NORTHERN TERRITORY GEOLOGICAL SURVEY, G.S. 75/17

REPORT ON THE HASSTS BLUFF COPPER PROSPECTS

by

D. Barraclough

THE HAASTS BLUFF COPPER PROSPECTS
HAASTS BLUFF

Mount Liebig 1:250,000 Sheet area SF 52-16
Northern Territory

SUMMARY

Copper, lead and zinc mineralization occurs in Precambrian Arunta Complex schists, 10 km east of Haasts Bluff Native Settlement. Two areas have been mapped and auger drilled. One, "Nickel Hill", contains copper, lead and zinc in minor amounts and therefore no further work is recommended. The other contains high-grade surface-copper mineralization in amphibolite. Mapping suggests that further mineralization may occur at shallow depth and thus a programme of costeaning and subsequent chip sampling is recommended.

INTRODUCTION

At the request of the secretary of the Haasts Bluff Mining Co. N.L., D.B. Clarke, a geologist with the Northern Territory Geological Survey, examined a small outcrop of schist, designated "Nickel Hill" but known locally as "Ulpuruta" and a similar outcrop 300 metres north-west of "Nickel Hill". (Clarke 1973)

In January 1975, the author gridded the "Nickel Hill" area with a 20 metre x 30 metre grid to cover both outcrops, and also gridded an area of copper mineralization, shown on the Mt. Liebig 1:250,000 Geological Series map, with a 20 metre x 20 metre grid. Both areas were mapped, and auger drilled in June and July 1975. Over two hundred auger-drill samples were sent to Darwin for analysis of copper, lead and zinc.

LOCATION AND ACCESS

The prospects are within the Haasts Bluff Native Reserve and about 10 km east of Haasts Bluff Native Settlement (Figure 1). The area can be reached by sealed road from Alice Springs to the Hermannsburg turn off and thence by graded track. "Nickel Hill" is a small hill on the south-west side of the graded track, 10 km from the Settlement.

PREVIOUS WORK

In 1956 G.R. Ryan reported on an occurrence of copper mineralization 6 miles east of the settlement (BMR Record 56/122). He noted that mineralization, predominantly malachite and cuprite, occurred over 300 yards but only two places had a sufficient

concentration to warrant further investigation. A sample from each of the two places gave the following assay results :-

11.76% Copper	32.29% Insolubles
9.85% Copper	18.69% Insolubles

He concluded "it is unlikely that even careful hand-picking could produce an appreciable quantity of ore of economic value".

Ryan also collected marble specimens for determination of economic value but he had no information of the value.

In 1964 P.G. Braham was shown three outcrops of schist containing "minor secondary copper mineralization" (report to Director of Mines 24th October 1964). He concluded that "although the copper mineralization is by no means high enough in grade ... there are indications ... that the outcrop is leached and there is some possibility ... there could be concentrations of copper of economic size and grade".

In 1971 O.G. Fruzzetti visited the north-western copper show and collected two samples of copper ore. These samples assayed 1.05% copper, 0.01% nickel and 5.3% copper respectively. Fruzzetti did not recommend any further work on this show. (Fruzzetti 1971, 1972)

In 1973 D.B. Clarke visited "Nickel Hill" and did a magnetometer traverse across the area. He noted "minor disseminated galena in forsteritic marble and copper mineralization (chalcopyrite, malachite, azurite, chrysocolla and (?) chalcocite) in ?para-amphibolites ... with pyrite boxworks and magnetite". (Oct., 1973 Mines Branch Internal Report) He suggested that "the magnetometer would be a useful tool for exploration of the area".

PRESENT INVESTIGATION

The area around "Nickel Hill" was designated Site 1 and the area around the copper show to the north-west was designated Site 2. (Figure 1)

SITE 1

A rectangular grid was set up around "Nickel Hill" and extended to cover a small outcrop 300 metres to the north-west. The area was auger drilled to locate any possible sub-surface ridges that could be extensions of the two main outcrops. The auger drill-hole depths were plotted on a plan and sub-surface contours drawn. (Figure 2)

Bedrock soil samples were collected from each hole and analysed for copper, lead and zinc. The results were plotted to see if the surface mineralization could be traced beneath the alluvial cover.

Several grab-samples of the two rock-types were also taken for analysis, and the area was geologically mapped on a scale of 1:500.

SITE 2

Lines were pegged around and across the outcrop with the base line aligned parallel to the regional strike. The area was auger drilled to see if the mineralization could be detected beneath the alluvial cover, however, to the north of the outcrop quartzite scree interferred with the drilling. (Figure 3)

Bedrock soil samples were collected from each hole, analysed for copper, lead and zinc and the results were plotted on a

base plan. Some grab samples of mineralized amphibolite and marble were also taken for analysis.

The area was mapped on a scale of 1:1000 and a geological cross-section was constructed.

GENERAL GEOLOGY

Both sites contain Precambrian Arunta Complex rocks surrounded by areas of fairly thick alluvium.

SITE 1

The outcrops in this area consist of interbedded schist and marble. At "Nickel Hill" the less competent marble beds are drag-folded and often infolded or disrupted into the more competent actinolite-magnetite-carbonate-mica schist. (Figure 4) The actinolite schist is often crenulated and carries minor, spotty copper mineralization in the form of malachite with subsidiary azurite and chrysocolla. Very minor sulphide mineralization can be seen in some freshly broken rocks.

The small outcrops to the north-west of "Nickel Hill" consist of steeply dipping actinolite schist and interbedded forsterite marble. The schist carries a small amount of rhodonite which is patchily developed, and also very minor copper and lead mineralization. Zinc mineralization was noted at one place in the northernmost outcrop together with minor malachite in a ferruginous actinolite-carbonate schist. Minor galena veinlets were noted in the schist and marble of the southern outcrop.

The bedrock contours (Figure 2) suggest that the outcrops may be connected by a sub-surface ridge and because the geology of the

outcrops is almost identical it is suggested that these outcrops may be part of a northerly-plunging synform with an inclined axial plane.

SITE 2

The small hill consists of Arunta Complex rocks, the main rock-type being a crenulated muscovite schist interbedded with quartzo-feldspathic schist, marble and amphibolite. (Figure 5) These subsidiary rocks are usually in the form of folded, discontinuous bands and pods which have been interpreted as the result of deformation by a set of small, doubly plunging folds.

There are two types of amphibolite present; one is a fine grained rock with very minor sulphide mineralization and forming narrow discontinuous bands; the other is a medium grained rock with strong copper mineralization, especially in areas of tight folding, brecciation, quartz-veining and epidotization.

One narrow quartz-feldspar pegmatite vein was recognised but it is not associated with any mineralization.

Small scale quartz veining and infilling is mainly associated with any mineralization.

The outcrop appears to be part of a southerly-plunging antiform with minor folding on the limbs. (Figure 6)

ECONOMIC GEOLOGY

SITE 1

Visible copper mineralization occurs at "Nickel Hill" and the small outcrops to the north-west, and visible lead mineralization occurs in the north-western outcrops. Several representative grab samples were taken from the schist and marble of both outcrops and sent for assay.

The results are as follows:-

(a)	Schist	590 ppm Cu	2150 ppm Pb	2.65% Zn	< 2 ppm Ag
		670 ppm Cu	5400 ppm Pb	1.65% Zn	< 2 ppm Ag
(b)	Marble (N side "Nickel Hill")	850 ppm Cu	275 ppm Pb	2700 ppm Zn	<2 ppm Ag
	(S side "Nickel Hill")	14 ppm Cu	70 ppm Pb	115 ppm Zn	<2 ppm Ag

Outcrops to N.W.

(a) Schist						
(i) South	5 ppm Cu	855 ppm Pb	2700 ppm Zn	< 2 ppm Ag		
(ii) Middle	5 ppm Cu	85 ppm Pb	375 ppm Zn	<2 ppm Ag		
(iii) North	5200 ppm Cu	6400 ppm Pb	11.5% Zn	<2 ppm Ag	20 ppm Ni	12 ppm Co
(b) Marble (Main outcrop)						
	5 ppm Cu	65 ppm Pb	550 ppm Zn	<2 ppm Ag		
	5 ppm Cu	65 ppm Pb	500 ppm Zn	<2 ppm Ag		

The results show that the overall values of copper and lead in both the schist and the marble are far below economic grade. The schist of "Nickel Hill" carries about 2% zinc which was not recognised in hand-speciment. This is probably in the form of a silicate and thus would be difficult to process, especially considering the low grade. The high zinc value contained in the schist of the north-western outcrops occurs in a ferruginous rock. The outcrop is small and the zinc is probably present as a carbonate or a silicate. The zinc values in other samples of schist are far too low to be of any economic importance and the high value obtained in the ferruginous rock appears to be an isolated occurrence.

