3600	1,200
	Access track	00/3600-06S/3600	600
			4,800 m
		TOTAL ADDITIONAL TRACKS	12,600 m

The cost of this track cutting should not be more than $4,500 (12.6 km at $350/km = $4,410).

For general work in the Clark Valley (track cutting, sampling, geophysics) 20 hours of helicopter hire is proposed for a cost of $6,800.

3.2.2 Geochemistry

Approximately 600 soil samples will be required to cover the new grid lines at a 25 m interval and follow up of anomalous zones at a 12.5 m interval. Only the -80# fraction will be assayed for a cost of $1,350 ($2.25 per sample). Rock chip sampling will be done as required and $150 is tentatively proposed.

About 200 drill core samples will be required to assay the drill core from the two proposed diamond drill holes for 1978-79. The cost will be $1,160 ($5.80 per sample).

3.2.3 Geophysics

Gradient array E.I.P. and total field magnetics surveys are planned to cover the new grid lines and line extensions that were not covered in the 1977-78 surveys. Twelve operator-days will be required for a cost of $4,800 ($400/operator/day).

The two drill holes will be logged using E.I.P. for a cost of $600 ($300/hole).

3.2.4 Diamond Drilling

Two diamond drill holes, each approximately 300 m long, are proposed to test the anomalous zones along the eastern side of Clark Valley. Details of these holes are:

CV1: Collar - CV08N/3225
Dip - -68°
Bearing - 087° (075° Mag)
Length - 300 m
Purpose - To test the stratigraphy, I.P. anomaly (CV08N/3300-3400), geochemical anomalies (CV08N/3262-3400) and possible fault structures (CV08N/3375 and 3400).

CV2: Collar - CV30N/4050
Dip - -65°
Bearing - 087° (075° Mag)
Length - 300 m
Purpose - To test the stratigraphy and likely extensions to the I.P. and geochemical anomalies encountered on CV28N.

A helicopter-based programme is proposed, as was adopted by Pacminex in its 1977-78 programme, of which details are given in Appendix III.

The total drilling cost will be about $46,200 which comes from:

Drilling - 600 m at $65/m	= $39,000
Helicopter Hire - 20 hours at $340/hour	= $ 6,800
Site Preparation - $200 per site	= $ 400

If a Mt. Lyell crew is used the total cost will be reduced by $12,000 to $34,200 ($45/m).

3.3 Garfield River

3.3.1 Access

To facilitate access lines GR A, B, E, D, J and Q will be cleared or re-cut early in the season.

The Garfield River grid will consist of a 3 km baseline, on an approximate bearing of 354° (342° mag), along the Garfield-Flannigan's Divide. For reference purposes this baseline will be designated 2000 m E.

Seven grid lines will cover the area between the baseline and lines GR D and GR Q (Currie-Garfield Divide). Details are given in Table 4 and shown on Figure 12.

TABLE 4

Proposed Garfield River Grid

Line	Length (m)	Approximate Bearing (mag)	Connects With
Baseline	3,000	342°	GR B/1100
GR 32N	1,800	054°	GR D/1400
GR 36N	1,800	056°	GR D/1000 (includes GR J/1250-1425)
GR 40N	1,000	058°	GR J/700
GR 46N	1,900	053°	GR Q/200
GR 50N	1,000	050°	GR Q/730
GR 54N		GR B/00-1100	
GR 58N	700	048°	GR Q/1700
	11,200 m		

At a cost of $350/km the grid should cost no more than $4,000.

One or two helipads will be cleared on the baseline if suitable sites can be found.

Twenty hours of bulldozer hire is proposed to upgrade the four wheel drive access road from Darwin to Intercolonial Spur for a cost of $600 ($30/hour).

Total helicopter usage for the Garfield River area will be about 20 hours for which $6,800 is budgetted.

3.3.2 Geochemistry

The soil sampling programme over the Garfield River grid will require about 600 samples, initially at a 25 m interval with follow up 12.5 m sampling over anomalous zones. Only the -80# fraction will be assayed for a cost of $1,350 ($2.25/sample). Some rock chip sampling may also be necessary for which $250 is budgetted.

3.3.3 Geophysics

(a) Gradient array E.I.P. and total field magnetics over the Garfield River grid, approximately 8.2 km. About ten operator-days will be required for a cost of $4,000.

(b) Gradient array E.I.P. and total field magnetics over the mineralized zone on Snake Spur, one operator-day for a cost of $400.

3.4 Other Areas

3.4.1 Andrew River Volcanics

Reconnaissance mapping is proposed for exposures of the Andrew River Volcanics along the three four wheel drive access roads and creek exposures on the eastern side of the Main Range. Some track cutting may be required but is not budgetted.

3.4.2 Bird River Gossan

About 1.5 km of track cutting may be required to gain access

to the ridge along which Moore located the gossan. This work may be done by Mt. Lyell personnel and so no direct cost is budgetted.

For rock chip sampling of the gossan $150 is budgetted.

3.5 Exploration Budget 1978-79

Table 5 itemises the costs of the proposed 1978-79 exploration programme. Table 6 presents the unit costs which were used in evaluating the exploration budget. Where alternative costs are given the maximum is used in the proposed budget.

TABLE 5

Itemised Exploration Budget for 1978-79 Programme

(1) Clark Valley Fill-in		
Access - Roadworks, 20 hrs. bulldozer hire	600	
7.8 km track cutting	2,730	
20 hrs. helicopter hire	6,800	10,130
Geochemistry - 370 soil samples, one fraction	840	
Rock chip samples	150	990
Geophysics - E.I.P. + Magnetics, 8 days	3,200	3,200
		14,320
(2) Clark Valley Extension		
Access - 4.8 km track cutting	1,680	1,680
Geochemistry - 230 soil samples, one fraction	510	510
Geophysics - E.I.P. + Magnetics, 4 days	1,600	1,600
		3,790
(3) Clark Valley Drilling		
Site Preparation - 2 helipad/drill sites	400	
Drilling - 2 x 300 m holes	39,000	
Helicopter Hire - 20 hrs.	6,800	46,200
Geochemistry - 200 drill core samples	1,160	1,160
Geophysics - E.I.P. logging, 2 holes	600	600
		47,960
(4) Garfield River Grid		
Access - Roadworks, 20 hrs. bulldozer hire	600	
11.2 km track cutting	3,920	
20 hrs. helicopter hire	6,800	11,320
Geochemistry - 600 samples, one fraction	1,350	
Rock Chip samples	250	1,600
Geophysics - E.I.P. + Magnetics, 10 days	4,000	4,000
		16,920
(5) Snake Spur Costean		
Geophysics - E.I.P. + Magnetics, 1 day	400	400
		400
(6) Bird River Gossan		
Geochemistry - Rock chip samples	150	150
		150

TABLE 6

Unit Costs Used in 1978-79 Exploration Budget

EXPLORATION METHOD	UNIT COST	PRODUCTIVITY
1. TRACK CUTTING	Max. $350/km Min. $250/km	500 m/crew/day
2. GEOCHEMICAL ASSAYS		
(i) soils	1 fraction - $2.25 2 fractions - $4.50	Cu, Pb, Zn, Ag, Mn
(ii) rock chips	Cu, Pb, Zn, Ag, Mn - $4.25	less $2.00 if sample preparation by field assistants
(iii) drill core	Cu, Pb, Zn Ag, S - $5.80	less $2.00 if sample preparation by field assistants
3. GEOPHYSICS		
(i) gradient array I.P.	$400/km	1 km/crew/day
(ii) D.D.H. E.I.P. logging	Max. $300/hole (Scintrex) Min. $100/hole (Mt. Lyell)	1 hole/day
(iii) ground magnetics	$130/km	3 km/operator/day
4. DIAMOND DRILLING (all inclusive)	Outside contractor $65/m Mt. Lyell crew $45/m	10 m/shift
5. EARTHMOVING		
(i) drill site preparation	D7 - $30/hour	20 hours/drill site
(ii) road construction	$6,000/km - steep terrain $2,100/km - flat terrain	20 dozer days/km 7 dozer days/km
6. HELICOPTER	$340/hour Bell Jetranger 206B	1977-78 average usage 4 hours/day

TABLE 7

Exploration Budget 1978-79

*	Salaries, Wages, Burdens	30,000
*	Materials	8,000
	Access	29,930
	Geophysics	9,800
*	Geochemistry & Petrology	4,410
	Diamond Drilling	39,400
*	Equipment & Facilities	3,000
	General Costs	530
	Indirect Charges, 6½% of *	2,950
		$128,020

REFERENCES

Howland-Rose, A. W. (1978) - Report on gradient array EIP and total magnetic field survey over the Clark River grid.
Unpublished Scintrex Report Tas-054D

Moore, T. B. (1913) - Exploration Progress Report to General Manager.
Unpublished Mt. Lyell Mining and Railway Company Limited Report

Ruddock, I. (1973) - Proposed Correlations of Lithologies and Mineralization in the Cambrian Volcanics in the Jukes-Darwin and Queenstown areas.
Unpublished Report, International Nickel Australia Limited

Stitt, J. G. A. (c. 1900) - Report to General Manager on the Northern Exploration Company property at Mt. Darwin.
Unpublished Report, Mt. Lyell Mining and Railway Company Limited

Whitehead, S. (1978) - Description of volcanic rocks and mineralized samples.
Unpublished Report, Amdel GS 19/79

