DEPARTMENT OF MINES

SOUTH AUSTRALIA

THIRD GEOCHEMICAL AND GEOLOGICAL REPORT

ON THE SERLE - ANGEPENA AREA

Nichols Nob, Serle 1-Mile Sheet

by

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PLANS

Rept. Bk. No. 66/81
G.S. No. 3943
D.M. 1200/65

20th March, 1968.

DEPARTMENT OF MINES

SOUTH AUSTRALIA

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ABSTRACT

Geochemical soil sampling near Nichols Nob, over the western margin of the Burr diapir, has delineated several copper anomalies. The largest of these have formed over the Yudnamutana Sub-Group, at the edge of the diapir, and over black shales lying within the diapir. Most of the smaller anomalies are related to local vein type mineralisation and thought to be insignificant.

The black shales, which may have malachite spotting, suggestive of possible syngenetic mineralisation, are much thicker than nearby exposures of the Tindelpina Shale Member, and may be of Torrensian age.

Geophysical investigations over the geochemical anomalies have been recommended.

INTRODUCTION

General

Geochemical stream sampling of the Burr diapir, in the Serle-Angepena area, commenced in 1965 and was completed in November 1966, when the reservation on the eastern half of the reserve was revoked. Results of sampling from this preliminary geochemical investigation have been incorporated on a set of geochemical plans, included with a report on the project (Fairburn, 1967A). Areas of anomalous copper area most clearly revealed on the contoured plan (op. cit Plan No. L66-108).

Most of the recorded anomalies lie round the margins of the diapir and have been derived from secondarily dispersed copper in the Yudnamutana Sub-Group, but several significant anomalies also occur within the diapir, apparently unrelated to the Yudnamutana Sub-Group. Included in this second group are five separate anomalies, all of which would seem

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* (Footnote) The alternative but new officially discredited spelling of Nichol's Knob for this name has been inadvertently used on the plans accompanying this report.

to be associated with outcrops of black shale, which may be visibly mineralised with copper. The most obvious examples occur ar the Federal and Mandarin mines, where the shales have been exploited for copper. Only two of the anomalies associated with black shale lie within the present reserve; these occur at the Federal mine and over a wider area easterly from Nichols Nob, in the regien of the Big Lode mine.

The Nichols Nob anomaly, which is also partly derived from a small outcrop of the Yudnamutana Sub-Group near the margin of the diapir, was selected for detailed soil sampling, as part of the second phase in geochemical investigations of the Burr diapir (See Fairburn, 1967B, p.1). Sampling commenced in July 1967, and was completed by September.

This report includes plans of the geochemical soil sampling locastions with assay results, and also a geological plan of the sampled area showing the boundary of the diapir and the extent of the outcrops of the Yudnamutana Sub-Group and the black shales.

Size

The sampled area, which forms only a small part of the Serle - Angepena reserve, is about 2 square miles in extent, being formed by two joining rectangular blocks aligned roughly northeasterly along the north-western edge of the Burr diapir.

Location and Access

The Nichols Nob area is situated in the northern Flinders Ranges about 22 miles easterly from Lyndhurst and about the same distance northeasterly from Leigh Creek. It includes the Big Lode mine and part of the workings associated with the Nichols Nob mine. The most prominent landmarks in the region are Nichols Nob and Mount Burr.

Access to Benalack well, which is in the immediate vicinity of the area, is by way of station tracks from the Lyndhurst Siding - Mt. Lyndhurst road through Tower Gap, from the Copley - Umberatana road through Mt. Serle and Weedna bore, or from Leigh Creek by way of Burr Well. From Benalack well, the sampled area is either approached from an old track between the Nichols Nob and Big Lode mines, or from another disused track joining Benalack well and Extension bore.

Physiography

The country forming the Nichols Nob area is a fairly distinct topographic unit of quite high relief lying along but mainly inside the northwestern edge of the Burr diapir. The relatively umbrecoiated and well bedded nature of the block has produced a series of sharp crested, near parallel ridges, sharply contrasting with the subdued relief of the brecciated diapir proper to the southeast, and the alluviated plains on Tapley Hill Formation to the northwest. Tower Creek forms the south-westedge of the unit, while a tributary to that creek forms the north-eastern side.

Although no elevations are known, it is probable that the crests of the highest hills and ridges near Nichols Nob represent the remnants of the 1200ft. surface, which is conspicuously developed in this part of the Flinders Ranges (Fairburn 1967B, p.3).

The elevation of the plain of recent alluvium between Nichols Nob and Tower Gap is mainly below 900ft. An older alluvial surface (Telford Gravel) has not been recognized.

Previous Geological Work

Geological reports on the region are mainly from Inspector of Mines report of mining activity from the Nichols Nob and Big Lode mines. These reports are included in the Reviews of Mining Operations and Mining Reviews between 1905 and 1921. Early reference is also made to the Nichols Nob mine (Benalack mine) by H.Y.L. Brown (1908). More recent reports on the geology of the mines are from L.W. Parkin (1953) and M.L. Reyner and R.K. Pitman (1955).

Geological mapping by the Department of Mines in the region of Nichols Nob is included on the Serle sheet (Geological Atlas 1 Mile Series) published in 1953, which shows the proximity of the Burr "Crush zone" (or diapir) to the localitites of copper mineralisation. Revision of the mapping on the Serle sheet by R.P. Coats (Regional Mapping Division) has recently been completed for inclusion on the Copley 4-Mile sheet.

GEOLOGY

This account of the geology will be limited to the sampled area and the region immediately adjacent to the sampled area.

Basically, the geology of the area is not complex, consisting of a block of steeply dipping Willouran or Torrensian siltstones and dolomites in diapiric breccias and delomites (which form part of the anticlinal Burr diapir), flanked to the northwest with a very irregular contact by northwesterly dipping strata of the Umberatana Group.

Stratigraphy

Following detailed geological mapping in recent years, the stratigraphy of the Proterozoic System exposed in the Flinders Ranges is fairly well known and the boundaries of many diapiric structures have been recognised. Inside the diapirs, however, mapping has been more restricted, due to the lack of mappable sequence and the discontinuity of the isolated blocks of bedded deposits which normally occur surrounded by diapiric breccias. Some bedded deposits of distinct lithology exposed within the diapirs have been correlated with stratigraphic units outside the diapirs, but in other cases no such correlations have been made and even the exact age (Torrensian or Willouran) of the unit may be uncertain. For this reason, the description of the Proterozoic geological sequence outside the diapir will be based upon stratigraphic units, whilst inside the diapir, on lithologic units.

A geological plan (No. 68-91), showing the fundamentals of the geology is included with this report.

