

GEOCHEMISTRY

TR16-70-82

13. Geochemical survey in the vicinity of the Barrington copper mine, north-west Tasmania

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INTRODUCTION

The Barrington (or Alma) copper mine is situated on the northern side of Barrington Creek some 500 m upstream from its confluence with the Forth River in north-western Tasmania, and approximately 1 km above the Palooa dam.

The mine was developed on one of a series of small copper prospects in the area during the latter part of the last century. Only minor amounts of ore were recovered and the workings have long since been abandoned.

In order to reinvestigate the possible economic potential of the workings and surrounding area, a soil sampling survey was carried out by the Department of Mines during the period December 1969 - February 1970. All samples were analysed for copper, lead and zinc (Table 1), and in addition those from a restricted area were tested for barium (Table 3).

LOCAL GEOLOGY

The area is underlain by Cambrian sediments of the Gog Range Greywacke (Jennings et al. 1959) trending approximately north-east. In the vicinity of the mine, this formation includes black slate, mudstone, sandstone, chert and quartzite folded into a SW-plunging asymmetrical syncline (fig. 14).

Sulphide mineralisation is apparently confined to one of two pebbly sandstone/mudstone units, each some 15 m thick, which crop out in Barrington Creek near the mine workings, and which can be followed along the strike for at least one kilometre. Outcrop is poor and structural details are uncertain, but it is probable that the two units represent the same folded horizon. An irregular, but in places strong, ironstone (gossan) has developed on the pebbly mudstone, and this feature initiated prospecting in the area. Although the presence of minor amounts of native copper, chalcocopyrite, pyrite, siderite and secondary malachite in a quartz-barite gangue was reported in early publications, no sulphides were observed during the present survey. However, barite is relatively common throughout the area, occurring as small veins and as larger irregular masses.

PREVIOUS INVESTIGATIONS

A number of reports refer specifically to the mine area. Thureau (1882) visited the workings soon after operations had commenced. He described the host rocks as black slate and schist and observed that the gossans at the surface were associated with barite and quartz veins. In addition to numerous costeans, the mine workings at that time consisted of a horizontal adit driven 90 m into the hillside in a north-westerly direction from creek level, and two small north-westerly crosscuts.

Twelvetees (1905, 1906) examined the workings in detail and described

the barite occurrences. In 1905 the main adit had been extended to 130 m and had passed through 'gossanous slate', and a shallow shaft had been sunk on the hillside to the north of the mine. A third crosscut had penetrated pebbly mudstone, including barite/quartz veins up to 0.5 m thick containing minor amounts of siderite and pyrite. In addition, a second smaller adit (the Devonport tunnel) had been driven in a northerly direction from the