APPENDIX I

Geochemical Statistics

(i) Soil Data

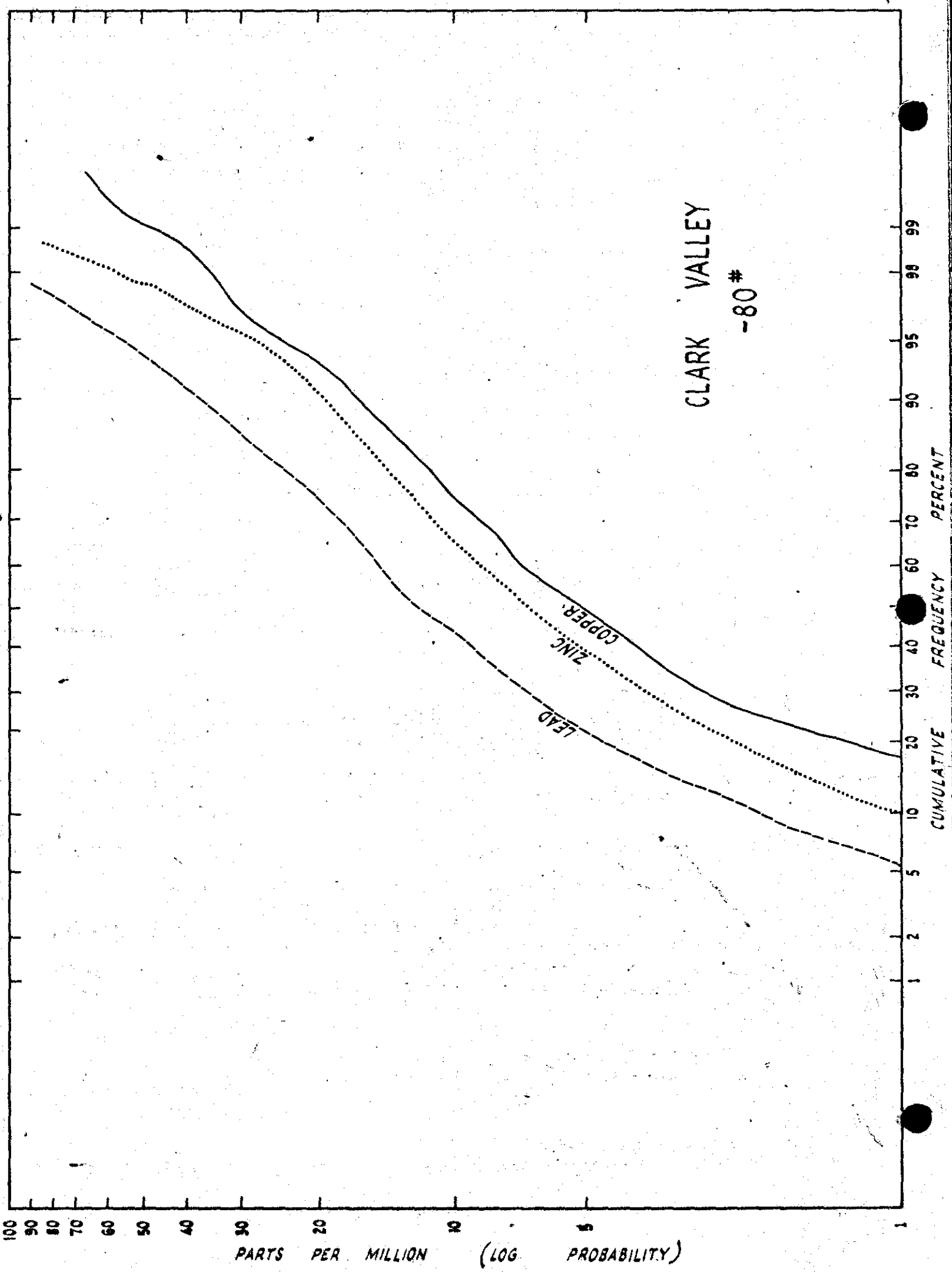


FIG. 13

235025

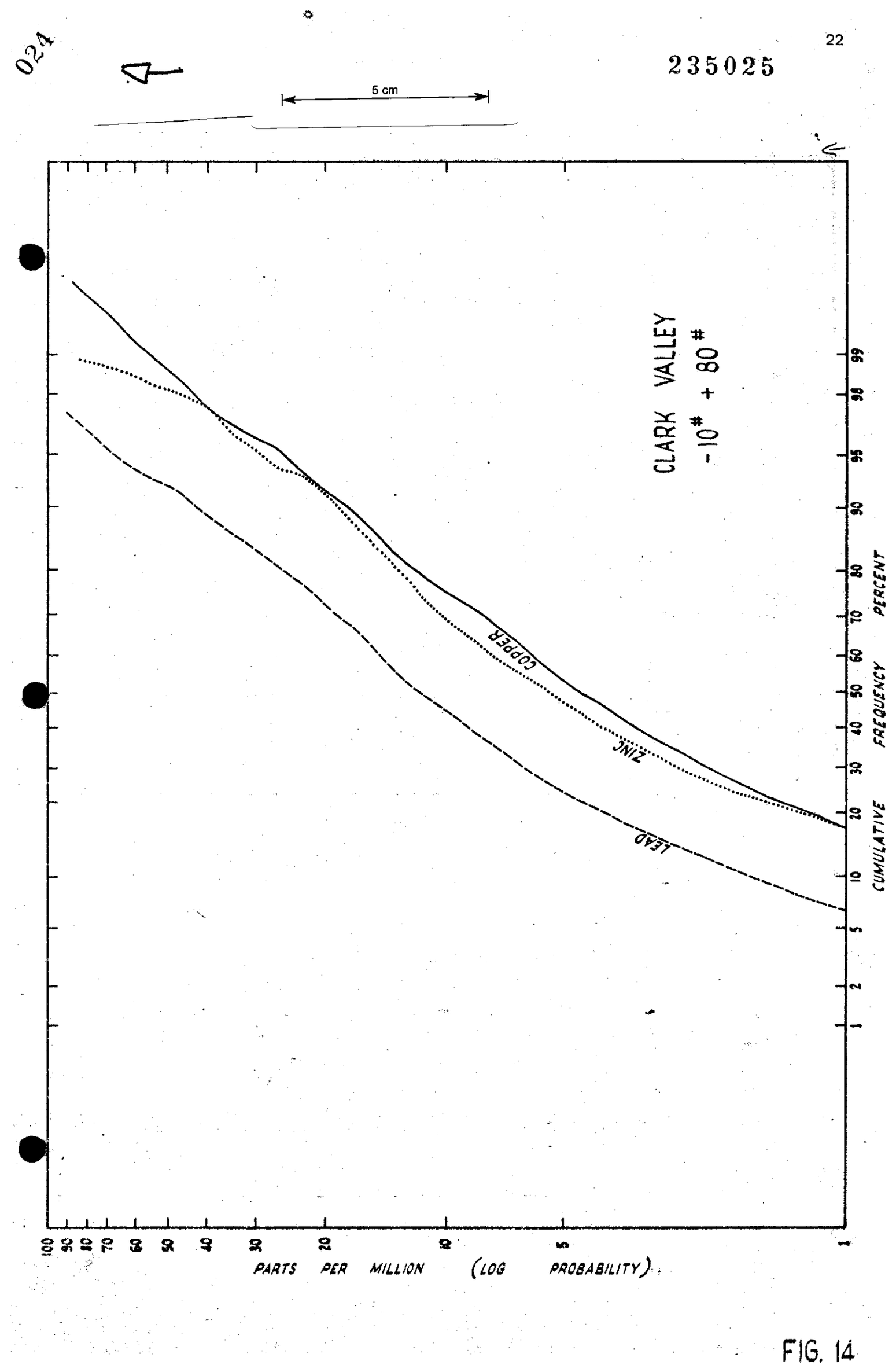


FIG. 14

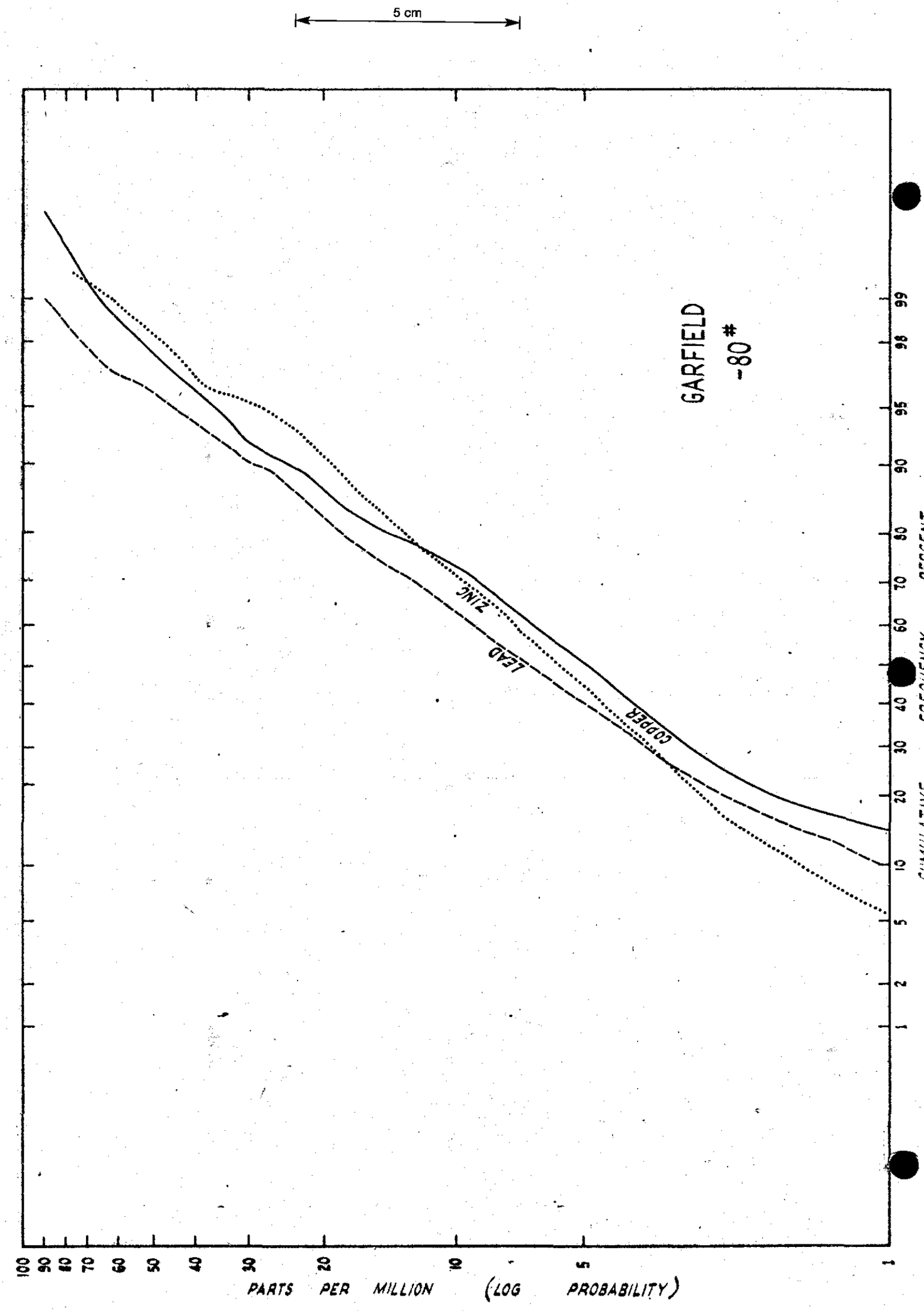

5 cm
GARFIELD
-80#
ZINC
LEAD
COPPER
CUMULATIVE FREQUENCY PERCENT
100 90 80 70 60 50 40 30 20 10 5 1
PARTS PER MILLION (LOG PROBABILITY)

