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ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED
West Coast Department.

INTERIM REPORT ON EXPLORATION AT MELBA FLATS TASMANIA

EXPLORATION LICENCE
2/62

BY

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INTERIM REPORT ON EXPLORATION LICENCE 2/62.....

MELBA FLATS

Summary

The report is mainly concerned with exploration work done in the northern part of the area E.L.2/62. Magnetometer and geochemical surveys were conducted along with limited geological mapping. The report discusses the magnetic results and the geochemical results along with the methods used for analysing the latter, namely qualitative, profiles, contour plans and statistical means. Anomalous areas are discussed and recommendations for electromagnetic surveys of these areas are made.

1.0 Introduction

Investigations within the area held by the Company under Exploration Licence 2/62 - Melba Flats have been done in four stages. The first involving induced polarisation (I.P.) surveys and drilling of lead prospects in the southern half; the second involving drilling of the Cuni copper-nickel field from Genets Winze south to Nickel Reward; the third stage was a magnetic survey, primarily to test for Renison Bell type pyrrhotite-cassiterite mineralisation, of the northern half of the area with subsequent drilling of the anomaly outlined; and fourth, a geochemical soil sampling programme covering the geophysical grid laid out for the magnetic survey.

The first two stages have been reported on separately, and this report deals mainly with the magnetic and geochemical work done to date in the northern part of the licence area.

2.0 Location

Exploration Licence E.L.2/62, Melba Flats, covers an area of nine and a half square miles lying between Renison Bell and Zeehan, the N.E. corner being three quarters of a mile west of Renison Bell.

The Murchison Highway runs beside the eastern side and the area is served for access by a few timber logging tracks off the Highway and an old tramway turning north off the N.E. Dundas Tram. The disused portion of the Emu Bay Railway cuts across the S.E. corner of the area. Further access is limited to the cut lines of the geophysical grid, by foot only.

6.0 Topography, Vegetation and Drainage.

Topographically the area divides itself into two distinct parts, namely the flats and the hills. The flats, from which the area gets its name, cover the southern two-thirds of the area and form a semi-swampy plain lying at about 700' above sea-level. They are covered mainly by button grass, swamp grasses and short scrub with occasional stands of timber over the better drained parts, thick stands of ti-tree occur in places, especially where burning off has been done in the past.

The hills, which rise in the northern part of the area up to heights of 1,800' form a deeply dissected water-shed between the Pieman River system to the north and draining to the Little Henty in the south. The watershed runs obliquely N.W.-S.E. across the region. The hills are covered by the thick sclerophyll rain forest typical of Tasmania's West Coast Regions.

4.0 Geology

The area is underlain by rocks of Upper Proterozoic and Lower Cambrian age from the Oonah Quartzite and Slate Series (Spry 1958) and Crimson Creek Series Formation (Taylor 1954). Exposures are poor to non-existent except in cuttings along the trams and the Emu Bay Railway.

4.1 Oonah Quartzite and Slate

The Oonah Quartzite and Slate series occupy the northern and north-western portions of the area. Outcrops can be found in the larger creeks and in wash-aways along timber tracks. The series is, as its name implies, a succession of quartzite and slates. Lithologically ther series consists of alternating pale grey saccharoidal quartzitic sandstone, thin bedded micaceous quartzite and siltstone and hard, laminated grey or black shale.

The sequence is often intensely folded but has suffered little dynamic metamorphism. Despite the fact that the formations are often cleaved and the shale and siltstones converted to slate or phyllite the bedding is usually visible.

Within the licence area the formation along with the overlying Crimson Creek Formation form the southern limb of an anticline, which runs through Renison Bell, striking somewhat south of east and plunging to the east.

The boundary between the Oonah and Crimson Creek is obscure in the field, but shows up in the geochemical sampling as an abrupt change in the background values for Copper and Nickel. The boundary appears to be faulted in the west by a N-S fault at or about 6100' W but could be structurally conformable between 500'S and 00 in the north of the area, and south of line 14S in the west.

4.2 The Crimson Creek Formation

On the West Coast of Tasmania the Crimson Creek Formation is a series of unfossiliferous red, green and purple argillites and mudstone with grey and black slates and shales, and occasional greywackes, they lie with structural conformity over the Oonah Quartzites and Slate Formation and apparently conformably under the fossiliferous Dundas Group. Lithologically the formation is similar to the Dundas Group. The sequence is considered as ranging from Lower to Middle Cambrian in age.

In Melba Flats E.L.2/62 the Crimson Creek rocks occupy the southern part of the area, outcrops are rare but the rocks appear to be similar to those described from the type area. They form a thick sequence of coloured argillites, slates and greywackes, with the argillites predominating in the north (near the base of the sequence) and the slates and greywackes predominant in the south. Evidence from drill cores indicates fairly rapid changes in the sedimentary facies along strike.

As mentioned earlier the sequence in Melba Flats forms part of the southern limb of the Renison Bell anticline.

4.3 Silurian - Devonian

Rocks from the Silurian and Devonian have been mapped by Department of Mines geologists in the extreme south of the area. This portion has not been examined in the current programme.

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4.4 Quaternary - Recent

In the flat lying southern part of the area there is an intermittent superficial cover of gravels, silts and alluvium probably deposited in a shallow lake. A bull-dozer cut at Nickel Reward shows the sequence well.

4.5 Intrusive Rocks

Intrusives in the area fall into two periods and three or four types.

(a) Cambrian

Towards the close of the Cambrian Period, the West Coast eugeosyncline which must have been largely filled with Crimson Creek and Dundas sediments was intruded by dykes and sills of basic to ultrabasic composition.

In the Melba Flats exploration area there is a large transgressive sill which appears to have been intruded at the top of the Crimson Creek Formation. The predominent rock is pyroxenite (Spry 1962) grading into norite. The pyroxenite is locally serpentinised and contain segregations of massive magnetite. This sill cuts the area on its eastern side by the Argent Tunnel and runs S.W. across the area.

In addition there is a swarm of both basic and ultrabasic sills (or dykes) running N-S through the middle of the area. These sills are of two types, pyroxenite and gabbro, although both are now altered by regional metamorphism. At times the sills are distinct of one type and elsewhere they are composite of the two types.

Nickel and copper mineralisation is associated with the pyroxenite intrusions.

(b) Post-Cambrian

Although not seen in outcrop, boulders of fresh dolerite, probably of Jurassic age have been found occasionally. The main occurence lies at about 2000'W on Line 5S. The nearest known occurences of Jurassic dolerites are Mt. Dundas to the S.E. and the Eureka Cone Sheet. It is possible that the dolerites in the exploration area of glacial origin, but since no deposits of glacial type have been observed it is more likely that the boulders are of local derivation, probalby from a small dyke.

5.0 Mineralisation

Three types of mineralisation are known in the general area around Melba Flats and all have been or are being worked. Copper-nickel mineralisation of the 5-mile Cuni Field, lead-zinc-silver from the McKimmie and Lead Blocks mines and tin from the cassiterite-pyrrhotite deposits of Renison Bell. Apart from the Renison Bell deposits, in no case was production large and mining activity ceased completely several years ago.

5.1 Copper-Nickel - The Five Mile Cuni Line

Mineralisation of copper and nickel from associated ultrabasic miner intrusions was first discovered in the area in 1893 and the various prospects and mines were worked intermittently up to 1938.

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Extensive geophysical surveys of the field were made by the Imperial Geophysical Experimental Survey in 1928 and by the Bureau of Mineral Resources in 1952-53. Several drill-holes were put down as a result of this work.

The mineralisation forms two types viz:- Pentlandite-Pyrrhotite - Chalcopyrite over the stretch from Genets Winze to the Vaudeau Shaft, and Millerite - Chalcopyrite - Pyrite at Nickel Reward and Devereaux's Prospect. They appear to be different phases of the same mineralisation (Williams 1958).

The deposits showed good electromagnetic and self-potential results and indicate reasonable geochemical anomalies around the known workings.