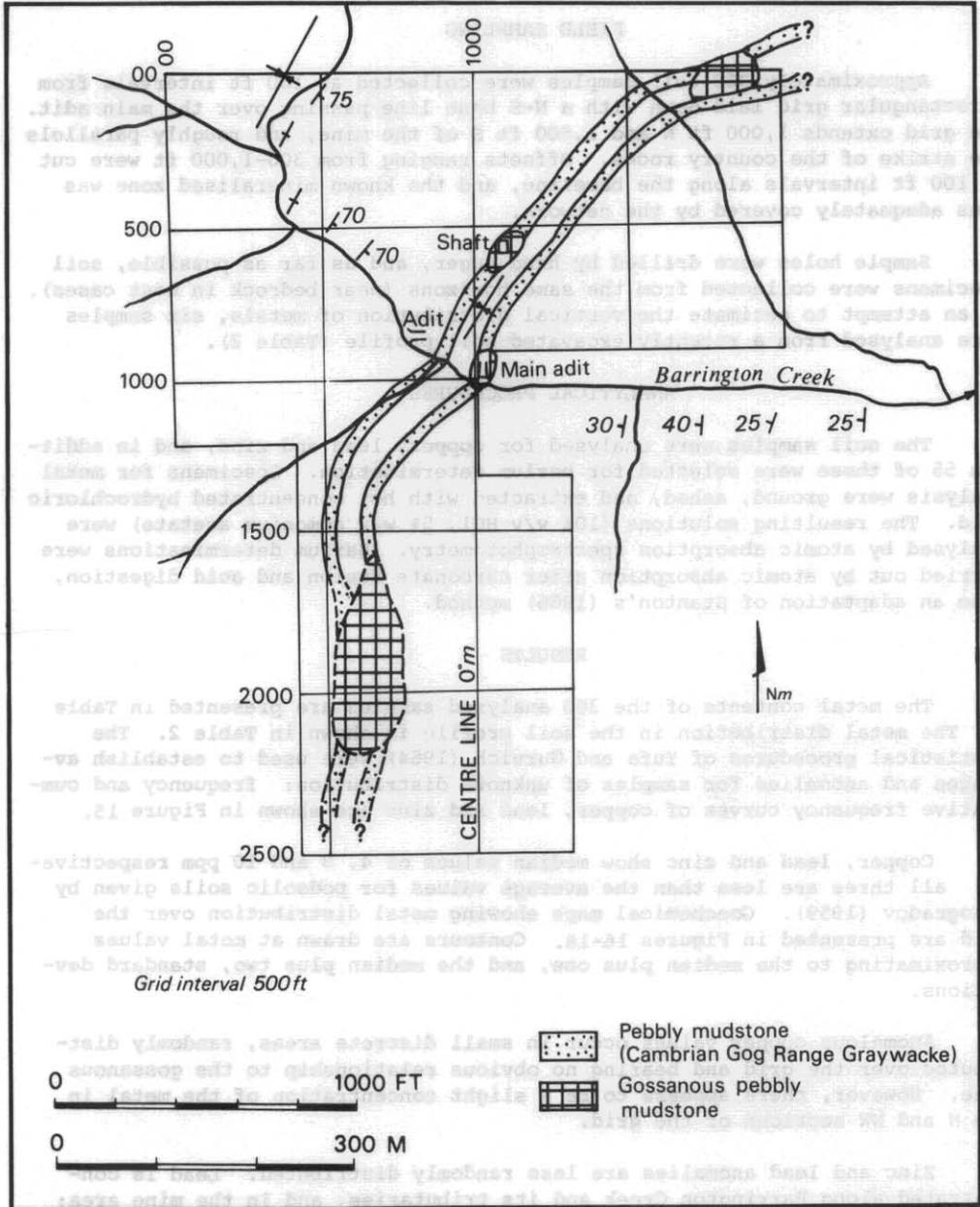


Figure 14. Locality map, Barrington copper mine.

creek bed, some 50 m upstream from the main adit.

Blake (1928) reporting on the occurrence of barite in Tasmania, visited the mine and found the abandoned workings flooded and inaccessible. He re-examined the main barite outcrops described earlier by Twelvetrees (1905, 1906), and published analyses of the mineral.

The area was also included in a regional survey of the Sheffield quadrangle which was mapped by Jennings et al. (1959).

FIELD SAMPLING

Approximately 360 soil samples were collected at 100 ft intervals from a rectangular grid laid down with a N-S base line passing over the main adit. The grid extends 1,000 ft N and 1,500 ft S of the mine, and roughly parallels the strike of the country rocks. Offsets ranging from 300-1,000 ft were cut at 100 ft intervals along the baseline, and the known mineralised zone was thus adequately covered by the network.

Sample holes were drilled by hand auger, and as far as possible, soil specimens were collected from the same horizons (near bedrock in most cases). In an attempt to estimate the vertical distribution of metals, six samples were analysed from a recently excavated soil profile (Table 2).

ANALYTICAL PROCEDURES

The soil samples were analysed for copper, lead and zinc, and in addition 55 of these were selected for barium determination. Specimens for metal analysis were ground, ashed, and extracted with hot concentrated hydrochloric acid. The resulting solutions (10% v/v HCl, 5% w/v ammonium acetate) were analysed by atomic absorption spectrophotometry. Barium determinations were carried out by atomic absorption after carbonate fusion and acid digestion, from an adaptation of Stanton's (1966) method.

RESULTS

The metal contents of the 360 analysed samples are presented in Table 1. The metal distribution in the soil profile is shown in Table 2. The statistical procedures of Yufa and Gurvich (1964) were used to establish averages and anomalies for samples of unknown distribution: frequency and cumulative frequency curves of copper, lead and zinc are shown in Figure 15.

Copper, lead and zinc show median values of 4, 8 and 10 ppm respectively: all three are less than the average values for podsollic soils given by Vinogradov (1959). Geochemical maps showing metal distribution over the grid are presented in Figures 16-18. Contours are drawn at metal values approximating to the median plus one, and the median plus two, standard deviations.

Anomalous copper values occur in small discrete areas, randomly distributed over the grid and bearing no obvious relationship to the gossanous zone. However, there appears to be a slight concentration of the metal in the N and NW sections of the grid.

