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SML 171

ANGEPENA

PROGRESS AND TECHNICAL REPORTS TO LICENCE EXPIRY/RENEWAL, FOR THE PERIOD 18/12/1967 TO 17/12/1969

Submitted by
Carpentaria Exploration Co. Pty Ltd
1969

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

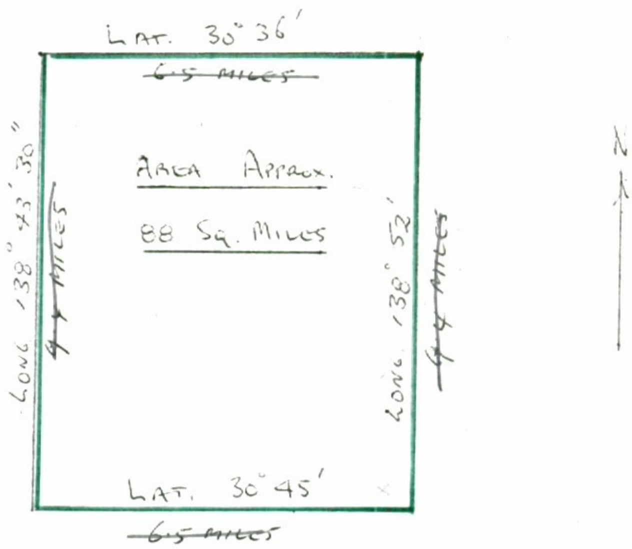
Government of South Australia
Department for Manufacturing, Innovation, Trade, Resources and Energy

24. 11. 1967.

APPLICATION FOR SPECIAL MINING LEASE "ANGEPINA"

THE GEOGRAPHICAL DETAILS OF THE S.M.L. HERE BEING APPLIED FOR ARE AS INDICATED BELOW.

THE AREA IS LOCATED WITHIN THE ANGEPINA ONE MILE SHEET AREA.



61 sq. m.

SIGNED J. RUSSELL LORD

J Russell Lord

MOUNT ISA MINES LTD..

Copley

D.M. 1869/67

S.M.L. 171

CONTENTS ENVELOPE 928 DOCKETS: 1869/67

TENEMENT: S.M.L. 171

TENEMENT HOLDER: MOUNT ISA MINES LTD.,

REPORTS:

Plans:

CONTENTS ENVELOPE 928

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PLANS:

Plans

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RECEIVED
3 - OCT 1968
DEPT. OF MINES
REGISTRY

567 South Road,
Everard Park,
S.A. 5035

30th September, 1968

The Director of Mines,
Department of Mines,
Box 38 Rundle Street P.O.,
Adelaide,
S.A. 5001.

Report for Quarter ended 18-9-68

for SML 171

Dear Sir,

Work on SML 171 so far has been chiefly concerned with compilation of a general base map of the area and preliminary inspections of certain features of exploratory interest.

Interpretation of data compiled to date suggests that the area occupied by SML 171 was broken into fault blocks which moved relative to each other prior to the Lower Palaeozoic deformation. Some of these evidently influenced sedimentation. Abrupt changes of thickness occur within the Umberatana Group which are probably due to this cause, and in two cases, abrupt changes in thickness occur within the Bunyeroo Formation across certain faults.

Some investigations have been made within the breccia zones but these are insufficient so far to permit useful comment. A number of apparently intrusive outcrops of medium grained basic igneous rocks have been located near Windy Creek upstream from Muckatoona Mines.

Examination of the Angepena Alluvial Gold Diggings showed that all of these occur down slope from a long linear gossan over 6,000 feet in length. The extensive pitting taken in conjunction with the appearance of the gossan suggest that the source of the gold is an auriferous pyrite reef.

Cont'd...

Examinations of other prospects such as Muckatoona and small gossans along Pinda Creek suggest little promise but will be inspected in more detail in due course.

Yours faithfully,
for and on behalf of Mount Isa Mines Ltd.

Walter D. Smith

Walter D. Smith
Party Leader (S.A.)
Carpentaria Exploration Co.Pty.Ltd.

ENW 928

007

567 South Road,
Everard Park,
S.A. 5035.

2nd January, 1969

The Director of Mines,
Department of Mines,
Box 38, Rundle Street P.O.,
Adelaide,
S.A. 5001.

Dear Sir,

Report for Quarter ended 18.12.68
for SML 171

Work carried out to date has been essentially visual examination intended to clarify the areas of most interest, and suggest appropriate exploratory techniques. This work has confirmed the previous delineation of 3 main masses of breccia by other workers, namely a northern area south of Mount Wallace, a middle area along the southern branch of Windy Creek, and a southern area west of old Angepena Station. No evidence of important mineralisation has been recognised in any of the breccias so far, though the middle one does contain small showings of chalcopyrite in carbonate gangue. The middle breccia also contains several plugs of dolerite, but it is not known at this stage whether or not the intrusives have any significance in relation to the mineralisation. No intrusives have been recognised so far in either the northern or southern breccias. It is intended to soil sample the breccia zones to provide further data relevant to the question of their ore potential. Examination of the breccia zones indicated that it would not be profitable to map them in detail because of considerations arising from degree of exposure, weathering, and impersistence of lithology, and structure. The two northern areas do contain rocks older than their rim rocks, and therefore represent piercement features of some sort. Whether they represent features analogous to salt diapirs seems questionable. It seems likely to me that the 3 breccia zones mentioned will not significantly assist interpretation of the piercement features.

Samples of the gossan up slope from the Angepena Gold Field returned nil gold assays, but this will be checked again by resampling.

Examination of the Muckatoona mineralisation showed that many of the showings are strongly associated with particular structures, although as a whole, the showings are grouped within an area of outcrop of a particular variety of the Bunyeroo Formation. It is thought that concentration of copper within structures has occurred because of groundwater movement. However, it is not clear whether the source was remobilized syngenetic copper or strictly epegenetic copper. At least some primary copper is present as fracture fill, so the source was not solely syngenetic copper. The mineralisation appears to be too patchy to be economic but this conclusion will probably be tested more fully.

A summary of expenditure is attached hereto.

Yours faithfully,
For and on behalf of MT. ISA MINES LTD.

Walter D. Smith

WALTER D. SMITH
Party Leader (S.A)
CARPENTARIA EXPLORATION COMPANY PTY.LTD.

009 ENV 928

CARPENTARIA EXPLORATION COMPANY PTY. LTD.
567 South Road,
Everard Park,
S.A. 5035

31st March, 1969

The Director of Mines,
Department of Mines,
Box 38,
Rundle Street P.O.,
Adelaide,
S.A. 5001.

Dear Sir,

**Report for Quarter ended 18.3.69
for SML 171**

Student labour was used during the quarter to soil sample selected parts of the lease, and stream sediment sample the head of Sliding Rock Creek.

Soil sampling was carried out

a) within the northern breccia and around its perimeter

b) within the central and southern breccias,

c) in selected areas remote from breccias,

d) across the mineralised zone at Muckatoona.

Sampling was not carried out around the perimeter of the central and southern breccias because the nature of the terrain is such that the results would not be meaningful.

The provisional geological map used to guide the soil sampling is appended as Figure 1. The results for Cu, Pb, Zn, Co, and Ni are appended as Figures 2, 3, 4, 5, and 6 respectively.

The results of the stream sediment sampling in the head of Sliding Rock Creek are presented in Figures 7 and 8 (copper), 9 and 10 (lead) and 11 and 12 (zinc). Both a coarse and a fine fraction were analysed to assess variation of metal content with size.

Stereograms showing poles to bedding for the northern and central breccias are appended as Figures 13 and 14. These were prepared from measurements made by students during sampling activities.

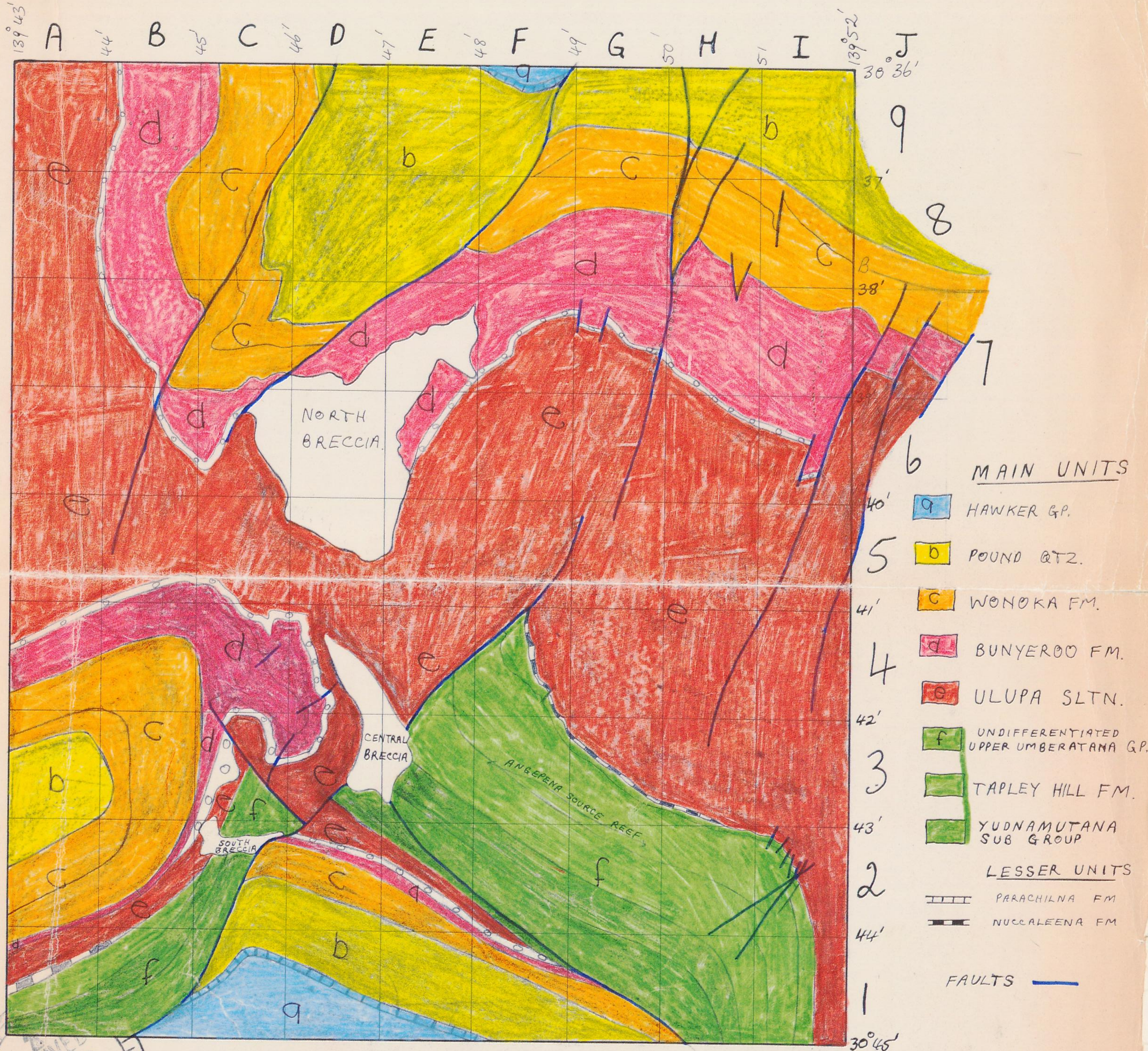
The results of the soil sampling appear to offer no real hope for a base metal orebody except possibly at Muckatoona. However a number of the better "anomalies" will be checked out in due course.

As there is further sampling data for which results have not been collated yet, detailed interpretation will be postponed until a later date.

Yours faithfully,
For and on behalf of MT. ISA MINES LTD.

Walter D. Smith
WALTER D. SMITH
Party Leader (S.A)

NOTED
Director of Mines



PROVISIONAL GEOLOGICAL MAP SML 171.

AFTER SPRIGG + WILSON (1953)
COATS (COPLEY COMPILATION)
DALGARNO + WHITEHEAD (1966)
DR. RICHARD RUKER. + ASSOCIATES (1966)

March 1969

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FIGURE I

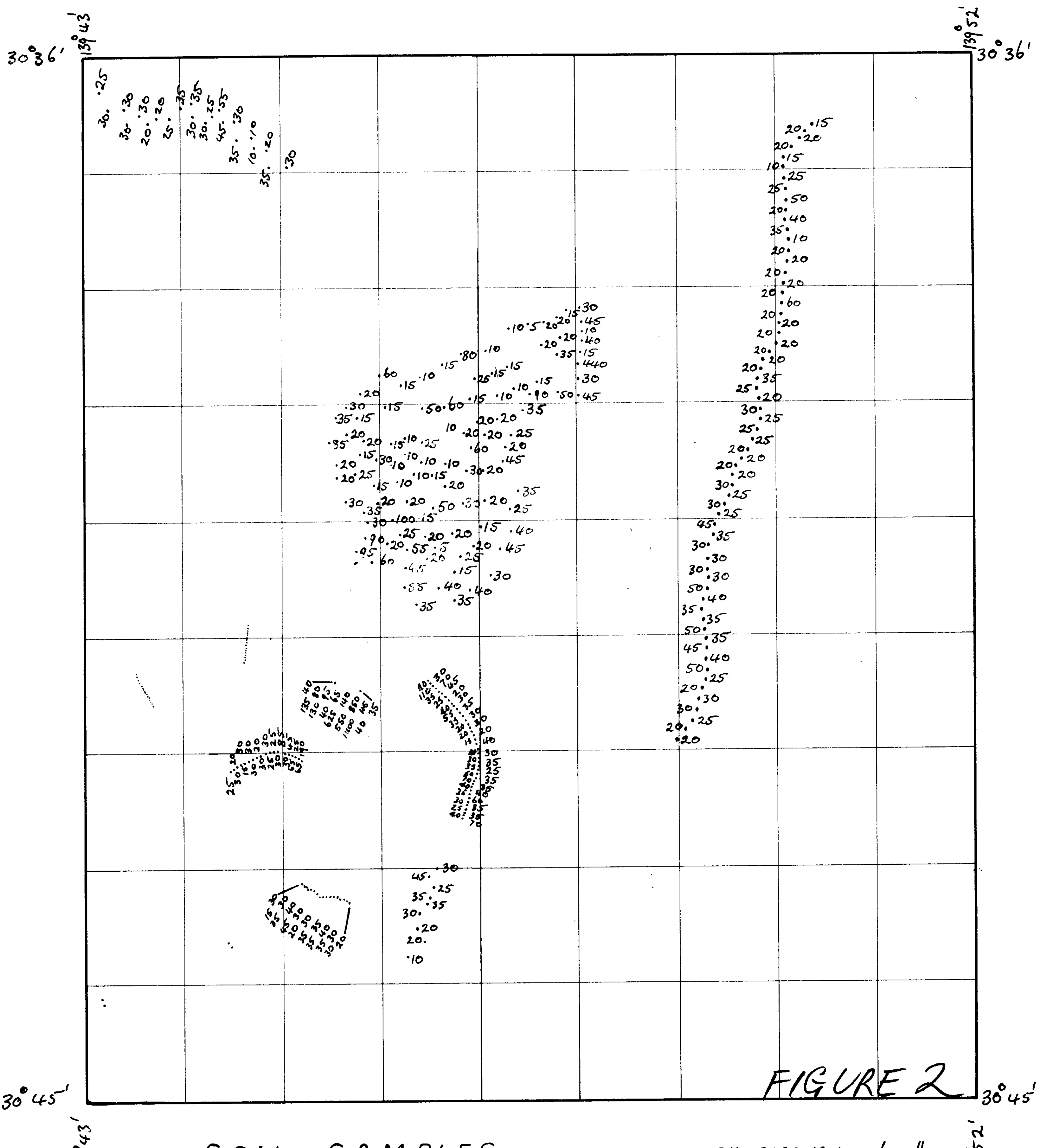

FIGURE 2

SOIL SAMPLES MINUS 80 MESH FRACTION 6-9"