The following sequence of rock units over which soil sampling has taken place have been recognized:-

Pleistocene-Recent	-	(Recent deposits (Telford Gravel
Adelaide System	Umberatana Group	(Tapley Hill F. (Tindelpina Shale M. (Yudnamutana Sub-Group
	Burra Group and Callanna Beds	(Bedded dolomites (Dolomitic siltstones (Black shales (Diapiric breccia and (massive delomite

Pleistocene - Recent

Recent deposists

Recent deposits are represented by a flat plain of alluvium stretching northwesterly from the region of the Nichols Nob mine to Tower Gap and thin silty soils developed over the hills.

The alluvium is mainly fairly thin, rock exposure being present in most creek beds which are not deeply incised. Small isolated exposures of Tapley Hill Formation also project above the plain in many places.

Soil cover is very sparse, being only present in appreciable thickness where accumulation by transportation has occurred on scree slopes and valley floors. On hill crests, particularly where dolomite is present, transported soil is limited to depressions and dolution hollows on the rock surface.

Telford Gravel

The Telford Gravel surface is not conspicuously developed, being probably only present as a narrow apren round some of the hills, where it grades into the scree slopes. Part of the alluviated plain may have developed by downgrading of a Telford Gravel surface.

Umberatana Group

Outside the diapir

The Burr diapir, as with many other domal or anticlinal type diapirs in the Flinders Ranges, has typically developed around its rim the basal units of the Umberatana Group. In most places the lowest member is the Yudnamutana Sub-Group.

East of Nichols Nob, the very irregular edge of the Burr diapir (see plan No. 68-91) is mainly in contact with the Tapley Hill Formation, the Yudnamutana Sub-Group and Tindelpina Shale Member being generally missing, due to possible engulfment within an outwardly expanding diapir.

Tapley Hill Formation

An in-sequence contact between the Tapley Hill Formation and the top of the Tindelpina Shale Member is only exposed between sample lines 3200S and 800N (Fig. -), where a block of Tapley Hill shale has been almost enclosed within the diapir by two 'intrusive' tongues of diapiric breccia. Elsewhere, the Tapley Hill Formation is in direct contact with the diapir, the boundary between being very irregular and often marked by veins of coarse calcite and zones of brecciation.

Tindelpina Shale Member

The Tindelpina Shale, which reaches a maximum thickness of about 100ft. overlies the Yudnamutana Sub-Group easterly and southeasterly from the Nichols Nob mine. Its variations in thickness on the map (Plan No. 68-91) are due to variations in the extent of its exposure down the dip slope of the Yudnamutana Sub-Group. No known copper mineralisation is associated with the Tindelping Shale and where free of contamination from the Yudnamutana Sub-Group, does not give rise to anomalous copper in overlying soils.

Yudnamutana Sub-Group

This unit is exposed overlying diapiric breccias and underlying the Tindelpina Shale Member between sample lines 400S and 800N, and as a capping on a small hill surrounded by breccia between lines 4800S and 5600S.

The absence of the Yudnamutana Sub-Group elsewhere between the diapir and the Tapley Hill Formation is probably due to post-Tapley Hill movements of the diapir, rather than to non-deposition of the Yudnamutana Sub-Group. Apart from the small exposure of tillite between lines 4800S and 5600S, there is no other evidence within the diapir in this region of included blocks of the Yudnamutana Sub-Group.

<u>Inside the diapir</u>

The bedded formations lying inside the diapir form a distinctive topographic block surrounded by lower lying ground of gentle relief formed by weathering of typical diapiric breccias and dolomites.

Due to the lack of correlation between the younger Proterozoic rocks within the diapir with equivalent formations outside the diapir, it is not known whether the bedded rocks in the diapir are of Torrensian or Willouran age, and for this reason they have not been assigned to any one group.

Generally, the various bedded units in the block form sharp crested, steep sided ridges, with the intervening ground being occupied by diapiric breccia.

Bedded dolomites

The bedded or banded dolomites, which are pale in colour and finegrained in texture, form a ridge of steeply dipping strata extending northeasterly from the Big Lode mine track and lying just to the east of the northwestern outcrop of black shale (Plan No. 68-91). The south-western end of the ridge terminates against the outcrop of the Yudnamutana Sub-Group, while the northeastern end lies outside the sampled area.

Soils with anomalous copper content (up to 290 p.p.m.) are associated with these dolomites on lines 400N and 4800N.

Dolomitic siltsones having a maximum thickness in the order of 1000ft. outcrop as a distinctive unit with bold relief bordering the northwesterly edge of the largest outcrop of the black shales. The siltstones, which are greyish or brownish in colour, show wavey or cross-bedding, are micaceous on their bedding planes and contain very thin layers of brown carbonate. Interbedded and grading into the siltstones are thin bands of yellow weathering dolomite, which probably represent a more highly dolomitic facies of the siltstone.

The northeastern end of the siltstone outcrop terminates sharply against massive dolomites along the line of the tributary to Tower Creek, while the southwestern end of the outcrop terminates in diapiric breccias.

Copper mineralisation in the silstones occurs at the Big Lod mine and at a small locality on sample line 00 southwesterly from the Big Lode mine. Except for soils near these two occurrences, soil samples over the siltstones give only background copper contents.

Black Shales

Apart from the Tindelpina Shale Member already described (p.6), two outcrops of black or dark coloured shale and siltone occur in the sampled area. The largest of these outcrops, which is about 600ft. thick, lies close to the southeastern edge of the sampled grid between lines 1600S and 4800N, while the smaller outcrop, which is less than 300ft. thick, lies in the northwestern corner of the area between lines 2400N and 4800N. It is possible that the larger mass of black shale is in sequence with the dolomitic siltstones,although the order of succession was not determined. Along strike, both outcrops pass abruptly into breccias or massive dolomites.

Characteristically, the black shales, which weather dark blue or grey, are finely laminated and highly pitted. The pits are usually subrounded in outline and are seldom greater than 1mm. in diameter. Inclusions in the pits are most usually iron oxides (limonite), but malachite infillings are not uncommon. Dispersed malachite along joint planes in the shales were noted at one locality on line 400N over the larger exposure, while carbonate veins with copper sulphides have been exploited at a number of localities on the smaller exposure.

The copper anomaly outlined by stream sediment samples east of Nichols Nob was largely due to high copper contents in stream sediments derived from the black shale outcrops (Fairburn, 1967A, Plan No. 66-1041). Soil sampling on a grid over this anomalous area revealed well marked zones over the black shales with anomalously high copper.

Diapiric breccia and massive dolomite.

The most typical rock type in the Burr diapir is the chaotic dolomitic breccia, which contains characteristic blocks of cross-bedded sandstones with halite pseudomorphs, and longer blocks of massive, siliceous or cherty, flow folded dolomite. Original bedding structures are rarely recognized in this unit as a whole.