Zinc and lead anomalies are less randomly distributed. Lead is concentrated along Barrington Creek and its tributaries, and in the mine area: of the three metals it shows the closest relationship to the gossanous zone. Zinc anomalies are strongly concentrated in the NE and NW sections of the grid, and there appears to be some correlation with anomalous copper values.

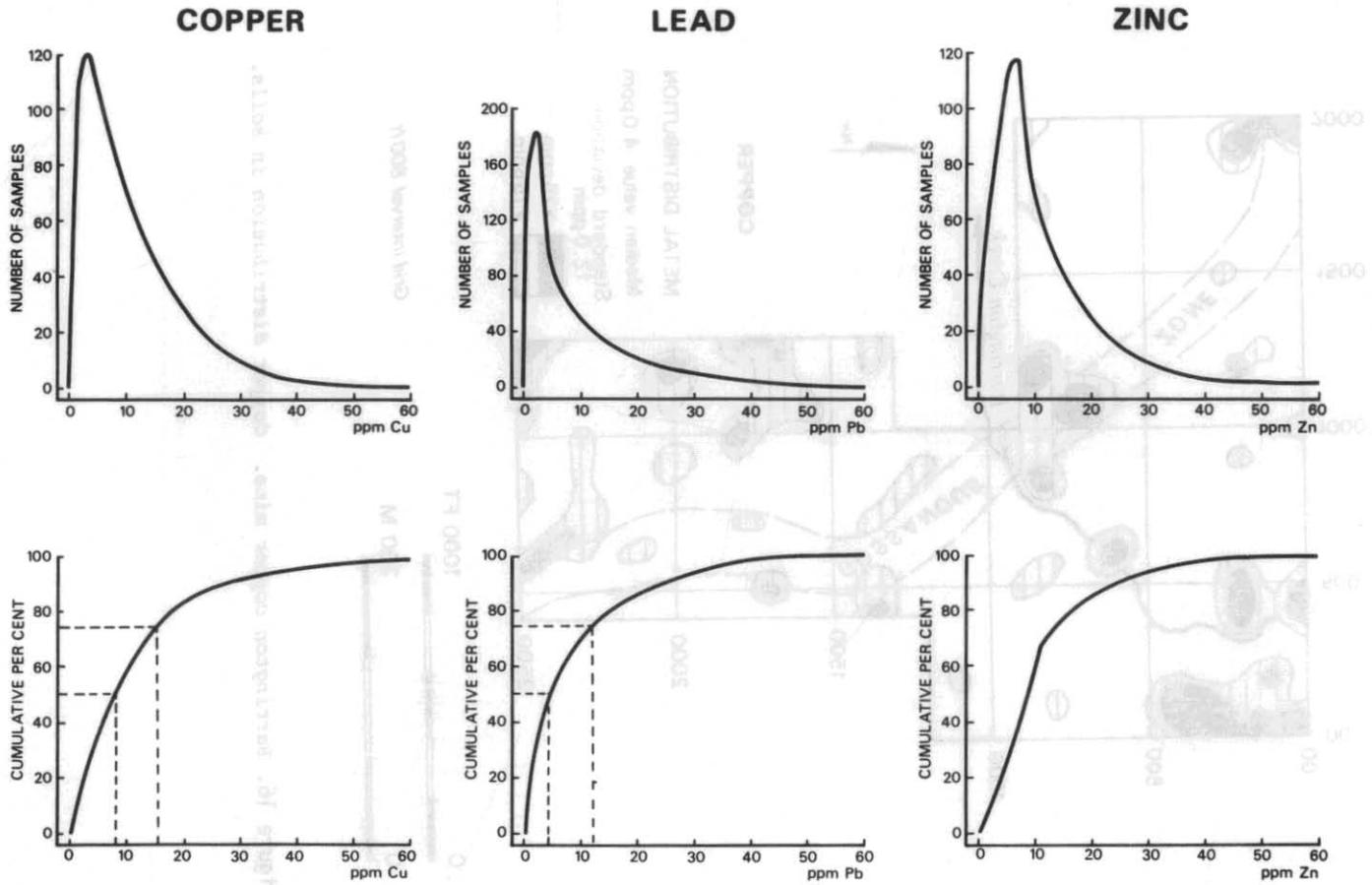


Figure 15. Barrington copper mine. Frequency and cumulative frequency curves for copper, lead and zinc in soils.