FIG. 15

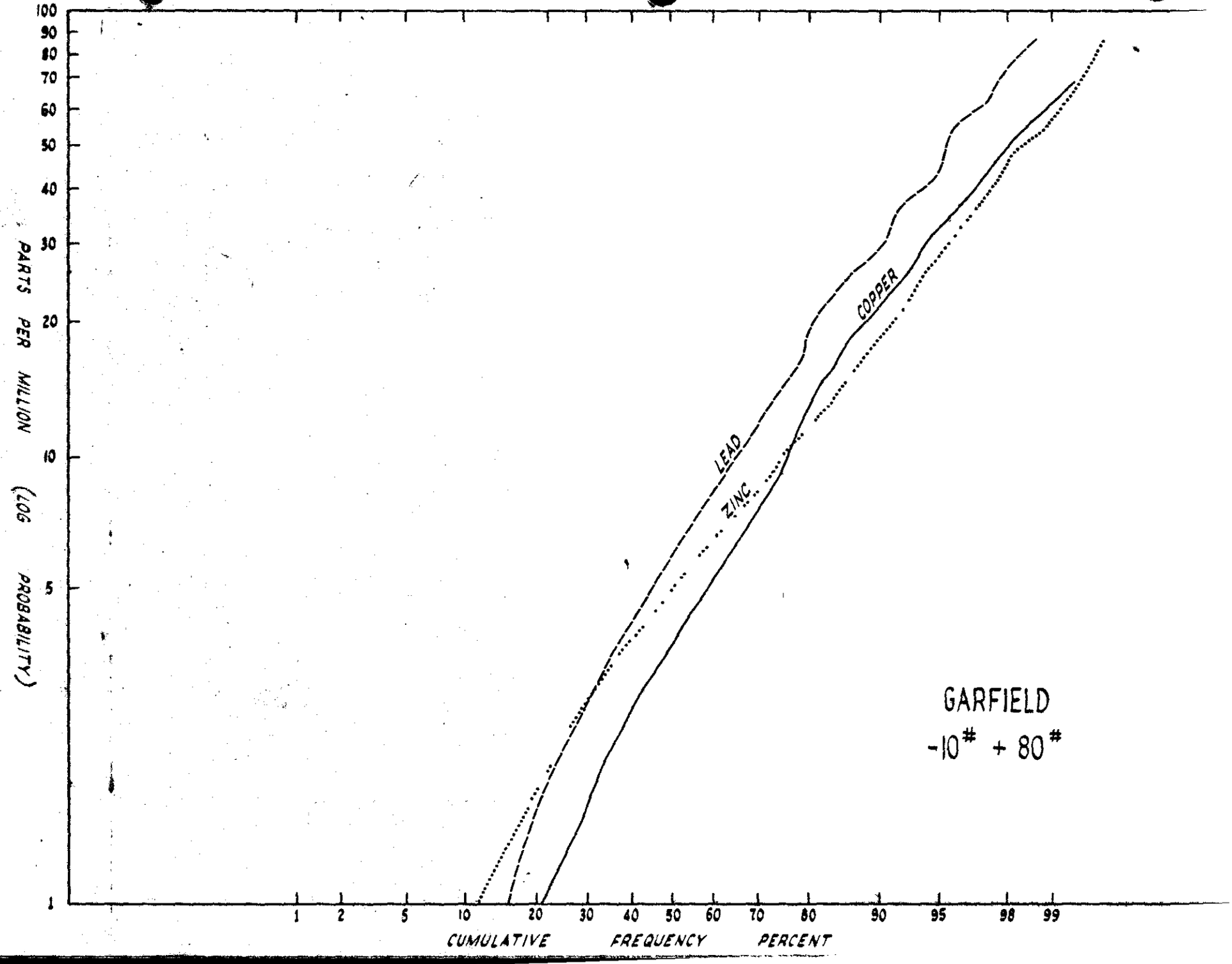
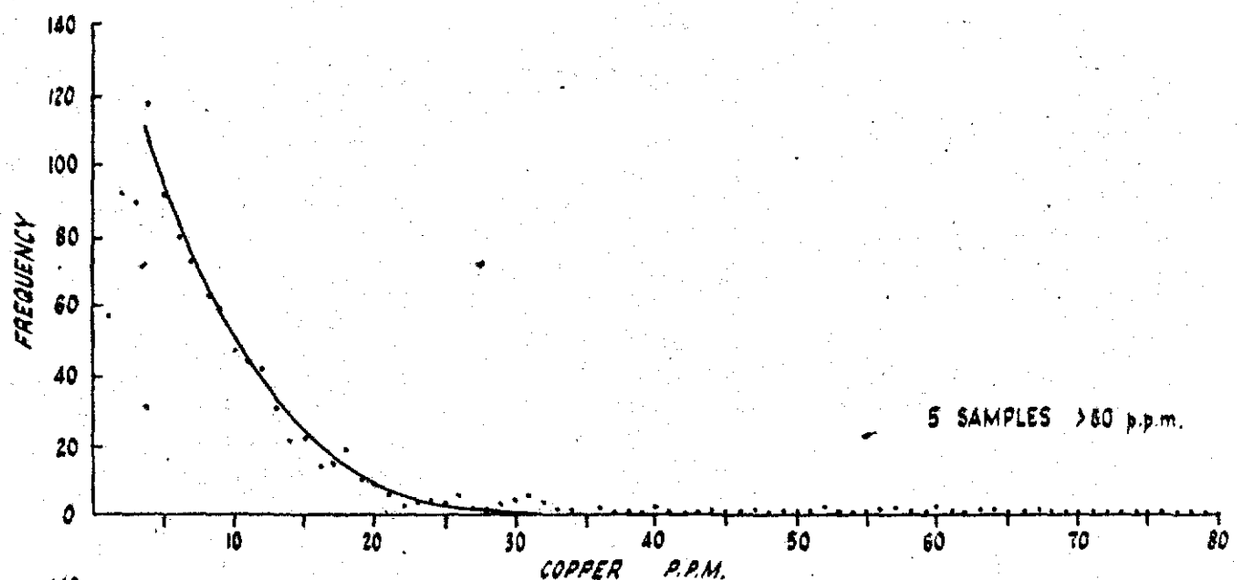
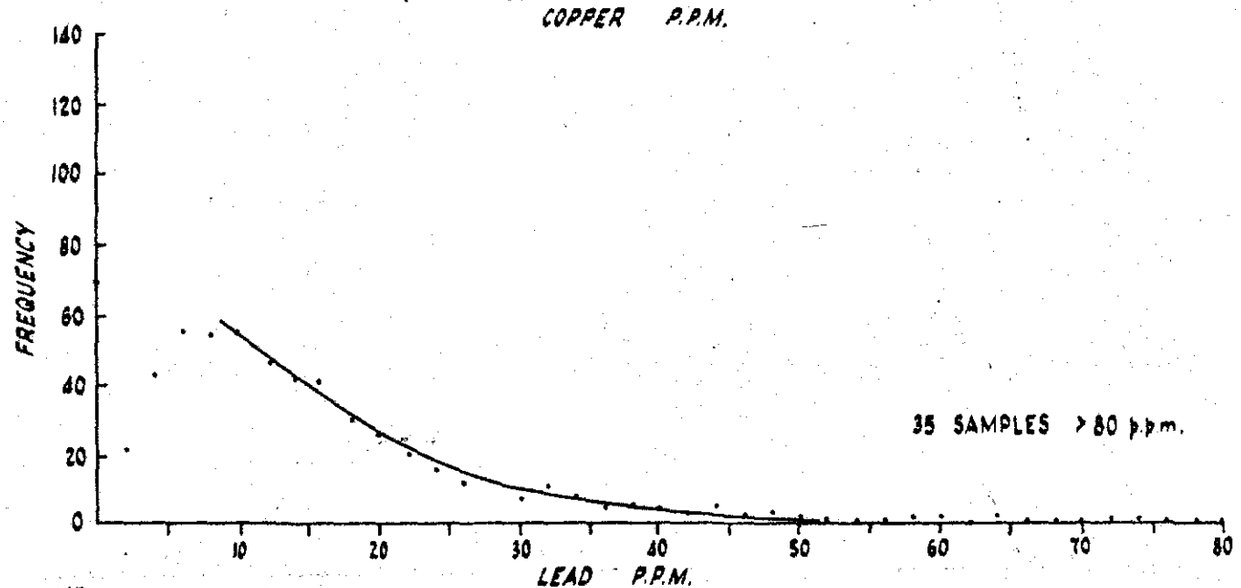
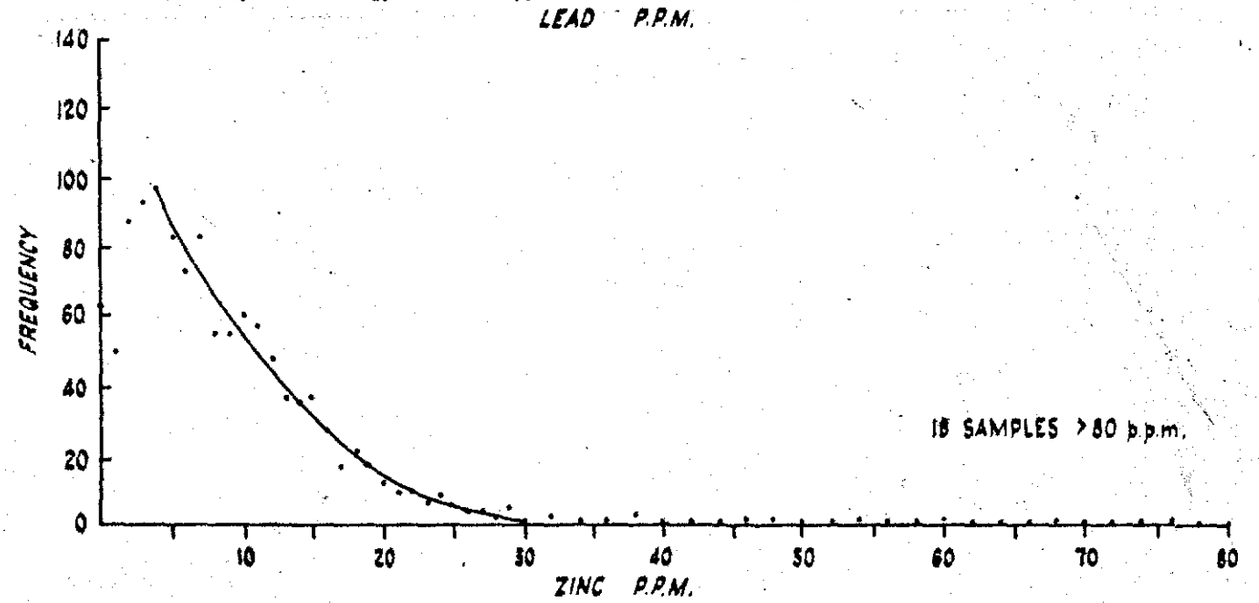