The geochemical distribution plots of the auger drill samples (Figure 7) show no strongly anomalous copper values. One lead and three or four zinc values found close to the outcrops may be regarded as anomalous; however no pattern of sub-surface mineralization emerges. (Figures 8, 9a, 9b, 9c) These lead and zinc values may simply be reflecting the amphoteric nature of the elements, in so far as their salts tend to precipitate and concentrate at or slightly above the

water table in high pH environments. The high pH in this case is caused by the calcareous schist and marble, and the water table was reached in four holes at depths between 6.3 metres and 7.1 metres.

It is unlikley that Site 1 has any economic mining potential.

SITE 2

Strong surface copper mineralization occurs in the folded and faulted areas of the medium-grained amphibolite but traces of copper mineralization occur throughout the rock. Very minor copper mineralization can be seen in the narrow bands of fine-grained amphibolite.

Ryan took "a fairly large representative sample" from each of the two most strongly mineralized outcrops in the north of the hill. These gave assay results of 11.76% and 9.85% copper. Fruzzetti took two grab samples of amphibolite which assayed 1.05% and 5.3% copper.

During the present investigation a composite grab-sample was taken of about average-grade mineralized-amphibolite and the assay result was 1.6% copper, 300 ppm lead, 850 ppm zinc.

The auger drilling shows only one anomalous sample, the other samples are uniformly low with a tendency to decrease in value southwards away from the outcrop. (Figure 10)

A cross-section and a block impression have been drawn of the interpreted structure of the hill and shows possible extensions of the mineralized amphibolite beneath the surface of the hill.

Any further work should be aimed at testing this interpretation because if it is proved to be correct, other pods of mineralization may be found within a short distance of the surface.

CONCLUSION

Even though high zinc values are present in Site 1, the size of the outcrop and the discontinuous nature of the mineralization makes the area a sub-economic prospect. The areal extent of the copper mineralization in Site 2 is small but the grade is fairly high. Ryan concluded that this outcrop would be unlikely to produce an appreciable quantity of ore of economic value but if the present interpretation of the geology is correct, then further occurrences of high-grade ore could exist beneath the surface.

RECOMMENDATIONS

Site 1

No further work be carried out in this area.

Site 2

To test the interpretation of the structure of the hill and the theory that further high grade ore may exist beneath the surface of the hill, three or four costeans should be cut by hand or by bulldozer across the heavily mineralized sections, and two or three costeans cut by bulldozer in areas of possible sub-surface mineralization. The sites of the proposed costeans are shown in Figure 11.

When this work has been carried out, the Geological Survey will be prepared to assist in making a further assessment of the ore potential of this area by chip-sampling and chemical analysis and will consider if diamond drilling is required.

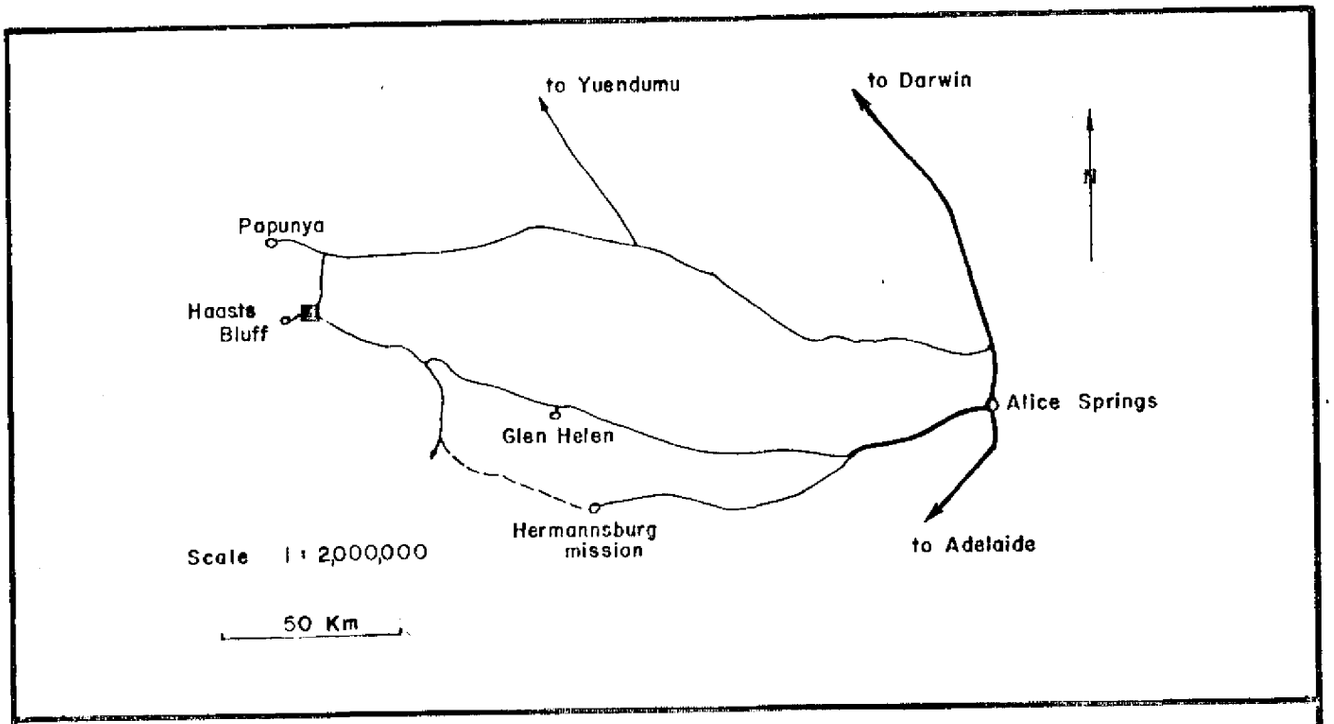
REFERENCES

Braham, P.G. Report to the Director of Mines, October 24, 1964.

Clarke, D.B.	1973	Internal Monthly Report, Alice Springs Office, N.T.G.S. (October 1973)
Fruzzetti, O.G.	1971	Internal Monthly Report, N.T.G.S. (December 1971)
	1972	Internal Monthly Report, N.T.G.S. (February 1972)
Ryan, G.R.	1956	Bureau of Mineral Resources Record 56/122.