5.2. Lead-Zinc.

The old mines, McKimmie and Lead Blocks, were developed on veins of galena and sphalerite in a gangue of quartz and siderite. The veins generally strike north-south, but although the veins may be presumed to extend over fair distances, the economic mineralisation is patchy. Little information is available but it would appear that the mineralisation occurred as high grade lenses within the gangue.

Apart from these old mines numerous other minor occurrences of Lead/Zinc bearing veins and veinlets have been recorded, all in the flat-lying part of the exploration area. It is probable that this mineralisation, which in late-Devonian in age, was concentrated along pre-existing fractures, there being no suitable rock units for replacement deposition. Among the more unexpected places to find this type of mineralisation is within the ultra-basic intrusives of the Cuni Field, and nearly all the drill-hole intersections of the Ultrabasic intrusives show a thin seam of quartz-siderite-galena-sphalerite within them.

No mineralisation of this type is known north of Lead Blocks, although there has been a certain amount of past prospecting activity, as is shown by the number of quite long adits existant in the area. None of those adits open to examination show any traces of extant mineralisation, nor can any obvious reason be found for their having been developed.

5.3. Tin-pyrrhotite-cassiterite.

The tin deposits of Renison Ltd. lie approximately one mile to the east of the northern part of the area. The lodes form three types,

(a) The sill type lodes - formed by replacement of calcerous sediments by cassiterite and sulphides, the sulphides being primarily pyrrhotite.
(b) Fissure lodes - which are replacement bodies along fault lines trending N.W. with mineralisation similar to a).
(c) Quartz-Tourmaline-cassiterite veins.

Of these type c) is unimportant econimically.

The sill type orebodies lies near the top of the Oonah or the base of the Crimson Creek and fall along strike from the north of E.L. 2/62. The presence of pyrrhotite makes this type of deposit susceptible to magnetic prospecting though at Renison the magnetics, although often significant, are confused.

The mineralisation is probably associated with nearby intrusions of quartz porphyry of Late Devonian age.

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6.0 Exploration in the Northern Area.

Prospecting under the current licence in the northern area has been done in two stages, one involving a magnetometer survey followed by drilling of the magnetic anomalies so defined, and secondly, following the inconclusive nature of the first stage by a geochemical soil sampling programme using the grid laid out for the magnetic survey.

6.1 The Geophysical Grid.

A grid of cut and pegged lines for the purposes of magnetometric surveying in the northern area was put down from three base lines. The first, following the eastern side of the licence area was cut for some 8000' south from the datum peg for the area. The second was cut at a position 5000'W, northerly from Genet's Winze in an attempt to reduce the errors inherent in cutting straight lines for 10,000' through heavy forest. The third at 4000'W ran northerly from line 1S.

Traverse lines, intended to run west from the primary base line for 10,000' were laid out perpendicularly to the base lines at 500' intervals, initially from 1S to 16S and later from 1S to 10N. Although originally intended to be parallel, the traverse lines frequently ran badly askew and their approximate positions are shown on the accompanying plans.

The traverse lines were pegged with stations at 100' spacings.

7.0 The Magnetometer Survey.

The magnetometer survey was done using a McPhar 500 magnetometer, with readings taken at 100' intervals along the traverse lines.

The first part of the survey covered lines 1S to 16S and showed two, elongated, parallel, anomalous zones striking NW-SE.

The Westerly anomaly - the stronger of the two - runs S.E. from around 5800E on line 1S and diminishes to the S.E. As there was no closure of the anomaly to the north the grid was extended in that direction from lines 00 to 10N. In the event the anomaly was found to close in the north at line 00.

The minor, easterly anomaly, starts on Line 3S and peters out between 9S and 10S.

Three source types producing magnetic anomalies connected with mineralisation are known in the area, these are:

(a) Cassiterite-Pyrrhotite at Renison Bell.
(b) Magnetite in serpentine.
(c) The copper-nickel mineralisation of the Cuni Field.

(a). The Renison magnetic anomalies are discontinuous in length and are of very variable shape, whereas the E.L. 2/62 anomalies are remarkable in their continuity and shape over a long strike distance. The Renison anomalies are also markedly larger.

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(b) A magnetite-serpentine association with less magnetite than that found in the local major ultrabasic instrusions could account for the anomaly.

(c) The magnetometer survey conducted by the B.M.R. over the Cuni area was inconclusive in character and cannot be discussed in relation to the N. Melba Flats anomalies, although their very inconclusiveness would tend to preclude any thought as to a similar origin.

Webster in his report on the survey calculated the depths and dips of the sources of the two anomalies, on line 1S for the westerly one - Anomaly 'A' and on lines 5S and 6S for the easterly, Anomaly 'B'.

For anomaly 'A' he calculated a source beneath 5875'W, 100' in thickness, at a depth of 100' and dipping to the east at 45°.

Anomaly 'B' on lines 5S and 6S was calculated to have a depth/width ratio of 1:1 and a depth of 75-100 feet. The source was calculated to dip east at 45°.

On thr results of the magnetometer survey anomaly 'A' was drilled.

7.1 Drilling of Magnetic Anomaly 'A'.

Drill-hole M.F.P. 124 was sited at 5600'W near line 2S and was drilled to the west to investigate the magnetic source at a shallow depth. The hole passed through a thick series of sandstones, argillites and mudstones without encountering any recognisable magnetic source. However since the weathering of the rocks extended to 200' no reasonable assessment of the rock types could be made.

Because of the weathering encountered in M.F.P. 124, a second hole M.FP. 125 was drilled to 500', to pass below this weathered zone. Sediments similar to those encountered in M.F.P. 124 were found but no magnetic source was intersected.

It was then decided to apply other methods of investigation before drilling again, starting with geochemical soil testing.

8.0 The Geochemical Soil Survey

The soils in this area generally fall into the category designated as yellow podzolic. These soils normally form over siliceous rocks which form sufficient clay on weathering. The soil depth in the area varies from six inches to three feet with normal soil profiles being found only in the areas of deeper soil cover. Where the soil is shallow the 'B' horizon is usually vestigial; this most frequently occurs on the steeper slopes.

The north Melba Flats area being hilly and showing this wide variation in soil development meant that sampling of either of the two upper horizons would be of dubious value, so that in order to attain reasonable similarity between samples it was decided to take the lower 'B' and 'C' horizons for comparative analysis.

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Soil sampling was done using a 3" diameter hand-driven soil auger of standard type. Samples were taken over the grid laid out for the magnetic survey and a sample of approximately 50 grams from the lower 'B' and 'C' horizons was collected at each 100' station.

No preparation of the samples was done locally (for fear of contamination at Rosebery) and all were sent for analysis to outside analysts (Geochemical and Mineralogical Laboratories). All the samples were analysed by atomic absorption spectrophotometry for lead, zinc, copper and nickel, and by colorimetric methods for tin.

The analysis results were recorded in parts per million (p.p.m.) for each metal and were subjected to plotting and analysis by various methods.

8.1 The Geochemical Results.

A first examination of the geochemical analyses showed the general range of values for each metal, suggesting probable anomalies for lead, zinc and copper and indicating that tin was unlikely to be an important factor in the area. The analyses also revealed that the boundary between the Oonah Quartzite and Slate Formation and the Crimson Creek Formation could be fairly accurately located from the analyses for copper and nickel. The background values for these metals fell markedly from around 30-40 ppm Ni and 40-70 p.p.m. Cu over the Crimson Creek rocks to 0-10 p.p.m. for both metals over the Oonah. The lead and zinc values were also generally lower but the fall is not so marked as the range of values is somewhat greater. This same effect has also been noted over the contact between similar rock groups at Trial Harbour S.P.L. 22.

8.2 Qualitative Analysis.

A qualitative analysis of the results of a geochemical survey is probably the most accurate method of assessing backgrounds and anomalous areas. Strict data analysis may be used as a guide but in a situation as complicated as a semi-regional field survey the probability of multiple populations must not be over-looked and to much weight should not be given to estimates made by these methods. The basic problem of the amount of data accrueing from a survey of this nature is to present it in a digestible manner.

In this instance, to allow for qualitative appraisal the results were plotted in profiles along each line, initially with the individual metal profiles plotted one on top of the other. The advantage of this method is that all the available data could be presented on one or two sheets of paper and the whole could then be viewed as a whole entity. Subsequently the line profiles were plotted indepently along with the magnetic profiles for presentation.