ANGEPENA SML 171. COPPER

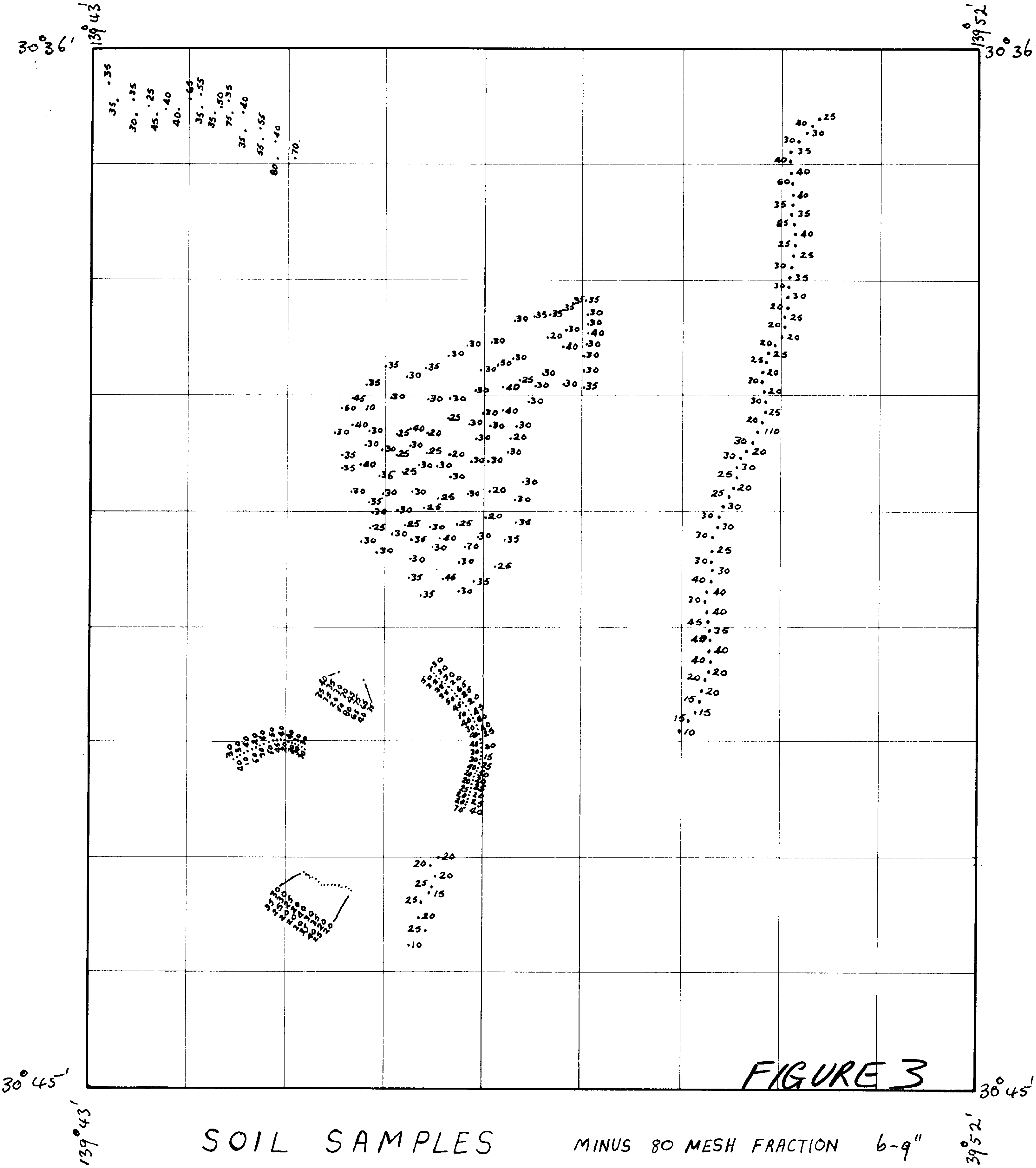

FIGURE 3

SOIL SAMPLES   MINUS 80 MESH FRACTION 6-9"

ANGEPENA SML 171. LEAD

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ENV 928-10

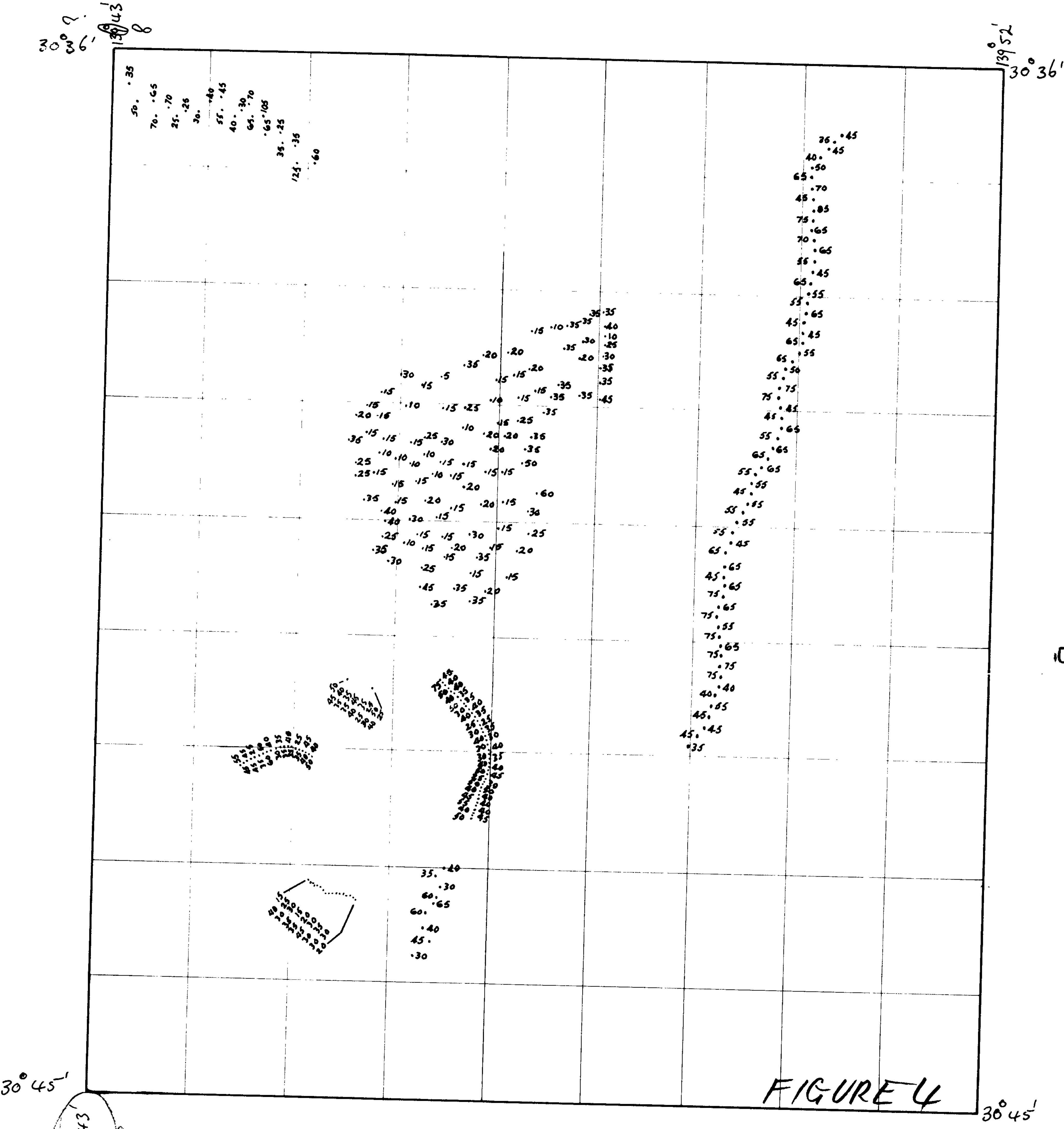

FIGURE 4

SOIL SAMPLES MINUS 80 MESH FRACTION 6-9"

ANGEPENA SML 171. ZINC

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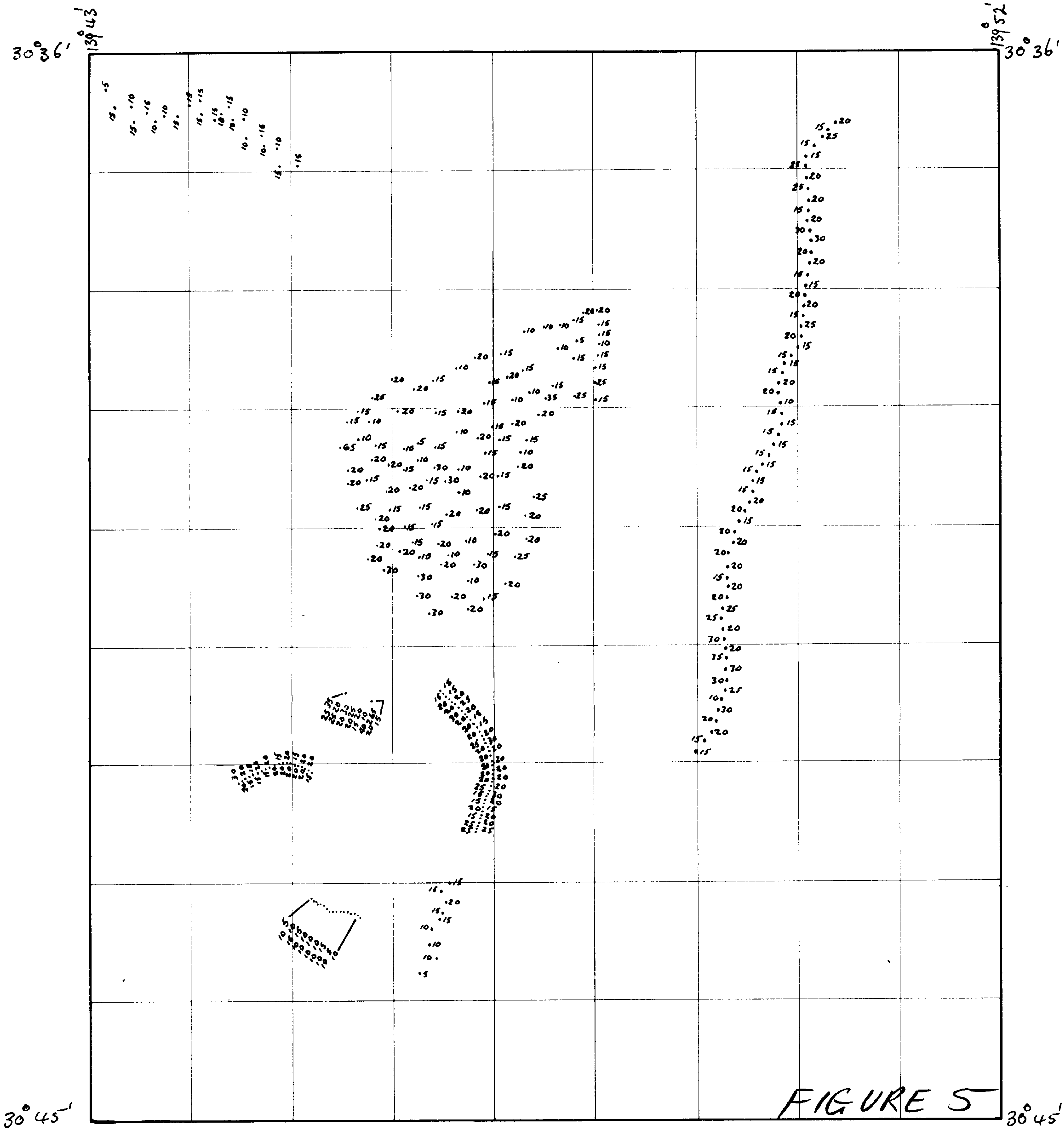
ENV 928-11



SOIL SAMPLES MINUS 80 MESH FRACTION 6-9"