HAASTS BLUFF COPPER PROSPECTS

LOCATION DIAGRAMS



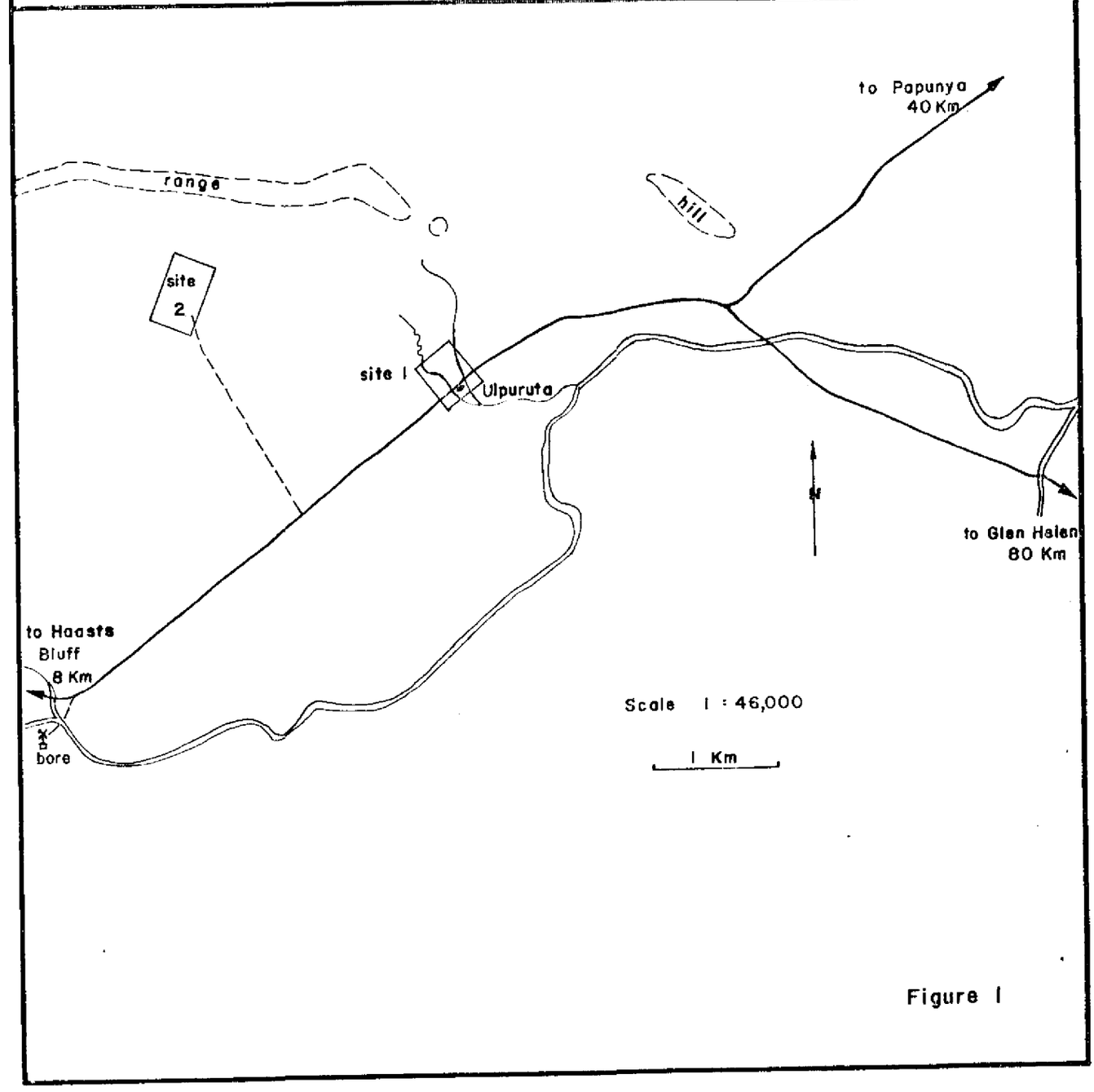


Figure 1

SITE 1 BEDROCK CONTOURS

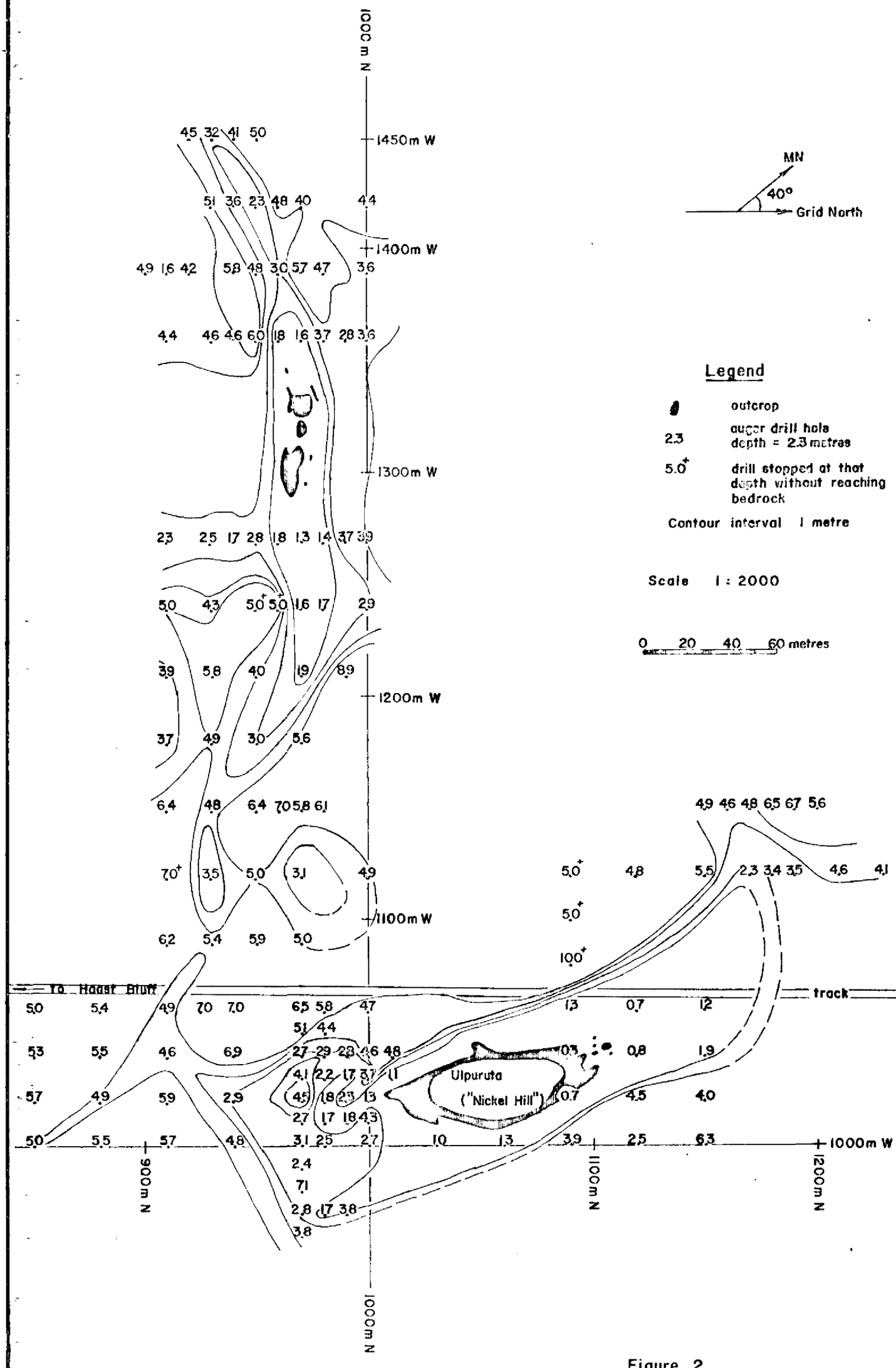
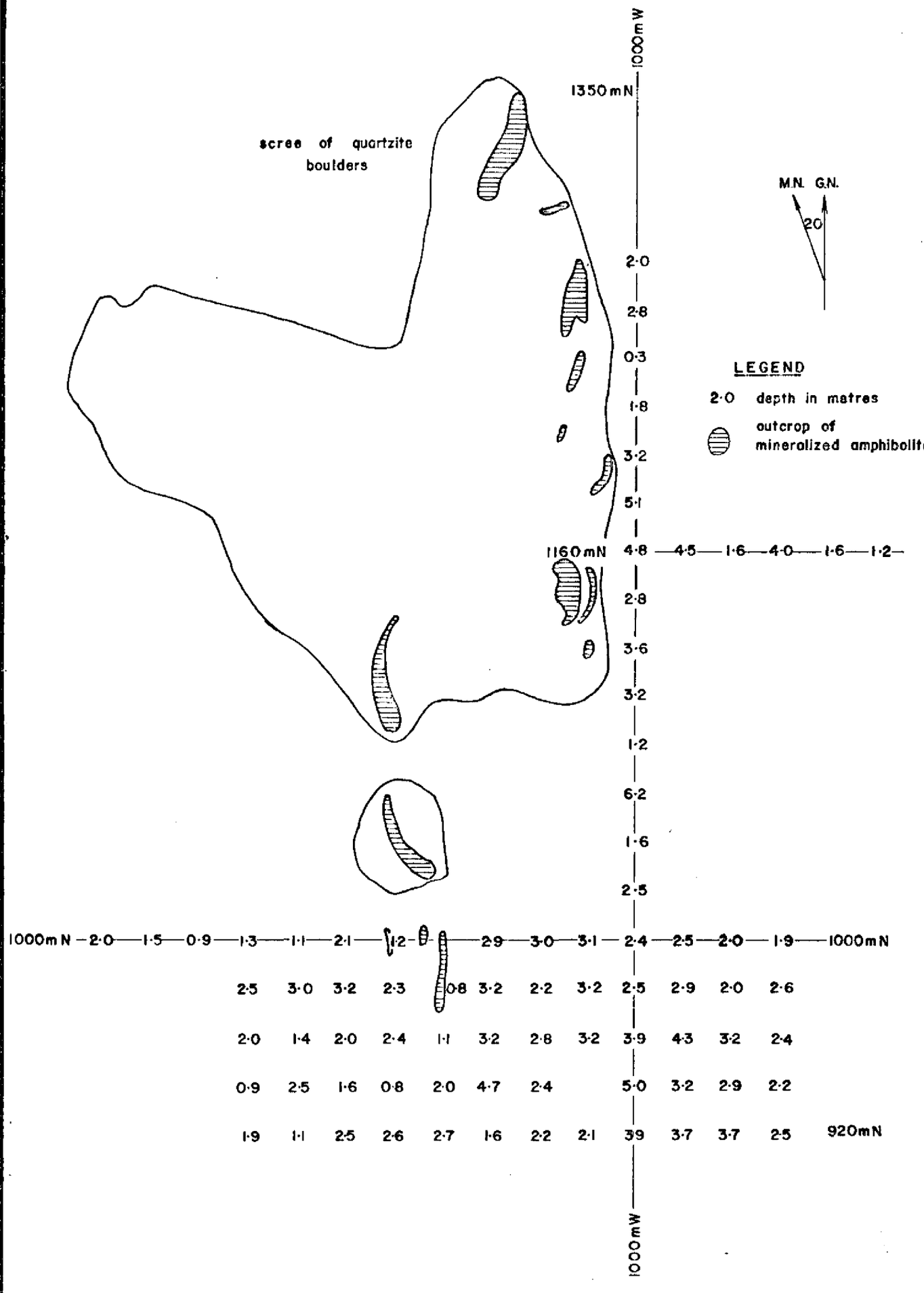