Contour plans were also attempted but prior to the strict data analysis difficulty was encountered in selecting the optimum contour intervals for the range of values received, to enable a readable plan to be drawn up.

8.3 Statistical Analysis.

Ahrens (1954; i) & ii), 1956) reported that the distribution of some elements in specific rock types is log-normal. Following on from Ahrens' report Tennant and White (1959) applied the idea to geochemical work on soil in the area around Franklin, New Jersey, and their work tended to confirm the suggestion of log-normality for the distribution of trace elements in soil.

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The geochemical results for lead, zinc and copper from the exploration area were first divided into those taken over Crimson Creek rocks and those from the Oonah. The results for the Crimson Creek were then distributed normally and the distributions for the three metals were all found to be strongly skewed to the right, which itself suggested a log-normal distirbution. This was then tried and the log-distribution curves for each metal showed that there was a far closer fit for log normal than for normal distributions. The log distribution curves were then tested by the χ^2 test of Pearson and Hartley for 'goodness of fit', but in no case was the fit with the theoretical distribution close enough to suggest that the samples could have been taken randomly from a single population.

Following on from this the log distributions were then plotted as cumulative percentage distributions on linear probability paper (alternatively, the normal distributions could be plotted on log-normal probability paper) in the manner described by Tennant and White. In each case the cumulative % distribution curves plotted out as two or more straight lines of different slopes suggesting that there is more than one population from which the metals are derived. It is suspected that in all probability two populations are present, one a background of metal originally in the sediments and syngenetic with them and a second anomalous one superimposed later. There is no method by which two overlapping populations can be separated statistically.

8.4 Means, Threshold Values and Probably Anomalous Values

Notwithstanding the presence of multiple populations, the impossibility of estimating the threshold and probably anomalous values by rule of thumb made the use of statistical methods necessary.

In each case from the complete data the logrithims of the geometric means, log (Mg), and the geometric standard deviations, log (Sg), were calculated. On the method described by Hawkes and Webb, that threshold values may be considered as the mean plus two standard deviations and probably anomalous values being greater than the mean plus three standard deviations the log values of these quantities were derived and then converted to parts per million.

In the results, the threshold and probably anomalous values calculated in this manner are considered to be far too high, because they are drawn from two populations one of which is probably anomalous. So that in order to assess the survey as a whole they have been donw graded arbitarily by what seems to be a reasonable figure.

The calculated results are as follows:-

(a) Crimson Creek Formation

	Threshold	Down graded value p.p.m.	Probably anomalous greater than	Down graded p.p.m.
Pb	log 2.9190=p.p.m.	500	log 3,3923=2470p.p.m.	1000
Zn	log 2.7284=535p.p.m.	300	log 3,1126=1295p.p.m.	500
Cu	log 2.3207=209p.p.m.	100	log 2,7074=510p.p.m.	250

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(b) Conah Quartzite and Slate Formation.

Pb	log 2.2176 = 165 p.p.m.	100	log 2.7463 = 557 p.p.m.	300
Zn	log 1.7812 = 60.41 p.p.m.	50	log 2.1286 = 135 p.p.m.	100

On completion of the statistical data analysis, the second stage qualitative appraisal was made. Contour plans using the probably anomalous and threshold values as primary contour intervals (essential a debased form of log value contours) were drawn up, as well as a graphic plot to high-light the anomalous samples.

From these two plots certain anomalous zone were identified.

9.0 The Anomalous Areas.

9.1 Copper.

Only one area of anomalous copper is present, involving samples taken at 4300'W on line 14S at 800 p.p.m. and at 4100'W on line 15S at 750 p.p.m. Both values are markedly anomalous and 'peak' strikingly up from a background of 40-50 p.p.m. The anomaly may have an association with an isolated lead high of 5800 p.p.m. at 4100W on line 14S.

Field examination shows the area to lie in a flat-lying basin to the south of the hills. No outcrops were observed save at 4100W on line 14S where a short trench has been dug in a quartz rich gossanous material.

It is proposed to use the R.E.M. equipment over the area to look for possible conductors and their attitudes.

9.2. Nickel.

Analyses for nickel revealed two anomalous areas.

(a) Line 16S 00-700' W.

High nickel and zinc in this area are associated with the underlying proxenite and serpentine of Serpentine Hill. The values are as expected over such a bedrock and no further action would appear necessary.

(b) Line 14S 5100-5200 W.

Very high nickel values were located in samples taken adjacent to an outcroping gabbro dyke or sill. The 'C' horizon soil was the typical blue colour associated with the ultrabasic intrusives of the Cuni Field and it is likely that the anomaly is associated with mineralisation of this type. Since the anomaly is not repeated to the north or south it appears unlikely that the size of the mineralised zone is of sufficient size to be of interest.

9.3. Copper-Nickel

One minor copper-nickel anomaly occurs on Line 3S at 2100W and 2200W. The copper, at 292 p.p.m., is definitely anomalous. There are no outcrops to be seen and the anomaly appears to have no extensions to North or South and the source is almost certainly small. No further action would appear warranted.

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9.4 Lead-Zinc

The major geochemical anomalies in the area are, as expected, lead/zinc with lead predominating. The anomalies fall into three major zones and a number of small isolated groups. Possible connections can be extrapolated between the major anomalies.

(a) Lines 13S, 14S and 15S 0-1500W

This area of 0.08 square mile contains the largest single grouping of anomalous lead and zinc values. A cumulative percentage distribution plot of the log values yields an almost straight line, suggesting a single population, although it is more likely that a second anomalous population has swamped the background population into insignificance.

Contour plots of the lead values show two trends both approximately N-S indicating two distinct sources. The eastern trend is fairly compact over lines 15S, 14S and 15S, while the western trend can be extrapolated south to line 16S and north to line 12S.

Field examination along the lines has revealed an almost complete lack of outcrop and further investigation will have to depend of geophysical prospecting methods or diamond drilling.

(b) A.N.E. trending anomaly lies between 1100W and 1400W on line 11S and 200W-500W on line 6S. This anomaly is somewhat erratic over its whole length of 2500' and its strike is at variance with that of the country rocks (strike-335°T) and the general strike of the known galena lodes in the Dundas and Crimson Creek mining field which both strike generally W of N (Blisset 1962).

(c) A.N.E. trending anomaly lies parallel to (b). and to the west of it between 2300W and 2800W on line 10S and 1600W on line 6S. As with (b) the anomaly is erratic over its length of some 2000'. It can possibly be extrapolated to 3500W on line 13S.

(d) Line 14S 6900-7000W

Two adjacent samples near the Crimson Creek-Oonah boundary show very high zinc and above threshold lead. Field examination was baulked by poor outcrop, but samples of a quartz rich limonitic material were found at 6900'W from the roots of an upturned tree. There appears to be the possibility of a lode source 500-1000' in length in the area, which is flat lying and swampy. Geophysical methods should be tried over the anomaly.

(e) Line 4N 6500'W - 6900'W

This is the only anomalous area in the region underlain by the Oonah Formation. Highly anomalous lead and minor zinc show up over 500' on this line.

(f) Miscellaneous

Several isolated anomalous values.

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10.0 Discussion and Recommendations

Examination of the data shows that in no case can any correlation be made between the magnetic anomalies and the geochemical anomalies. Which still leaves the question as to the source of the magnetic anomalies unanswered.

The known mineralised zones in the Crimson Creek Formation to the south and north of the area sampled show that the mineralisation occurs either as groups of small veins - as at Lead Blocks, or as mineralised sheer zones with lenses of economic mineralisation in a gangue of quartz and siderite - as at the McKimmie Mine in the south and the Success Creek Mines in the north. It would seem likely that the sources of the anomalies under discussion will fall into one or other of these patterns. The chances of more continuous mineralisation than is normal in the Zeehan-Dundas fields are poor, but the possibility must be looked for.

Surface mapping in the area seems unlikely to supply any additional information due to an almost complete lack of adequate outcrop, and recourse must be made to geophysical prospecting methods to try and locate the mineralised zones by their electrical properties.