The breccia surrounds and enclosed the blocks of bedded sediments and appears to have intruded the rim rocks of the diapir. East of Nichols Nob, a large outcrop of Tapley Hill Formation overlying Tindelpina Shale and the Yudnamutana Sub-Group has been very nearly engulfed by breccia (Plan No. 68-91).

Copper contents of soils over the breccia are background values only.

Structural Geology

The Nichols Nob area lies partly outside and partly inside the northwestern edge of the Burr diapir, which is an elongate domal structure modified by folds (probably later) with axes oblique to the median axis of the diapir. One of these oblique anticlinal fold axes runs through the line of the Nichols Nob mine working and although the fold is not clearly recognisable at this point, it can be clearly demonstrated near Tower Gap, where the fold has a northwesterly plunge.

The bedded strata within the diapir have very steep to vertical dips, with strike directions roughly aligned parallel to the edge of the diapir. Outside the diapir, the rim rocks which dip away from the structure, have locally, steeper angles of dip near the diapir contact.

Mines and Mineralisation

According to Pitman and Reymer (1955, pp. 8-9), the Nichols Nob mine shipped 62 tons of ore between 1895 and 1920 from copper bearing veinlets composed of quartz, calcite on siderite, while the Big Lode mine between 1905 and 1919 shipped 195 tons of ore from an irregular, ferruginous, quartz lode. The true total productions from these two small mines are not known and the above production figures must be estimates only.

Stratigraphically, the Big Lode mine is situated within the diapir in the dolomitic siltstones and the Nichols Nob mine is situated outside the diapir in the Tapley Hill Formation.

The structural control for the location of the Big Lode mine is not known but the worked veins of the Nichols Nob mine are occupying tension joints along the crest of an anticline.

Limited exploitation of copper deposits has taken place at several other localities within the sampled area, particularly from carbonate or quartz-ferruginous veins within the diapir or the Yudnamutana Sub-Group (See plans with report). Malachite as spotting and dispersions along joint planes in the black shales has already been referred to (p. 8).

GEOCHEMISTRY

Preliminary geochemical exploration over the Burr diapir by stream sampling in 1965-66 indicated a copper anomalous area of about 2 square miles in extent, situated mainly inside the diapir, just east of Nichols Nob. Follow up work over this anomaly by soil sampling, completed in 1967, has restricted the extent of the anomaly to certain stratigraphic units.

Stream Sediment Sampling

The extent of the copper anomaly in the Nichols Nob area, outlined by stream sediment sampling, is most clearly illustrated by the 80p.p. contour on plan L66-108 (Fairburn, 1967A), which enclosed an area controlled by 12 samples each containing copper in excess of 80 p.p.m.

It became apparent even during this phase of sampling, that there are at least two possible sources for the sediments containing anomalous copper, after allowing for possible contamination from old mine workings. One source is the outcrops of the Yudnamutana Sub-Group, with one sample over 400 p.p.m. copper, and the other source the black shale areas, with samples containing about 120 p.p.m. copper. Drainage trains extending from these anomalous sources can be traced for at least as far as Tower Gap, a distance of about three miles.

As the Nichols Nob anomaly had been fairly clearly delineated by stream sediment sampling using the minus 80 mesh fraction, it was decided not to gain better contrast by repeating the sampling to obtain copper contents for coarser fractions, but to proceed directly to soil sampling.

Soil Sampling

The soil sampling grid over the Nichols Nob anomaly was established by outlining the area of interest on a 20 chains to 1 inch aerial photograph, and plotting on the sample lines at intervals of 800ft. This gird as outlined, consists of two joining rectangular areas aligned in a northeasterly direction. One of the rectangles is 8000ft. long by 5200ft. wide, while the other is 4,000ft. long by 3,300 ft. wide. The positions of the plotted sample lines were pegged on the ground and samples were taken along them at intervals of 100ft. Measurement between sample points was determined by taping, so no adjustment was made on the ground for changes in topography.

Complete sampling of the grid resulted in 795 soil samples being taken, all of which were sieved to minus 80 mesh and then analysed for copper by atomic absorption spectrophotometer, at the Australian Mineral Development Laboratories. Of these samples, 278 were also examined for lead and zinc. Wherever possible, all soil samples were taken at a depth of a few inches.

A contoured geochemical plan (Plan No. 68-92), on the scale of 1 inch to 800ft., of copper contents in the soils was drawn to illustrate resulting anomalies. In plotting sample positions on this plan some adjustment had to be made for the accumulated errors in the original taping due to topography. As there were no anomalous lead or zinc values, a combined geochemical plot (Plan No. 68-93) was left uncontoured.

Copper

The distribution of copper in 750 of the soil samples examined is illustrated in Fig. 1, Plan No. S6413 (values greater than 170 p.p.m. are not included). In this diagram, the copper contents, which had been determined to the nearest 5 p.p.m., have been plotted to the nearest 10 p.p.m. to smooth out the distribution curve. The mode of this distribution, which is markedly asymmetrical and unimodal is 20 p.p.m.

Assuming that the distribution of background copper is normal and unimodal, the arithmetic mean of background calculated from the pre modal, modal and post-modal frequencies is 23.5 p.p.m. The standard deviation of background is 80 p.p.m. As an arbitrary lower limit of anomalous values, the upper limit of background (arithmetic mean plus twice standard deviation) for the distribution of copper is approximately 40 p.p.m.

Plotting of the copper contents on a sample location plan has resulted in the preparation of a contoured plan (Plan No. 68-92) indicating the areal distribution of copper. The contour intervals chosen for this plan are 50 p.p.m., 100 p.p.m and 200 p.p.m., which correspond to 1.25 x background, 2.5 x background and 5 x background.

By comparison of the geological plan with the contoured plan of copper distribution, it can be clearly seen that there are three main anomalous areas, which can all be related closely to stratigraphic units. Two of the anomalies overlie areas of black shale, while the third is related to the outcrop of the Yudnamutana Sub-Group. Soil samples from over the Tindelpina Shale Member where contamination from the Yudnamutana Sub-Group is unlikely, are not anomalous. Many miner anomalies in the sampled area, such as the small anomaly surrounding the Big Lode mine, can be ignored, as they are mainly related to old dumps and workings. It is noticeable that for the anomaly over the larger black shale outcrop, the most highly anomalous samples are from the an area where secondarily dispersed malachite has been noted.

The origin of the copper in the black shales producing the soil anomalies is not known, but it is suggested, that there is a strong possibility that copper has been fixed in these rocks during secondary dispersion by weathering, of copper bearing veinlets. That epignetic copper bearing veins exist in the area can be adequately demonstrated, although this cannot be proved in the case of the larger exposure of black shale. A fixing agent in the black shale could be pyrite, the original presence of which indicated by the abundant pitting.