PARTS PER MILLION (LOG PROBABILITY)
100
90
80
70
60
50
40
30
20
10
5
1
LEAD
COPPER
ZINC
GARFIELD
-10# + 80#
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
CUMULATIVE FREQUENCY PERCENT

FIG. 16



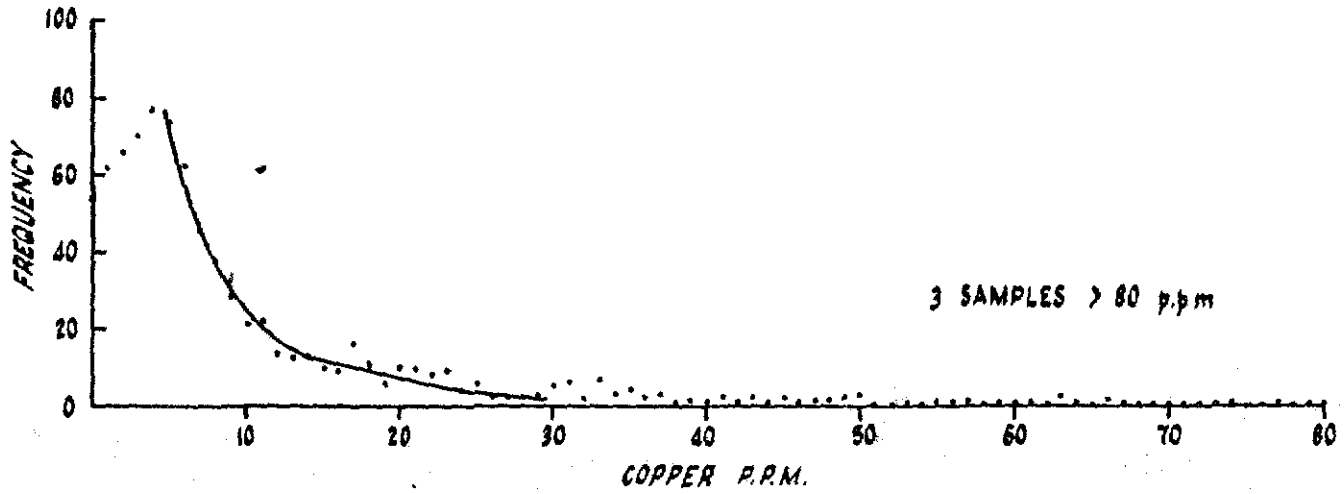


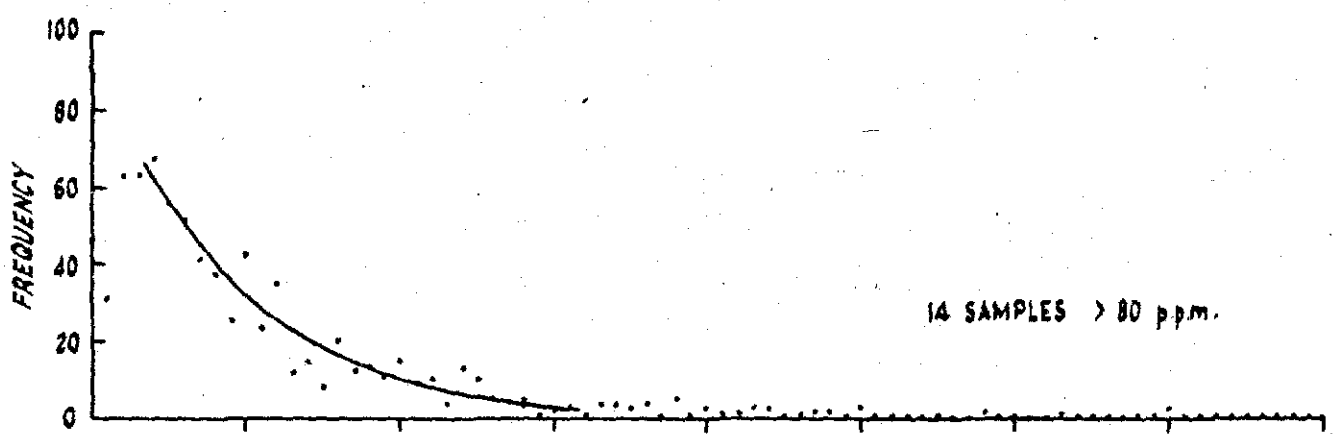


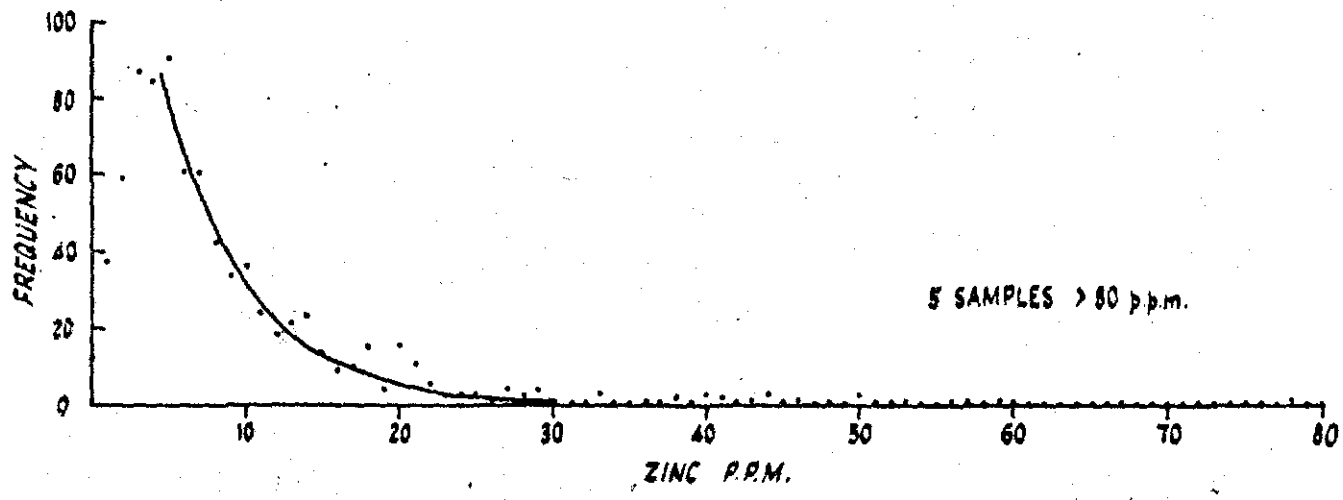
CLARK VALLEY SOIL GEOCHEMISTRY
DISTRIBUTION CURVES
-80 # FRACTION

5 cm

FIG. 17







GARFIELD RIVER SOIL GEOCHEMISTRY
DISTRIBUTION CURVES
-80 # FRACTION

5 cm

FIG. 18

APPENDIX I

(ii) Stream Sediment Data: -80# Fraction

Sample	MR	River System	Cu	Pb	Zn	Mn
SS1	0178 5907	Garfield	11	13	10	50
SS2	0164 5896	"	12	9	16	50
SS3	0150 5895	"	35	46	23	590
SS4	0118 5883	"	9	18	8	90
SS5	0142 5869	"	20	24	10	120
SS6	0187 5859	"	10	28	30	420
SS7	0189 5854	"	5	7	6	40
SS8	0175 5850	"	4	50	8	60
SS9	0174 5846	"	10	8	6	130
SS10	0263 5905	"	8	18	5	30
SS11	0292 5881	"	10	10	8	30
SS12	0294 5883	"	6	24	5	140
SS13	0366 5891	Currie	12	18	9	70
SS14	0368 5892	"	13	12	4	50
SS15	0330 6014	"	8	4	5	50
SS16	0332 6011	"	9	5	8	160
SS17	0353 5993	"	7	30	7	1,300
SS18	0370 5975	"	6	4	5	90
SS19	0377 5968	"	5	6	4	120
SS20	0390 5946	"	10	330	23	26,000
SS21	0440 5897	"	9	12	3	400
SS22	0448 5875	"	5	12	5	490
SS23	0454 5867	"	4	3	7	30
SS24	0485 5838	"	9	6	4	120
SS25	0312 5867	Garfield	4	2	3	< 10
SS26	0315 5867	"	0	4	11	36
SS27	0300 5814	"	3	6	5	12
SS28	0327 5792	"	2	2	0	< 10
SS29A	0438 5723	"	3	0	2	< 10
SS29B	0382 5835	"	17	8	8	59
SS30	0383 5836	"	6	4	8	46
SS31	0274 5990	Currie	2	2	1	< 10
SS32	0205 6038	"	4	9	1	33
SS33	0199 6035	"	4	13	3	64
SS34		NO SAMPLE TAKEN				
SS35	9939 6089	Garfield	3	9	2	30
SS36	9928 6056	"	2	8	1	19
SS37	9999 5993	"	3	8	3	108
SS38	0045 5990	"	3	7	6	67
SS39	0062 5976	"	4	6	5	156
SS40	0377 5792	"	10	40	10	1,050
SS41	6 mile creek Kelly Basin Road	Nora	0	2	11	175

- All samples less than 1 ppm Ag and Au

APPENDIX I

(iii) Rock Chip Data * All values in ppm unless shown otherwise

Sample	Location	Cu	Pb	Zn	Ag	Mn	S
30004	Snake Spur Costean 0-2 m	0.37%	-	-	-	-	1.9%
30005	Snake Spur Costean 2-4 m	0.96%	-	-	-	-	1.8%
30006	Snake Spur Costean 4-6 m	1.05%	-	-	-	-	1.7%
30007	Snake Spur Costean 6-8 m	0.79%	-	-	-	-	1.3%
30008	Snake Spur Costean 8-10 m	1.04%	-	-	-	-	2.2%
30009	Snake Spur Costean 10-12 m	0.29%	-	-	-	-	0.8%
30010	Snake Spur Costean 12-14 m	0.63%	-	-	-	-	0.4%
30011	Snake Spur Costean 14-16 m	0.03%	-	-	-	-	Nil
30012	CV24N/4127, Pyritic Breccia	0.07%	-	-	-	-	2.2%
30201	ICS near Turair 28 Cp "Gossan"	22400	30	108	12	350	
30202	ICS near Turair 28 Mte vein	1000	75	160	1	2,100	
30203	Shale in ck N of CV12N/2800	170	115	31	< 1	39	
30204	Shale in ck S of CV12N/2800	80	70	19	< 1	55	
30205	Shale in ck N of CV08N/3350	180	85	52	< 1	210	
F435	CV04N/3745 Mte	59	35	34	2	33	
F448	CV16N/3565 Pyritic Tuff	35	34	75	< 1	36	
F469	CV28N/4100 Shale	62	113	45	3	97	
F519	Tasman Darwin Mine	47	12	7	< 1	13	
F522	Shale in ck N of CV08N/3350	107	58	125	2	200	
F580	Garfield River GR 77 Shale	17	200	31	1	200	
F483	CV40N/4205 Pyritic Shale	28	35	34	< 1	105	
F431	CV00/3000	52	187	60	1	420	
F432	CV04N/3575	110	14	54	1	65	
F434	CV04N/3650	220	5	33	1	51	
F437	CV08N/3600	72	7	46	1	110	
F440	CV12N/3295	150	5	18	1	63	
F445	CV12N/4115	74	4	23	1	21	
F448	CV16N/3565	110	176	140	1	41	
F452	CV20N/3455	110	11	11	1	10	
F457	CV20N/4215	95	13	38	1	171	
F459	CV24N/3394	95	4	20	1	36	
F460	CV24N/3645	42	34	78	1	580	
F462	CV24N/3835	18	6	44	1	31	
F463	CV24N/3920	40	12	56	1	365	
F466	CV24N/4162 Pyritic Breccia	75	28	48	1	350	
F467	CV24N/4175	36	2	43	1	63	
F470	CV28N/4125 Shale	75	2550	40	3	36	
F474	CV32N/3950	90	21	34	1	137	
F475	CV32N/3975	14	18	39	1	127	
F476	CV32N/3995	50	8	20	1	61	
F478	CV36N/4275	175	65	83	1	375	
F479	CV40N/3670	174	7	30	1	195	