On this basis it is recommended that the next stage of prospecting be done by electromagnetic methods using the McPhar R.E.M. equipment. It is recommended that readings be taken at 50' intervals with transmitter - receiver spacings of 50', 100' and 200' over the following areas, which cover the main anomalous zones and the larger isolated anomalies.

10.1 Areas recommended for R.E.M. Transversing

Line 4N	6300W	-	7100W
Line 5S	500W	-	1300W
Line 6S	00	-	700W
Line 6S	1100W	-	1700W
Line 7S	00	-	700W
	1100W	-	1700W
Line 8S	00	-	1300W
	1800W	-	2500W
Line 9S	00	-	1500W
	2200W	-	2800W
Line 10S	2200W	-	3300W
	00	-	1400W
Line 11S	800	-	1500W
	2200W	-	3200W
Line 12S	600W	-	1200W
Line 13S	00	-	1500W
Line 13A S	00	-	1500W
Line 14S	00	-	1500W
	3500W	-	4500W
	6800W	-	7200W
Line 15S	00	-	1500W
	3500W	-	4500W

To check for conductors in the region of the magnetic anomaly.

Line 2S	5200W	-	600W
Line 6S	1400W	-	2200W

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APPENDIX

A). Statistical Calculations

i) Crimson Creek Formation - Lead
Zinc
Copper

ii) Oonah Slate and Quartzite - Lead
Zinc

B). Linear Probability Plots of Logrithmic distributions

i) Crimson Creek Formation - Lead
Zinc
Copper

ii) Oonah Slate and Quartzite - Lead
Zinc

iii) Lines 12S, 13S, 13A.S, 14S, 15S, 0-1500W.

CRIMSON CREEK FORMATION..... LEAD DATA ANALYSIS

GRADE INTERVAL log	MIDPOINT OF GRADE INTERVAL m.p.	OBSERVED FREQUENCY f.o.	fox(mp)	$fox(mp)^2$
0.6-0.8	0.7	1	0.7	0.49
0.8-1.0	0.9	3	2.7	2.43
1.0-1.2	1.1	6	6.6	7.26
1.2-1.4	1.3	46	59.8	77.74
1.4-1.6	1.5	110	165.0	247.50
1.6-1.8	1.7	187	317.9	540.43
1.8-2.0	1.9	132	250.8	476.52
2.0-2.2	2.1	100	210.0	441.00
2.2-2.4	2.3	87	200.1	460.23
2.4-2.6	2.5	51	127.5	318.75
2.6-2.8	2.7	38	102.6	277.02
2.8-3.0	2.9	28	66.7	193.43
3.0-3.2	3.1	15	46.5	144.15
3.2-3.4	3.3	6	19.8	65.34
3.4-3.6	3.5	5	17.5	61.25
3.6-3.8	3.7	2	7.4	27.38
		=8.2	$\Sigma fo(mp)=1601.6$	$\Sigma fo(mp^2)=3340.92$

$$\text{Log (Geometric Mean)} = \log (mg) = \frac{1601.6}{812} = 1.9724$$

$$\text{Log (Standard Deviation of Mg)} = \log (Sg) = \sqrt{\frac{\Sigma fo(mp)^2}{n} - \left(\frac{\Sigma fo(mp)}{n}\right)^2}$$

$$= \sqrt{\frac{3340.92}{812} - (1.9724)^2}$$

$$= \sqrt{0.2240}$$

$$= 0.4733$$

Threshold Values $\log (Mg) + 2 \times \log (Sq) = 2.9190 = 830$ p.p.m.

Probably anomalous values $\log (Mg) + 3 \times \log (Sq) = 3.3923 =$ 2470 p.p.m.

CRIMSON CREEK FORMATION - ZINC DATA ANALYSIS

Grade Interval Log	Midpoint of Grade Interval (mp)	Observed Frequency fo.	fox(mp)	fox$(mp)^2$
0.6 - 0.8	0.7	5	3.5	2.45
0.8 - 1.0	0.9	6	5.4	4.86
1.0 - 1.2	1.1	14	15.4	16.94
1.2 - 1.4	1.3	23	29.9	38.87
1.4 - 1.6	1.5	69	103.5	155.25
1.6 - 1.8	1.7	162	275.4	468.18
1.8 - 2.0	1.9	187	355.3	675.07
2.0 - 2.2	2.1	130	273.0	573.30
2.2 - 2.4	2.3	123	282.9	650.67
2.4 - 2.6	2.5	73	182.5	456.25
2.6 - 2.8	2.7	24	64.8	174.96
2.8 - 3.0	2.9	4	11.6	33.64
3.0 - 3.2	3.1	1	3.1	9.61
3.2 - 3.4	3.3	1	3.3	10.89
3.4 - 3.6	3.5	1	3.5	12.25

n = 823 ΣFo.mp=1613.1 Σfo.$(mp)^2$ 3283.19

Log (Geometric Mean) = Log (Mg) = $\frac{1613.1}{823}$ = 1.9600

Log (Standard Deviation of Mg) = Log (Sg) = $\sqrt{\frac{\Sigma fo\ (mp)^2}{n} - \left(\frac{\Sigma fo\ (mp)}{n}\right)^2}$

$= \sqrt{\frac{3283/19}{823} - (1.9600)^2}$

$= \sqrt{0.1476}$

= 0.3842

Threshold Values Log (Mg) + 2 x log (Sg) = log. 2.7284 = 535 p.pm.

Probably anomalous values log (Mg) = 3 x log (Sg) = log 3.1126

= 1295 p.pm.

CRIMSON CREEK FORMATION - COPPER DATA ANALYSIS

GRADE INTERVAL log	MIDPOINT mp GRADE INTERVAL	OBSERVED FREQUENCY fo	fo x mp	fo x $(Mp)^2$
0-1.0	0.5	20	10.00	5.00
10.-11	1.05	14	14.70	15.40
1.1-1.2	1.15	24	27.60	31.68
1.2-1.3	1.25	14	17.50	21.84
1.3-1.4	1.35	48	68.50	87.36
1.4-1.5	1.45	72	104.40	151.20
1.5-1.6	1.55	59	91.45	141.60
1.6-1.7	1.65	137	226.05	372.64
1.7-1.8	1.75	116	203.00	354.96
1.8-1.9	1.85	104	192.40	355.68
1.9-2.0	1.95	105	204.75	399.00
2.0-2.1	2.05	41	84.05	172.20
2.1-3.0	2.65	15	39.00	101.40
		N= 769	Σ(fo.mp)=1269.60	$\Sigma f_o(mp)^2$= 2209.96

LOG (Geometric Mean) = log Mg = $\frac{1269.60}{769}$ = 1.6513

LOG (Standard deviation) = log Sq = $\sqrt{\frac{\Sigma f(mp)^2}{n} - \left(\frac{\Sigma f_o mp}{n}\right)^2}$

$= \sqrt{\frac{2209.96}{769} - 1.6513)^2}$

$= \sqrt{0.148}$

log Sq. = 0.3847

Threshold values log Mg + 2 x log sq. = log 2.3207 = 209 p.p.m.

Probably anomalous values log Mg + 3 x log Sq. = log 2.7074 = 510 p.p.m.

017

102018

OONAH QUARTZITE AND SLATE .... LEAD DATA ANALYSIS

GRADE INTERVAL log (mp)	MIDPOINT OF GRADE INTERVAL (mp)	OBSERVED FREQUENCY fo	fo x (mp)	fo x $(mp)^2$
0.2-0.4	0.3	20	6.0	1.80
0.4-0.6	0.5	28	14.0	7.00
0.6-0.8	0.7	166	166.2	81.34
0.8-1.0	0.9	158	142.2	127.98
1.0-1.2	1.1	142	156.2	171.82
1.2-1.4	1.3	93	101.9	157.17
1.4-1.6	1.5	60	90.0	135.00
1.6-1.8	1.7	27	45.9	78.03
1.8-2.0	1.9	17	32.3	61.37
2.0-2.2	2.1	8	16.8	35.28
2.2-2.4	2.3	5	11.5	26.45
2.4-2.6	2.5	1	2.5	6.25
2.6-2.8	2.7	3.	8.1	21.87
		$= 728$	$\Sigma fo(mp) = 743.6$	$\Sigma fo(mp)^2 = 911.36$

$$\log (\text{Geometric Mean}) = \log (Mg) = \frac{743.6}{728} = 1.0214$$

$$\log (\text{Standard Deviation}) = \log (Sg) = \sqrt{\frac{\Sigma fo(mp)^2}{n} - \left(\frac{\Sigma fo(mp)}{n}\right)^2}$$

$$= \sqrt{\frac{911.36}{728} - (1.0214)^2}$$

$$= \sqrt{0.2099}$$

$$= 0.4582$$

The Threshold Values $\log (Mg) + 2 \times \log (Sg) = \log 1.9378 = 87$ p.p.m.