Figure 2

SITE 2 AUGER DRILL-HOLE DEPTHS



SCALE 1 : 2000

0 20 40 60 metres

Figure 3

SITE 1 GEOLOGICAL PLAN

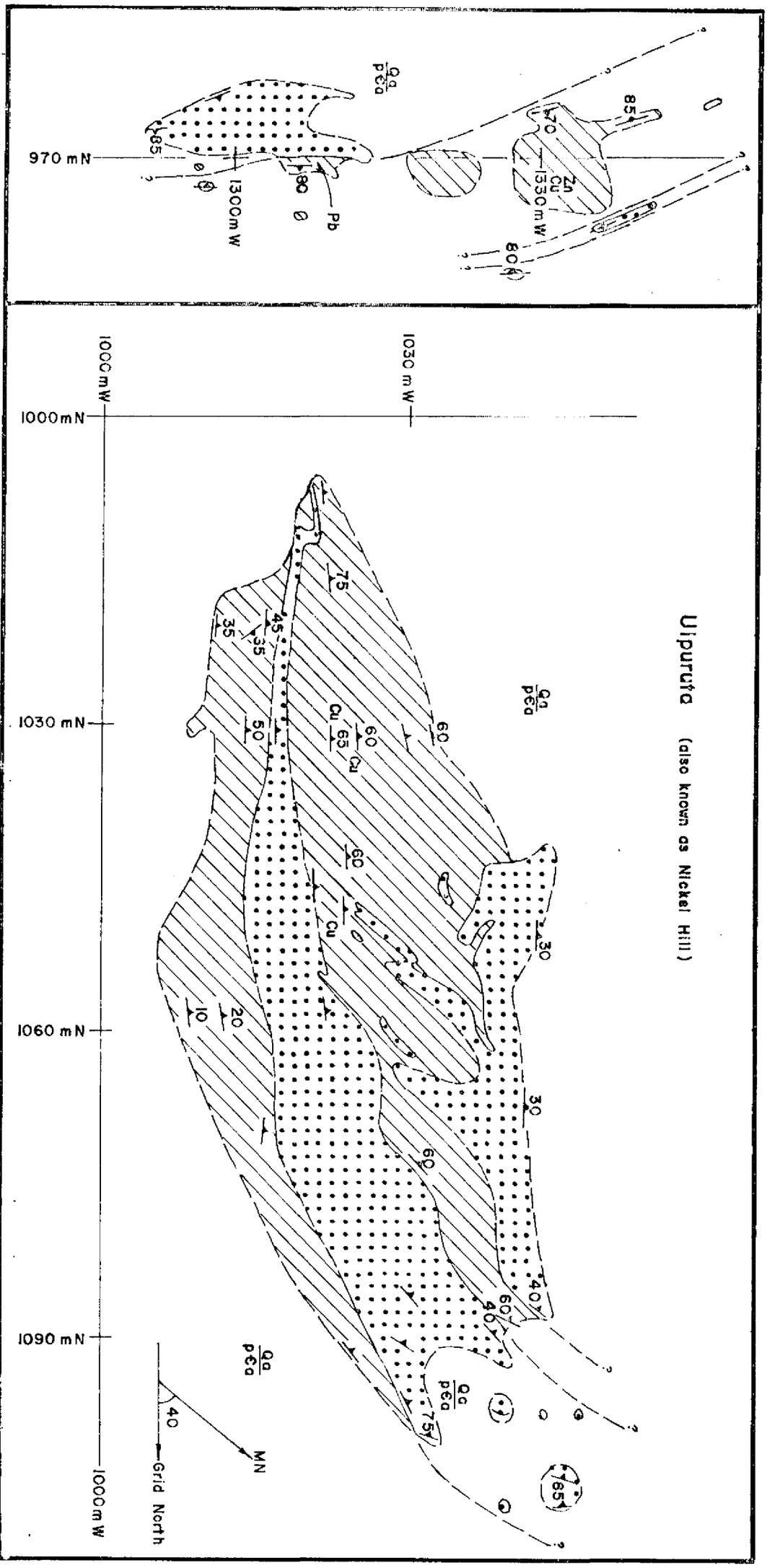
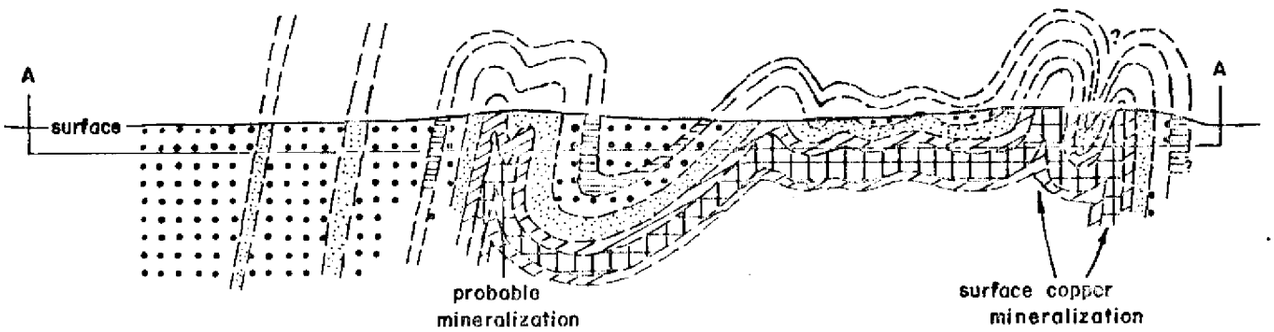


Figure 4

SECTION THROUGH A-A

Looking Northwards
(Site 2)