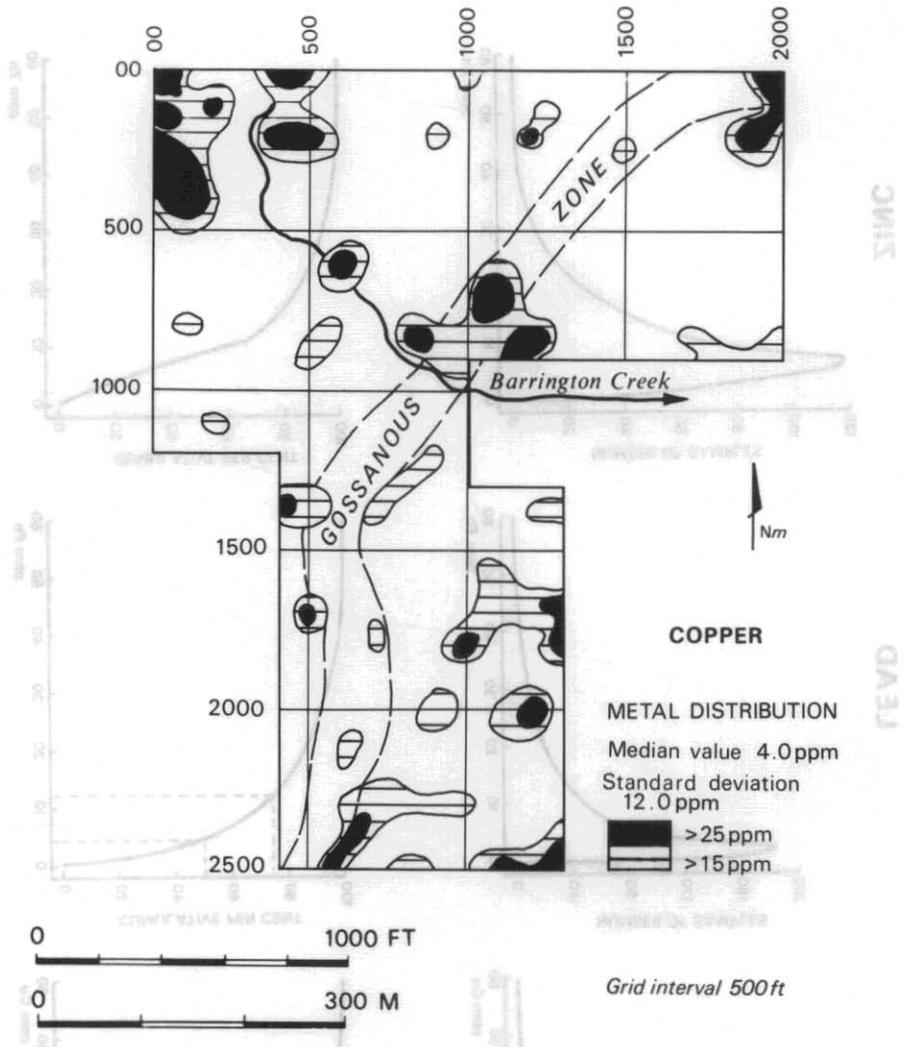
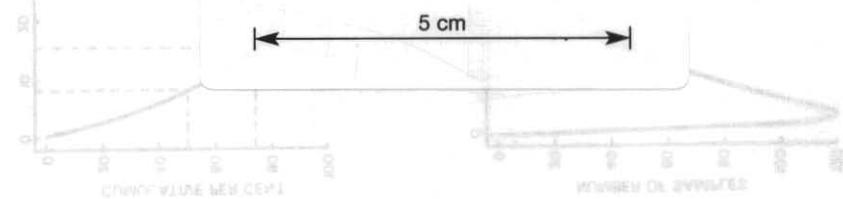


Figure 16. Barrington copper mine. Copper distribution in soils.