Probably Anomalous $\log Mg + 3 \times \log (Sg) = \log 2.3960 = 250$ p.p.m.

CONAH QUARTZITE AND SLATE..... ZINC DATA ANALYSIS

GRADE INTERVAL log	MIDPOINT OF GRADE INTERVAL (mp)	OBSERVED FREQUENCY fo	fo x (mp)	fo x $(mp)^2$
0.2-0.4	0.3	18	5.4	1.62
0.4-0.6	0.5	14	7.0	3.50
0.6-0.8	0.7	140	98.0	68.60
0.8-1.0	0.9	122	109.8	98.82
1.0-1.2	1.1	127	139.7	153.67
1.2-1.4	1.3	87	113.1	147.03
1.4-1.6	1.5	58	87.0	130.50
1.6-1.8	1.7	27	45.9	78.03
1.8-2.0	1.9	17	32.3	61.37
2.0-2.2	2.1	8	16.8	35.28
2.2-2.4	2.3	4	9.2	21.16
2.4-2.6	2.5	1	2.5	6.25
2.6-2.8	2.7	1	2.7	7.29
		n = 625	$\Sigma fo(mp) = 679.4$	$\Sigma fo(mp)^2 = 822.47$

$$\log (\text{Geometric Mean}) = \log Mg = \frac{679.4}{625} = 1.0870$$

$$\log (\text{Standard Deviation}) = \log Sq = \sqrt{\frac{\Sigma fo\,(mp)^2}{n} - \left(\frac{\Sigma fo\,(mp)}{n}\right)^2}$$

$$= \sqrt{\frac{822.47}{625} - (1.0870)^2}$$

$$= \sqrt{0.1354}$$

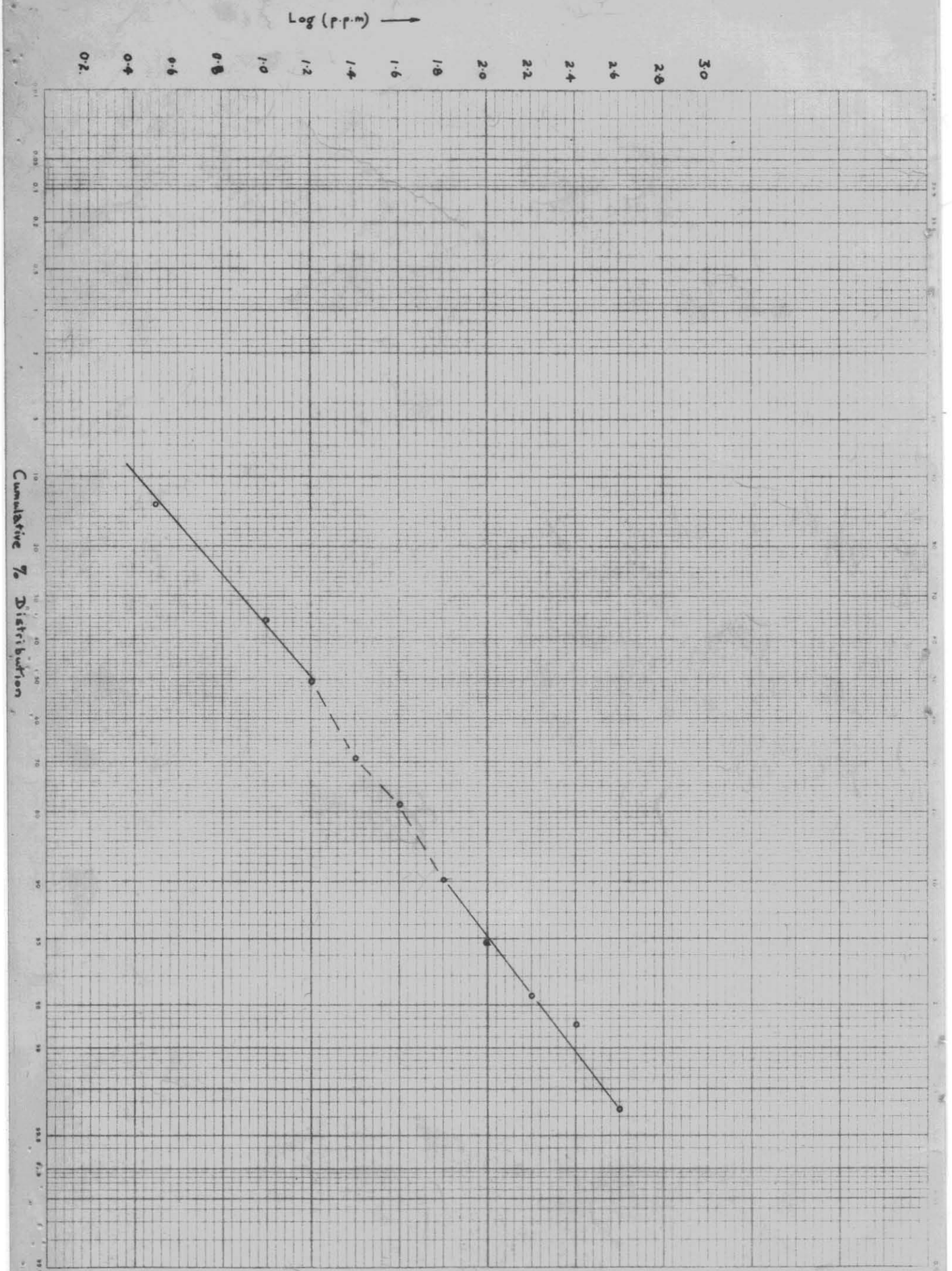
$$= 0.3680$$

Threshold Values $\log (Mg) + 2 \times \log (Sq) = \log 1.8230 = 63.$ p.p.m.

Probably Anomalous values $\log (Mg) + 3 \times \log (Sq) = \log 2.1910 =$ 155 p.p.m.