ANGEPENA SML 171. COBALT

ENV 928

ENV 928-12

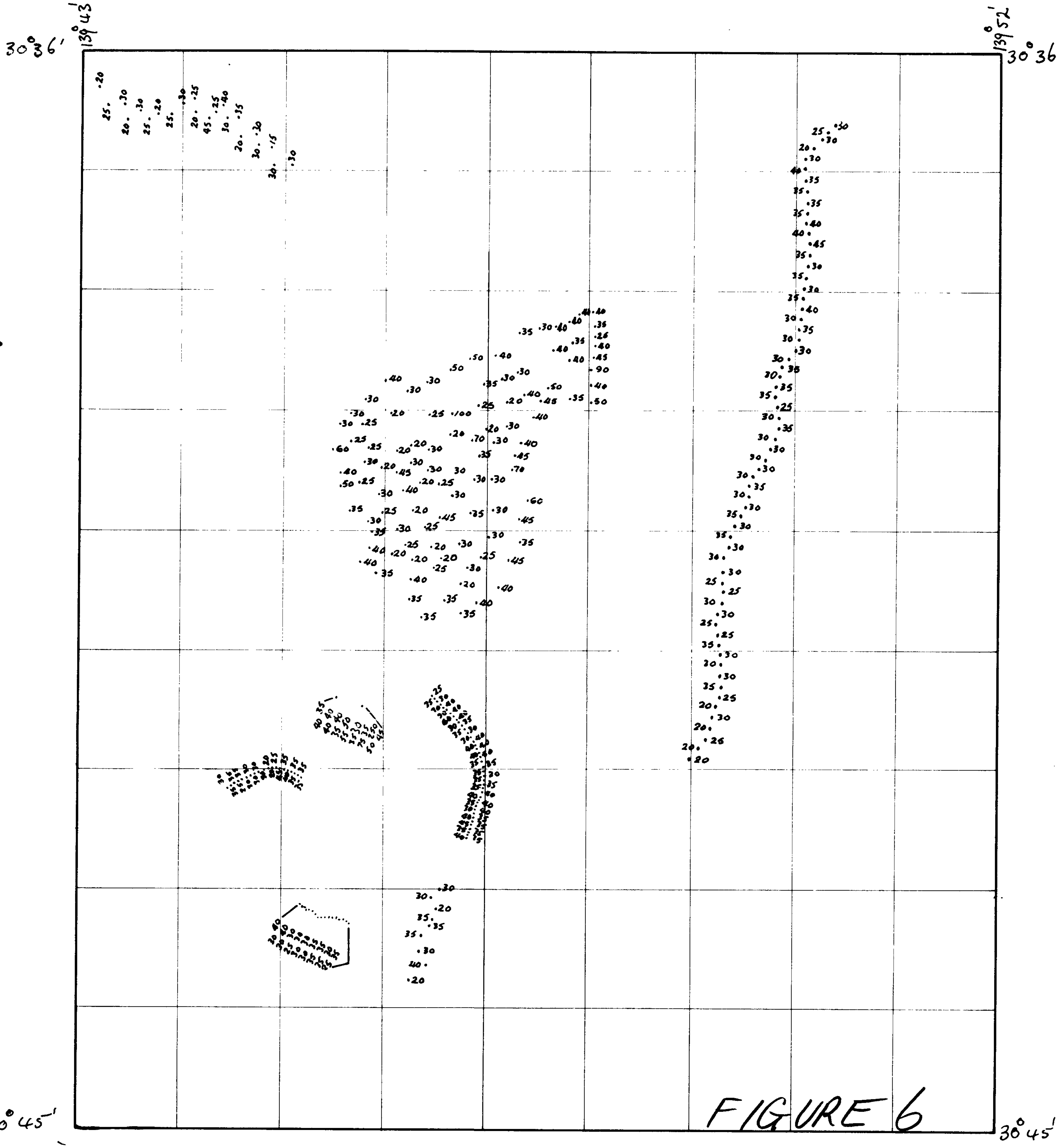
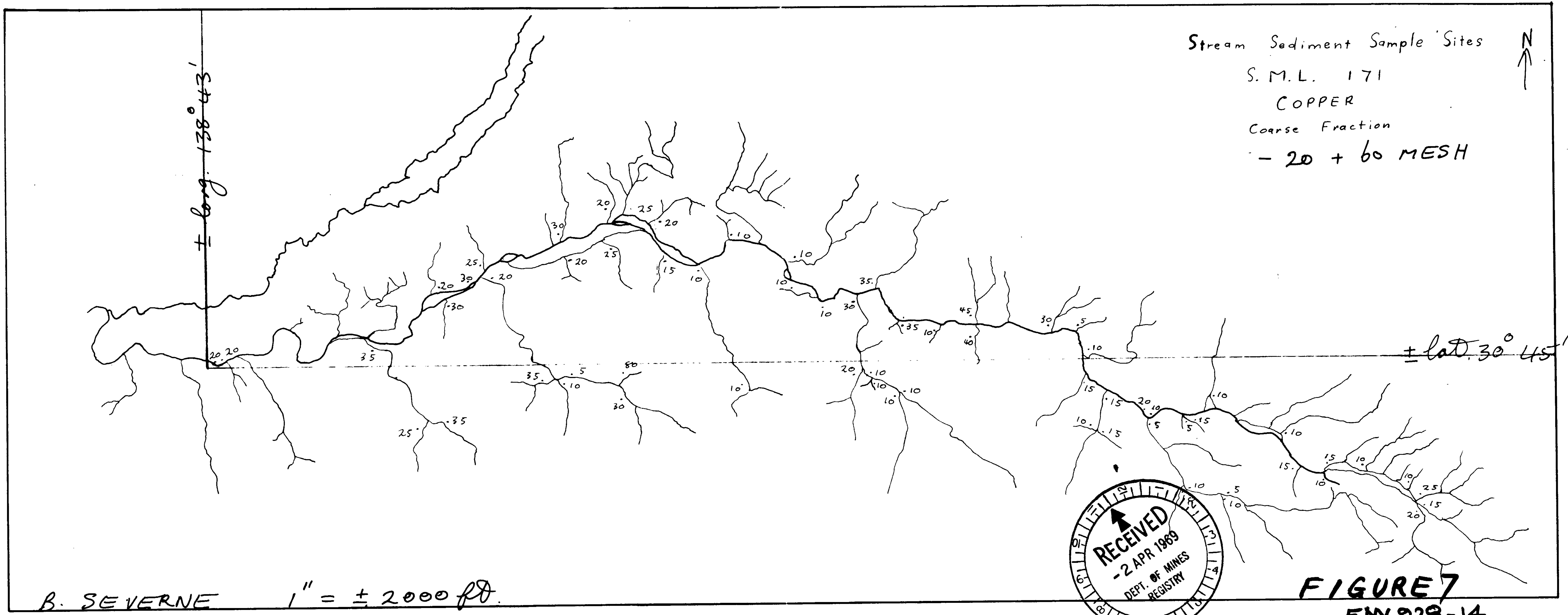


FIGURE 6

SOIL SAMPLES MINUS 80 MESH FRACTION 6-9"

ANGEPENA SML 171. NICKEL

ENV 928-13



B. SEVERNE 1" = ± 2000 ft.

FIGURE 7

ENV 928-14

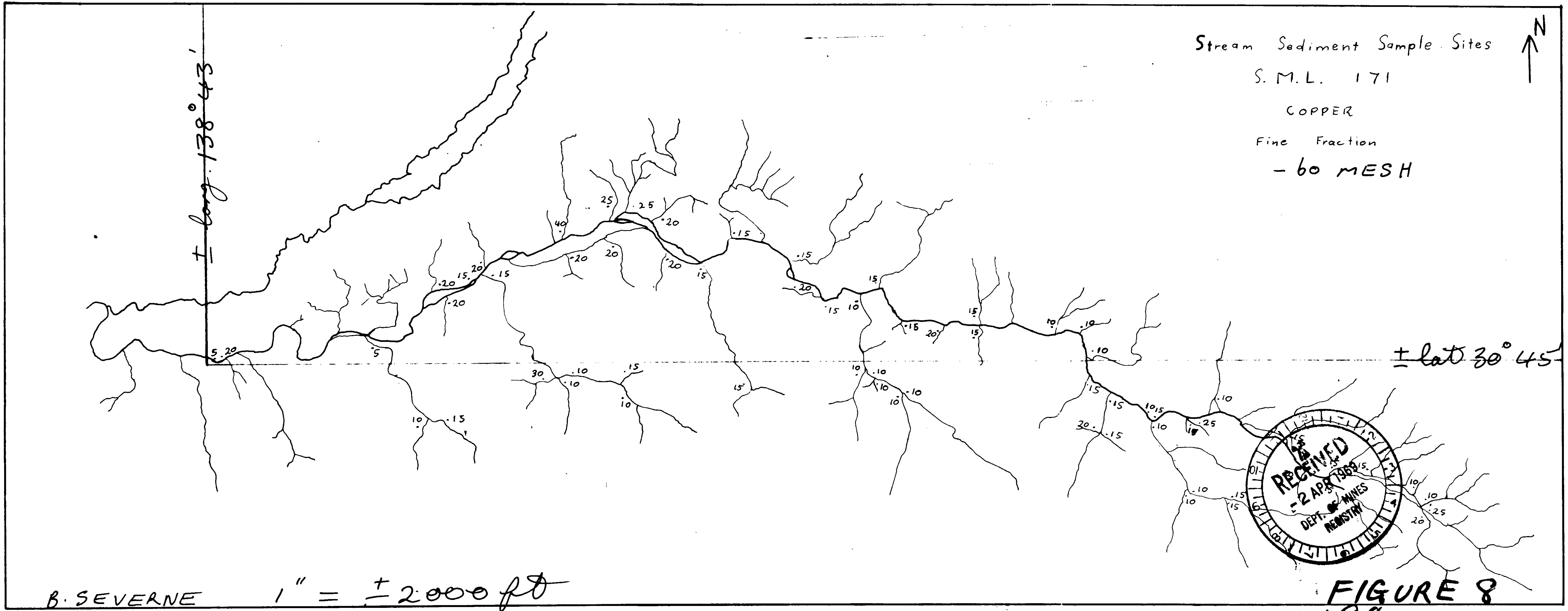


FIGURE 8
ENV 928-15

Stream [illegible]

[illegible] 171

LEAD

Coarse Fraction

− 20 + 60 MESH

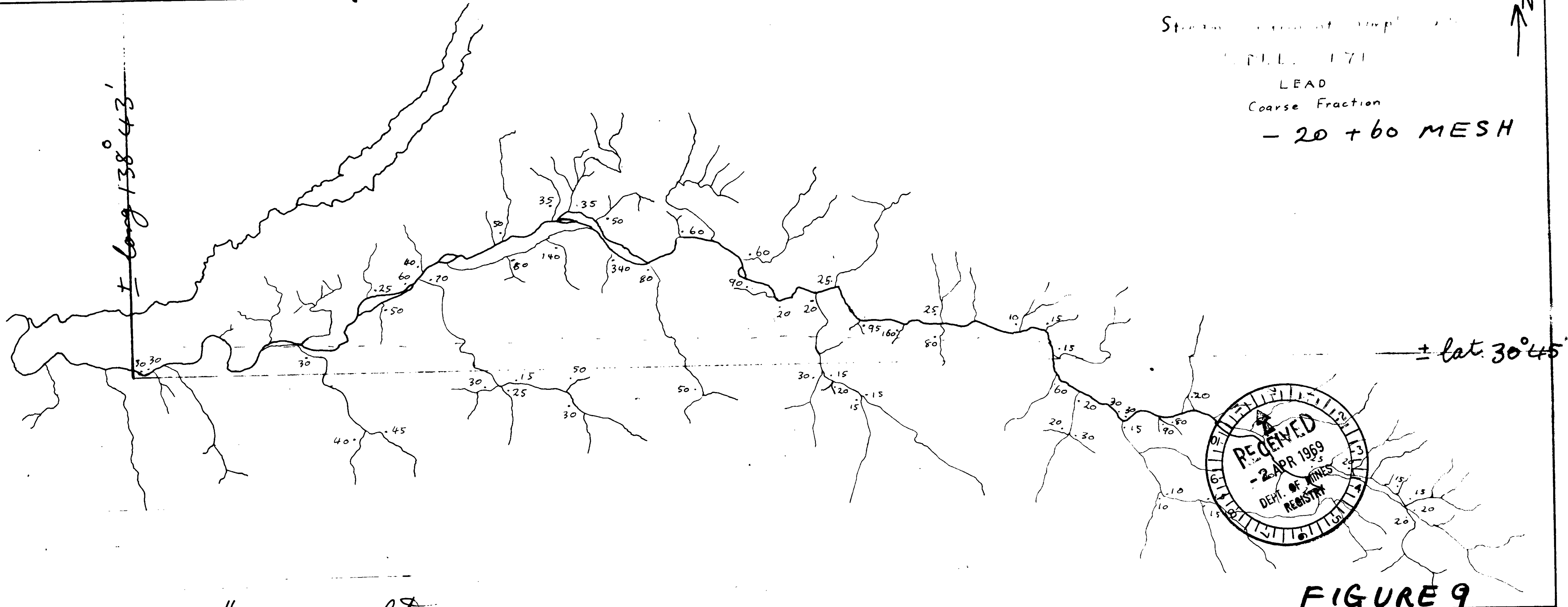


FIGURE 9

ENV 928-16

B. SEVERNE 1" = ±2000 ft

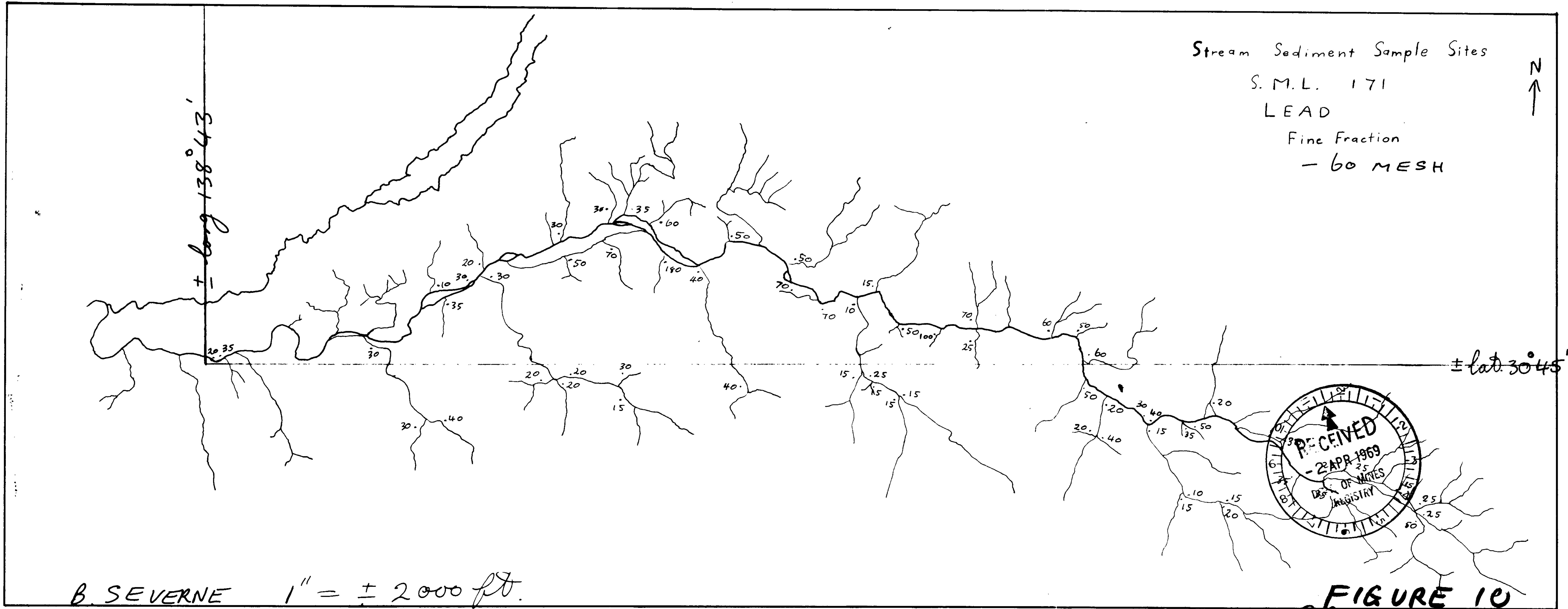
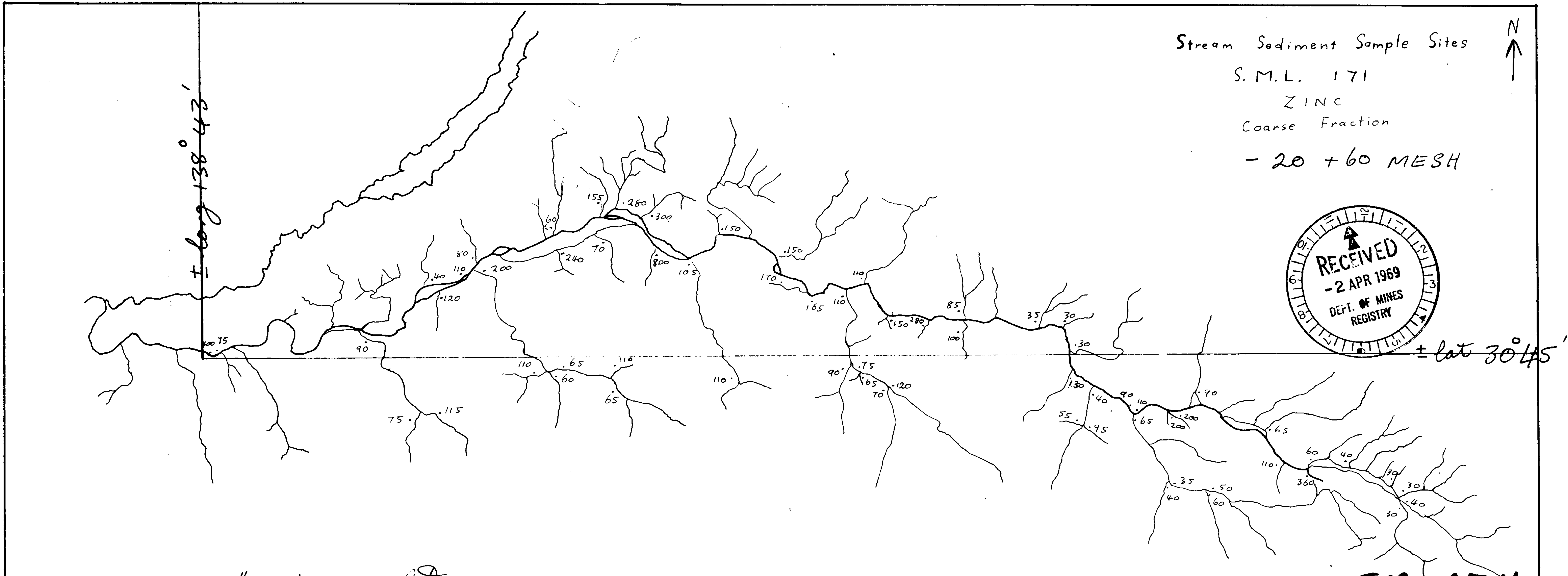