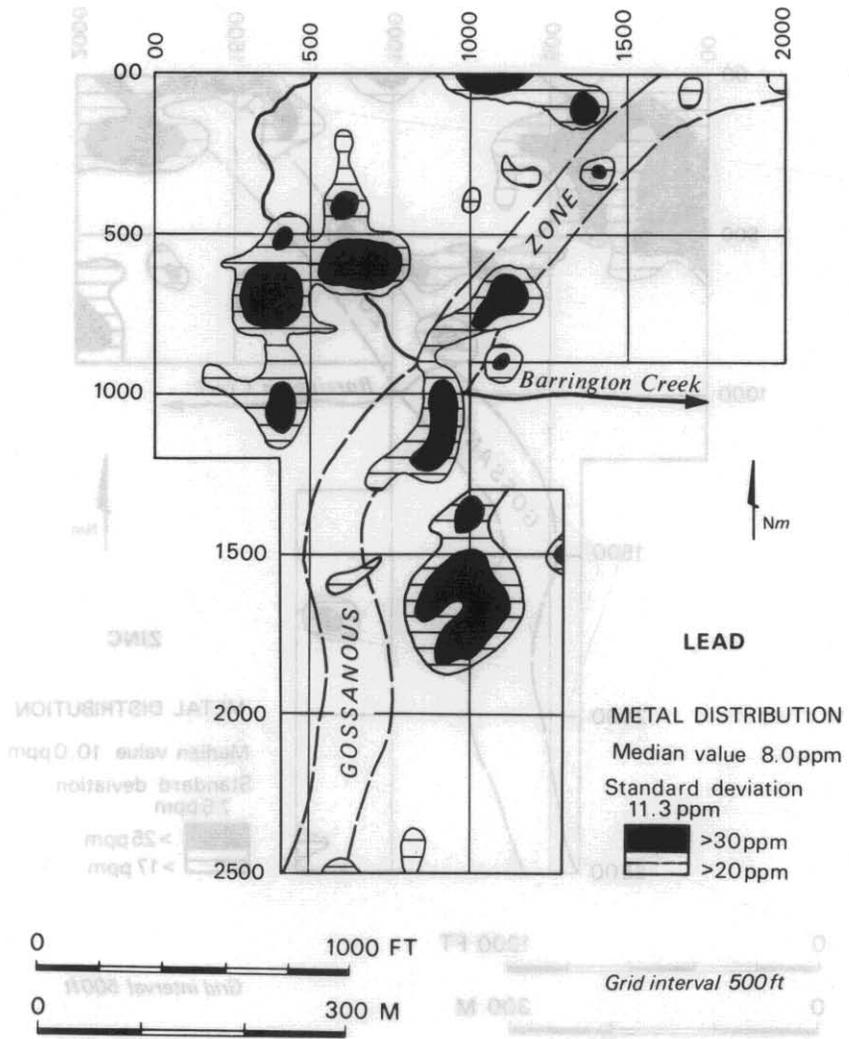


Figure 17. Barrington copper mine. Lead distribution in soils.

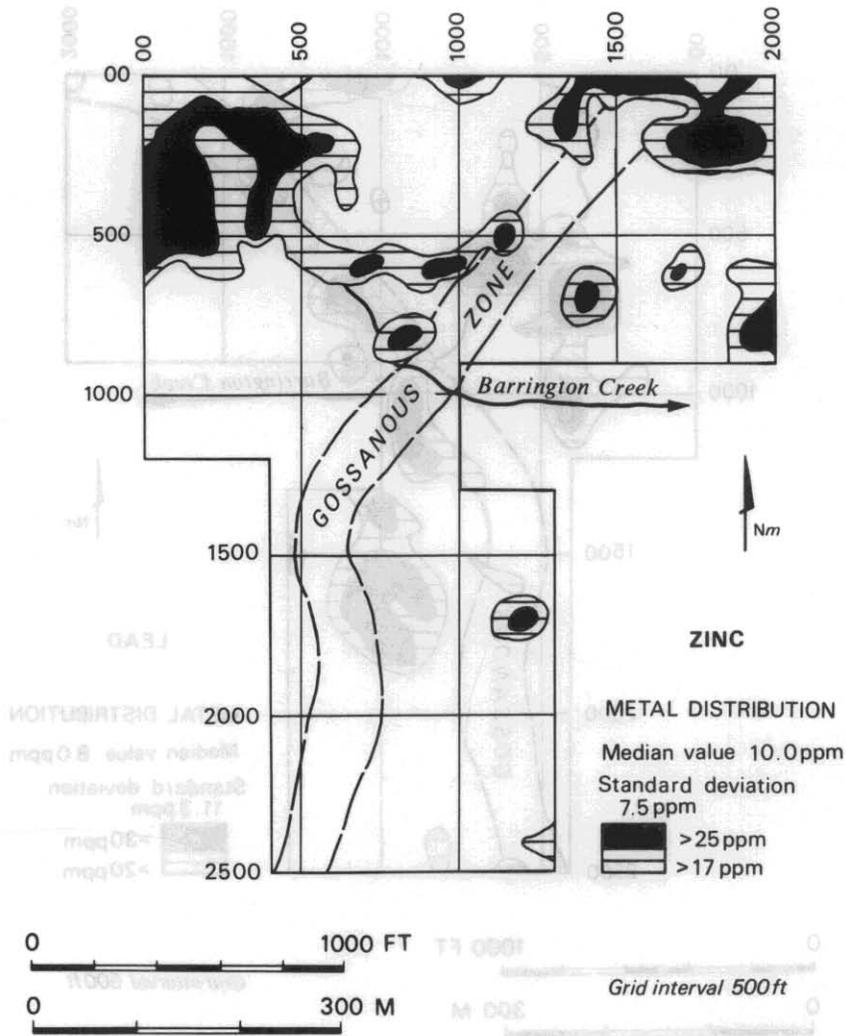
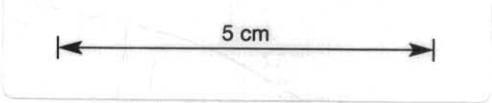


Figure 18. Barrington copper mine. Zinc distribution in soils.