F481	CV40N/4005	100	3	26	1	1,380	
F487	CV39N/2725	100	8	35	1	85	
F488	CV00/3460 Intermediate Tuff	50	30	150	2	580	
F489	CV04N/2475	17	3	15	1	15	
F492	CV08N/3375 Shale	110	10	13	1	10	
F495	CV39N/2785	42	26	80	1	780	
F498	CV44N/3700	200	10	28	1	85	
F508	CV12 Clark River Shale	90	18	16	1	21	
F511	CV44 Clark River	85	8	34	1	76	
F512	CV48 Clark River Basalt	120	18	40	1	348	
F513	CV49 E.Z.Walking Track	45	14	35	1	105	
F515	CV Baseline 075 N	33	105	34	1	14	
F516	CV Baseline 450 N	190	14	165	1	62	
F501	CV44N/4450	25	6	24	1	53	
F523	Ck N of CV08N/3350 Shale	80	9	152	1	280	

* All lithologies are felsic volcanics unless marked otherwise.

APPENDIX II

Rock Specimen Localities

Number	Location	Map Reference
F430	Mt. Lyell consols.	9821 6270
F431	CV00/3000	9262 6057
F432	CV04N/3575	9311 6113
F433	CV04N/3625	9312 6118
F434	CV04N/3650	9312 6120
F435	CV04N/3745	9313 6131
F436	CV08N/3435	9353 6095
F437	CV08N/3600	9354 6113
F438	CV12N/2665	9392 6030
F439	CV12N/2970	9393 6041
F440	CV12N/3295	9395 6075
F441	CV12N/3335	9395 6079
F442	CV12N/3625	9397 6110
F443	CV12N/3790	9397 6126
F444	CV12N/4080	9392 6153
F445	CV12N/4115	9390 6157
F446	CV12N/4470	9385 6193
F447	CV12N/4470	9385 6193
F448	CV16N/3565	9441 6103
F449	CV16N/3850	9444 6134
F450	CV16N/4375	9436 6179
F451	CV20N/3445	9481 6084
F452	CV20N/3455	9481 6086
F453	CV20N/3465	9481 6087
F454	CV20N/3510	9481 6092
F455	CV20N/3790	9484 6121
F456	CV20N/4060	9487 6148
F457	CV20N/4215	9488 6164
F458	CV20N/4310	9489 6174
F459	CV24N/3394	9528 6025
F460	CV24N/3645	9526 6102
F461	CV24N/3670	9527 6104
F462	CV24N/3835	9528 6121
F463	CV24N/3920	9528 6129
F464	CV24N/4085	9529 6147
F465	CV24N/4127	9529 6151
F466	CV24N/4162	9529 6154
F467	CV24N/4175	9529 6156
F468	CV28N/3875	9567 6122
F469	CV28N/4100	9568 6147
F470	CV28N/4125	9568 6150
F471	CV28N/4185	9568 6156
F472	CV28N/4325	9569 6170
F473	CV28N/4345	9569 6172
F474	CV32N/3950	9617 6126
F475	CV32N/3975	9617 6129
F476	CV32N/3995	9617 6130
F477	CV36N/4045	9661 6131
F478	CV36N/4275	9665 6154
F479	CV40N/3670	9698 6089
F480	CV40N/3905	9699 6113
F481	CV40N/4005	9700 6124
F482	CV40N/4190	9703 6144
F483	CV40N/4205	9703 6145
F484	CV40N/4290	9703 6153
F485	CV40N/4390	9704 6165
F486	CV39N/2520	9682 5975

Number	Location	Map Reference
F487	CV39N/2725	9683 5995
F488	CV00/3460	9264 6126
F489	CV04N/2475	9302 5997
F490	CV04N/3570	9313 6112
F491	CV04N/3775	9313 6133
F492	CV08N/3375	9353 6089
F493	CV32N/3410	9615 6067
F494	CV36N/3535	9657 6078
F495	CV39N/2785	9685 6001
F496	CV44N/3375	9745 6060
F497	CV44N/3525	9746 6076
F498	CV44N/3700	9747 6095
F499	CV44N/3925	9748 6120
F500	CV44N/3960	9748 6124
F501	CV44N/4450	9788 6146
F502	CV1	9577 6182
F503	CV2	9577 6182
F504	CV3	9600 6161
F505	CV6	9605 6147
F506	CV8	9598 6147
F507	CV11	9700 6156
F508	CV12	9687 6150
F509	CV25	9625 6153
F510	CV33	9356 6036
F511	CV44	9285 6036
F512	CV48	9617 6151
F513	CV49	9450 6103
F514	Slate Spur West	-
F515	Baseline 075N	9272 6057
F516	Baseline 450N	9312 6051
F517	Baseline 1100N	9382 6046
F518	Humpty Dumpty	9276 6162
F519	Tasman Darwin	9263 6154
F520	Clark River Float	-
F521	CV50	9234 6059
F522	Clark Trib. 5S	9355 6089
F523	Clark Trib. T5S	9360 6090
F524	GRA/290	0262 5957
F525	GRA/342	0259 5953
F526	GRA/402	0255 5951
F527	GRB/720	0302 5826
F528	GRB/800	0300 5820
F529	GRB/820	0300 5818
F530	GRD/250	0225 5961
F531	GRD/710	0181 5971
F532	GRQ/800	0294 5881
F533	GRD/1320	0118 5977
F534	GRJ/350	0181 5929
F535	GRJ/838	0165 5898
F536	GRJ/845	0164 5898
F537	GRJ/925	0158 5899
F538	GRJ/1070	0145 5896
F539	GRS/370	0258 6002
F540	GRS/480	0251 6010
F541	GRF/050	9995 6162
F542	GRF/965	9943 6092
F543	GRF/1200	9926 6076
F544	GRF/1205	9926 6075
F545	GRF/1225	9925 6075
F546	GRH/120	9953 5976
F547	GRH/335	9950 5956
F548	GRH/425	9951 5948