FIGURE 10

ENV 928-17



B. SEVERNE 1" = ± 2000 ft

FIGURE 11

ENV 928-18

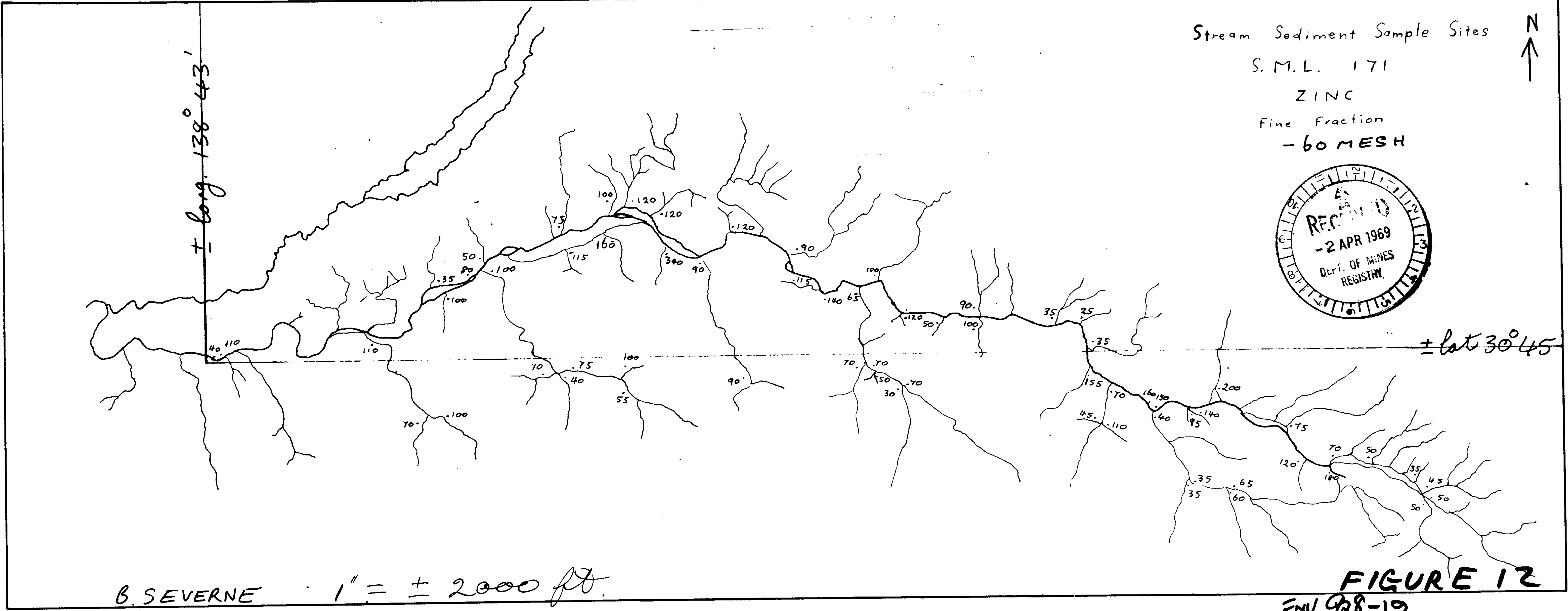


FIGURE 12

ENV 928-19

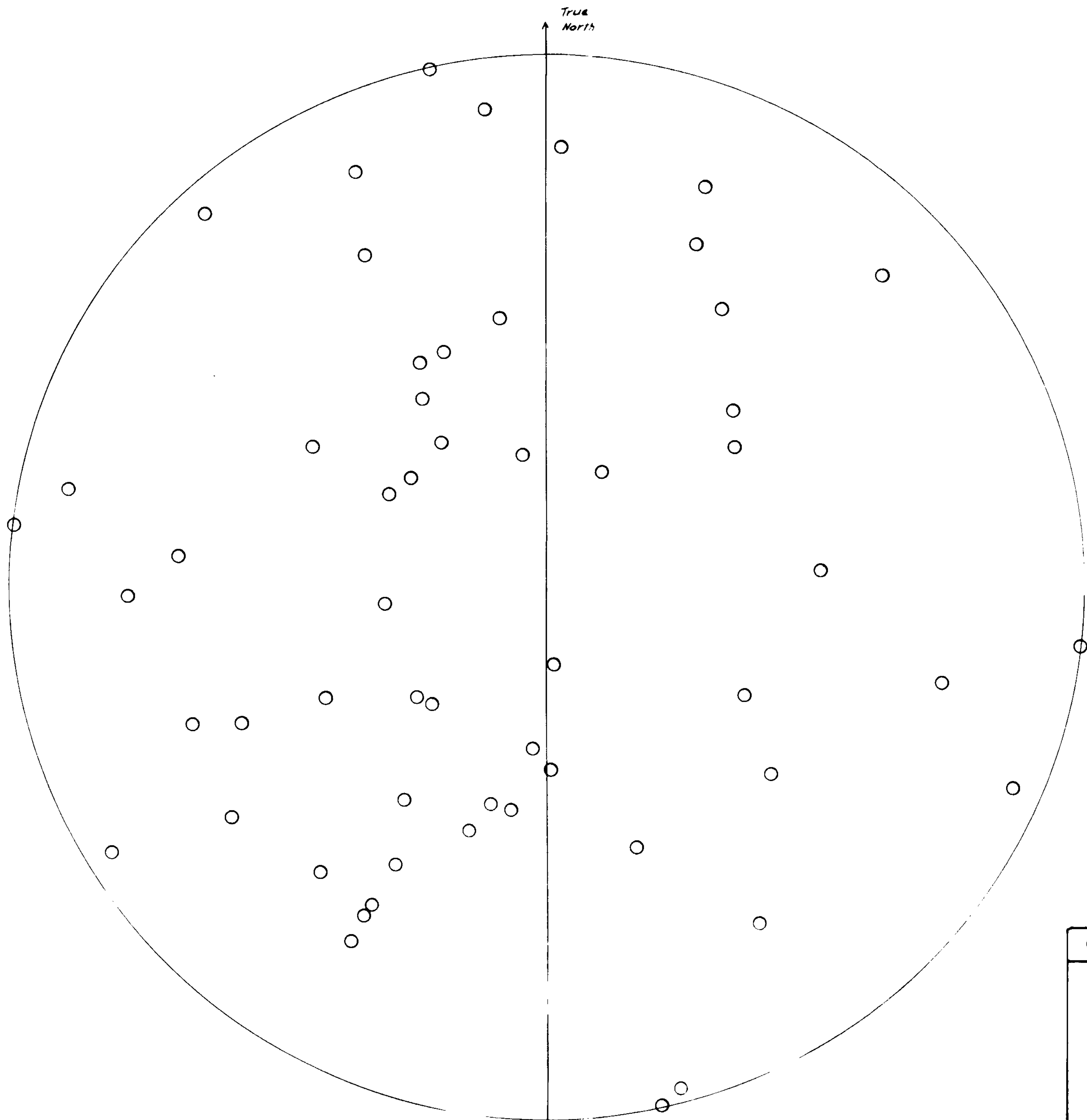


FIGURE 13

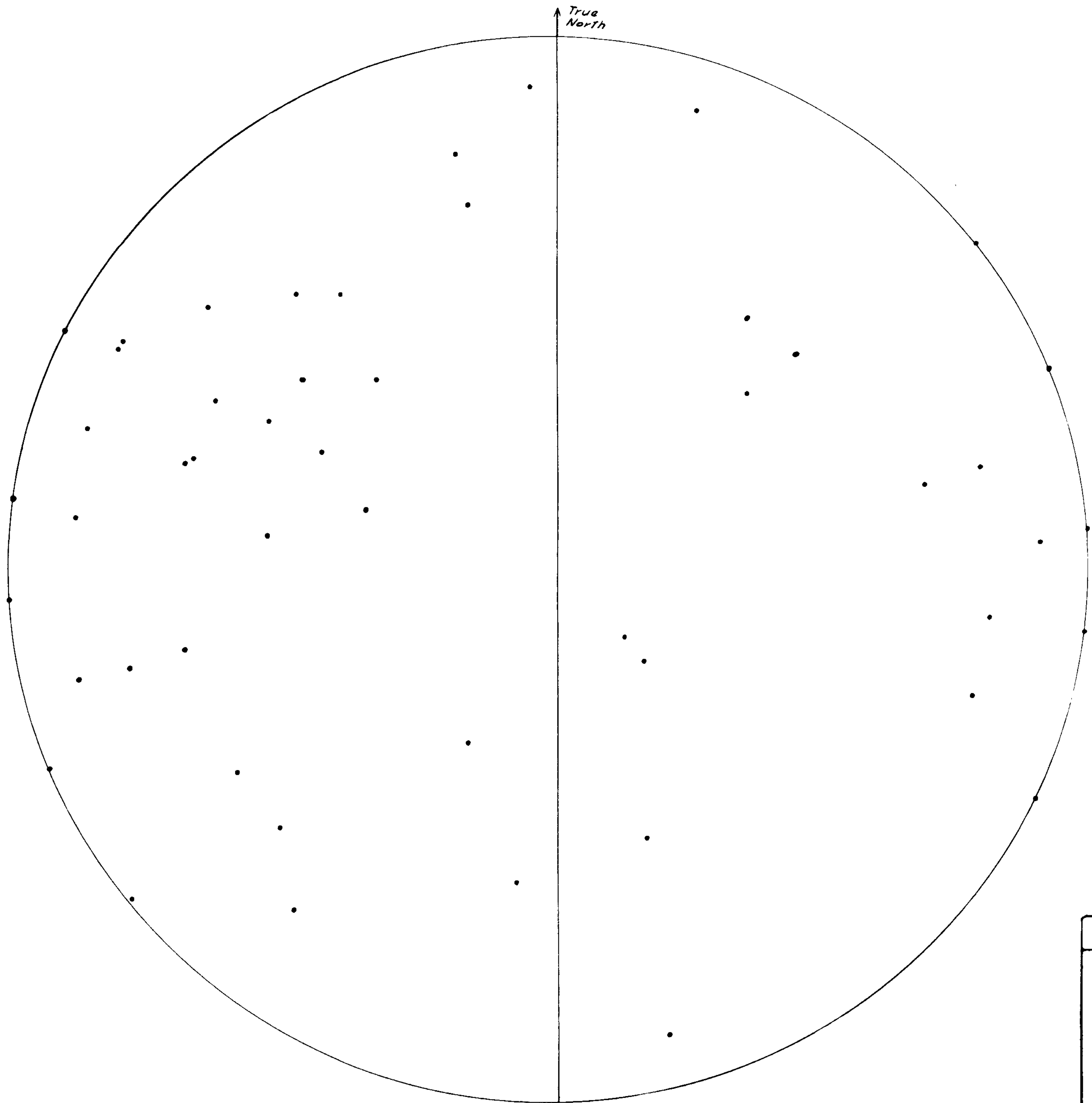
CARPENTARIA EXPLORATION COMPANY PTY LTD.

PLOT OF POLES TO BEDDING
ANGEPENA NORTH BRECCIA
54 POLES
W.G. HARVEY
JANUARY, 1969
SCHMIDT NET

SCALE	GEOL. W.G.H.	DATE Feb. 1969.
CHECKED:	DRAWN: J.C.N.	3671

ENV 928

ENV 928-20



CARPENTARIA EXPLORATION COMPANY PTY. LTD.		
PLOT OF POLES TO BEDDING ANGEPENA CENTRAL BRECCIA 45 POLES RE. READ DECEMBER, 1968 SCHMIDT NET FIG 4		
SCALE	GEOL. R.E.R	DATE Feb. 1969.
CHECKED	DRAWN. J.C.N.	3670

928-21

ENV 928

011

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

COPPER AT MUCATOONA

1. POSITION AND ATTITUDE OF CUPRIFEROUS HORIZON

Mapping the Bunyeroo Formation in the Mucatoona area led to the recognition of an extensive, thin (one to five feet thick), cupriferous horizon within the light-grey to white shale. See Figure 1. This white shale is a bleached black shale as can be seen near the dolomite bands.

The thickness of the white shale was estimated by Whitehead (1966) to be 15 to 24 feet, but two measured sections suggest it could be up to fifty feet thick.

Stratigraphically, the cupriferous horizon is about in the middle of the white shale. The regional dip of the white shale is to the south-west at a low angle, but folding has created a local west-plunging synclinal area to the south-east.

2. DESCRIPTION OF THE CUPRIFEROUS HORIZON

Brown (1908) described the mineralised zone as "... a great number of lodes ..... one foot to five feet thick.... consisting mostly of iron and little quartz, all carrying a quantity of green carbonate of copper".

This description applies to numerous small individual gossanous showings locally enriched due to ground water movement.

Whitehead (1966) recognised that the mineralisation is confined to the white shale band or lens within the Wearing Dolomite Member. He described the mineralisation as "Malachite and azurite are associated with innumerable small limonite veins generally less than one inch thick, and many of these follow the direction of bedding".

2. DESCRIPTION OF THE CUPRIFEROUS HORIZON (Contd)

I consider the primary mineralisation is confined to a thin ferruginous horizon which is extensively stained with malachite. The original appearance of this horizon has been modified by the passage of ground water through it. This has resulted in the generation of acid solutions and subsequent leaching of copper. In some places the cupriferous horizon is leached at its base and stalactites of malachite are evident.

3. GEOCHEMISTRY

Results of ridge soil sampling are shown in Figure 1 and Table 1.

They show that copper values vary with, and may be controlled by, lithology.

Table 1

Geochemical results of Mucatoona Mines Area -

Lithology	Average copper content (p.p.m.)	Number of samples
Wonoka Formation	25	10
Bunyeroo Formation		
- Upper red shale	34	22
- Upper green shale	108	13
- White shale	266	100
- Lower green shale (1)	146	18
- Lower red shale	69	17
A.B.C. Range Quartzite (2)	37	2

(1) One sample with 1,400 p.p.m. Cu was excluded as this value is not considered to reflect the original Cu content of this facies.

(2) Samples sited on or near the top of this unit are excluded, for the reason given in (1).

4. INTERPRETATION OF GEOCHEMICAL RESULTS

The white shale facies has the highest copper content. Within this facies no systematic variation of copper content in either a vertical or lateral (spatial) sense could be discerned. However, four of the five samples with more than 1,000 p.p.m. Cu are sited along a fault. This suggests that the copper has been redistributed, from the cupriferous horizon, by ground water.

5. SOURCE POTENTIAL FOR SECONDARY ENRICHMENT

Ground waters have transported copper in solution from the cupriferous horizon into hydrological traps such as faults. Such redistribution of copper has been controlled partly by bedding planes which generally dip westward. Thus soluble copper has moved down dip until some kind of hydrological trap was encountered, such as the numerous, small, north-east trending faults which traverse this area. This reasoning may be supported by the fact that some of the major workings are apparently more closely related to the faults than to particular beds.

Since it is not known how far the present land surface is below the surface at the time when folding in this area was completed (Lower Paleozoic), the total volume of the copper source bed is unknown. Hence the amount of copper that could be trapped in faults is not known.

There are 3 areas where the oxidized cupriferous horizon underlies shallow cover and these may be drilled. Results of this drilling will indicate the copper grades of the oxidised portion of the cupriferous horizon only. The only reliable method of determining the copper grade of the fresh (unoxidised) cupriferous horizon would be from a series of drill holes through the overlying red shale to the west.