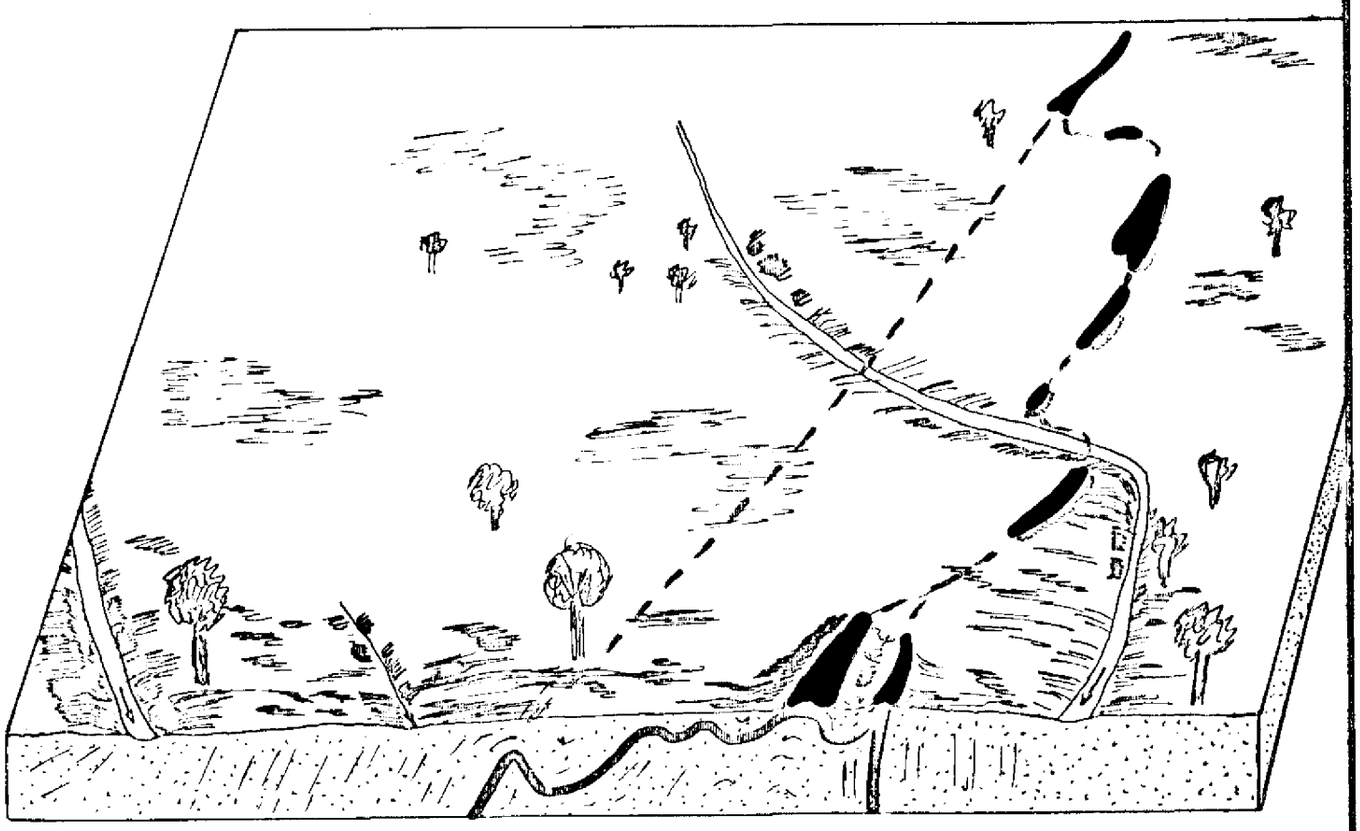


For symbols, see Site 2 Geological Plan, Figure 5

Scale 1 : 1000

20m

Figure 6



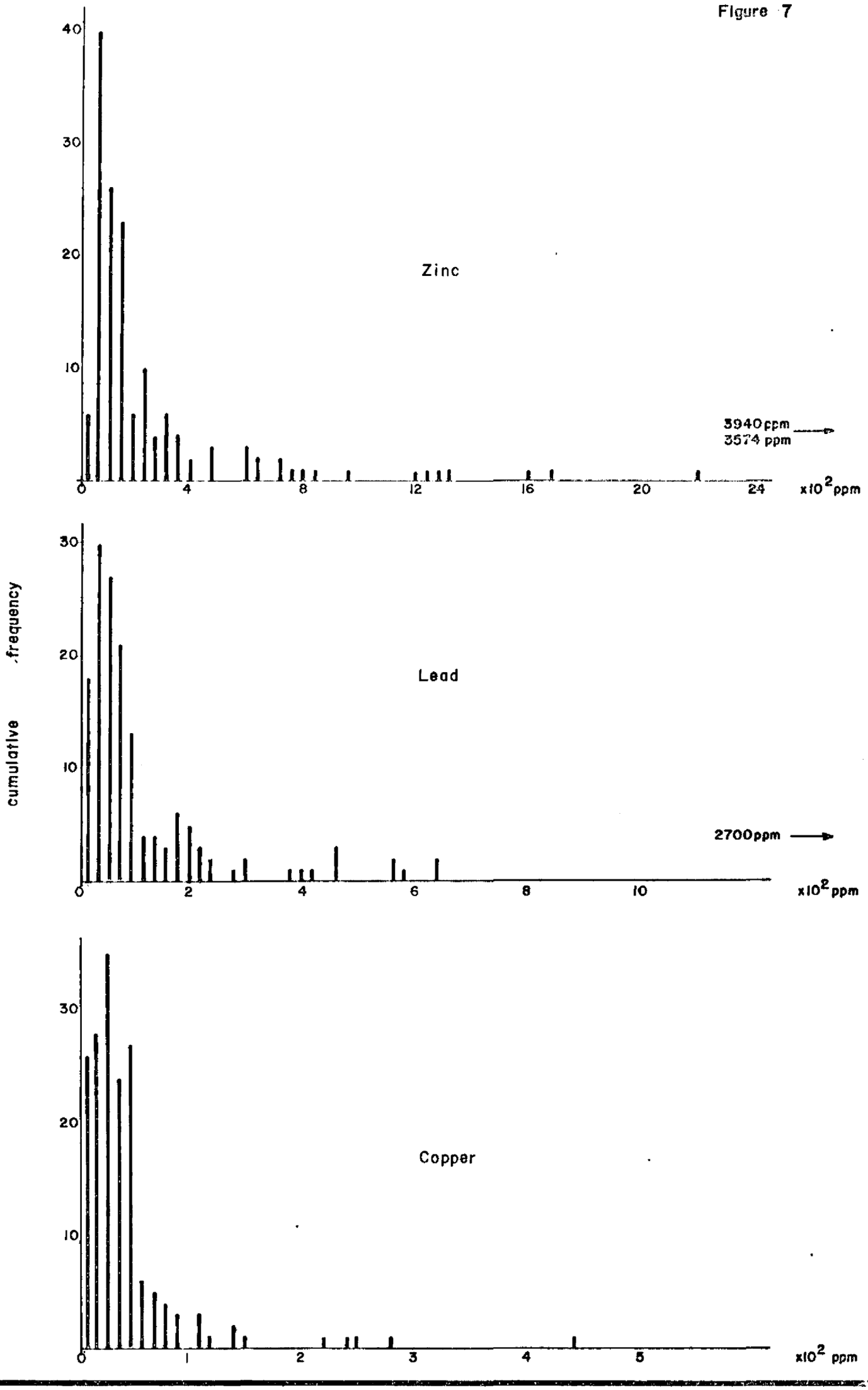
BLOCK IMPRESSION OF SECTION A-A

Diagram shows possible sub-surface extensions of mineralized outcrop.

Not to scale.