Lack of anomalous lead and zinc in soils over the black shales is also suggestive of a secondary mineralisation, rather than a primary syngenetic mineralisation.

Lead and Zinc

Analyses of soil samples for lead and zinc are mainly limited to those samples taken from over or near the black shales. Such analyses were designed as supporting evidence to test possible theories for the origi of the copper in the shales. Anomalous lead and zinc contents would be somewhat indicative of syngenetic copper in the shales, while lack of anomalous quantities of these metals would favour a secondary origin for the copper.

A total of 278 soil samples were assayed for lead and zinc, the distributions of the metal contents being illustrated by the histograms in figs. 2 and 3 (Plan No. S6413). The lead distributions are given to the nearest 5 p.p.m., while the zinc distributions are given to the nearest 10 p.p.m.

Although there is some asymmetry in both sets of distributions, particularly as regards the lead, it is considered that both sets of results are representing background values only, the strong positive skew on the lead curve being due to either a log normal distribution, or an analytical preference resulting in values between 10 and 15 p.p.m. being more commonly recorded as 10 p.p.m.

The lead contents have a standard deviation of 5.5 p.p.m., an arithmetic mean of 14.1 p.p.m. and an upper limit of background of 25 p.p.m while the zinc contents have a standard deviation of 11.5 p.p.m., an arithmetic mean of 38.9 p.p.m. and an upper limit of background of about 60 p.p.m. It will be noticed from the histograms, that very few lead and zinc values the soils lie above their respective upper limits of background. One strongly anomalous lead content (110 p.p.m.) is not significant.

Due to lack of anomalous lead and zinc contents, contouring of the sample location plan (No. 68-93) for these elements is not justified.

CONCLUSIONS AND RECOMMENDATIONS

Geochemical soil sampling easterly from Nichols Nob over an area of about two square miles, previously defined by anomalous copper in stream sediments, has revealed three significant stratigraphically controlled copper anomalies. Two of the anomalies overlie outcrops of black shale and siltstone, while the third has formed over an exposure of the Yudnamutana Sub-Group. The anomalous soil samples in all cases contain only background lead and zinc contents.

Epigenetic mineralisation in the form of cross-cutting veins is well established in the area, while syngenetic mineralisation is suggested by the presence of malachite spotting in some exposures of the black shales.

It has been recommended that the geochemical anomalies be investigated by induced polarization traverses prior to exploratory waggon drilling.

WAF:CC

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There is no page 13 in report 66/81

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APPENDIX

Cumulative frequency plots on linear and log probability paper for the copper contents of soils in the Nichols Nob area show marked deviations from both normal and legnormal districutions. Such deviations, can only be explained by the existance of multiple populations, or by the presence of anomalous values occurring with a normal or legnormal background distribution.

In calculating the upper limit of background copper for the Nichols Nob area, it was assumed that the distribution of background copper was normal.

Lead and zinc contents plot as straight lines on both types of probability paper.

Included with this appendix are cumulative frequency plots of the copper, lead and zinc contents on log probability paper.

DEPARTMENT OF MINES — SOUTH AUSTRALIA

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Tcd.
Ckd.
Exd.