6. INTERPRETATION OF SEDIMENTOLOGY

In the Mucatoona area the Wearing Dolomite Member is represented by bands of dolomite up to 4 feet thick enclosing a black shale lense; which makes up to 50 feet thickness and a strike outcrop of about 1 mile. Whitehead (1966) notes that the increase in thickness of this Member occurs next to a diapir and evidently considers this significant.

Horwitz (1962) considers that 'diapirs' locally influence Bunyeroo sedimentation. There are 3 'diapirs' less than 2 miles distant from the mines area. And just to the south of Mucatoona is a fault which may have been active contemporaneously with Bunyeroo sedimentation, thereby creating a 'long' sequence on the lee side.

The colour of the shale in the Bunyeroo Formation is considered to reflect the physicochemical environment of deposition. The change from red to green to black facies accompanies changes from normal oxidising to euxinic marine conditions.

Geochemical results indicate that copper was deposited under reducing conditions. It seems that an euxinic facies was a prerequisite for copper mineralisation. Such a facies could result from either penecontemporaneous faulting or the existence of local highs ('diapirs') on the sea floor during Bunyeroo sedimentation.

Either of the above controls may have functioned as egression loci for the hypogene copper.

The Mucatoona section differs from the section, described by Thomson (1965), at Wearing Well 28 miles to the east. See Figure 2.

7. GENESIS OF THE CUPRIFEROUS HORIZON

Two possibilities seem, to me, the most likely -

(a) Mineralising fluids, either hypogene or supergene, were introduced to this stratigraphic horizon and precipitated copper and iron selectively within it. This is the epigenetic viewpoint.

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7. GENESIS OF THE CUPRIFEROUS HORIZON (Contd)

(b) This horizon is an unusual but nevertheless ordinary sedimentary unit, i.e. the copper has a syngenetic origin.

I favour a syngenetic origin, with modifications due to supergene solution activity for the following reasons, none of which are unequivocal:-

(i) There is no sign of thermal or hydrothermal alteration in the rocks.

(ii) The cupriferous horizon is confined to what was black shale.

(iii) The cupriferous horizon is areally extensive, stratigraphically narrow and conformable with the sedimentary envelope.

(iv) No feeder veins were seen.

These criteria would not exclude supergene enrichment of copper due to selective deposition in the horizon of the white shale; perhaps as a result of an unusually high original syngenetic iron (pyrite) content.

8. REFERENCES

Brown, H.V.L.	1908	Record of the Mines of South Australia
Horwitz, R.C.	1962	Eclogae Geol. Helv., v.55 p.275
Leeson, R.	1966	Geology of the Beltana 1 : 63,360 map area
Thomson, B.P.	1965	Geology of Australian Ore Deposits
Whitehead, S.	1966	Report on Beltana Concession S.M.L. 113. South Australia

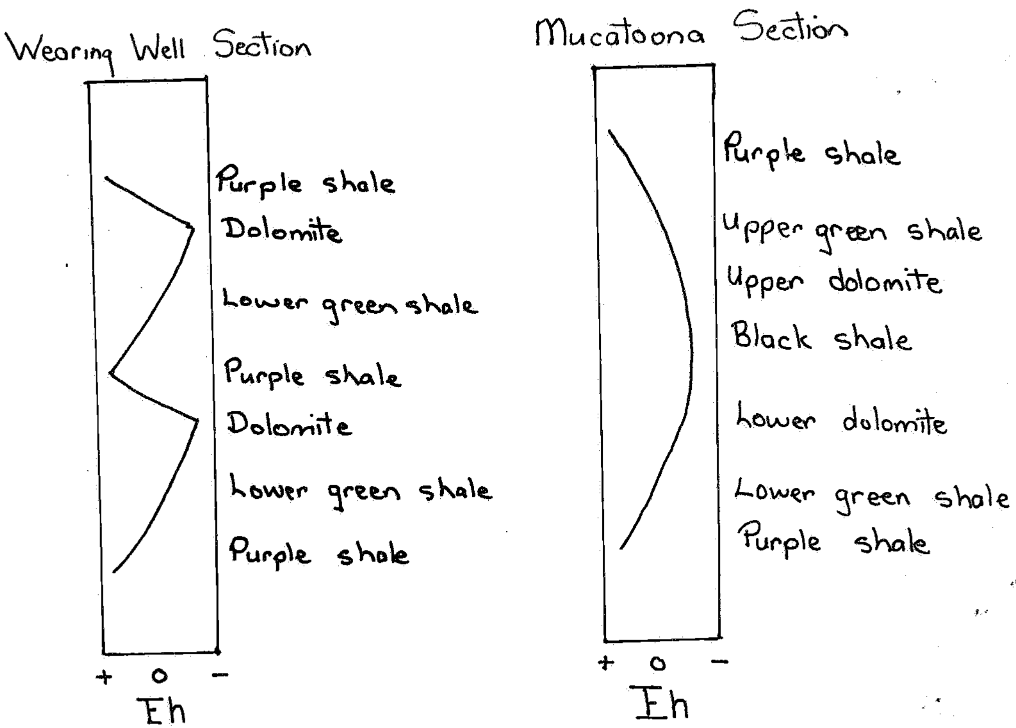

Fig. 2 – Diagrammatic illustration of inferred changes in the physicochemical environment (Eh) during Bunyeroo sedimentation; the difference between the 2 sections is due to the absence of an upper green shale at Wearing Well. It is not known if this difference has any economic significance.

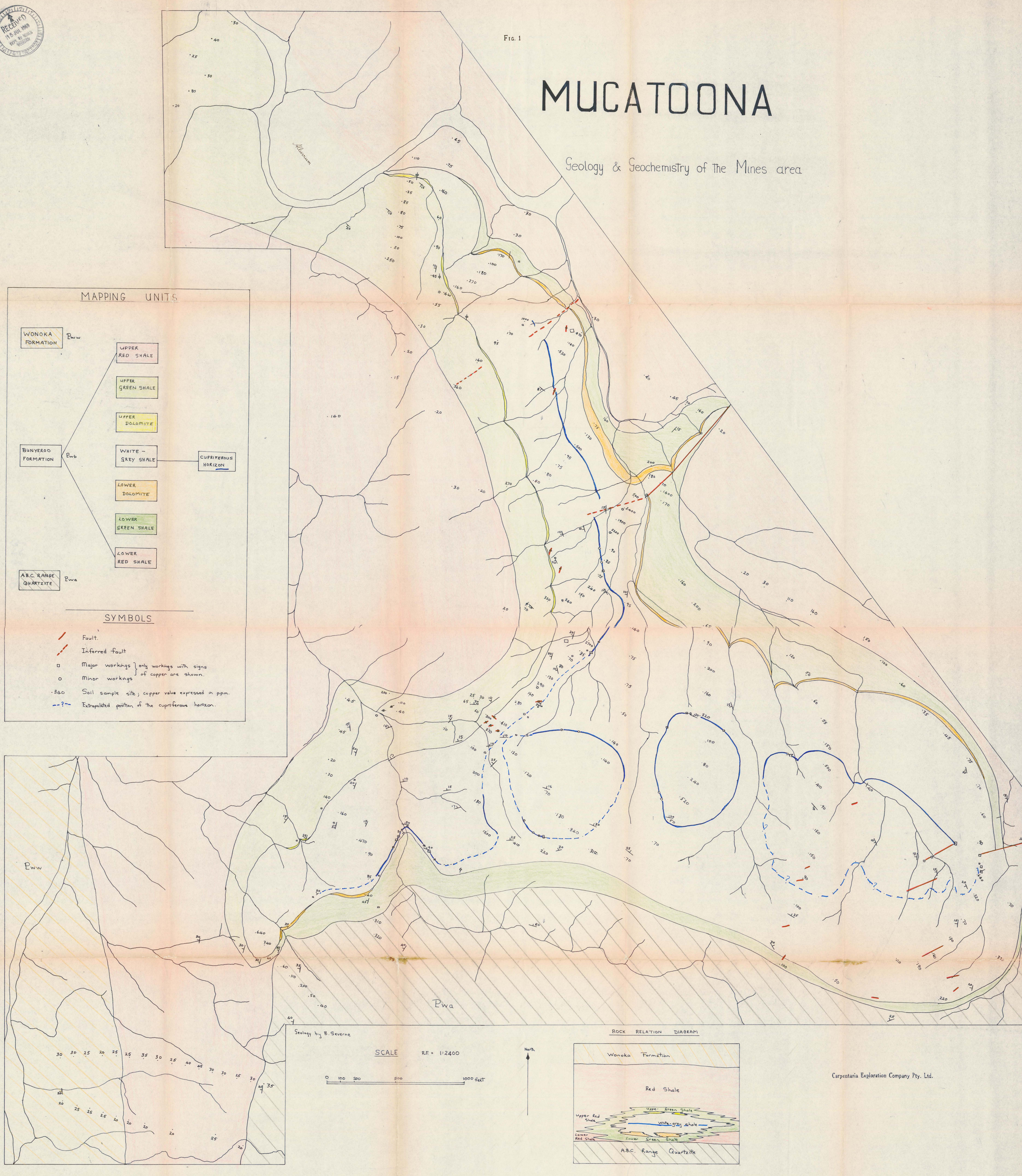
FIG. 1
MUCATOONA
Geology & Geochemistry of the Mines area
MAPPING UNITS
WONOKA FORMATION
Ꝑww
UPPER RED SHALE
UPPER GREEN SHALE
UPPER DOLOMITE
BUNYEROO FORMATION
Ꝑwb
WHITE - GREY SHALE
CUPRIFEROUS HORIZON
LOWER DOLOMITE
LOWER GREEN SHALE
LOWER RED SHALE
A.B.C. RANGE QUARTZITE
Ꝑwa
SYMBOLS
Fault.
Inferred fault
Major workings
Minor workings
only workings with signs of copper are shown.
·340 Soil sample site; copper value expressed in p.p.m.
--?-- Extrapolated position of the cupriferous horizon.
Alluvium
Ꝑww
Ꝑwa
Geology by B. Severne
SCALE
R.F. = 1:2400
0 100 200 500 1000 feet
North
ROCK RELATION DIAGRAM
Wonoka Formation
Red Shale
Upper Green Shale
Upper Red Shale
White-grey shale
Lower Red Shale
Lower Green Shale
A.B.C. Range Quartzite
Carpentaria Exploration Company Pty. Ltd.

FIGURE 2

IS

MISSING

C.E.C.81

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

TECHNICAL REPORT No. 173 017

Title	PROGRESS REPORT - ANGEPENA - SML 171
Author	W.D. SMITH
Investigations Conducted By	W.D. SMITH B.C. SEVERNE
Submitted By	W.D. SMITH
Date	NOVEMBER 1969

DISTRIBUTION

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TABLE OF CONTENTS

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

TECHNICAL REPORT No. 173

SUMMARY

Date November, 1969.

OBJECT:

TO EVALUATE SML171 with respect to base metals and gold.

PRECIS:

Geological and geochemical investigations have indicated that the breccia zones have no particular potential for mineralisation. There is a definite but marginal association of mineralisation with the perimeter of the North Breccia Zone, (the largest), and this is probably true of all four. This is considered to be due to the behaviour of the breccia zones as conduits for hypogene mineralising agencies, precipitation occurring principally in the wall and roof rocks.

Two prospects, Mucatoona and the Angepena Gossan, were selected for initial airblast drilling, the former for copper, and the latter for gold.

CONCLUSIONS:

Airblast drilling results should be appraised for Angepena and Mucatoona, and further work and or ground reduction planned accordingly.

RECOMMENDATIONS:

Appraise airblast drilling results, and if appropriate, plan immediate work to justify further reduction of area on a pro rata expenditure basis as soon as possible.

Walter D. Smith

1-0 INTRODUCTION

Special Mining Lease 171 comprises about 95 square miles near the general centre of the Flinders Ranges in S.A.

The area was selected to permit evaluation of the Angepena Diapir, and reappraisal of Mucatoona Mines, and the Angepena Goldfield.

The boundaries of SML 171 are shown in Figure 1. A claim (No. 5157) currently being worked for gold is excluded from SML 171.

This report covers work completed prior to drilling, which will be reported separately.

2-0 GEOLOGY

2-1 GENERAL GEOLOGY

The area consists of folded and faulted representatives of the Umberatana and Wilpena Groups (see Plate 1), together with a number of disturbances called breccia zones, at least two of which contain rocks from stratigraphic levels lower than those of the rim rocks. Thus piercement features of some sort are indicated.

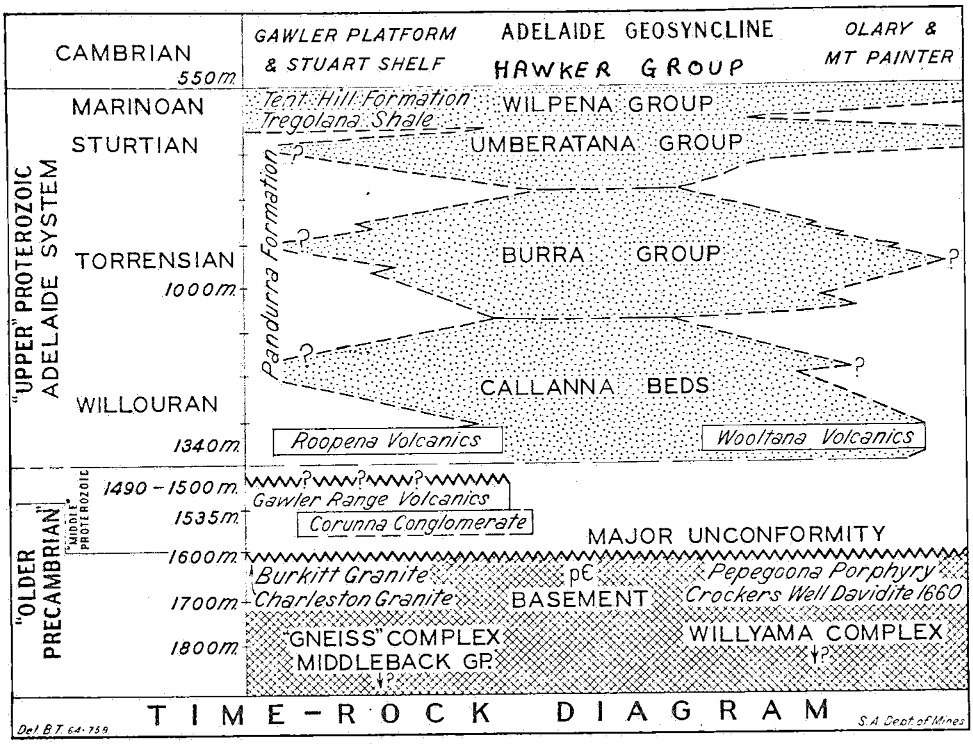
The mutual relationships and structure of the various units, together with the breccia zones, the main outcrop area of the Angepena Gossan and the Mucatoona Mines area are shown in Figure 1.

There are five aspects of the general geology of the area that appear to merit special mention.

(1) The Bunyeroo Formation is abruptly altered in thickness at two places (J7 and C3) (Grid reference Figure 1) across particular faults.

(2) There is a local conglomerate lensing eastwards within the Wonoka Formation from the major fault in the C2 area.

PLATE I.



AFTER THOMPSON'S (1965) Fig. 6.

(3) There are local stratigraphic irregularities such as the disconformable to unconformable relationships of the Wilpena and Umberatana Groups in the C2 area and the E2 area.

(4) The area is divided into certain segments by major faults, and the fold trends within these separate segments are dissimilar (see Figure 2).

(5) There are four breccia zones, which are examples of the features usually referred to as diapirs.