019

102020



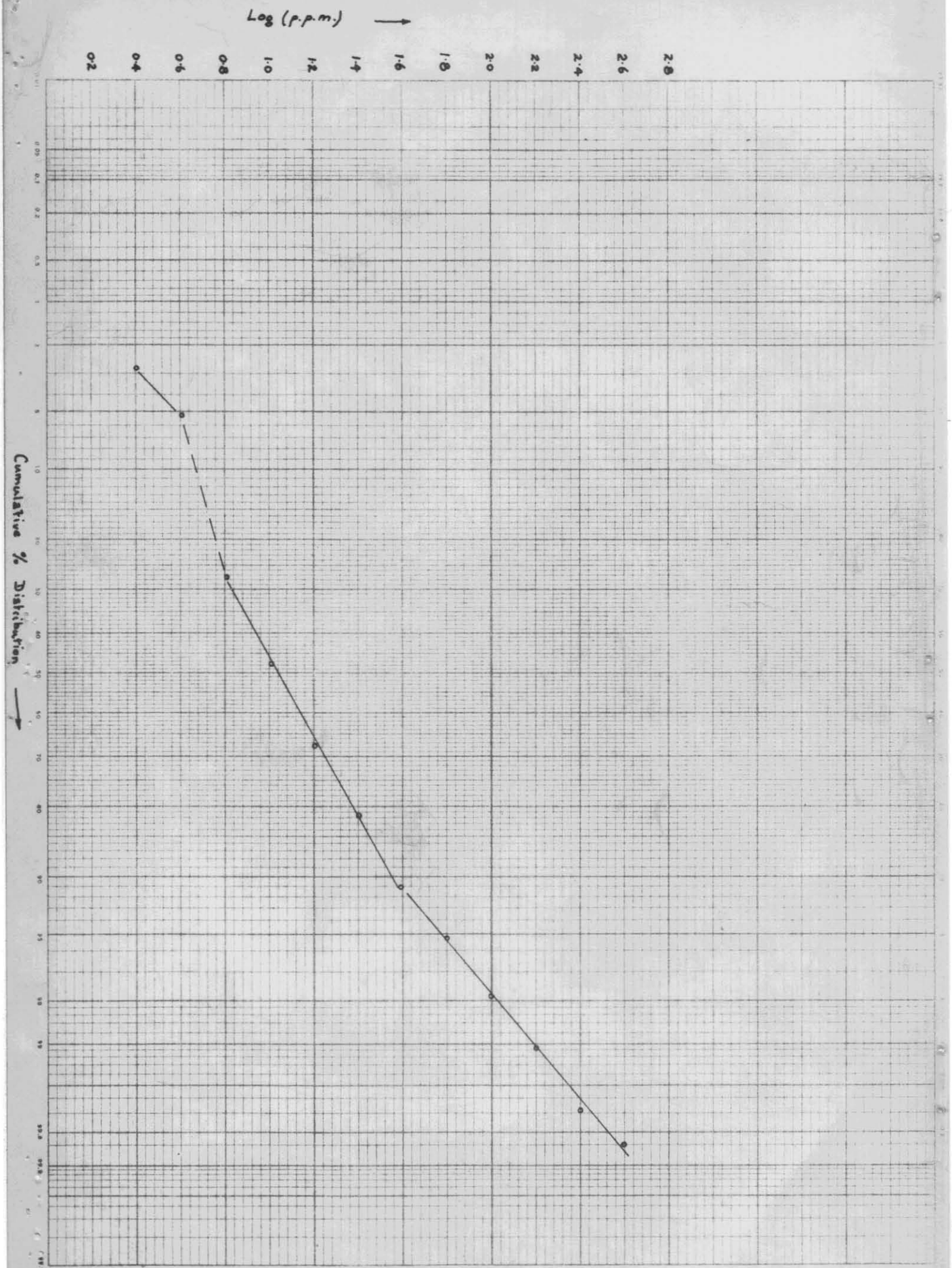
Lead .... Oonah .... Cumulative % Distribution Plot

5 cm

GORMACK GRAPH PAPERS : CHRISTCHURCH, N.Z.

020

102021



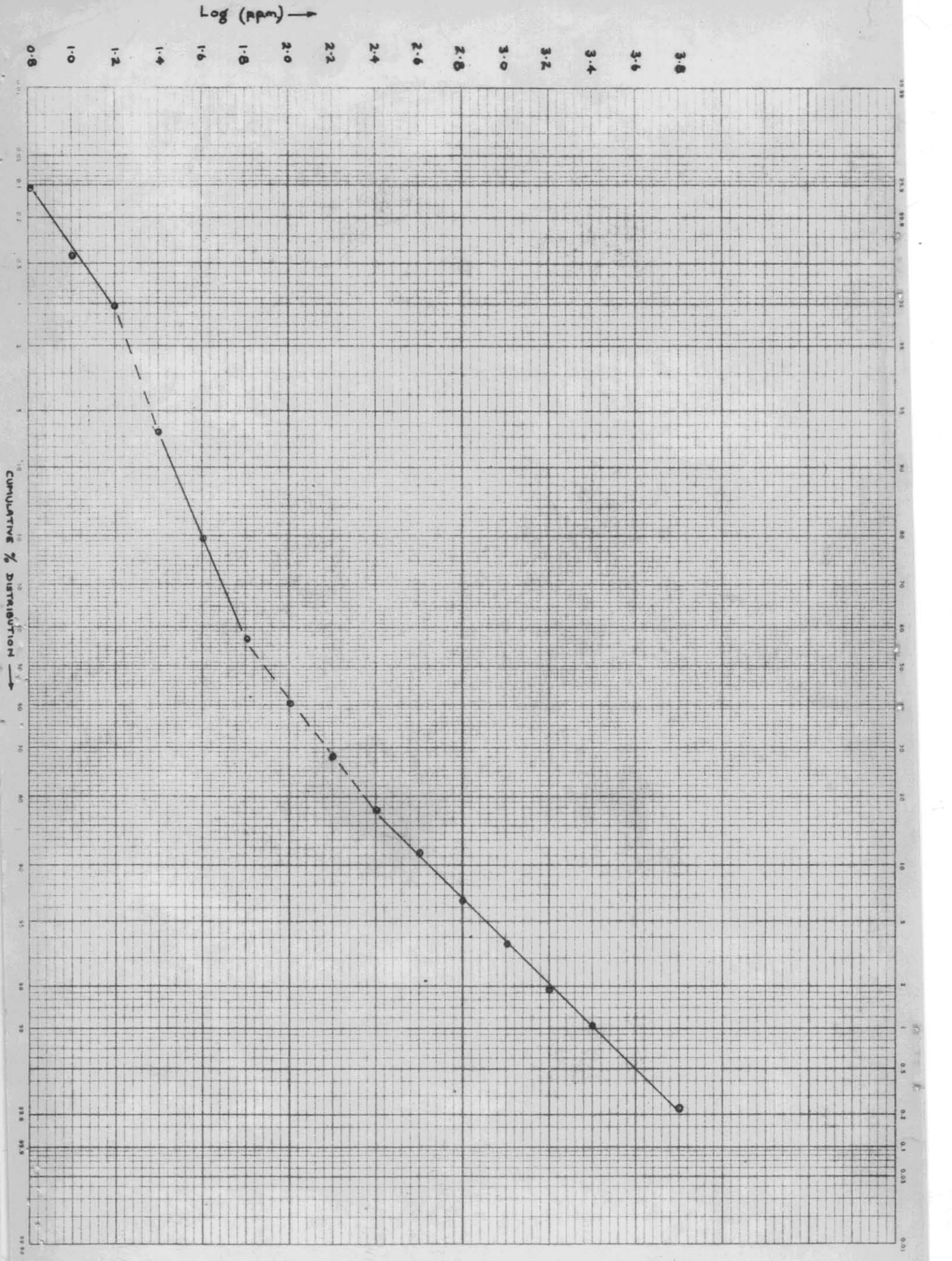
Zinc .... Oonah ..... Cumulative % Distribution Plot