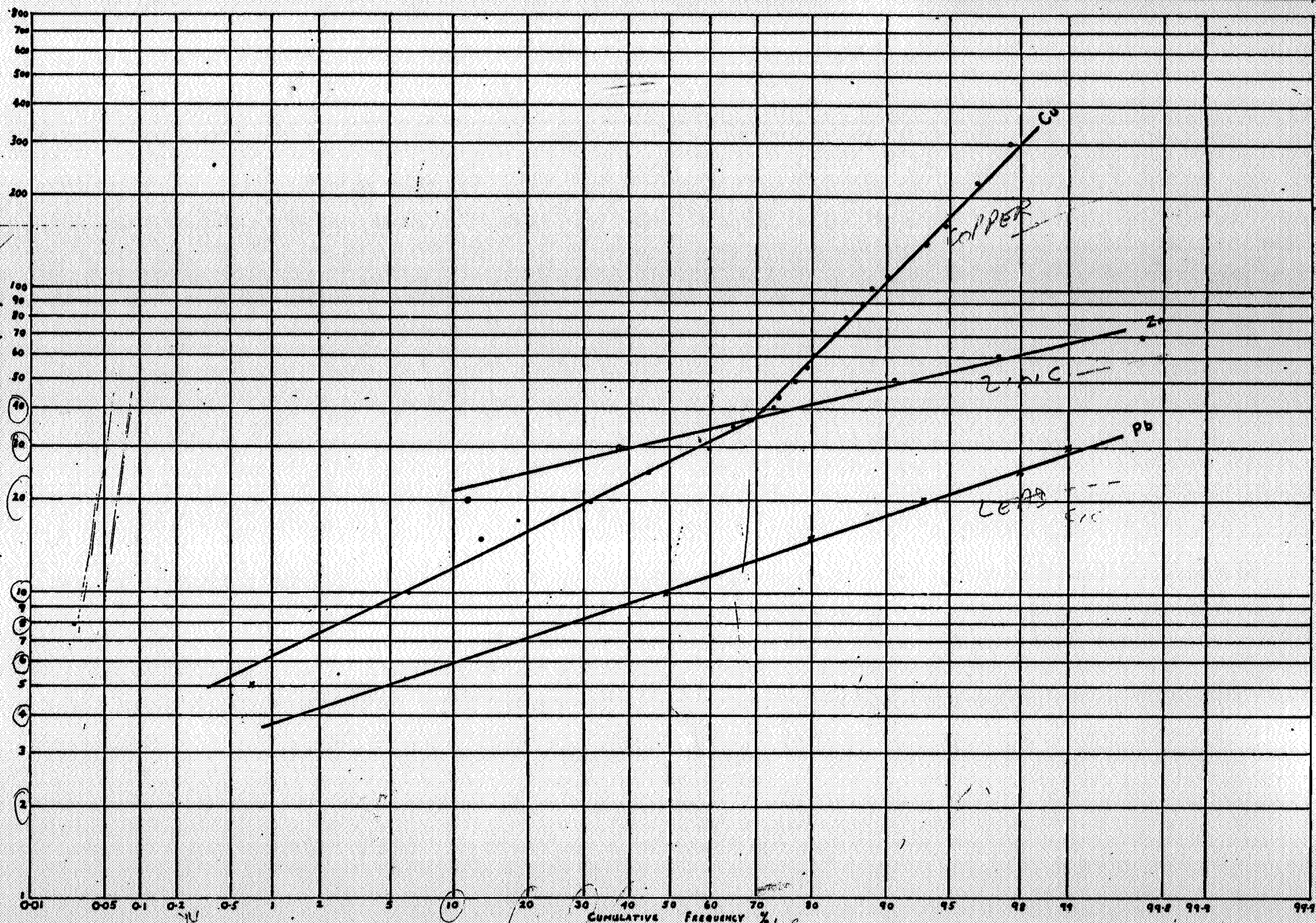
NICHOLS NOB AREA

CUMULATIVE FREQUENCY PLOTS OF COPPER LEAD AND ZINC ON LOG PROBABILITY PAPER

SCALE: ——

S 6462

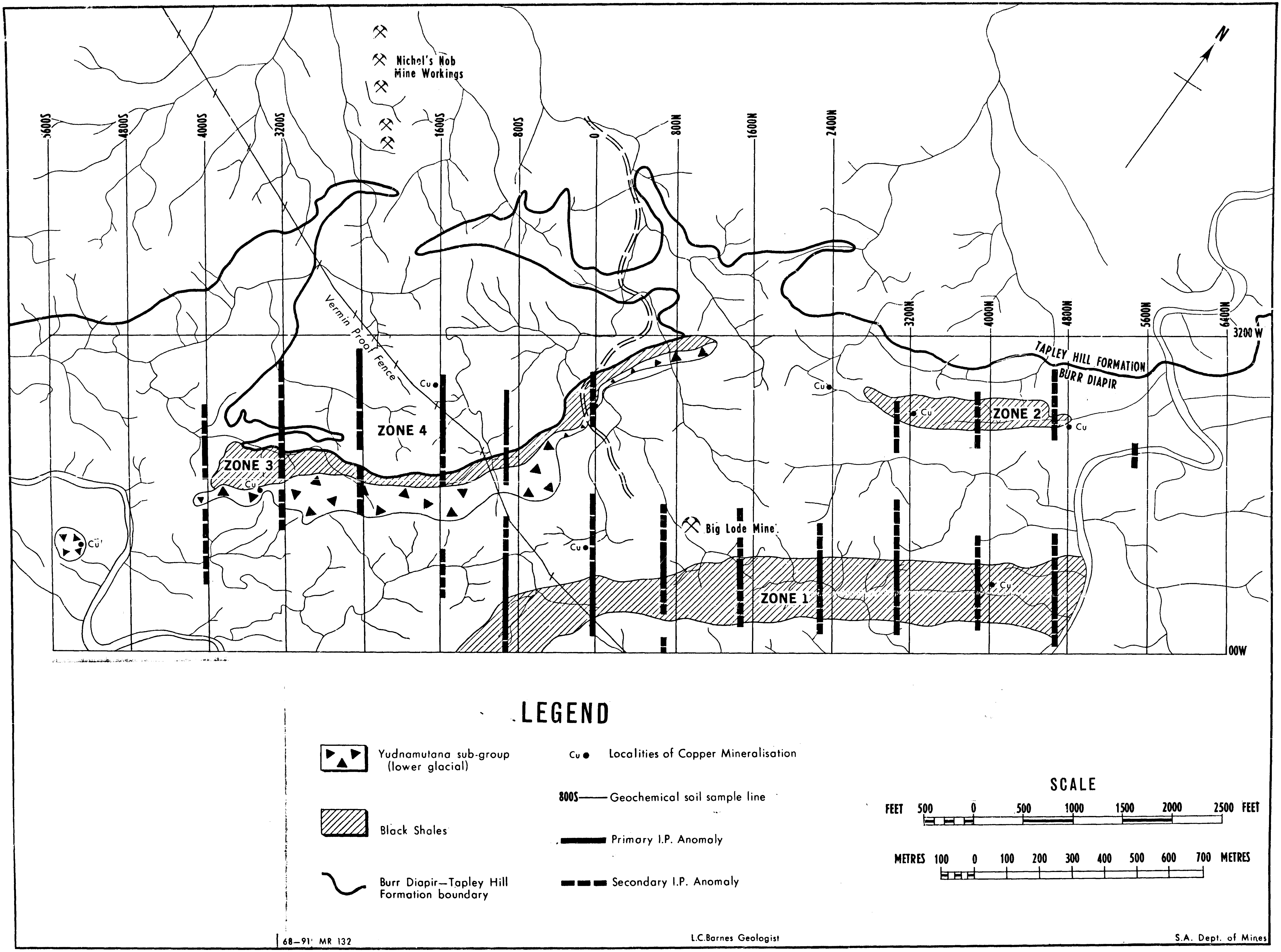
DATE: 4·4·68



A14

P18

TRIM · LINE


Nichol's Nob
Mine Workings
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4800S
4000S
3200S
1600S
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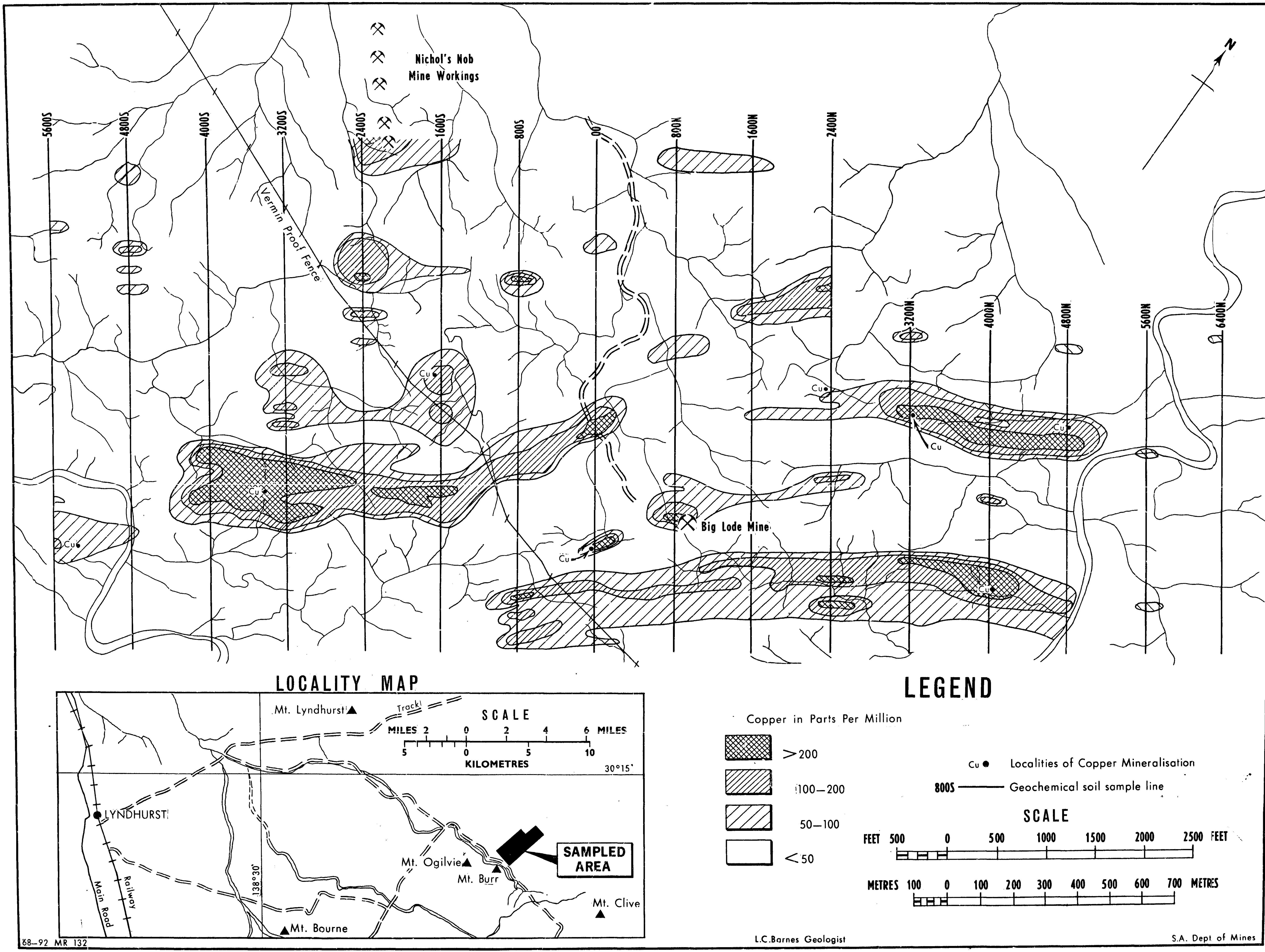
800N
1600N
2400N
3200N
4000N
4800N
5600N
6400N
3200 W
00W
Vermin Proof Fence
TAPLEY HILL FORMATION
BURR DIAPIR
ZONE 1
ZONE 2
ZONE 3
ZONE 4
Cu
Big Lode Mine
LEGEND
Yudnamutana sub-group (lower glacial)
Black Shales
Burr Diapir—Tapley Hill Formation boundary
Localities of Copper Mineralisation
800S Geochemical soil sample line
Primary I.P. Anomaly
Secondary I.P. Anomaly
SCALE
FEET 500 0 500 1000 1500 2000 2500 FEET
METRES 100 0 100 200 300 400 500 600 700 METRES
68—91 MR 132