Points 1,2,3 and 4 above are interpreted as indicating that block faulting was occurring in the basement rocks and was influencing deposition of the Umberatana and Wilpena Groups. Thus movements on the faults between areas of dissimilar Bunyeroo thickness are considered to have been penecontemporaneous with respect to the Bunyeroo Formation. The conglomerate lens in the Wonoka Formation is considered to indicate that block movement locally caused disruption and redistribution of the Wonoka Formation soon after and or during deposition. The local stratigraphic irregularities are believed to mean either that certain blocks were too positive in behaviour to develop a full sequence above them and or that sequences once developed were subsequently shortened by periods of erosion. The major segmental faults are believed to be penecontemporaneous. Thus they preceded the general deformation of the area. Consequently certain segments deformed more or less separately in accordance with their own individual stress fields, without giving rise to the structural continuity expected of an area deformed in accordance with one uniform stress field.

The nature and origin of the breccia zones is mentioned below:-

2-2 GEOLOGY OF THE BRECCIA ZONES

The most fundamental feature of the breccia zones is that they are areas of marked disorder. Thus they contrast sharply with the well ordered sedimentary sequence of the Adelaide Geosyncline. The breccia zones are characterised by discontinuity of outcrop, structural irregularity, anomalous juxtaposition of different lithologies, prevalence of breccias of different kinds, and contorted zones of haphazardly oriented folds. The problems arising from the factors outlined above, together with deep weathering, poor exposure, particularly of the contacts, inhibit the development of confident conclusions concerning the origin and significance of these features.

A less fundamental but nevertheless important feature of the breccia zones, is that they usually contain rocks older than those of the rim rocks. In the case of SML 171, the North Breccia contains Burra-Callanna lithologies surrounded by Wilpena Group rocks, and the Central Breccia includes representatives of the Umberatana Group surrounded by Wilpena Group rocks. In the case of the two smaller breccias, South and East, it is not clear whether the breccia is older or not than the surrounding rocks.

Another feature of breccia zones is that they frequently have a marked concentration of igneous intrusives. Within SML 171, such intrusives have been recognised only in the Central Breccia, especially in the E3 block.

One feature which is conspicuous by its absence, is the lack of upwarps in the rim rocks surrounding the breccia zones.

Due to the difficulties anticipated, the breccia zones were not mapped internally. However, numerous measurements of strike and dip were made, and these are presented as bedding plane plots for the North and Central Breccias in Figures 3 and 4 respectively. These show the general structural character of the breccia zones, which seem to have a high degree of disorder, together with some tendency for bedding to parallel the walls of the feature.

The origin of the breccia zones is uncertain, and work carried out on SML 171 did not lead to definite conclusions concerning this aspect. However, it is thought likely that their origin is linked to penecontemporaneous basement faulting and syntaphral tectonics dependent upon this. These processes would have operated before the Ordovician orogenic deformation of the area, and thus some further effects may also be attributable to this. These effects could be expected to be diapiric in nature, but direct evidence of diapirism (i.e., piercement with pushing apart) has not been recognised. The four Angepena breccia zones shown on Figure 1 do not have associated upwarped rim rocks such as do the analogous features at Blinman and Beltana. In general, the breccia zones are considered to accord with a composite piercement interpretation developed for the Beltana Complex and outlined in Progress Report -

Beltana - SML 170. This involves

(1) A block faulting stage

(2) A syntaphral tectonics stage

(3) An orogenic deformational (diapiric) stage.

The Angepena breccias are thought to exhibit good evidence of stages 1 and 2, and to have only poorly developed stage 3 effects.

3-0 AEROMAGNETICS

The principal feature of the Angepena Aeromagnetic Sheet covers the general vicinity of the four breccia zones. The feature consists of a complex of anomalies and gives a distinct impression of sources at different depths, deep and intermediate. The intermediate source seems several thousand feet deep. It is thought most likely to be due to blind igneous intrusives similar to several exposed in the E3 block, and also to the numerous such features known from other piercements. The deep source, the depth of which is uncertain, is thought most likely to be due to basement irregularities resulting from block faulting. Thus, while the aeromagnetic data cannot be regarded as proving or confirming basement irregularities, it does seem to accord well with the hypothesis of block faulting developed above on geological grounds. The spacial association of such effects with piercement features seems suggestive of at least some element of common genesis. Thus, the aeromagnetic data at Angepena augments the credibility of the composite piercement interpretation favoured for the breccia zones.

4-0 RECONNAISSANCE GEOCHEMISTRY

4-1 DATA OUTSIDE THE BRECCIA ZONES

Four lines of soil samples were taken along suitable sections to provide an indication of general background for the various units of the Wilpena Group. The locations and sample numbers for lines 1-4 are shown in Figure 6. Results are shown in Table 1, summarised in accordance with the particular stratigraphic units to which they belong. All of the results are rather similar and of a low order.

Average values for the Wilpena Group in general are given in Table 2.

Fifteen soil samples were taken at nearly equal intervals across the general mineralised area at Mucatoona. The locations (samples 501 to 515) are shown in Figure 6, and the results are given in Table 3. The results are distinctive in comparison with normal background values. A more detailed geochemical investigation of Mucatoona is described below.

4-2 DATA INSIDE THE BRECCIA ZONES

Soil samples were collected to represent each of the four breccia zones shown in Figure 1.

4-2-1 THE NORTH BRECCIA ZONE

Fifty-six samples were taken distributed fairly evenly throughout the North Breccia. The sample locations and numbers are shown in Figure 6 and results are shown in Table 4. All of the results are rather similar and of a low order.

4-2-2 THE CENTRAL BRECCIA ZONE

Forty samples were taken evenly spaced along one line through the long axis of the Central Breccia Zone proceeding northwestward from sample number 200 to sample number 238 as shown on Figure 6. Results are shown in Table 5. All of the results are rather similar and of a low order.

4-2-3 THE SOUTH BRECCIA ZONE

Seventeen samples were taken evenly spaced along one line through the long axis of the South Breccia Zone proceeding westward from sample number 251 to sample number 267, as shown on Figure 6. Results are shown in Table 6. All of the results are rather similar and of a low order.

4-2-4 THE EAST BRECCIA ZONE

Sixteen samples were taken nearly evenly spaced in a group inside the East Breccia as shown (see Figure 6). Results are shown in Table 7. All of the results are rather similar and of a low order except for two which are higher. Evidence of hydrothermal alteration was recognised near these locations but they are believed to be insignificant in relation to ore.

4-3 COMPARISON OF CORE, PERIMETER AND REMOTE SAMPLES

To permit a geochemical comparison of the core rocks with remote representatives of the Wilpena Group, and both of these features with the immediate rim rocks, a line of 49 soil samples was run around the perimeter of the North Breccia. The locations of the samples are shown in Figure 6, and the results are given in Table 8. The results are all fairly similar with only one isolated exception, (Sample No. 40), which is considered to be of no significance.

Average results for core, perimeter and remote samples are given in Table 9.

It is apparent from Table 9 that the core rocks are poorer in base metals than the remote samples. Moreover both core rocks and remote samples are poorer than the perimeter samples. Thus the immediate wall rocks of the breccia appear to be the chief locus of mineralisation, but the effect is very marginal and appears to have no economic significance. A similar exercise on the Beltana complex indicated a similar conclusion (see Progress Report - Beltana - SML 170). Thus wall rock enrichment may be a general feature of S.A. breccia zones. If so, the effect seems probably due to the behaviour of the breccias as conduits for hypogene mineralising influences due to their extraordinary porosity and permeability. Precipitation evidently takes place chiefly in the wall and roof rocks.

Owing to the small number of small order and anomalies arising from reconnaissance sampling and the conclusions reached above, the breccias are regarded as having no special potential for ore, and further work was confined to particular prospects as outlined below.

5-0 DETAILED WORK

5-1 THE ANGEPENA GOSSAN

The Angepena Gossan is a linear ferruginous zone about 20 feet wide immediately upslope from the Angepena Alluvial Gold Field. It appears to be continuous under shallow cover for a length of about 14,000 feet and continues in a discontinuous and offset manner for a further 12,000 feet before passing out of the southern boundary of SML 171. The position and continuity of the Angepena Gossan are shown broadly on Figure 7. The gossan shows a very close parallelism to bedding, and for this reason it is suspected that it represents the weathered equivalent of a bedded ironstone. The surface expression is thought to be limonite after pyrite.

Since the Angepena Gossan appears to have been the source of the alluvial gold, it was sampled and assayed for gold. The results, which are shown on Figure 7, were negative. Having regard to the possibility of gold enrichment with depth either in the weathered or fresh rock, and the known continuity of the feature, it is considered essential to drill to confirm the nature of the fresh material and test for possible increased gold values. Accordingly, four initial airblast holes are proposed. These are intended to indicate the attitude of the feature with respect to bedding, its width, the nature of the primary material, and provide samples from near the water table for assay. If these holes confirm that the feature is pyritic in depth, further drilling (diamond drilling) will be merited to provide fresh samples from greater depth.

5-2 MUCATOONA

Mucatoona is an area of numerous small copper workings within a local facies variant of the Bunyeroo Formation. The workings are in secondary ore, and none have penetrated into primary mineralisation.

A reconnaissance soil sample line (see above - see Table 3) showed that the area was geochemically distinctive. Whitehead (1966) had recognised that the mineralisation was confined to a local lens of bleached shale, and during the present work it was realised that this occurs immediately on the long sequence side of a penecontemporaneous fault (see Figure 1). This relationship was suspected of having significance, the Mucatoona mineralisation being possibly introduced through penecontemporaneous faults by a volcanic exhalative mechanism, and depositionally controlled by stagnant sedimentary environments close by. As other penecontemporaneous faults were recognised (see Figure 1 - I6-J7 area), six lines of soil samples were run to permit comparison of short and long sequences in different areas, and permit comparison of the I6 area with the Mucatoona area. The locations and results of this sampling are given in Figure 6, and Tables 10 and 11. The results show that:-

(1) At the sections sampled north west and south west of Mucatoona, there are no significant differences between short and long sequences with respect to copper, lead, zinc and silver.

(2) There are no significant differences between short and long sequences with respect to copper, lead, zinc and silver in the I6-J7 area.

Since there is a distinct change of values across the penecontemporaneous fault at Mucatoona in the immediate vicinity of the fault, the I6-J7 area seems to offer no promise of a repetition of Mucatoona type mineralisation from the geochemical evidence.

The sampling mentioned above illustrates the highly local nature of the Mucatoona mineralisation, since copper values fall from about ten times background to background in about one mile (compare Table 3 results with the sample line in the B5-B4 area) - (also see comparable detailed Mucatoona geochemical results below).

Mucatoona itself was mapped and ridge soil sampled, the geological and geochemical data so gained being provided in Figure 8. This map shows that the bleached grey shale containing the mineralisation occurs as a lens within a larger lens of green shale, which represents a local variation of the normally red Bunyeroo Formation. The bleached grey shale represents a weathered black shale with pyrite of presumed sedimentary origin. One, and possibly several, particular horizons within the grey shale seem fairly consistently mineralised with copper. Secondary redistribution and enrichment has occurred, but the basic pattern of occurrence seems clearly to be along one main horizon.

The area was not considered to merit grid soil sampling, so a pattern of lines along most major ridges was chosen, and results were processed to reveal relationships in space, and with respect to lithological variations. No particular relationships with respect to space were revealed, but a very clear variation of copper content with respect to rock type (colour) was indicated. This is shown below:-

ROCK TYPE	Average Copper (ppm)	Number of Samples
Upper Red Shale	34	22
Upper Green Shale	108	13
Grey Shale	266	100
Lower Green Shale	146	18
Lower Red Shale	69	17

Note the sympathetic variation of copper with respect to rock type (colour).

Clearly, the ordinary red (oxidising environment) shale has least copper content, the green (transitional environment shale has intermediate copper content, and the grey shale (euxenic or black shale environment) has the most copper content.

Having regard to the general geological environment of SML 171, the local geological environment of Mucatoona Mines, and the geochemical data given above, it is considered very likely that the primary Mucatoona copper was sedimentary, introduced by a volcanic exhalative mechanism through penecontemporaneous faults and or breccia zones, and deposited nearby in accordance with particular facies of sedimentation.

Secondary alteration precludes the possibility of determining the width of primary mineralisation at the surface. Consequently five airblast holes are proposed in suitable locations to provide an indication of the width and grade of mineralisation below surface but at relatively shallow depth. A sixth hole is proposed near a cross fault to test for possible secondary enrichment along it.

5-3 THE HAWKER GROUP

Mindful of the general significance of the Hawker Group, both as a source rock and a trap rock for secondary zinc mineralisation as at Puttapa, this unit was given particular attention. It is chiefly exposed in the southern part of SML 171 in a west plunging syncline which contains the head of Sliding Rock Creek.

Sixty-five locations were stream sediment sampled in two size fractions, a coarser -20+60 mesh fraction, and a finer -60 mesh fraction. The locations are shown in Figure 6, and the results are given in Table 12. The values are arranged in their approximate spacial order moving downstream.

The corresponding values for the two different fractions are generally similar, and they are not regarded as anomalous for this particular unit except for sample number 43. The Hawker Group is well known for its consistent high zinc and lead contents. Sample number 43 is clearly anomalous in both coarse and fine fractions for both lead and zinc. Nevertheless, this does not represent a very high order anomaly for Puttapa type mineralisation in a Hawker Group background.

As a further check, nine lines of ridge soil samples were taken along prominent watersheds. The locations of these are shown in Figure 6. Samples were collected at approximately 100 foot intervals but only the alternate ones were submitted for assay (zinc) initially. Thus the samples with uneven numbers in Table 13 represent locations 200 feet apart. The direction of sample numbering is shown in parentheses in Figure 6 next to the line number. Sample No.9 in line seven (2000 ppm ZN) was the only one considered interesting, especially since it is up drainage from the anomalous stream sediment sample No. 43 mentioned above. Samples 8 and 10, 100 feet to each side were then assayed, giving 270 and 320 ppm zinc respectively. No zinc mineralisation was recognized visually, and as the anomalous results are confined to only one stream sediment sample, and only one soil sample, the source of the mineralisation is probably too small to be of significance.

As faulting probably affects ground water circulation and zinc enrichment as at Puttapa, a number of soil samples were taken from eleven locations fairly evenly spaced along the fault between the Hawker Group and the Umberatana Group in the B1 area. Results, which were all of a low order, are given in Table 14. (Locations are numbered proceeding southwesterly).

Four rock samples were taken also, and these gave results of 30,90,25 and 40 ppm zinc respectively.

In summary, the potential of that part of the Hawker Group inside SML 171 for a Puttapa type orebody is believed to be negligible.

5-4 FOLLOW UP WORK

A number of locations indicating low order anomalies were examined in the field. No significant mineralisation was recognised at any of these. The results of check samples taken are shown in Table 15.

6-0 REFERENCES

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TABLE 1 Showing Results for Particular Units within the Wilpena Group.