5 cm

GORMAN CHART PAPERS . CHRISTCHURCH N.Z. No 1310 Probability 100 equal divisions

021

102022



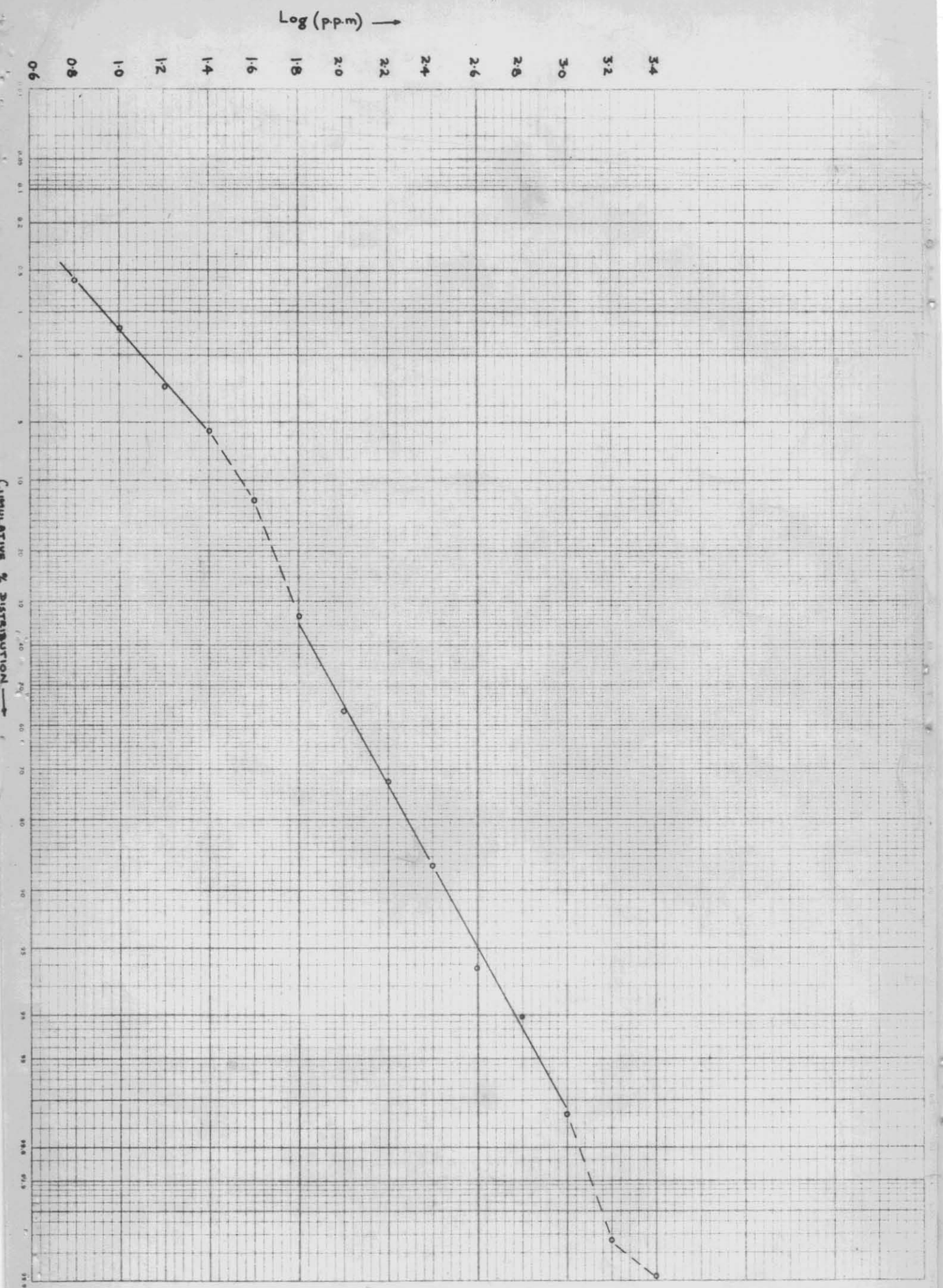
Lead .... Crimson Creek Series .... Cumulative % Distribution Plot

5 cm

GORMA ... PAPERS ... CHRISTCHURCH N.Z.

022

102023



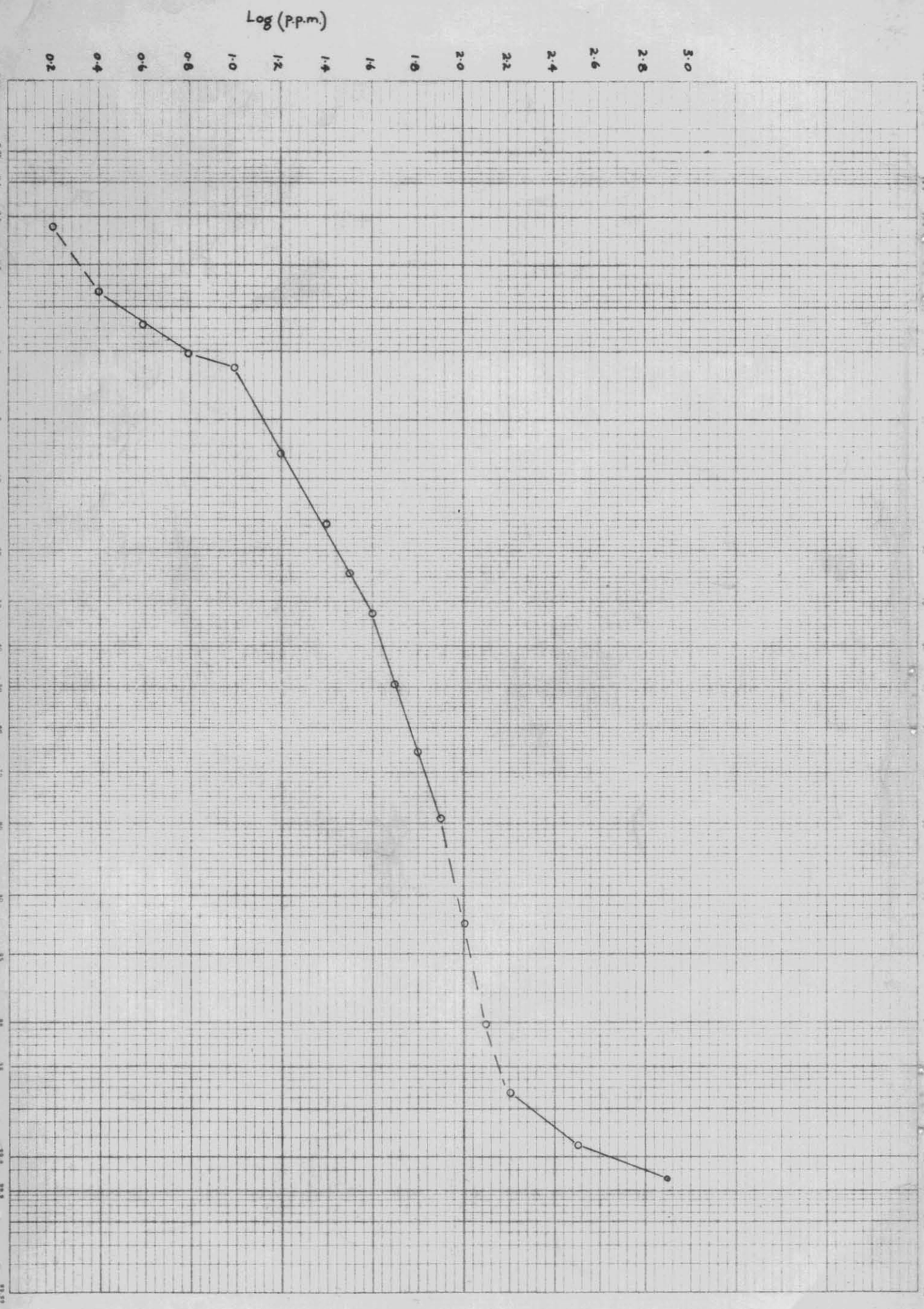
Zinc .... Crimson Creek Series .... Cumulative % Distribution Plot

5 cm

GORMAC GRAPH PAPERS : CHRISTCHURCH N.Z.