L.C.Barnes Geologist
S.A. Dept. of Mines


Nichol's Nob
Mine Workings
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5600S
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3200S
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1600S
800S
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800N
1600N
2400N
3200N
4000N
4800N
5600N
6400N
Vermin Proof Fence
Cu
Big Lode Mine
LOCALITY MAP
Mt. Lyndhurst
Track
SCALE
MILES 2 0 2 4 6 MILES
5 0 5 10
KILOMETRES
30°15'
LYNDHURST
138°30'
Main Road
Railway
Mt. Ogilvie
Mt. Burr
SAMPLED AREA
Mt. Clive
Mt. Bourne
LEGEND
Copper in Parts Per Million
>200
100—200
50—100
<50
Cu Localities of Copper Mineralisation
800S Geochemical soil sample line
SCALE
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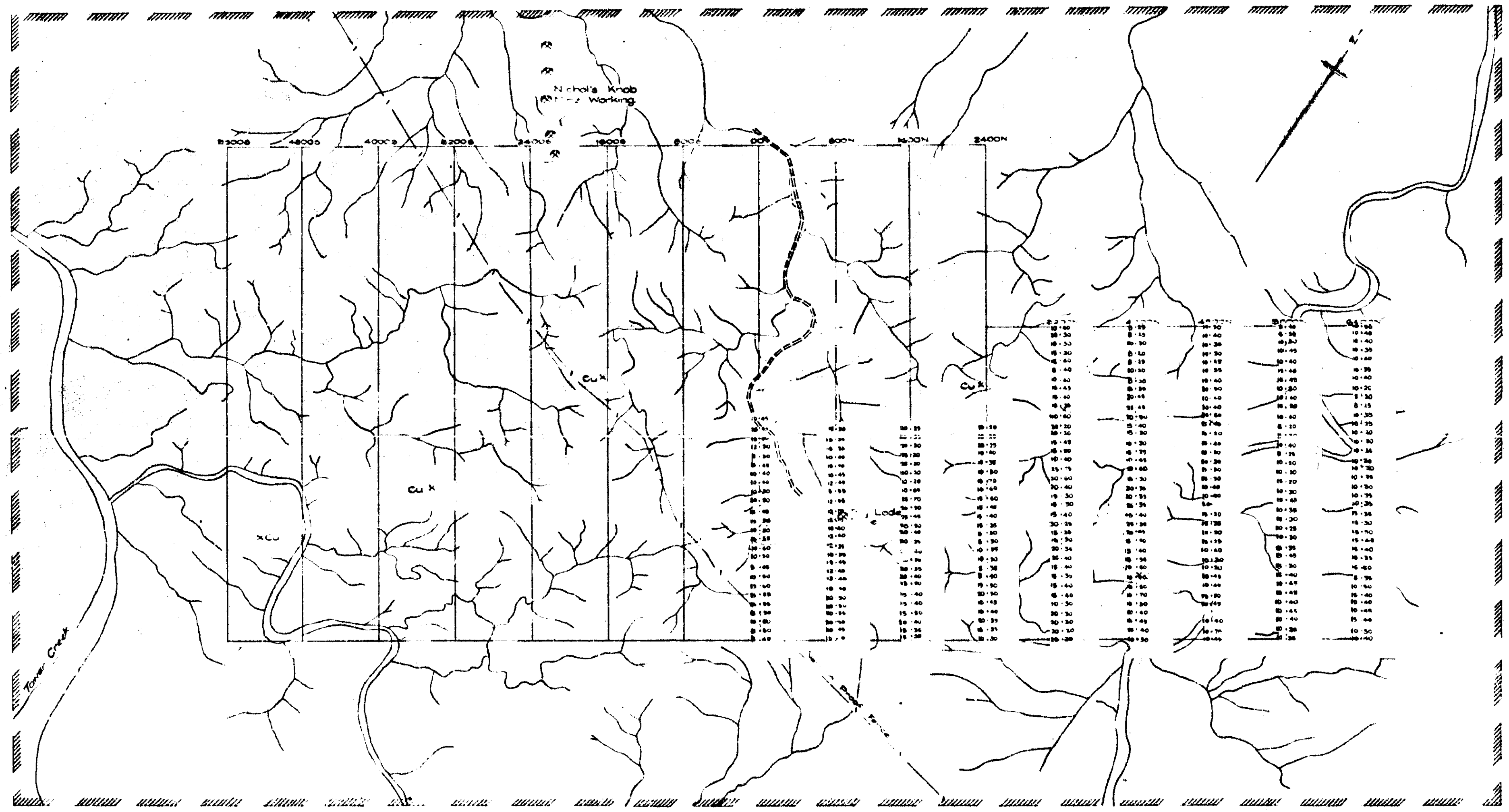
METRES 100 0 100 200 300 400 500 600 700 METRES
68–92 MR 132
L.C.Barnes Geologist
S.A. Dept of Mines