Number	Location	Map Reference
F549	GRH/700	9942 5923
F550	GRH/1190	9924 5878
F551	Snake Spur Costean	0239 6043
F552	Snake Spur Costean	0239 6043
F553	Snake Spur Costean	0239 6043
F554	GR1	0175 5845
F555	GR9	0176 5862
F556	GR11	0157 5866
F557	GR17	0127 5867
F558	GR19	0426 5872
F559	GR20	0386 5904
F560	GR21	0381 5905
F561	GR21	0381 5905
F562	GR21	0381 5905
F563	GR22	0378 5920
F564	GR27	0313 5976
F565	GR43	9873 6005
F566	GR55	9897 6061
F567	GR62	0370 5789
F568	GR63	0368 5784
F569	GR66	0342 5798
F570	GR67	0330 5804
F571	GR68	0320 5809
F572	GR69	0291 5813
F573	GR70	0276 5813
F574	GR70	0276 5813
F575	GR71	0260 5817
F576	GR72	0254 5818
F577	GR72	0254 5818
F578	GR74	0222 5822
F579	GR75	0205 5826
F580	GR77	0193 5830
F581	GR79	0179 5850
F582	GR80	0187 5857
F583	GR81	0174 5864
F584	GR83	0152 5865
F585	Andrew R. Volcs.	I.C.S. road
F586	Andrew R. Volcs.	I.C.S. road
F587	CV08N/3820	9355 6135

Map references correspond to the State Imperial Grid

APPENDIX III

Pacminex Drilling Programme 1977-78

The following details came out of a conversation with Mr. P. McNamara, Senior Exploration Geologist for Pacminex, at Zeehan on 25th May, 1978.

Pacminex drilled two diamond drill holes with an F30 rig near the Stanley River, about 18 km NW from Renison Bell. All drilling equipment was flown in using a Bell Jetranger 206B helicopter and each trip from Zeehan to the drill site was approximately 25 minutes flying time. A.D.D., Zeehan, were the contract drillers.

The F30 rig was separated into three parts: the base (about 1,000 lb.), the mast (about 600 lb.) and the motor (about 800 lb.), each being a separate chopper load. The rig was set in place while suspended from the chopper and bolted together. A swivel joint is required near the chopper hook to allow the loads to twist without the danger of breaking the sling.

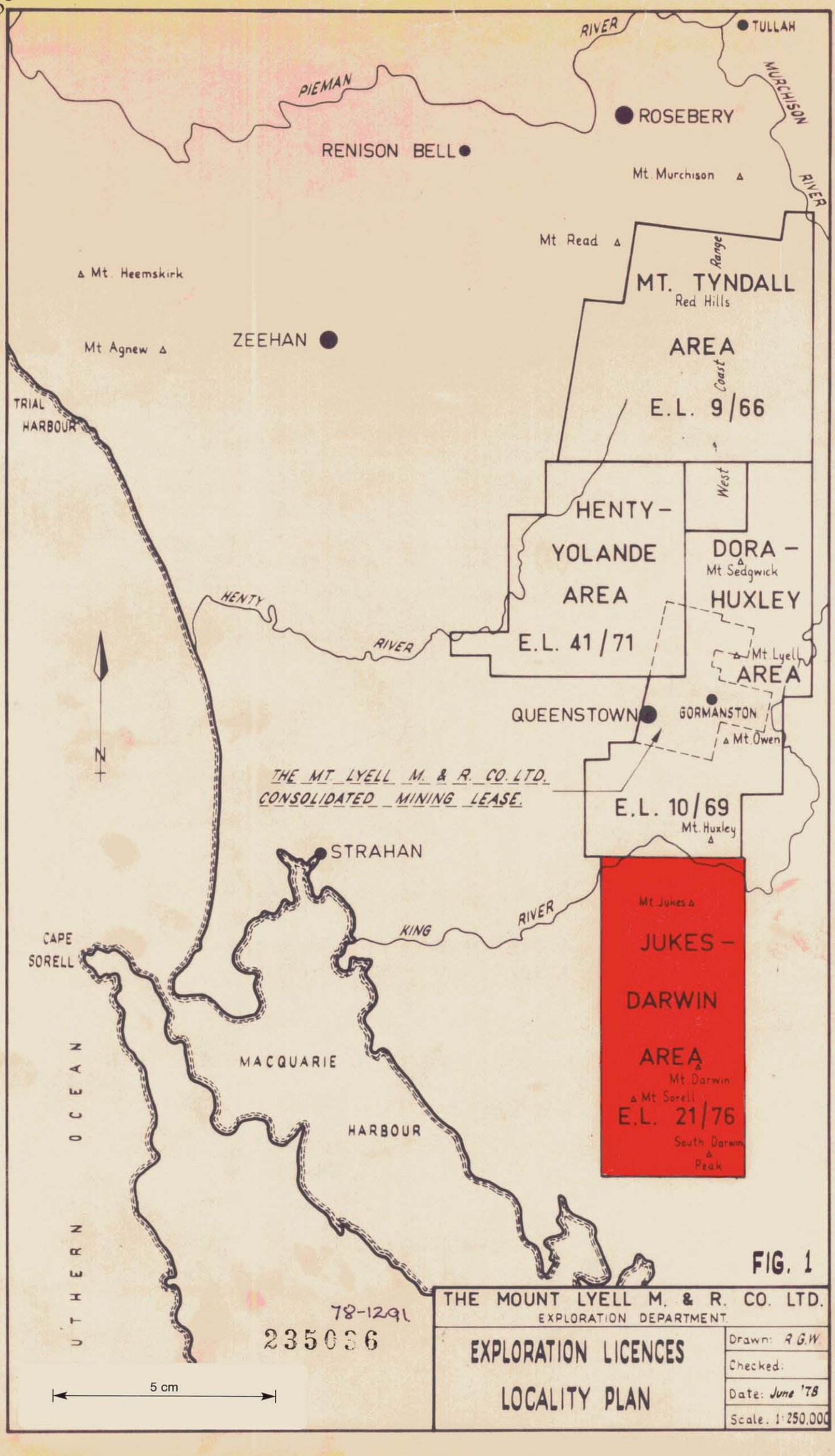
For initial assembly about 20 chopper loads are required:

3	rig
9	rods and casing (for 300 m hole)
2	fuel (1 drum per 100 m, 2 drums per load)
2	cement, mud, soluble oil
2	pumps + spare pumps
2	core trays

A similar number of loads will be required for moving the rig to a new drill site. Once assembled the rig can be winched into position.

Demobilising requires about 14 loads plus several trips for drill core (about 10 core trays inside chopper per load).

An estimate for flying time from Darwin Plateau to the drill sites in the Clark Valley is 15 minutes for the round trip. Therefore to assemble the rig and gear will require about five hours flying time per hole plus 5 hours for demobilising plus a few loads to take out the drill core.


U35
RIVER
TULLAH
MURCHISON
PIEMAN
ROSEBERY
RENISON BELL
Mt. Murchison
RIVER
Mt Read
Range
Mt. Heemskirk
MT. TYNDALL
Red Hills
AREA
ZEEHAN
Mt Agnew
Coast
E.L. 9/66
TRIAL
HARBOUR
West
HENTY-
YOLANDE
AREA
E.L. 41/71
DORA-
Mt Sedgwick
HUXLEY
AREA
Mt Lyell
HENTY
RIVER
QUEENSTOWN
GORMANSTON
Mt Owen
N
THE MT LYELL M. & R. CO. LTD.
CONSOLIDATED MINING LEASE.
E.L. 10/69
Mt. Huxley
STRAHAN
Mt Jukes
KING
RIVER
CAPE
SORELL
JUKES-
DARWIN
AREA
Mt. Darwin
Mt Sorell
E.L. 21/76
South Darwin
Peak
MACQUARIE
HARBOUR
OCEAN
UTHERN
FIG. 1
78-1291
235036
5 cm
THE MOUNT LYELL M. & R. CO. LTD.
EXPLORATION DEPARTMENT
EXPLORATION LICENCES
LOCALITY PLAN
Drawn: R.G.W
Checked:
Date: June '78
Scale. 1:250,000

LEGEND

- ====== FOUR WHEEL DRIVE TRACKS
- ------ ACCESS TRACKS
- ——— GRID LINES
- H HELIPADS

5 cm

78-1291 235037 FIG. 2

MT. LYELL - G.O.D.L. JOINT VENTURE

JUKES - DARWIN
E.L. 21/76
ACCESS MAP

DRAWN: R.G.W.
CHECKED:
DATE: Aug. 1978
SCALE: 1:31,680

001


KING RIVER
MT. JUKES
CROTTY
CURRIE
GARFIELD CAMP
DARWIN
MT. DARWIN
SLATE GAUR
CLARK VALLEY GRID
MT. SORELL
CLARK CAMP
SOUTH DARWIN PEAK
LIMONITIC GOSSAN
MACQUARIE HARBOUR
QUATERNARY
MORAINE, SCREE, ALLUVIALS, (NOT SHOWN)
TERTIARY
MACQUARIE BEDS: SANDSTONES, QUARTZ & CLAYS.
ORDOVICIAN - DEVONIAN
OWEN CONGLOMERATE, GORDON LIMESTONE & ELDON GROUP.
CAMBRIAN
JUKES CONGLOMERATE - VOLCANOCLASTIC CONGLOMERATE.
DOMINANTLY QUARTZ - FELDSPAR PORPHYRY TUFFS WITH FELSIC LAVAS AND TUFFACEOUS SEDIMENTS.
MIXED SEQUENCE OF SHALES, FELSIC LAVAS AND TUFFS AND INTERMEDIATE TUFFS, CHARACTERISED BY LENSES OF BLACK SHALE.
DOMINANTLY SILICIC FELSIC LAVAS WITH MINOR FELSIC TUFFS.
DARWIN GRANITE.
GEOLOGICAL BOUNDARY
FAULT.
SYNCLINE.
ANTICLINE.
OLD WORKINGS.
CLARK VALLEY GRID.
GARFIELD RIVER ACCESS TRACKS.
H HELICOPTER PAD
TRUE NORTH
MAGNETIC NORTH
235038
5 cm
78-129
FIG. 3
MT. LYELL - G.O.D.L. JOINT VENTURE
JUKES - DARWIN E.L. 21/76
GEOLOGICAL INTERPRETATION MAP
DRAWN: M.H.
CHECKED:
DATE: AUG. 1978
SCALE: 1:31,680