Analyses of 55 soil samples from the more immediate vicinity of the mine showed barium contents ranging from 30-9,800 ppm, with a median value of 250 ppm. High values are located over known barite occurrences, and also in soils collected along Barrington Creek where they are probably due to particulate barite in the stream sediments. This distribution probably reflects a downslope migration of material towards the creeks, in addition to the erosion of barite outcrops in the streams themselves. Unexpected high barium values were obtained from the eastern side of the grid, and are probably indicative of sub-surface barite deposits. Although small barite veins are present in the gossanous zone near the mine workings, it is apparent that these are not reflected in high barium values in the overlying soil.

RECOMMENDATIONS

With respect to the distribution of copper, lead and zinc, the survey has shown that further sampling to the north of the grid is warranted in order to delineate the anomalies present. Considered over a larger area, these may be of no regional importance: on the other hand, they may be peculiar to the mine area. However, the low metal values of the soils appear to offer no economic prospects.

The barium results are more promising, and it is possible that economic deposits of barite occur in the area. More extensive sampling over the existing grid, and in areas to the north, may delineate possible deposits.

ACKNOWLEDGMENTS

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Table 1. METAL CONTENTS OF SOIL SAMPLES IN THE VICINITY OF THE BARRINGTON COPPER MINE

Grid ref.	Cu ppm	Pb ppm	Zn ppm	Grid ref.	Cu ppm	Pb ppm	Zn ppm
00- 00	1	40	25	200-1000	4	4	8
- 100	5	20	17	-1100	20	-	9
- 200	6	2	18	-1200	>1000	28	18
- 300	5	2	19	-1300	17	2	29
- 400	7	28	10	-1400	-	-	5
- 500	7	8	13	-1500	5	8	10
- 600	9	8	9	-1600	1	2	12
- 700	9	1	4	-1700	6	2	55
- 800	5	-	7	-1800	10	14	176
- 900	15	6	5	-1900	10	52	82
-1000	63	16	29	-2000	4	-	17
-1100	43	4	20				
-1200	27	-	13	300- 00	6	44	48
-1300	10	2	10	- 100	9	36	28
-1400	14	10	25	- 200	16	2	28
-1500	17	-	34	- 300	6	1	10
-1600	8	6	67	- 400	16	5	32
-1700	26	4	34	- 500	18	3	22
-1800	-	2	13	- 600	18	-	17
-1900	-	18	35	- 700	14	1	8
-2000	29	960	16	- 800	8	1	5
				- 900	15	-	12
100- 00	-	-	18	-1000	8	1	3
- 100	-	16	21	-1100	18	6	6
- 200	4	28	30	-1200	24	-	14
- 300	4	4	26	-1300	10	-	10
- 400	4	6	28	-1400	34	1	18
- 500	8	-	18	-1500	11	-	10
- 600	3	4	12	-1600	5	8	9
- 700	2	-	4	-1700	2	-	8
- 800	3	-	5	-2000	12	6	17
- 900	1	-	1				
-1000	14	-	11	400- 00	15	20	74
-1100	1	4	16	- 100	13	20	33
-1200	12	4	10	- 200	13	4	25
-1300	76	20	37	- 300	11	-	22
-1400	4	8	10	- 400	14	1	26
-1500	12	2	18	- 500	9	-	13
-1600	3	-	12	- 600	40	22	19
-1700	26	-	4	- 700	7	2	1
-1800	-	8	27	- 800	8	-	11
-1900	-	-	14	- 900	4	-	6
-2000	2	32	12	-1000	23	-	6
				-1100	9	-	2
200- 00	3	44	23	-1200	1	-	12
- 100	6	24	46	-1300	9	1	12
- 200	3	10	3	-1400	2	1	12
- 300	4	8	32	-1500	15	22	7
- 400	-	38	29	-1600	1	1	10
- 500	8	34	31	-1700	15	-	11
- 600	21	12	28	-2000	6	8	15
- 700	14	8	9				
- 800	7	4	9	500- 00	4	12	55
- 900	2	18	9	- 100	10	76	44
				- 200	4	8	26