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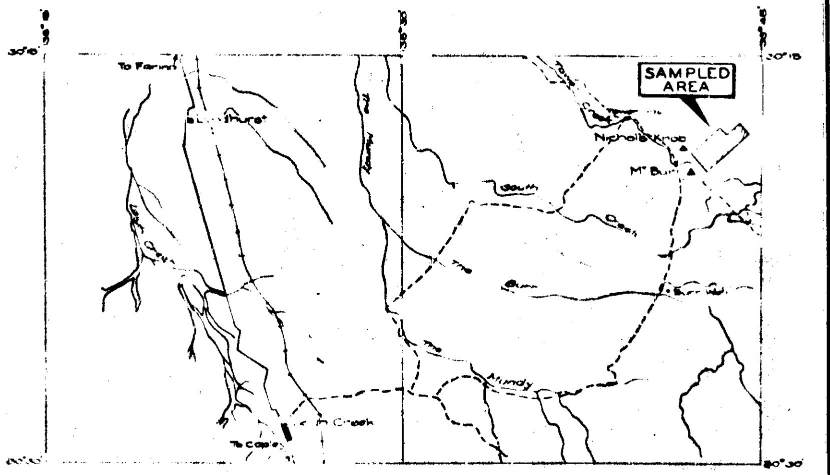


LOCALITY PLAN

Scale 1:250,000

LEGEND

10:30 / 10:40 / 10:35 } Soil sample localities with lead and zinc contents in p.p.m (Pb·Zn)

3200N 4000N — Geochemical soil sample lines

Vermin proof fence

Track to Big Lode Mine

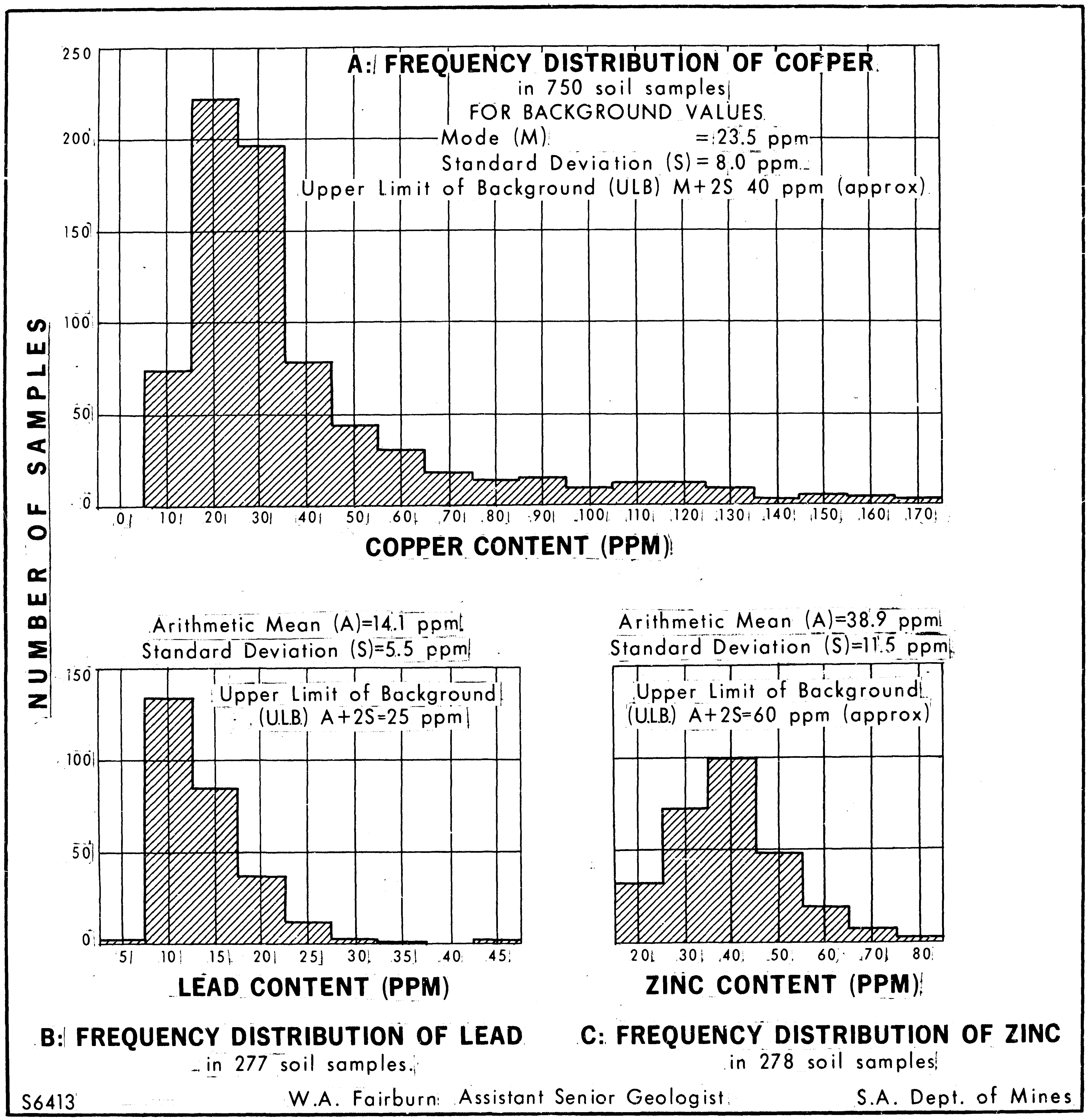
x Cu — Localities of copper mineralisation

DEPARTMENT OF MINES — SOUTH AUSTRALIA

NICHOL'S KNOB AREA

LEAD AND ZINC CONTENTS IN SOIL

		Drn. W.A.F.	SCALE: As Shown
		Tcd. A.M.C.D.	68-93 Cc
		Chd. L.V.W.	
Director of Mines		Exd.	DATE: 26th Jan '68



NICHOLS NOB AREA
DIAGRAMS OF COPPER, LEAD, ZINC
DISTRIBUTION IN SOIL SAMPLES

FIG. 3.