SITE I GEOCHEMICAL DISTRIBUTION PLOTS

Figure 7



SITE I . GEOCHEMISTRY

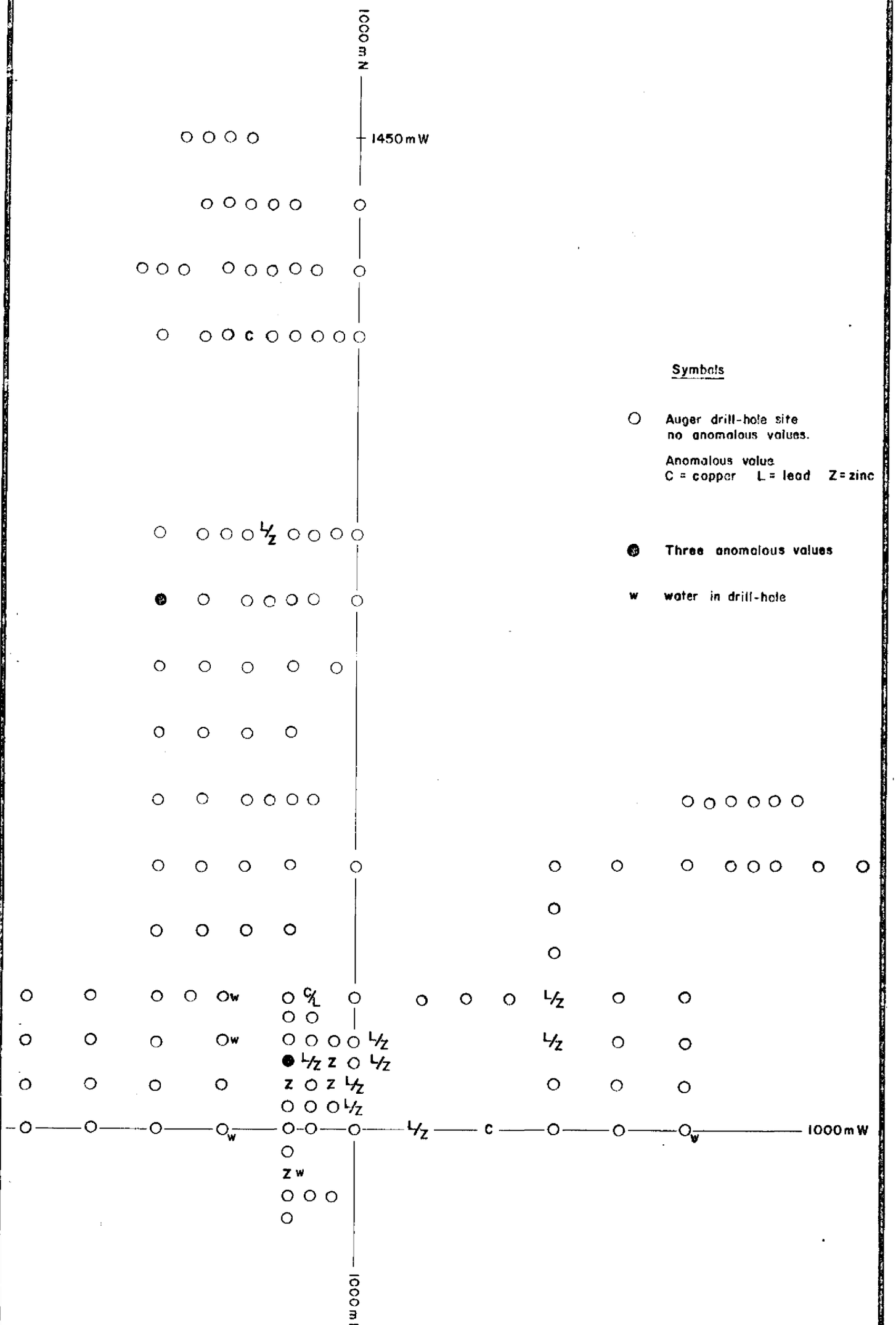


Figure 8

SITE I COPPER GEOCHEMISTRY

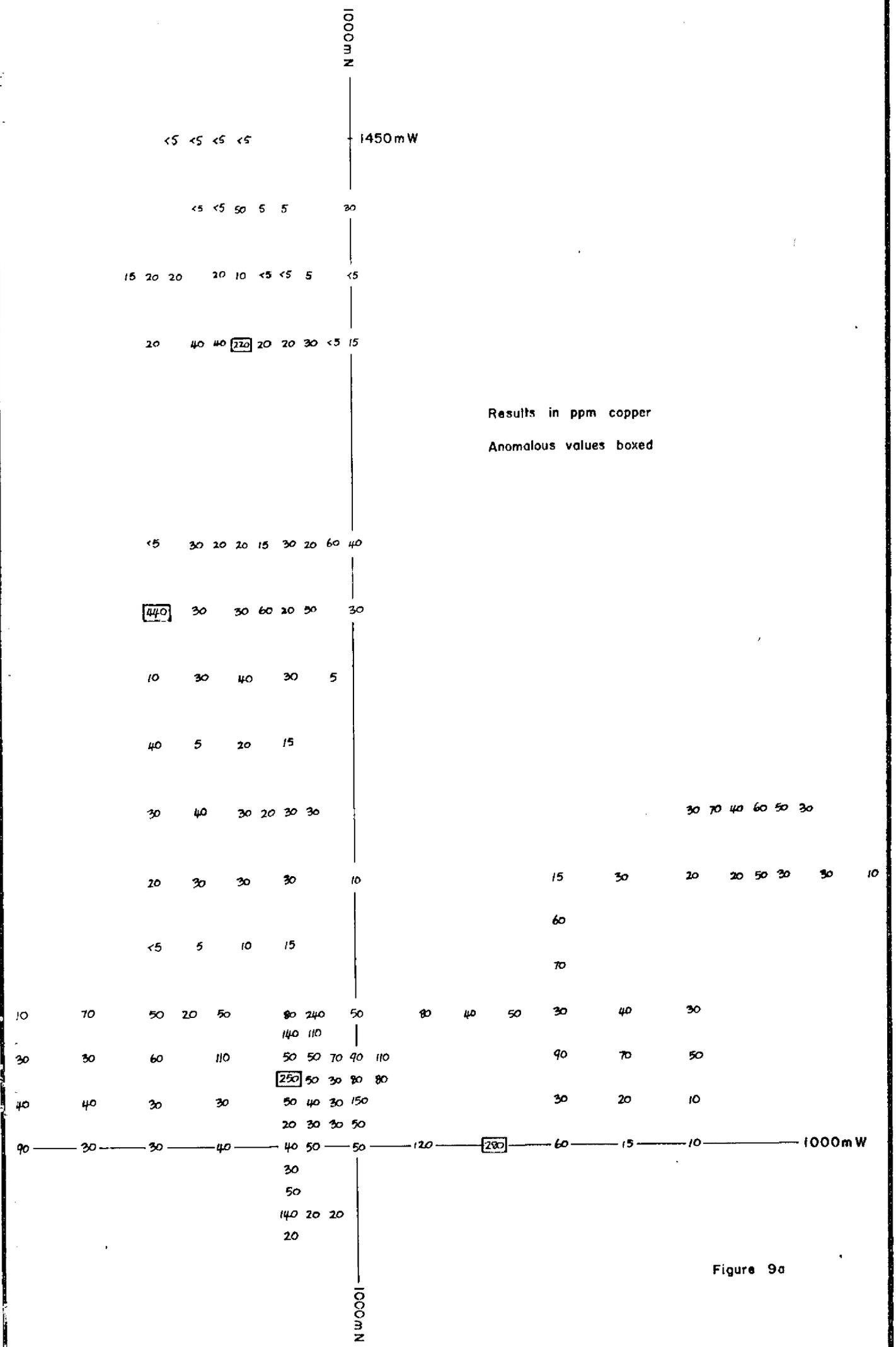