LINE No	SAMPLE No	Cu ppm	Pb ppm	ZN ppm	Ni ppm	Co ppm
			POUND QUARTZITE			
1	300	15	25	45	30	20
1	301	20	40	35	25	15
1	302	20	30	45	30	25
4	801	10	10	30	20	5
Averages		16	26	39	26	16
			WONOKA FORMATION			
1	303	20	30	40	20	15
1	304	15	35	50	30	15
1	305	10	40	65	40	25
1	306	25	40	70	35	20
1	307	25	60	45	35	25
1	308	50	40	85	35	20
1	309	20	35	75	35	15
1	310	40	35	65	40	20
1	311	35	85	70	40	30
1	312	10	40	65	45	30
1	313	20	25	55	35	20
2	621	35	80	125	30	15
2	622	30	70	60	30	15
3	401	25	30	55	30	30
3	402	20	40	45	35	20
3	403	30	30	45	35	20
3	404	30	10	45	25	15
3	405	15	40	25	35	15
3	406	30	50	35	30	15
3	407	30	20	50	30	20
3	408	20	30	60	30	15
3	409	30	40	40	30	20
3	410	30	50	30	30	20

3	411	25	50	35	20	15
3	412	25	45	35	20	20
3	413	30	40	40	25	20
3	414	85	20	35	45	20
3	415	30	40	25	35	15
4	802	20	25	45	40	10
4	803	20	20	40	30	10
4	804	30	25	60	35	10
Averages		28	39	52	33	19
BUNYEROO FORMATION						
1	314	20	25	45	30	20
1	315	20	30	65	35	15
1	316	20	35	55	30	15
1	317	20	30	55	35	20
1	318	60	30	65	40	20
1	319	20	20	45	30	15
1	320	20	25	45	35	25
1	321	20	20	65	30	20
1	322	20	20	55	30	15
1	323	20	20	65	30	15
2	612	30	35	40	45	15
2	613	25	50	30	25	10
2	614	55	35	70	40	15
2	615	45	75	65	30	10
2	616	30	40	105	35	10
2	617	35	35	65	30	10
2	618	10	55	25	30	15
2	619	10	55	35	30	10
2	620	20	40	35	15	10
3	416	45	30	35	40	20
3	417	65	30	45	35	20
3	418	25	30	40	35	20

3	419	65	30	40	35	20
4	805	35	15	65	35	15
4	806	35	25	60	35	15
Averages		31	33	53	33	16
ABC RANGE QUARTZITE						
1	324	20	25	50	35	15
2	610	35	55	45	25	15
2	611	30	35	55	20	15
Averages		28	38	50	27	15
ULUPA SILTSTONE						
1	325	20	25	55	30	15
1	326	35	20	75	35	20
1	327	25	30	75	35	20
1	328	20	20	45	25	10
1	329	30	30	45	30	15
1	330	25	25	65	35	15
1	331	25	20	55	30	15
1	332	25	110	65	30	15
1	333	20	30	65	30	15
1	334	20	20	65	30	15
1	335	20	30	55	30	15
1	336	20	30	55	35	15
1	337	30	25	45	30	15
1	338	25	20	55	30	20
1	339	30	25	55	35	20
1	340	25	30	55	30	15
1	341	45	30	55	35	20
1	342	35	30	45	30	20
1	343	30	30	65	30	20
1	344	30	25	65	30	20
1	345	30	30	45	25	15

1	346	30	30	65	25	20
1	347	50	40	75	30	20
1	348	40	40	65	30	25
1	349	35	30	75	25	25
1	350	35	40	55	25	20
1	351	50	45	75	35	30
1	352	35	35	65	30	20
1	353	45	40	75	30	35
1	354	40	40	75	30	30
1	355	50	40	75	35	30
1	356	25	20	40	25	25
1	357	20	20	40	20	10
1	358	30	20	55	30	30
1	359	30	15	45	20	20
1	360	25	15	45	25	20
1	361	20	15	45	20	15
1	362	20	10	35	20	15
2	601	25	35	35	20	5
2	602	30	35	50	25	15
2	603	30	35	65	30	10
2	604	30	30	70	20	15
2	605	30	25	70	30	15
2	606	20	45	25	25	10
2	607	20	40	25	20	10
2	608	25	40	30	25	15
2	609	35	65	40	30	15
4	807	25	20	30	20	20
4	808	45	20	35	30	15
4	809	30	20	40	30	15
Averages		30	31	54	28	18

NOTES

(1) All samples -80 mesh, 6-9" deep.

(2) All assays by Sampey Exploration Services (Method 101B).

(3) All samples assayed for silver - all values less than 7 ppm.

TABLE 2 Showing Average Values for Particular Stratigraphic Units and the Wilpena Group in General

STRATIGRAPHIC UNIT	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
POUND QUARTZITE	16	26	39	26	16
WONOKA FORMATION	28	39	52	33	19
BUNYEROO FORMATION	31	33	53	33	16
ABC RANGE QUARTZITE	28	38	50	27	15
ULUPA SILTSTONE	30	31	54	28	18
WILPENA GROUP IN GENERAL (1)	25	32	49	30	17

NOTES

(1) Averages for particular units above weighted in accordance with their relative thicknesses assumed to be approximately as follows:-

POUND QUARTZITE	45
WONOKA FORMATION	37
BUNYEROO FORMATION	39
ABC RANGE QUARTZITE	1
ULUPA SILTSTONE	43
TOTAL	165

(2) All samples -80 mesh, 6-9" deep

(3) All assays by Sampey Exploration Services (Method 101B)

TABLE 3 Showing Results of Soil Samples across the General Mineralised Area at Mucatoona Mines

SAMPLE NUMBER	COPPER ppm	LEAD ppm	ZINC ppm	NICKEL ppm	COBALT ppm
501	40	40	50	35	35
502	135	35	45	40	25
503	80	35	40	40	20
504	130	35	35	40	25
505	95	30	35	40	30
506	40	20	35	35	20
507	65	30	45	50	25
508	625	50	40	55	20
509	140	45	35	30	20
510	550	80	25	35	15
511	850	75	25	35	10
512	1400	65	30	75	40
513	45	65	50	250	265
514	40	40	40	50	20
515	35	35	25	45	15
Averages	285	46	37	57	39

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

(3) All samples assayed for silver - all values less than 1 ppm

TABLE 4 **Showing Results Inside the North Breccia Zone**

SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
49	20	30	30	35	5
50	35	40	20	40	15
51	20	20	35	40	10
52	10	25	15	40	10
52A	10	40	15	20	10
53	15	30	20	30	15
54	15	50	15	30	20
55	20	40	25	30	20
56	20	30	20	30	15
57	20	20	15	30	15
58	20	30	15	30	15
59	15	20	15	30	20
60	60	30	20	35	15
61	20	30	15	20	15
62	15	30	10	25	15
63	25	30	15	35	15
64	20	30	15	25	15
65	30	30	20	35	20
66	30	30	15	30	20
67	20	30	20	70	20
68	25	30	35	30	30
69	15	30	15	20	10
70	20	25	30	30	10
71	20	30	20	30	10
72	10	20	15	30	10
73	10	25	10	20	10
74	60	30	25	100	20
75	50	25	15	45	20
76	20	30	15	25	20
76A	5	40	20	20	10
77	20	30	15	20	20
78	15	25	15	25	15

79	15	30	15	25	30
80	10	25	15	30	30
81	25	20	30	30	15
82	50	30	15	25	15
83	55	35	15	20	15
84	20	30	20	20	15
85	10	30	10	20	15
86	10	30	10	30	10
87	10	40	25	20	5
88	25	25	15	25	15
89	100	30	30	30	15
90	10	25	15	40	20
91	10	25	10	45	15
92	15	25	15	20	10
93	15	30	10	20	20
94	20	30	10	20	20
95	20	30	15	25	15
96	15	35	15	30	20
97	30	30	10	20	20
98	20	30	15	25	15
99	15	30	10	30	20
100	15	10	15	25	10
101	25	40	15	25	15
102	20	40	15	25	10
Averages	23	29	17	30	16

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

(3) All samples assayed for silver - all values less than 1 ppm

TABLE 5 Showing Results Inside the Central Breccia Zone

SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
200	70	70	50	40	25
201	40	40	45	35	25
202	35	20	40	35	25
203	25	25	40	35	20
204	35	20	55	45	15
205	30	20	40	35	20
206	60	25	45	40	20
207	35	25	40	35	15
208	40	20	40	30	15
209	40	20	50	40	20
210	35	20	50	35	15
211	70	50	30	40	30
212	35	40	25	40	25
213	50	25	45	40	20
214	25	30	50	35	20
215	35	15	40	35	20
216	35	30	40	35	20
217	30	30	35	30	20
218	30	40	30	35	20
219	40	25	40	35	20
220	40	40	30	35	20
221	15	40	30	50	20
221A	20	30	40	40	20
222	20	50	35	40	30
223	30	40	30	40	25
224	20	45	25	40	20
225	30	50	25	30	20
226	35	20	35	30	15
227	35	45	40	35	20
228	55	25	40	35	15
229	30	50	30	30	20
230	40	65	35	40	20

231	20	35	50	60	30
232	25	20	35	40	25
233	45	25	40	30	20
234	35	30	40	40	20
235	70	35	50	30	20
236	110	30	40	30	15
237	30	50	75	35	15
238	40	30	45	25	15
Averages	38	34	40	36	20

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

(3) All samples assayed for silver - all assays less than 8 ppm

TABLE 6 Showing Results Inside the South Breccia Zone

SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
251	20	20	20	35	10
252	30	25	30	25	10
253	30	20	30	30	5
254	35	40	35	35	10
255	40	35	30	35	15
256	35	35	30	35	10
257	35	30	45	35	10
258	35	30	20	30	10
259	30	40	35	30	10
260	20	20	15	30	10
261	30	20	35	30	10
262	45	20	30	25	10
263	40	25	30	30	15
264	35	25	25	30	15
265	30	30	40	40	10
266	15	35	15	30	10
267	30	30	35	40	5
Averages	31	28	29	32	10

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

(3) All samples assayed for silver - all values less than 1 ppm

TABLE 7 Showing Results Inside the East Breccia Zone

SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
A1	10	40	30	20	25
A2	10	35	35	10	20
A3	20	30	45	25	30
A4	10	45	25	20	30
A5	10	50	50	20	35
A6	170	30	55	25	30
A7	20	25	35	25	20
A8	70	40	30	35	30
A9	15	35	20	30	30
A10	25	35	40	30	30
A11	30	25	35	30	15
A12	50	25	35	30	15
A13	15	30	20	20	15
A14	10	30	30	30	25
A15	25	40	15	30	25
A16	390	20	35	25	30
Averages	55	33	33	25	25
Averages excluding samples A6 and A16	23				

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by McPhar

(3) All samples assayed for silver - all values less than 2 ppm

TABLE 8 Showing Results of Perimeter Samples around the North Breccia

SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	N1 ppm	Co ppm
1	45	30	50	70	20
2	35	30	60	60	25
3	25	30	30	45	20
4	40	35	25	35	20
5	45	35	20	45	25
6	30	25	15	40	20
7	40	35	20	40	15
8	35	30	35	35	20
9	40	45	35	35	20
10	35	35	35	35	30
11	55	35	45	35	30
12	45	30	25	40	30
13	60	30	30	35	30
14	95	30	35	40	20
15	90	25	25	40	20
16	30	30	40	35	20
16A	35	35	40	30	20
17	30	30	35	35	25
18	20	35	25	50	20
19	20	35	25	40	20
20	85	30	35	60	65
21	35	50	20	30	15
22	30	45	15	30	15
23	20	35	15	30	25
24	60	35	30	40	20
25	15	30	15	30	20
26	10	35	5	30	15
27	15	30	35	50	10
28	80	30	20	50	20
29	10	30	20	40	15
30	10	30	15	35	10
31	5	35	10	30	10

32	20	35	35	40	10
33	20	35	35	40	15
34	15	35	35	40	20
35	30	35	35	40	20
36	45	30	40	35	15
37	10	30	10	25	15
38	40	40	25	40	10
39	15	30	30	45	15
40	440	30	35	90	15
41	30	30	35	40	25
42	45	35	45	50	15
43	50	30	35	35	25
44	15	30	35	50	15
45	90	30	35	45	35
46	35	30	35	40	20
47	25	30	35	40	15
48	20	20	35	45	10
Averages	44	33	30	41	20
Averages excluding sample number 40	36			40	

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

(3) All samples assayed for silver - all values less than 1 ppm

TABLE 9 Showing Comparison of Core and Perimeter Values for the North Breccia with the General Value for the Rim Rocks (Wilpena Group

ELEMENT ppm	CORE(1) SAMPLES	PERIMETER(2)	REMOTE (3) SAMPLES
Cu	23	44	25
Pb	29	33	32
ZN	17	30	49
N1	30	41	30
Co	16	20	17

Notes

(1) 56 samples - see Table 4

(2) 49 samples - see Table 8

(3) 113 samples - see Table 1

TABLE 10 Showing Soil Sample Results for Selected Long Bunyeroo Sequences.

AREA	SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	Ag ppm
I6-I7	A1	10	30	65	3
I6-I7	A2	35	50	70	4
I6-I7	A3	20	30	65	3
I6-I7	A4	25	30	75	3
I6-I7	A5	25	30	70	4
I6-I7	A6	30	20	75	4
I6-I7	A7	30	20	75	3
I6-I7	A8	30	25	60	3
I6-I7	A9	25	30	70	3
I6-I7	A10	25	30	85	3
I6-I7	A11	25	20	75	3
I6-I7	A12	30	20	75	3
I6-I7	A13	25	30	65	3
I6-I7	A14	25	25	70	5
I6-I7	A15	25	20	55	3
I6-I7	A16	25	25	50	2
I6-I7	A17	30	30	50	2
I6-I7	A18	25	30	50	3
I6-I7	A19	25	20	55	4
I6-I7	A20	30	20	55	2
I6-I7	A21	25	30	75	2
Averages		26	27	66	3
A4	A251	25	20	70	4
A4	A252	20	20	60	4
A4	A253	10	20	60	3
A4	A254	5	20	65	3
A4	A255	5	20	70	3
A4	A256	10	25	75	3
A4	A257	10	35	70	5

TABLE 10

A4	A258	10	30	85	5
A4	A259	15	25	80	4
A4	A260	20	35	80	5
A4	A261	45	35	110	5
A4	A262	50	35	95	5
A4	A263	30	30	80	5
A4	A264	30	30	85	5
A4	A265	35	30	85	5
A4	A266	35	40	105	5
Averages		22	28	80	4
B4-B5	A201	30	30	65	5
B4-B5	A202	30	30	50	3
B4-B5	A203	5	20	55	3
B4-B5	A204	5	20	55	3
B4-B5	A205	10	20	55	3
B4-B5	A206	10	30	65	3
B4-B5	A207	15	30	60	3
B4-B5	A208	10	30	75	4
B4-B5	A209	35	30	60	4
B4-B5	A210	90	20	75	3
B4-B5	A211	50	30	70	3
B4-B5	A212	30	20	70	3
B4-B5	A213	20	20	70	3
B4-B5	A214	55	20	65	3
B4-B5	A215	10	10	65	3
B4-B5	A216	15	10	65	4
Averages		26	23	64	3

Notes

(1) All samples -80 mesh fraction 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

TABLE 11 Showing Soil Sample Results for Selected Short Bunyeroo Sequences

AREA	SAMPLE NUMBER	Cu ppm	Pb ppm	ZN ppm	Ag ppm
J7	A51	20	30	70	2
J7	A52	25	30	60	3
J7	A53	30	30	60	3
J7	A54	25	15	50	2
J7	A55	25	20	60	2
J7	A56	25	30	65	2
J7	A57	20	30	65	3
J7	A58	25	30	65	3
J7	A59	25	30	65	3
J7	A60	25	30	70	4
J7	A61	20	20	70	3
J7	A62	15	20	60	3
J7	A63	20	20	50	3
J7	A64	15	30	55	3
J7	A65	20	20	65	3
J7	A66	20	30	65	3
J7	A67	20	30	70	3
Averages		22	26	63	3
A1	A151	45	30	45	5
A1	A152	80	30	35	4
A1	A153	60	30	40	5
A1	A154	40	30	40	5
A1	A155	40	30	50	5
A1	A 156	25	30	35	5
A1	A157	20	20	50	3
A1	A158	15	30	55	5
A1	A159	20	30	55	4
A1	A160	15	20	50	4
A1	A161	10	20	55	5