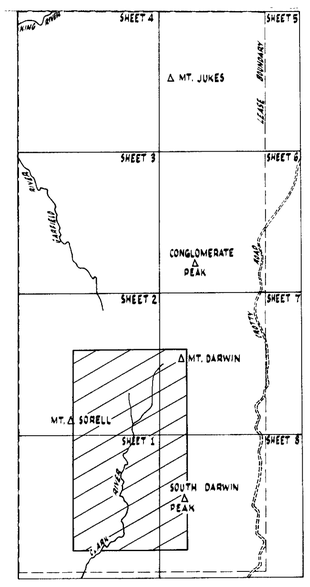
44N.
40N.
39N.
36N.
32N.
28N.
24N.
20N.
16N.
12N.
8N.
4N.

E.Z. CAMPSITE

CLARK RIVER CAMP

798,000 Yss N.
797,000 Yss N.
796,000 Yss N.
795,000 Yss N.
794,000 Yss N.
793,000 Yss N.
792,000 Yss N.
791,000 Yss N.
359,000 Yss E.
360,000 Yss E.
361,000 Yss E.
362,000 Yss E.
363,000 Yss E.

LOCATION MAP



SOIL

Cu Pb Zn (ppm)

200m — 2, 4, 6

ALL Ag VALUES < 1 ppm.

EXCEPT LINE 8N, 12TE & 14ODE ARE BOTH 3 p.p.m.

300m

400m

TRUE NORTH

MAGNETIC NORTH

78-1291 235039 003

MT. LYELL - G.O.D.L. JOINT VENTURE	DRAWN M.H.
	TRACED R.G.W.
	CHECKED
JUKES - DARWIN E.L. 21 / 76	DATE MAY 1978
CLARK VALLEY GRID	SCALE 1 : 6,000
GEOCHEMISTRY DATA -80 # FRACTION	FIG. 4

LOCATION MAP

SOIL
Cu Pb Zn (ppm)
2, 4, 6
Ag VALUES < 1 ppm.

STREAM SEDIMENT
Cu Pb Zn (ppm)
2, 4, 6
Au, Ag VALUES < 1 ppm.

TRUE NORTH
MAGNETIC NORTH

235040

5 cm

78-1201 004

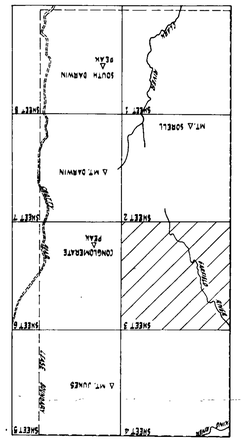
MT. LYELL - G.O.D.L. JOINT VENTURE	DRAWN M.H.
	TRACED R.G.W.
	CHECKED
JUKES - DARWIN E.L. 21/76 SHEET 2	DATE MAY '78
	SCALE 1:6,000
GEOCHEMISTRY DATA -80 # FRACTION	FIG. 5

MT. LYELL - G.O.D.L.P. JOINT VENTURE	
JUKES - DARWIN E.L. 21/76	
SHEET 3 005	
GEOCHEMISTRY DATA - 80 # FRACTION	
DRAWN M.H.	
TRACED R.G.W.	
CHECKED	
DATE APRIL '76	
SCALE 1:6,000	

FIG. 6

78-12A

LOCATION MAP



SOIL
Cu Pb Zn (ppm)
Ag values < 1 ppm.

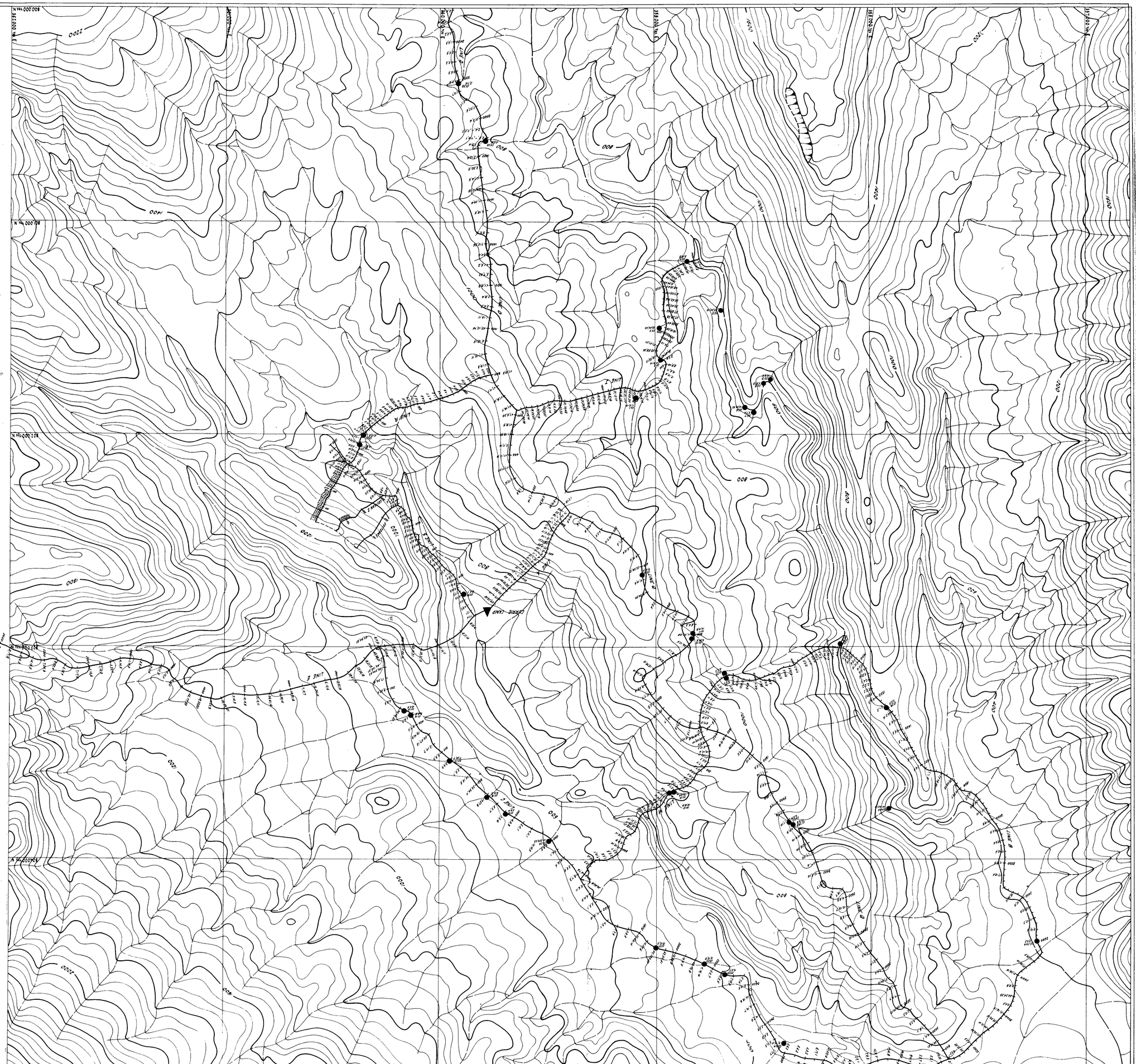
200m
400m

MAGNETIC NORTH

STREAM SEDIMENT
Cu Pb Zn (ppm)
Au, Ag values < 1 ppm.

5 cm

235041



MT LYELL - G.O.D.L. JOINT VENTURE	
DRAWN R.G.W.	JUKES - DARWIN E.L. 21/76
CHECKED	SNAKE SPUR COSTEAN
DATE JUNE 1978	GEOCHEMISTRY DATA - 80#
SCALE 1:1000	

5 cm

FIG. 7

78-129L

TRUE NORTH

MAGNETIC NORTH

SOIL
Cu Pb Zn ppm.
2, 4, 6

STREAM SEDIMENT
Cu Pb Zn ppm.
2, 4, 6

LINE S

LINE R

SPUR

COSTEAN 2

SNAKE

COSTEAN 1

CURRIE RIVER

1000'