Figure 9a

SITE I LEAD GEOCHEMISTRY

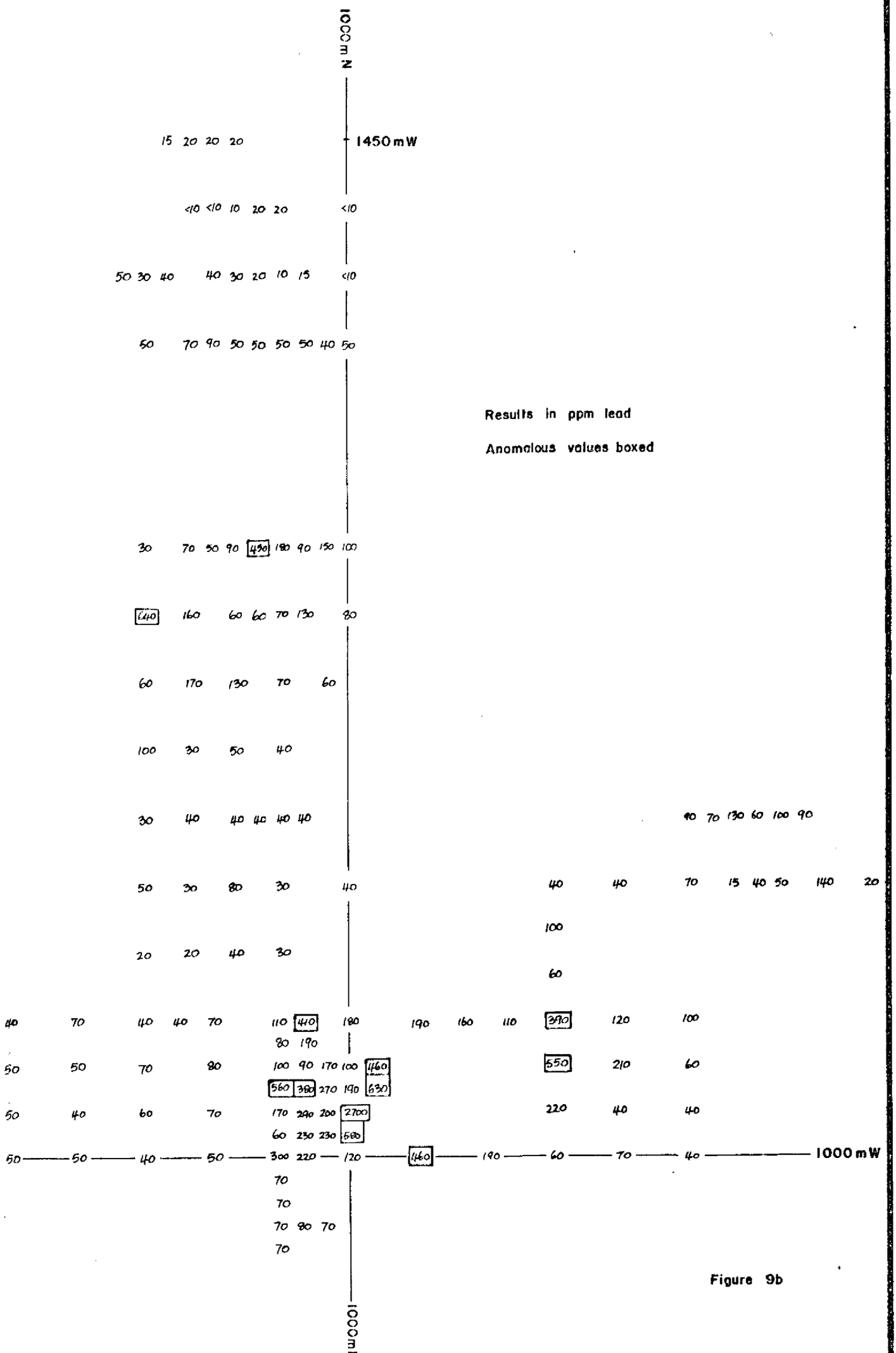


Figure 9b

SITE I ZINC GEOCHEMISTRY

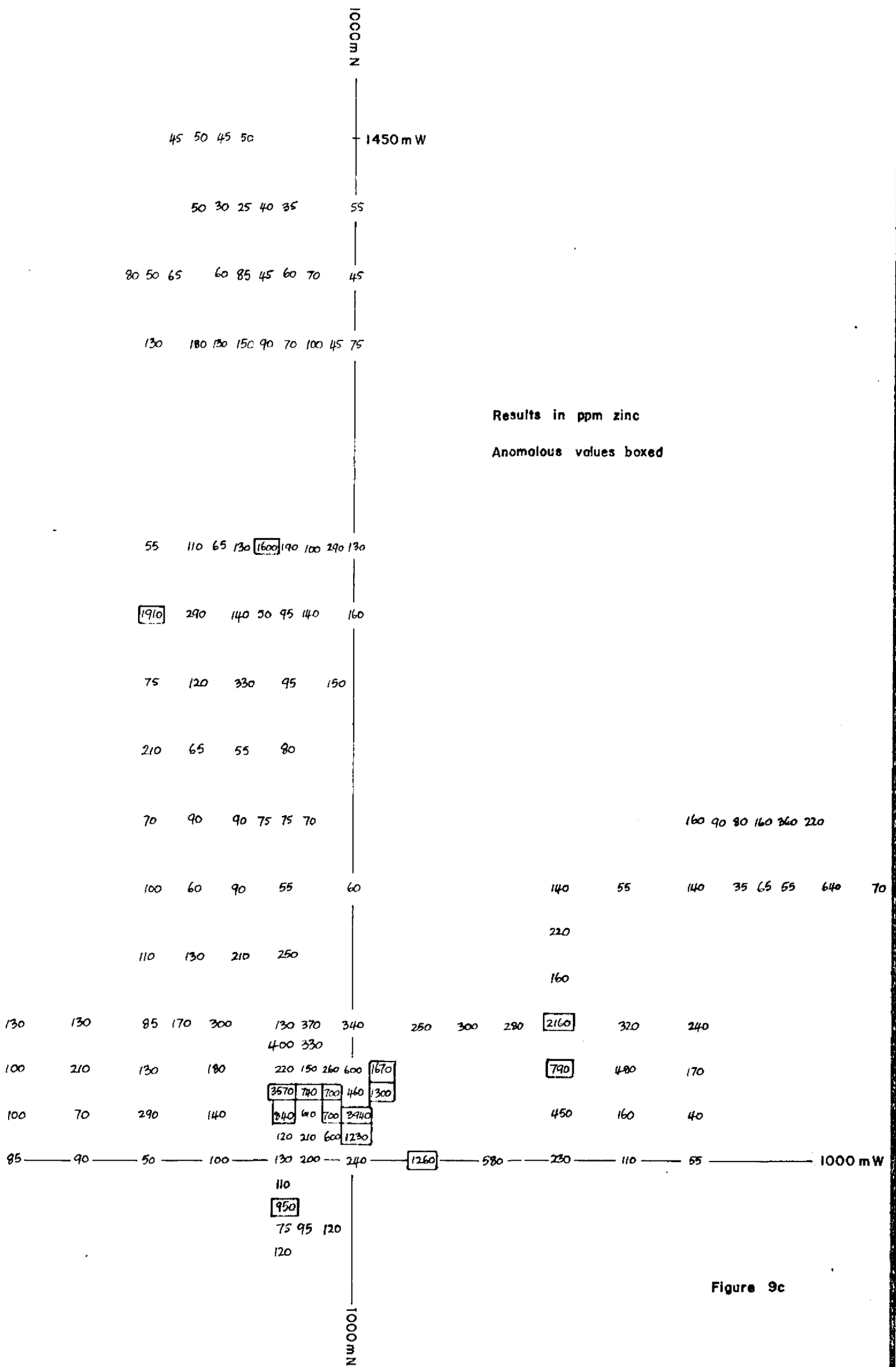
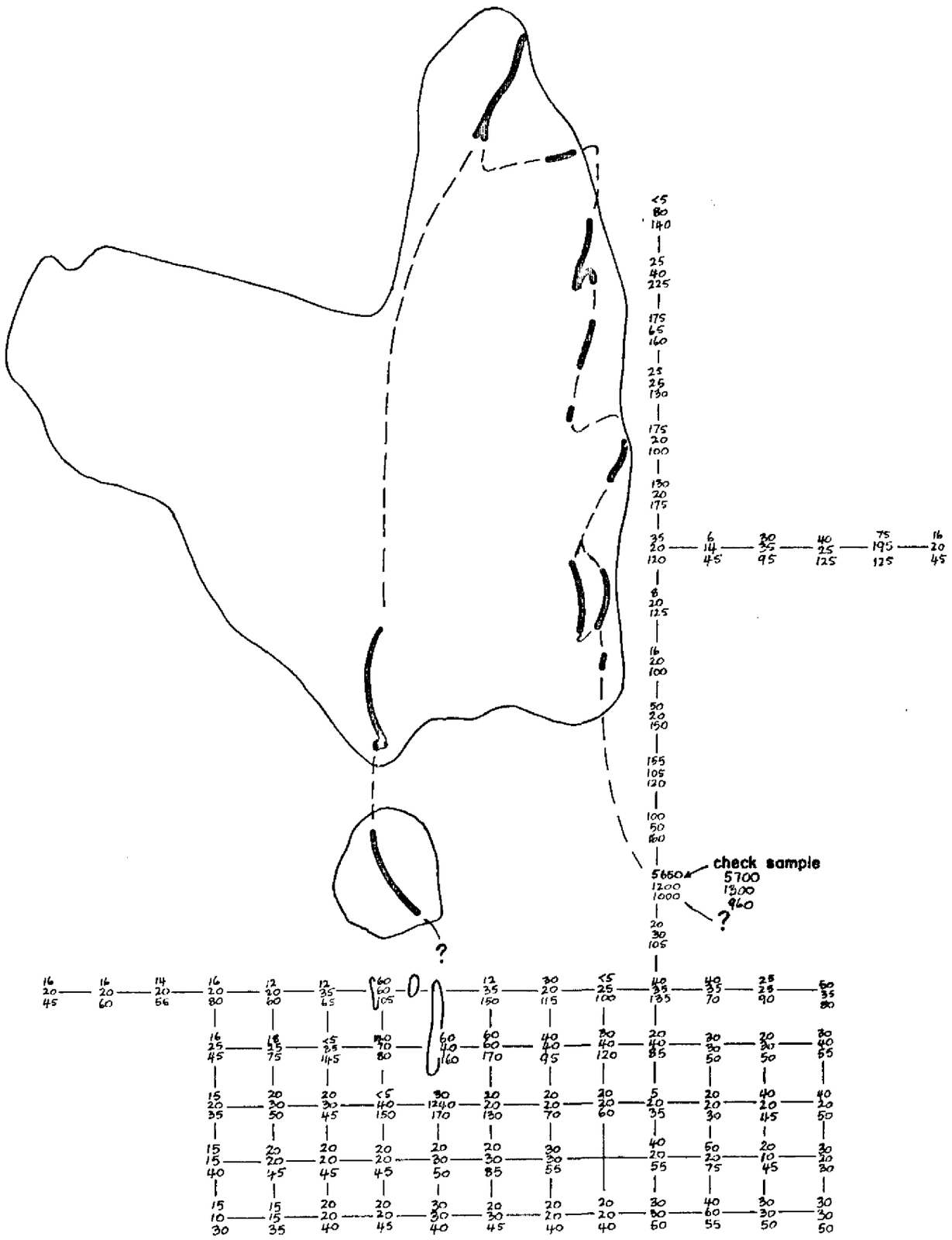