023

102024

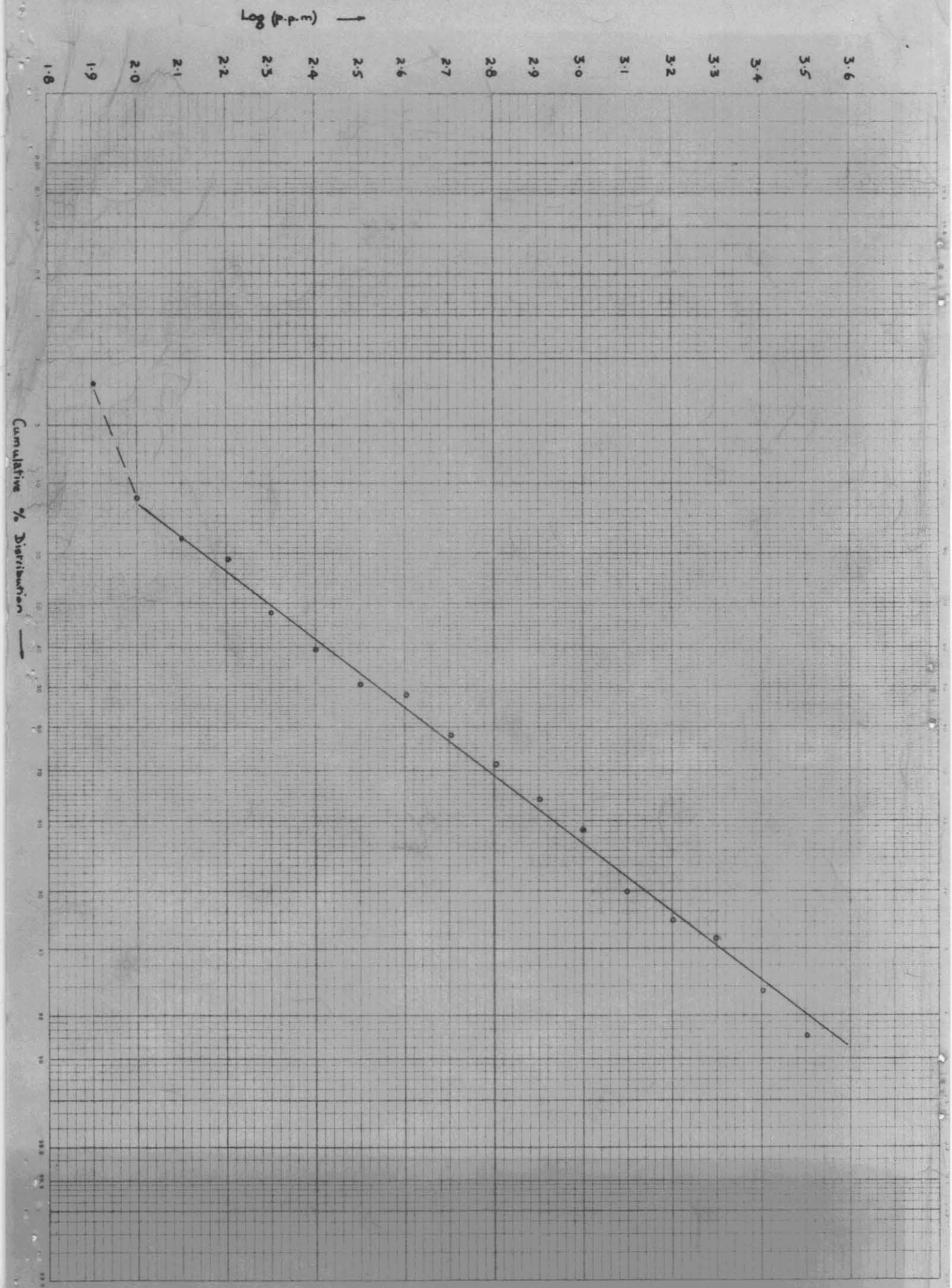


Copper .... Crimson Creek Series .... Cumulative % Distribution Plot

GORMACK GRAPH PAPERS : CHRISTCHURCH N.Z.

924

102025

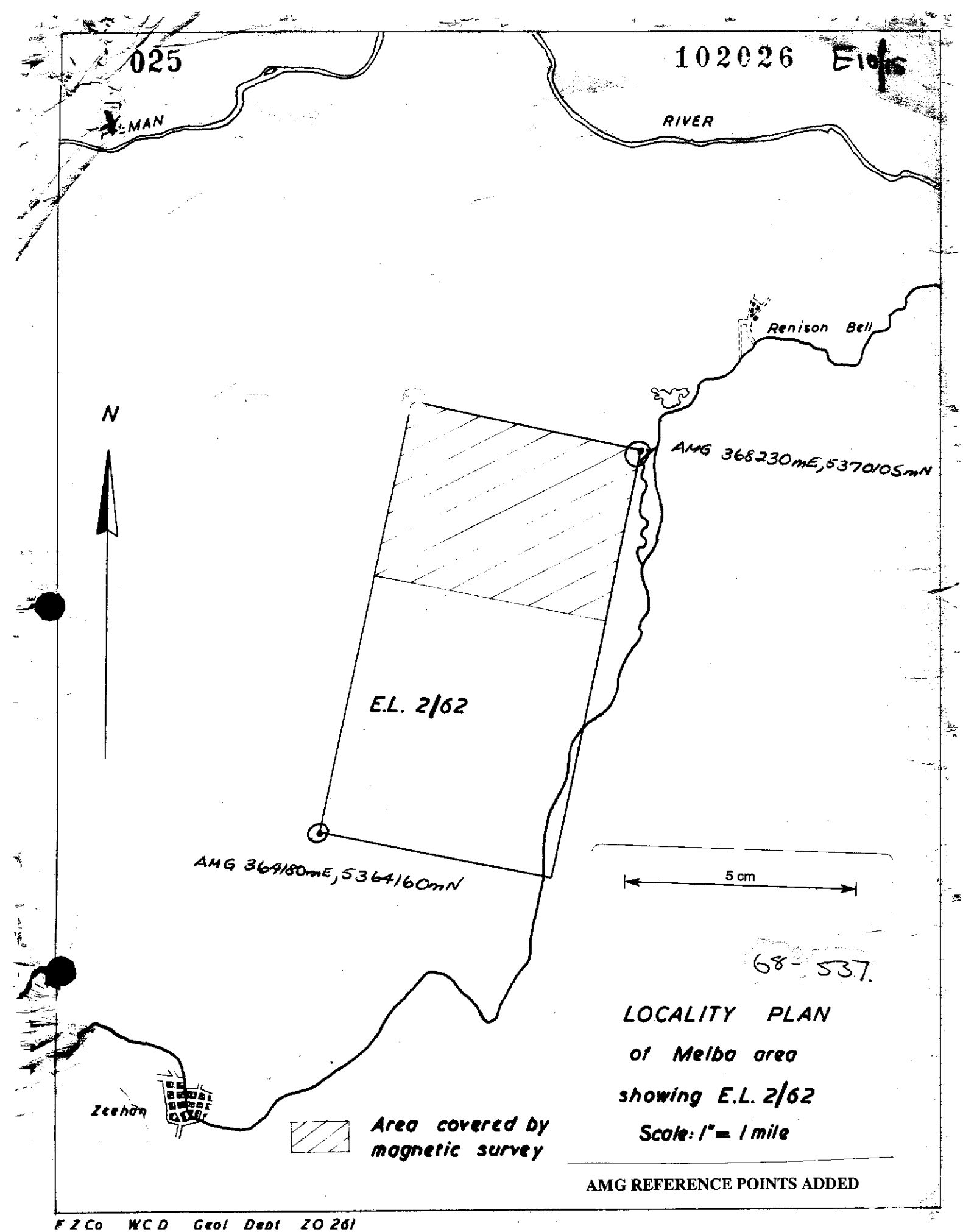


Lead .... Lines 12S, 13S, 13AS, 14S, 15S, 0-1500'W ... Cumulative % Distribution Plot

5 cm

025

102026 E10/6



68-537.

LOCALITY PLAN
of Melba area
showing E.L. 2/62
Scale: 1" = 1 mile

AMG REFERENCE POINTS ADDED

F Z Co WC D Geol Dept ZO 261

026

	Crimson Creek Ec				Oonah Bvo	
	Pb. ⊕	Zn. ⊕	Cu. ⊕	Ni. ⊕	Pb. ⊕	Zn. ⊕
◯	>1000 ppm	>800 ppm	>500 ppm	>500 ppm	>300 ppm	>100 ppm
○	>500 ppm	>400 ppm	>300 ppm	>300 ppm	>100 ppm	>50 ppm
o	>300 ppm	>200 ppm	>100 ppm	>100 ppm		

Anomalous Areas.

Bvo / Ec. Boundary ... Crimson Creek - Oonah.

Scale :- 1:5,000

Bvo / Ec

Bvo / Ec

Bvo / Ec

-60° MFP 124

-50° MFP 125

Base Line 4000N

Base Line

16S 15S 14S 13S 12S 11S 10S 9S 8S 7S 6S 5S 4S 3S 2S 1S 00 1N 2N 3N 4N 5N 6N

102027 68-537

050/84

E.Z. CO. W.C.D. GEOL. DEPT. VO.37.

5 cm

E.L.2|62 MELBA FLAT.

GRAPHIC PLOT TO SHOW GEOCHEMICAL ANOMALIES.