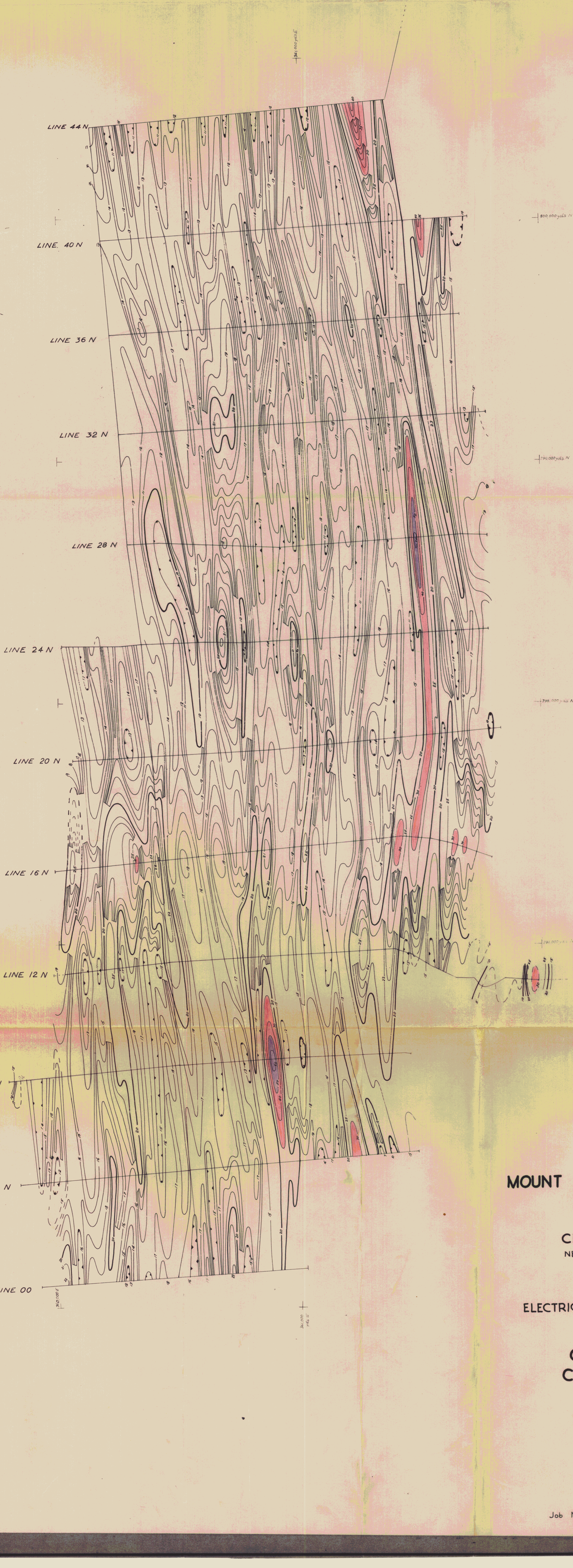
1200'

1400'

1600'

800'

2000'



MOUNT LYELL MINING & RAILWAY COMPANY LTD.

CLARK RIVER GRID

NEAR QUEENSTOWN - TASMANIA

78-1291

GRADIENT ARRAY
ELECTRICAL INDUCED POLARIZATION
SURVEY

CHARGEABILITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX

JANUARY - FEBRUARY 1978

SCALE 1 6000

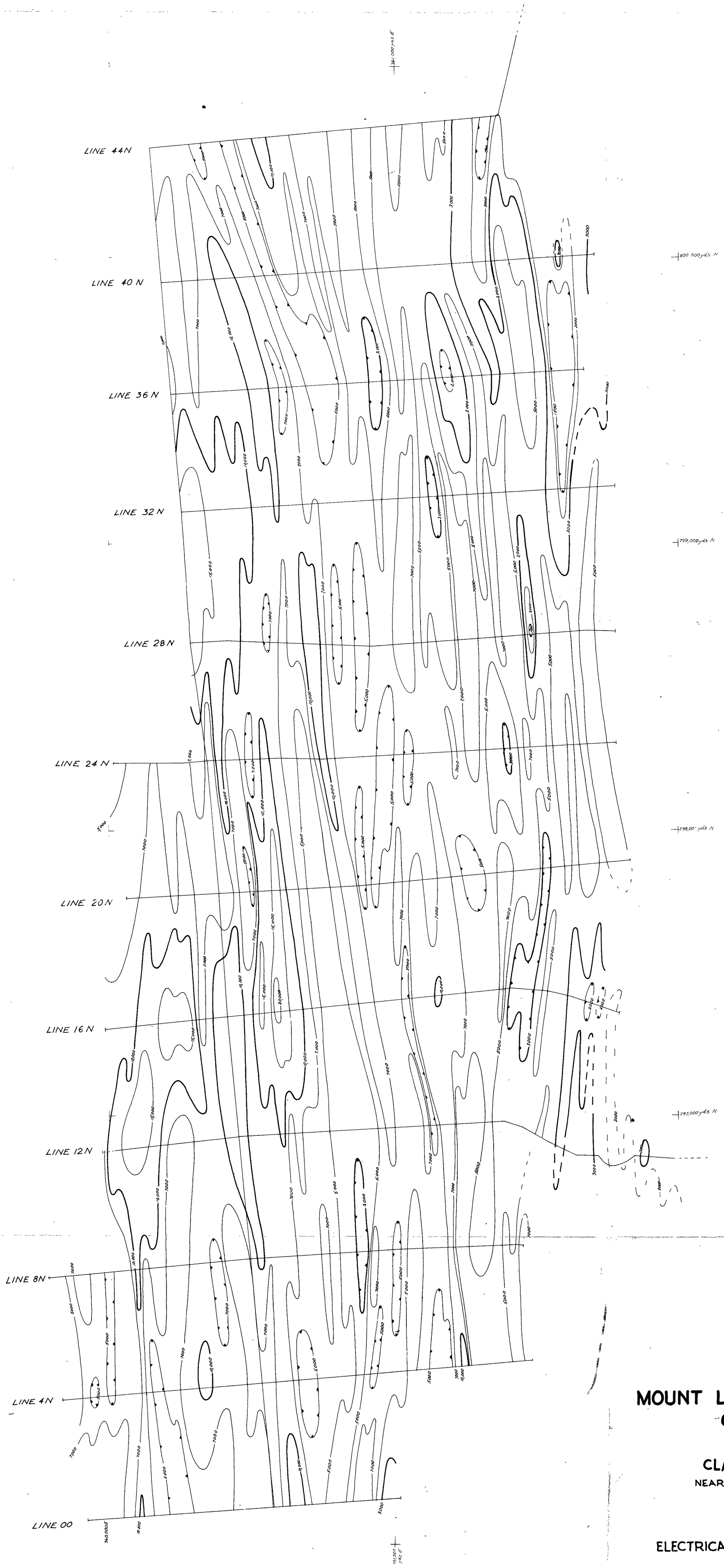
5 cm

Job N° TAS-054-D Sheet 1 of 1

FIG. 8
PLATE 1.

235043

007



MOUNT LYELL MINING & RAILWAY COMPANY LTD.

CLARK RIVER GRID

NEAR QUEENSTOWN - TASMANIA

78-1291

GRADIENT ARRAY
ELECTRICAL INDUCED POLARIZATION
SURVEY

RESISTIVITY CONTOUR PLAN

SURVEYED & COMPILED BY
SCINTREX

JANUARY - FEBRUARY 1978

225044

SCALE 1: 6000

5 cm

Job N° TAS-054-D Sheet 1 of 1

FIG. 9
PLATE 2.

003

Legend

(1) Magnetic high ≈ > 1000 γ

(2) Magnetic low ≈ < 400 γ

(3) Add 62,000 γ to all values

MOUNT LYELL MINING & RAILWAY COMPANY LTD.

CLARK RIVER GRID

NEAR QUEENSTOWN - TASMANIA

78 -1291

TOTAL MAGNETIC FIELD SURVEY

CONTOUR PLAN

SURVEYED & COMPILED BY

SCINTREX

JANUARY - FEBRUARY 1978

235045

SCALE 1:6000

5 cm

Job No. TAS-054-D Sheet 1 of 1

FIG. 10

PLATE 3

009

44N.
40N.
39N.
36N.
32N.
28N.
24N.
20N.
16N.
12N.
8N.
4N.
0

CLARK RIVER CAMP

798,000 Yss N.
797,000 Yss N.
796,000 Yss N.
795,000 Yss N.
794,000 Yss N.
793,000 Yss N.
792,000 Yss N.
791,000 Yss N.

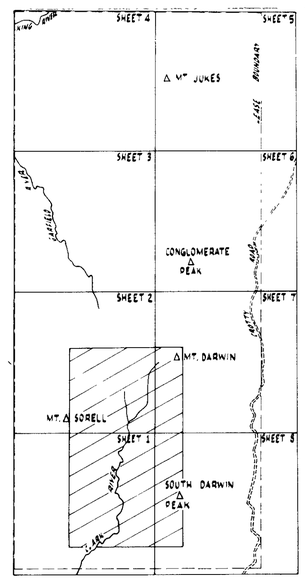
359,000 Yss E.
360,000 Yss E.
361,000 Yss E.
362,000 Yss E.
363,000 Yss E.

Ag 3 p.p.m.
GEOCHEMISTRY Zn >30 p.p.m.
Pb >50 p.p.m
Cu >30 p.p.m

CHARGEABILITY

RESISTIVITY

LOCATION MAP



5 cm

TRUE NORTH
MAGNETIC N.

235046 78-1291

MT. LYELL - G.O.D.L. JOINT VENTURE

JUKES - DARWIN E.L. 21/76

CLARK VALLEY GRID 010

ANOMALY COMPILATION

DRAWN	M.H.
TRACED	R.G.W.
CHECKED	
DATE	16:8:'78
SCALE	1:6,000

FIG. 11

MT. JUKES

CROTTY

KING RIVER

CURRIE CAMP

GARFIELD CAMP

DARWIN ROAD

MT. DARWIN

SLATE SPUR

CLARK VALLEY GRID

MT. SORELL

CLARK CAMP

TEN MILE HILL

SOUTH DARWIN PEAK

PIST

MACQUARIE HARBOUR

TRUE NORTH

MAGNETIC NORTH

LEGEND

- ROAD MAINTENANCE
- GRID CUTTING
- ACCESS CUTTING
- I. P. SURVEY
- DIAMOND DRILLING

5 cm

FIG. 12

78-1291

MT. LYELL - G.O.D.L. JOINT VENTURE

JUKES - DARWIN
E.L. 21/76
PROPOSED WORK 1978-79

DRAWN: M.H.
CHECKED:
DATE: Aug. '78
SCALE: 1:31,680

235047 011