Figure 9c

SITE 2 GEOCHEMISTRY



SCALE

0 20 40 60 metres

Explanation

30
30 parts per million of copper
30 lead
zinc

outcrop of mineralized amphibolite

possible sub-surface extension of amphibolite

Figure 10

SITE 2 GEOLOGICAL PLAN

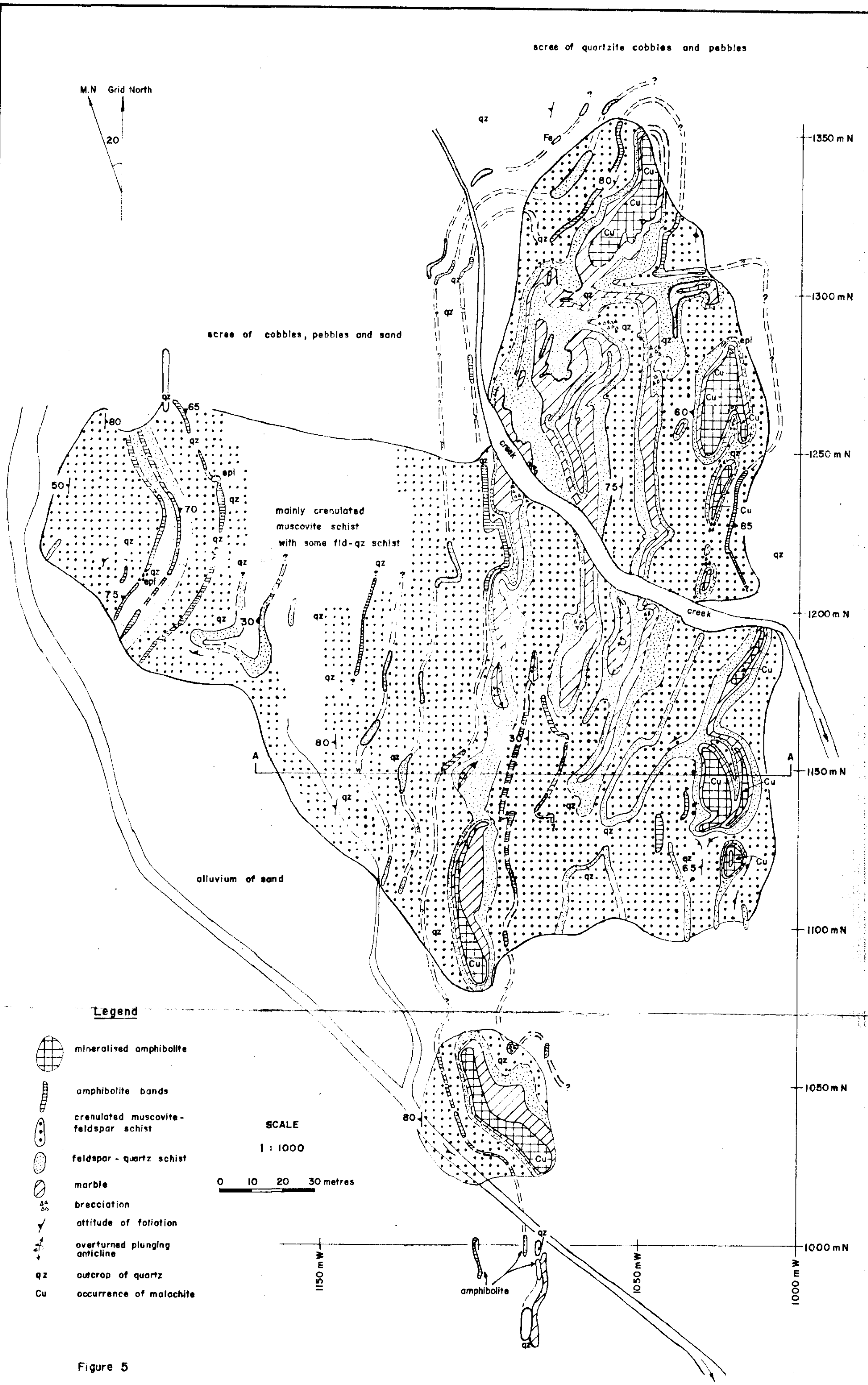
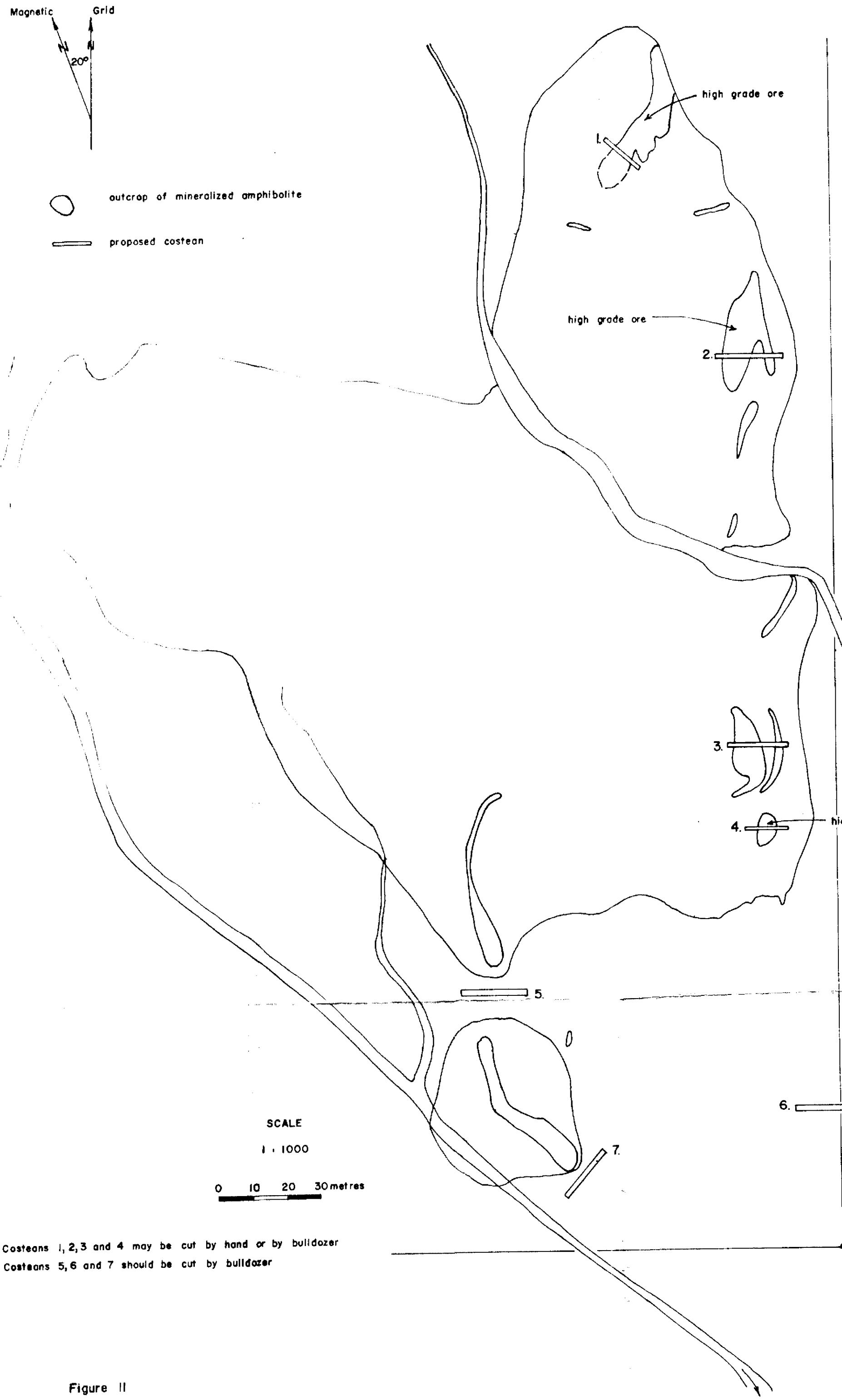


Figure 5

SITE 2 PROPOSED COSTEANS



Costeans 1, 2, 3 and 4 may be cut by hand or by bulldozer
Costeans 5, 6 and 7 should be cut by bulldozer

Figure II