Table 1 - continued

Grid ref.	Cu ppm	Pb ppm	Zn ppm	Grid ref.	Cu ppm	Pb ppm	Zn ppm
500- 300	10	1	17	700-1400	4	2	52
- 400	39	1	25	-1500	1	2	6
- 500	18	-	18	-1600	2	-	3
- 600	21	2	15	-1700	9	-	4
- 700	12	-	13	-1800	4	-	9
- 800	6	-	17	-1900	7	-	12
- 900	5	-	9	-2000	4	-	25
-1000	5	-	10	800- 00	5	1	8
-1100	5	6	17	- 100	2	18	4
-1200	26	-	30	- 200	10	8	5
-1300	2	-	6	- 300	14	3	4
-1400	7	-	5	- 400	6	1	5
-1500	4	2	10	- 500	20	10	13
-1600	1	-	5	- 600	22	20	2
-1700	6	6	10	- 700	1	1	8
-1800	7	-	16	- 800	13	31	31
-1900	3	-	9	- 900	21	16	25
-2000	5	3	7	-1000	29	19	13
600- 00	12	1	33	-1100	7	14	11
- 100	8	3	15	-1200	1	31	5
- 200	19	-	21	-1300	7	25	5
- 300	23	-	23	-1400	1	1	7
- 400	27	2	12	-1500	1	12	4
- 500	10	-	11	-1600	10	14	15
- 600	94	30	22	-1700	9	22	14
- 700	70	12	31	-1900	9	7	24
- 800	3	6	22	-2000	15	22	50
- 900	5	2	25	900- 00	10	2	6
-1000	2	3	28	- 100	9	10	10
-1100	2	-	14	- 200	6	8	6
-1200	-	-	10	- 300	12	10	10
-1300	9	-	3	- 400	19	12	9
-1400	4	-	10	- 500	6	16	11
-1500	7	3	12	- 600	3	6	10
-1600	11	4	11	- 700	9	6	9
-1700	17	1	26	- 800	21	1	16
-1800	10	1	16	- 900	16	22	9
-1900	8	2	21	-1000	9	20	4
-2000	12	-	18	-1100	38	28	10
700- 00	8	-	10	-1200	13	26	2
- 100	6	-	6	-1300	3	3	7
- 200	15	4	12	-1400	6	6	10
- 300	10	6	10	-1500	5	-	6
- 400	150	-	6	-1600	11	5	13
- 500	10	-	6	-1700	8	1	11
- 600	17	-	8	-1800	6	23	16
- 700	15	3	7	-1900	5	16	19
- 800	2	-	11	-2000	13	24	18
- 900	2	2	15	1000- 00	6	4	2
-1000	6	-	2	- 100	24	-	10
-1100	92	96	6	- 200	12	2	11
-1200	5	-	2	- 300	20	2	8
-1300	3	0	5				

Table 1 - continued

CONTINUED - I side

Grid ref.	Cu ppm	Pb ppm	Zn ppm	Grid ref.	Cu ppm	Pb ppm	Zn ppm
1000- 400	27	1	10	1500-1000	13	10	5
- 500	5	4	3	-1100	2	2	1
- 600	7	-	2	-1200	16	8	5
- 700	13	-	21	-1300	38	12	8
- 800	16	6	10	1600- 400	1	-	2
- 900	43	2	17	- 500	8	14	12
1100- 00	12	2	16	- 600	29	8	6
- 100	8	6	5	- 700	12	6	4
- 200	24	4	10	- 800	6	8	3
- 300	21	12	10	- 900	22	10	2
- 400	36	1	8	-1000	133	2	3
- 500	18	-	12	-1100	28	24	6
- 600	6	-	5	-1200	3	2	6
- 700	7	-	4	-1300	9	10	1
- 800	14	-	4	1700- 400	5	1	4
- 900	38	-	5	- 500	19	34	6
-1000	2	1	1	- 600	3	12	4
1200- 00	12	10	8	- 700	12	14	3
- 100	3	1	6	- 800	8	10	1
- 200	3	1	1	- 900	48	10	15
- 300	2	2	7	-1000	22	10	10
- 400	37	1	21	-1100	83	24	22
- 500	10	10	7	-1200	12	24	30
- 700	20	4	4	-1300	8	28	10
- 800	40	8	8	1800- 400	-	2	1
- 900	29	1	6	- 500	1	8	1
-1000	13	2	5	- 600	2	1	1
1300- 400	4	-	13	- 700	18	16	4
- 500	18	-	6	- 800	27	8	4
- 600	22	4	10	- 900	22	14	10
- 800	5	-	12	-1000	60	28	12
- 900	14	20	8	-1100	21	4	12
-1000	20	12	6	-1200	12	1	8
-1100	23	1	8	-1300	18	44	8
-1200	10	1	9	1900- 400	9	6	4
-1300	-	4	3	- 500	6	12	1
1400- 400	11	28	7	- 600	8	6	6
- 500	10	20	9	- 700	3	3	1
- 600	19	-	1	- 800	10	10	12
- 700	20	8	4	- 900	22	5	10
- 800	20	20	-	-1000	8	4	8
- 900	20	-	10	-1300	3	1	10
-1000	39	6	13	2000- 400	-	11	4
-1100	19	-	5	- 500	-	1	1
-1200	6	22	7	- 600	6	14	4
-1300	3	18	6	- 700	-	14	9
1500- 400	1	-	5	- 800	3	7	4
- 500	1	8	6	- 900	7	30	22
- 600	5	-	1	-1000	3	1	7
- 700	20	18	4	-1100	4	22	9
- 800	17	8	9	-1200	2	39	11
- 900	21	16	10	-1300	1	1	2