R.128

	Drn. D.J.W.	S6413
	Ckd.	Cc
	Passed	
Director of Mines		Date 16-5-69

DEPARTMENT OF MINES — SOUTH AUSTRALIA

NICHOL'S KNOB AREA
DIAGRAMS OF
COPPER, LEAD, ZINC,
DISTRIBUTION IN SOIL SAMPLES

Drn. W.A.F
Tcd. AMcD
Ckd. L.V.W.
Exd.

SCALE: AS SHOWN

S6413 Cc.

DATE: 14-3-68

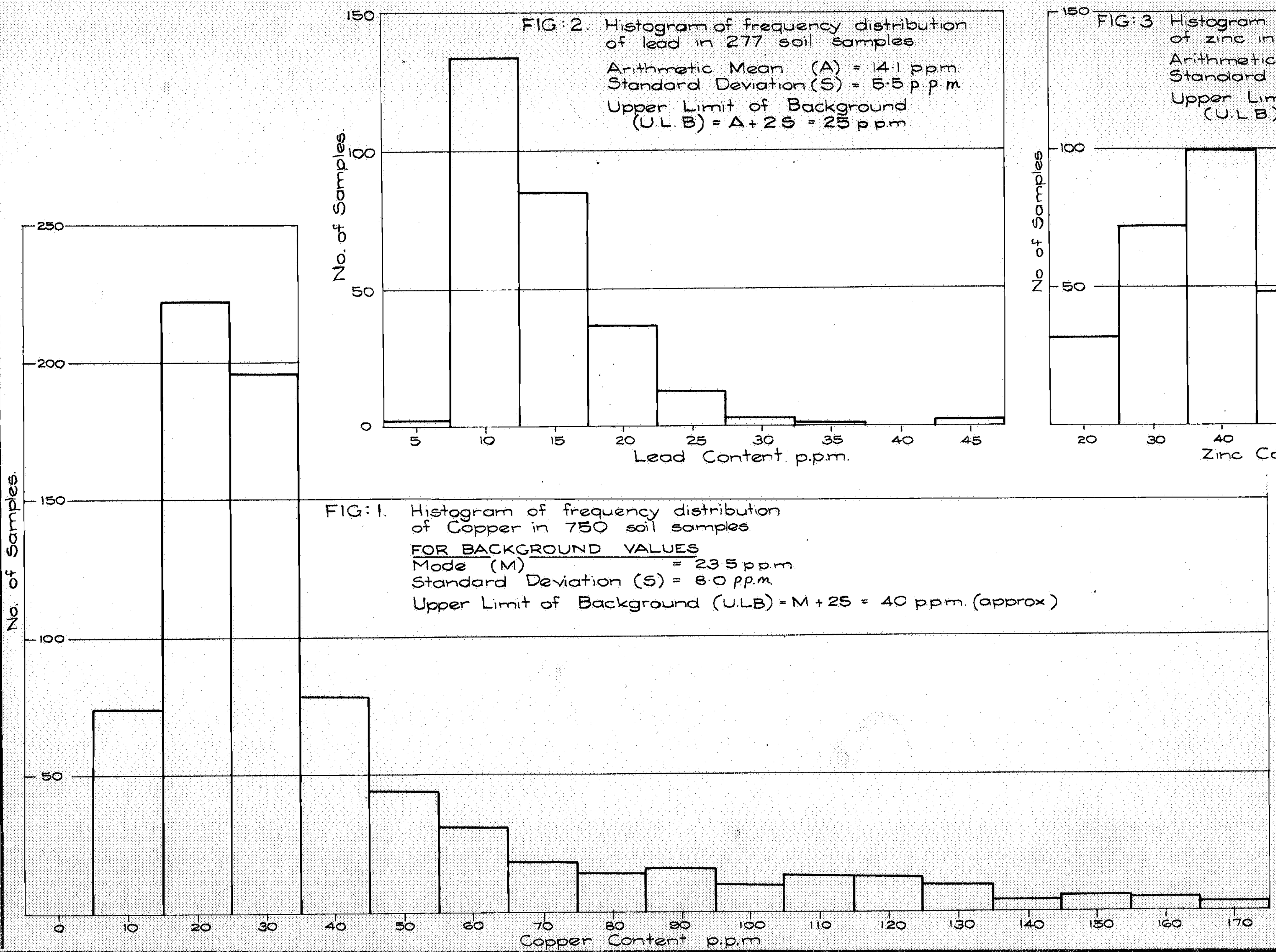


FIG: 2. Histogram of frequency distribution of lead in 277 soil samples

Arithmetic Mean (A) = 14·1 p.p.m.
Standard Deviation (S) = 5·5 p.p.m
Upper Limit of Background (U.L.B) = A + 2S = 25 p.p.m.

FIG: 1. Histogram of frequency distribution of Copper in 750 soil samples

FOR BACKGROUND VALUES
Mode (M) = 23·5 p.p.m.
Standard Deviation (S) = 8·0 p.p.m.
Upper Limit of Background (U.L.B) = M + 2S = 40 p.p.m. (approx)

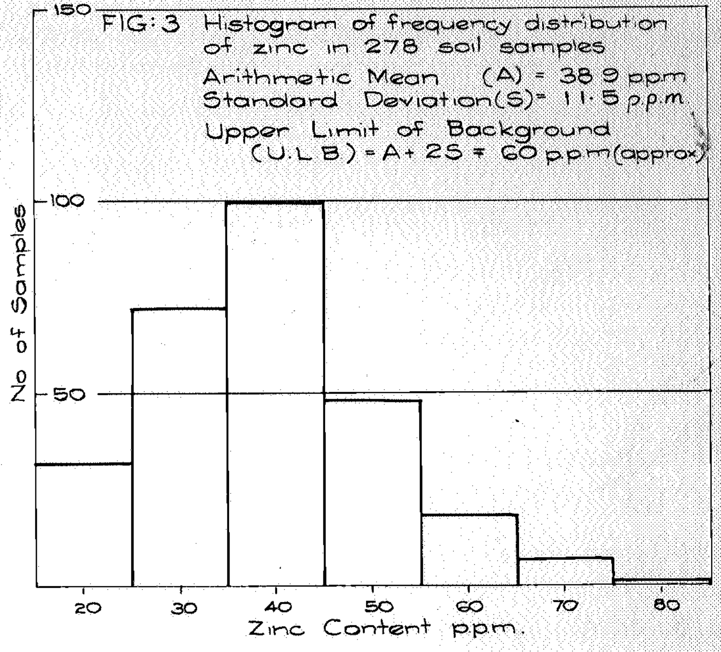


FIG: 3 Histogram of frequency distribution of zinc in 278 soil samples

Arithmetic Mean (A) = 38·9 ppm
Standard Deviation (S) = 11·5 p.p.m.
Upper Limit of Background (U.L.B) = A + 2S = 60 p.p.m (approx)