Table 1 - continued

Grid ref.	Cu ppm	Pb ppm	Zn ppm	Grid ref.	Cu ppm	Pb ppm	Zn ppm
2100- 400	-	1	3	2300-1000	7	16	7
- 500	-	1	2	-1100	4	12	12
- 600	4	19	9	-1200	2	6	2
- 700	15	11	6	-1300	2	-	5
- 800	-	12	7	2400- 400	18	17	1
- 900	7	3	5	- 500	6	1	5
-1000	14	7	10	- 600	2	8	10
-1100	12	16	14	- 700	4	27	6
-1200	3	22	7	- 800	25	10	14
-1300	12	12	9	-1100	-	1	10
2200- 400	-	1	5	-1200	13	6	17
- 500	-	2	2	-1300	22	28	25
- 600	8	14	3	2500- 400	20	8	5
- 700	5	2	2	- 500	3	13	4
- 800	3	13	2	- 600	24	29	15
- 900	8	3	6	- 700	16	10	7
-1000	14	12	15	- 800	20	24	11
-1100	9	6	18	- 900	16	14	5
-1200	3	5	6	-1000	3	10	13
-1300	2	6	8	-1100	15	28	12
2300- 400	1	1	1	-1200	11	24	10
- 600	11	18	3	-1300	3	32	7
- 700	3	20	1				
- 800	4	24	6				

Table 2. VERTICAL DISTRIBUTION OF METALS IN PODSOLIC SOIL AT THE BARRINGTON COPPER MINE

Depth from surface ft	Cu ppm	Pb ppm	Zn ppm	Depth from surface ft	Cu ppm	Pb ppm	Zn ppm
0.5	1	4	16	2.5	40	40	11
1.0	38	54	5	3.5	35	20	2
2.0	42	56	7	4.5	34	56	1

Table 3. BARIUM CONTENTS OF SOIL SAMPLES IN THE VICINITY OF THE BARRINGTON COPPER MINE

Grid ref.	Ba ppm	Grid ref.	Ba ppm	Grid ref.	Ba ppm
300-300	50	500-1100	110	700-600	1750
-400	100	-1200	140	-700	620
-500	200	-1300	30	-800	250
-600	70	-1400	120	-900	220
-700	27	-1500	460	-1000	400
400-300	90	600-300	120	-1100	1180
-400	200	-400	200	-1200	860
-500	180	-500	590	-1300	3380
-600	460	-600	5270	800-300	100
-700	280	-700	4360	-500	175
500-300	200	-800	230	-600	375
-400	100	-1200	140	-700	260
-500	100	-1300	730	-800	1275
-600	1950	-1400	180	-900	275
-700	400	-1500	350	-1000	550
-800	350	700-300	170	-1100	1050
-900	800	-400	9800	-1200	1040
-1000	120	-500	1240	-1300	1040

Table 4. VERTICAL DISTRIBUTION OF METALS IN SOILS AT THE BARRINGTON COPPER MINE

Depth from surface ft	Cu ppm	Pb ppm	Zn ppm	Depth from surface ft	Cu ppm	Pb ppm	Zn ppm
0.5	40	40	16	2.5	40	40	11
1.0	38	34	5	3.5	35	50	5
2.0	43	26	7	4.5	34	26	1