053

A1	A162	15	30	55	5
A1	A 163	20	30	55	5
A1	A164	15	30	40	5
A1	A165	10	30	30	5
A1	A166	10	30	30	4
		28	28	45	5
B2	A101	25	30	30	2
B2	A102	20	20	25	2
B2	A103	70	40	35	3
B2	A104	25	40	45	3
B2	A105	20	40	40	3
B2	A106	25	35	40	3
B2	A107	30	20	40	3
B2	A108	35	25	25	3
B2	A109	25	20	30	3
B2	A110	25	20	40	2
B2	A111	30	35	35	4
B2	A112	30	40	40	5
B2	A113	25	30	40	5
B2	A114	20	50	75	5
B2	A115	20	30	50	5
B2	A116	30	30	50	5
B2	A117	25	30	45	5
B2	A118	25	30	40	5
B2	A119	40	30	40	5
B2	A120	40	30	45	5
Averages		29	31	40	4

NOTES

(1) All samples -80 mesh fraction 6-9" deep

(2) All assays by Sampey Exploration Services (Method 101B)

TABLE 12 Showing Results of Stream Sediment Sampling in the Hawker Group in Sliding Rock Creek

Sample Number	COPPER ppm		LEAD ppm		ZINC ppm	
	Coarse Fraction	Fine Fraction	Coarse Fraction	Fine Fraction	Coarse Fraction	Fine Fraction
19	15	25	20	25	40	50
18	20	20	20	50	30	50
20	25	10	15	25	30	45
36	10	10	15	15	30	35
21	10	15	20	25	40	50
25	10	15	20	35	360	180
22	15	15	25	25	60	70
23	15	20	30	35	110	120
24	10	15	25	30	65	75
31	10	15	15	20	60	60
30	5	15	15	15	50	65
29	10	10	10	10	35	35
28	10	10	10	15	40	35
27	5	10	15	15	65	40
26	10	10	20	20	90	200
17	15	25	80	50	200	140
16	5	15	90	35	200	96
15	10	15	30	40	110	150
63	20	10	30	30	90	160
34	15	15	30	40	95	110
32	15	15	20	20	40	70
35	10	20	20	20	55	45
33	15	15	60	50	130	155
1	10	10	15	60	30	35
2	5	10	15	50	30	25
3	30	10	10	60	35	35
4	45	15	25	70	85	90

TABLE 12

5	40	15	80	25	100	100
14	10	20	160	100	280	50
6	35	15	95	50	150	120
12	10	10	15	15	120	70
11	10	10	15	15	70	30
13	10	10	20	15	65	50
10	10	10	15	25	75	70
9	20	10	30	15	90	70
8	30	10	20	10	110	65
7	35	15	25	15	110	100
37	10	15	20	70	165	140
39	10	15	60	50	150	90
38	10	20	90	70	170	115
40	10	15	60	50	150	120
42	10	15	50	40	110	90
41	10	15	80	40	105	90
43	15	20	340	180	800	340
44	20	20	50	60	300	120
45	25	25	35	35	280	120
46	20	25	35	30	155	100
47	25	20	140	70	70	160
56	30	10	30	15	65	55
55	80	15	50	30	110	100
54	5	10	15	20	65	75
53	10	10	25	20	60	40
52	35	30	30	20	110	70
50	20	15	70	30	200	100
49	20	20	80	50	240	115
48	30	40	50	30	60	75
51	25	20	40	20	80	50
62	30	15	60	30	110	80
60	20	20	25	10	40	35
61	30	20	50	35	120	100
58	35	15	45	40	115	100
59	25	10	40	30	75	70

57	35	5	30	30	90	110
64	20	20	30	35	100	110
65	20	5	30	20	75	40
Averages	19	15	44	36	116	89
Averages excluding No.43			39	34	105	85

NOTES

(1) Coarse fraction -20+60 mesh, fine fraction -60 mesh

(2) All assays by Sampey Exploration Services (Method 101B)

TABLE 13 Showing Results of Soil Sampling in the Hawker Group near Sliding Rock Creek

Sample Number	ppm ZINC LINE NUMBERS								
	1	2	3	4	5	6	7	8	9
1	140	100	85	210	230	450	130	20	55
3	75	55	110	130	190	270	220	30	50
5	85	100	150	70	350	310	180	80	75
7	250	130	80	50	390	130	400	120	85
8	–	–	–	–	–	–	270	–	–
9	440	130	100	100	220	40	2000	420	220
10	–	–	–	–	–	–	320	–	–
11	130	270	340	–	75	30	400	290	–
13	55	–	170	–	35	40	150	190	–
15	50	–	120	–	50	140	160	80	–
17	50	–	310	–	55	–	100	110	–
19	45	–	–	–	220	–	75	75	–
21	65	–	–	–	45	–	50	45	–
23	–	–	–	–	–	–	35	–	–
Averages	126	131	163	112	169	176	325	133	97

NOTES

(1) All samples –80 mesh fraction, 6–9" deep

(2) All assays by McPhar.

(3) Line 7 Averages exclude samples 8 & 10

TABLE 14 Showing Results of Soil Sampling along the Fault between Hawker and Umberatana Group Sediments

LOCATION NUMBER	SAMPLE NUMBER	Cu ppm	ZN ppm
1	4	10	20
1	5	10	30
1	6	10	15
1	7	10	180
2	8	15	40
3	9	40	30
4	10	70	15
5	11	20	15
6	12	10	15
7	13	15	20
7	14	10	15
8	15	15	15
9	16	20	15
9	17	30	20
9	18	25	30
10	19	15	20
10	20	10	15
10	21	25	15
10	22	15	10
11	23	25	15

NOTES

(1) All samples -80 mesh, 6-9" deep

(2) All assays by McPhar

TABLE 15 Showing Results of Check Sampling during Follow up of Work

Original Sample Number	General Location	Table	Anomalous with Resect to	Check Samples From Same Area Sample Number	Check Samples From Same Area Value ppm
14	PERIMETER	8	Cu	14-1	Cu 55
	SAMPLE		(95)	14-2	40
	NORTH			14-3	50
	BRECCIA			14-4	60
				14-5	50
				14-6	55
15	PERIMETER	8	Cu	15-1	Cu 60
	SAMPLE		(90)	15-2	50
	NORTH			15-3	50
	BRECCIA			15-4	50
				15-5	60
				15-6	55
20	PERIMETER	8	Cu	20-1	Cu 85
	SAMPLE		(85)	20-2	35
	NORTH			20-3	110
	BRECCIA			20-4	55
				20-10	50
28	PERIMETER	8	Cu	28-1	Cu 50
	SAMPLE		(80)	28-2	70
	NORTH			28-3	100
	BRECCIA			28-4	35
				28-5	40
				28-6	35
40	AS ABOVE	8	Cu (440) Ni (90)	40	Cu30, Ni25
74	NORTH	4	Cu (60)	74-1	Cu60, Ni35
	BRECCIA		Ni(100)	74-2	45, 35
	SAMPLE			74-3	95 25

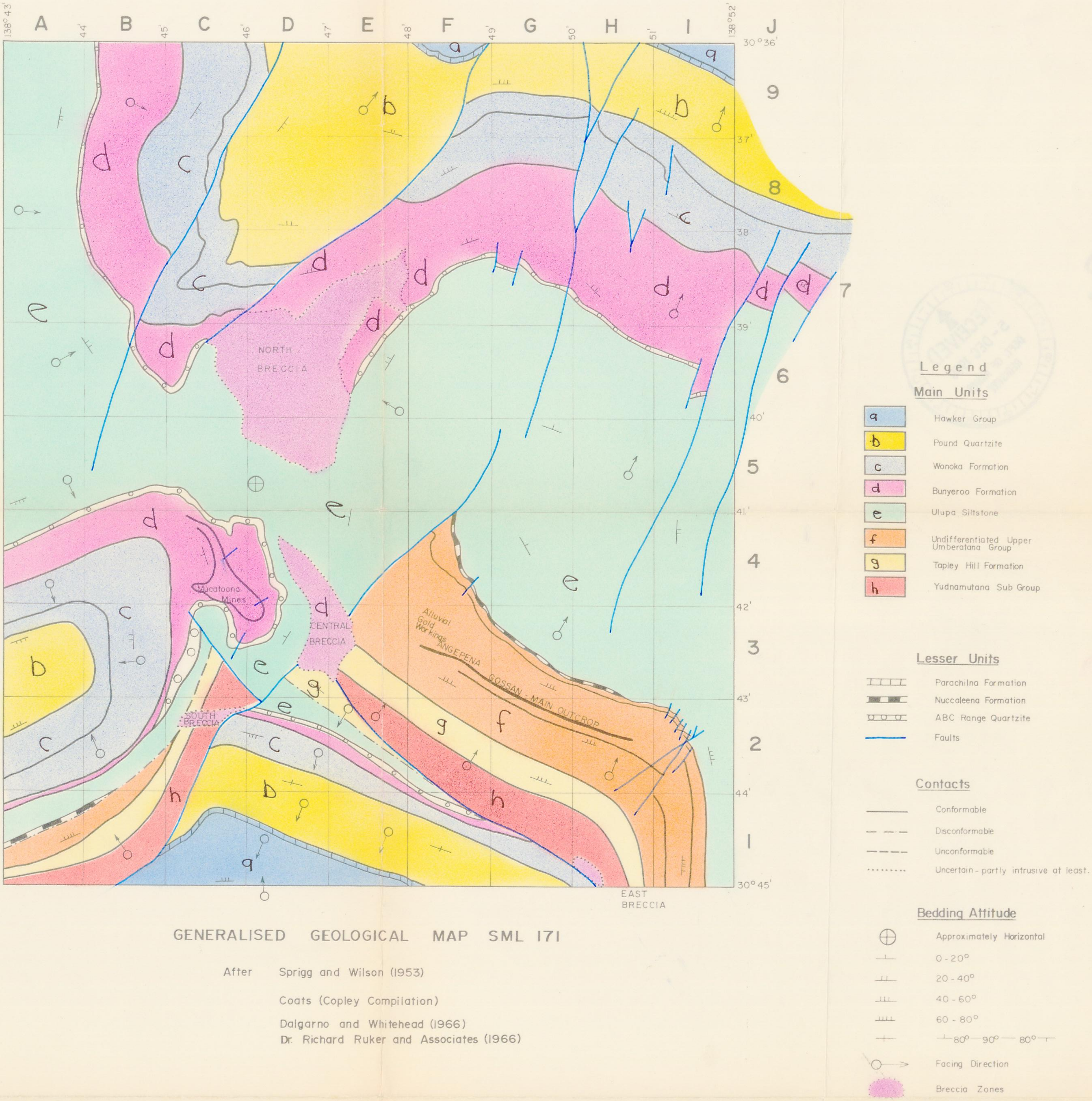
				74-4		30	20
				74-5		45	30
				74-6		45	25
89	NORTH BRECCIA SAMPLE	4	Cu (100)	89-1	Cu	25	
				89-2		25	
				89-3		20	
				89-4		20	
				89-5		20	
				89-6		60	
236	CENTRAL BRECCIA	5	Cu (110)	236-1	Cu	90	
				236-2		100	
				236-3		100	
				236-4		90	
				236-5		95	
				236-6		100	
332	REMOTE SAMPLE	1	Pb (110)	332-1	Pb	20,	ZN 50
				332-2		20	55
				332-3		20	60
				332-4		20	60
				332-5		20	120
				332-6		20	60

NOTES

(1) All samples -80 mesh fraction, 6-9" deep

(2) All original assays by Sampey Exploration Services (Method 101B)

(3) All check assays (not on same sample) by McPhar.



GENERALISED GEOLOGICAL MAP SML 171

After Sprigg and Wilson (1953)

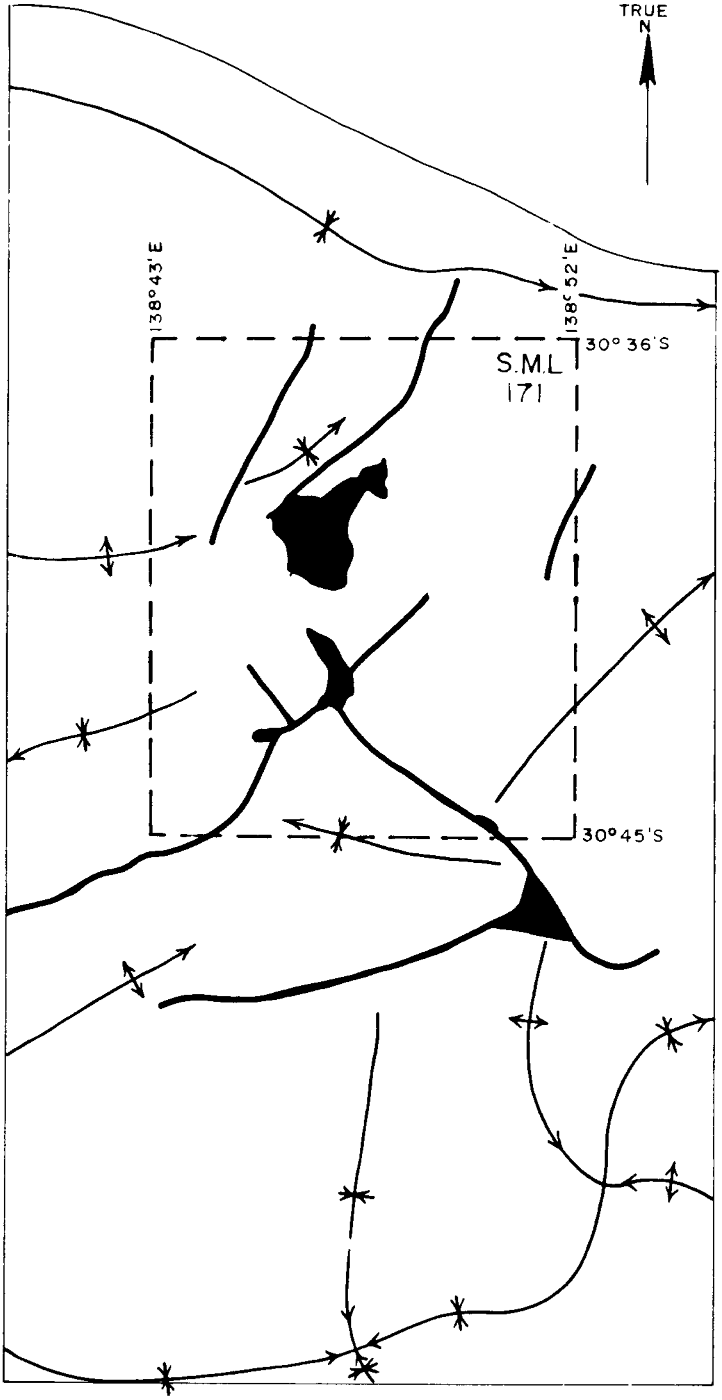
Coats (Copley Compilation)

Dalgarno and Whitehead (1966)

Dr. Richard Ruker and Associates (1966)

CARPENTARIA EXPLORATION COMPANY PTY. LTD.		
GENERALISED GEOLOGICAL MAP SML 171 ANGEPENA S.A.		
FIGURE 1		
SCALE: 1" = 1 mile	GEOL.: W.D.S.	DATE: November, 1969
CHECKED:	DRAWN: J.C.N.	3995

ENV 928-4



ENV 928

REFERENCE

- Breccia Zone
- Fault
- Fold with plunge

Note: After published Angepena and Cadnia 1 mile sheets and sources acknowled in Figure 1

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

FIGURE 2

SHOWING
BRECCIA ZONES IN
RELATION TO
MAJOR STRUCTURES

SCALE: 1" = 4 mls	**GEOL.:** W. D. S.	**DATE:** NOV. 1969
CHECKED:	**DRAWN:** G. N.	1/1290

928-23

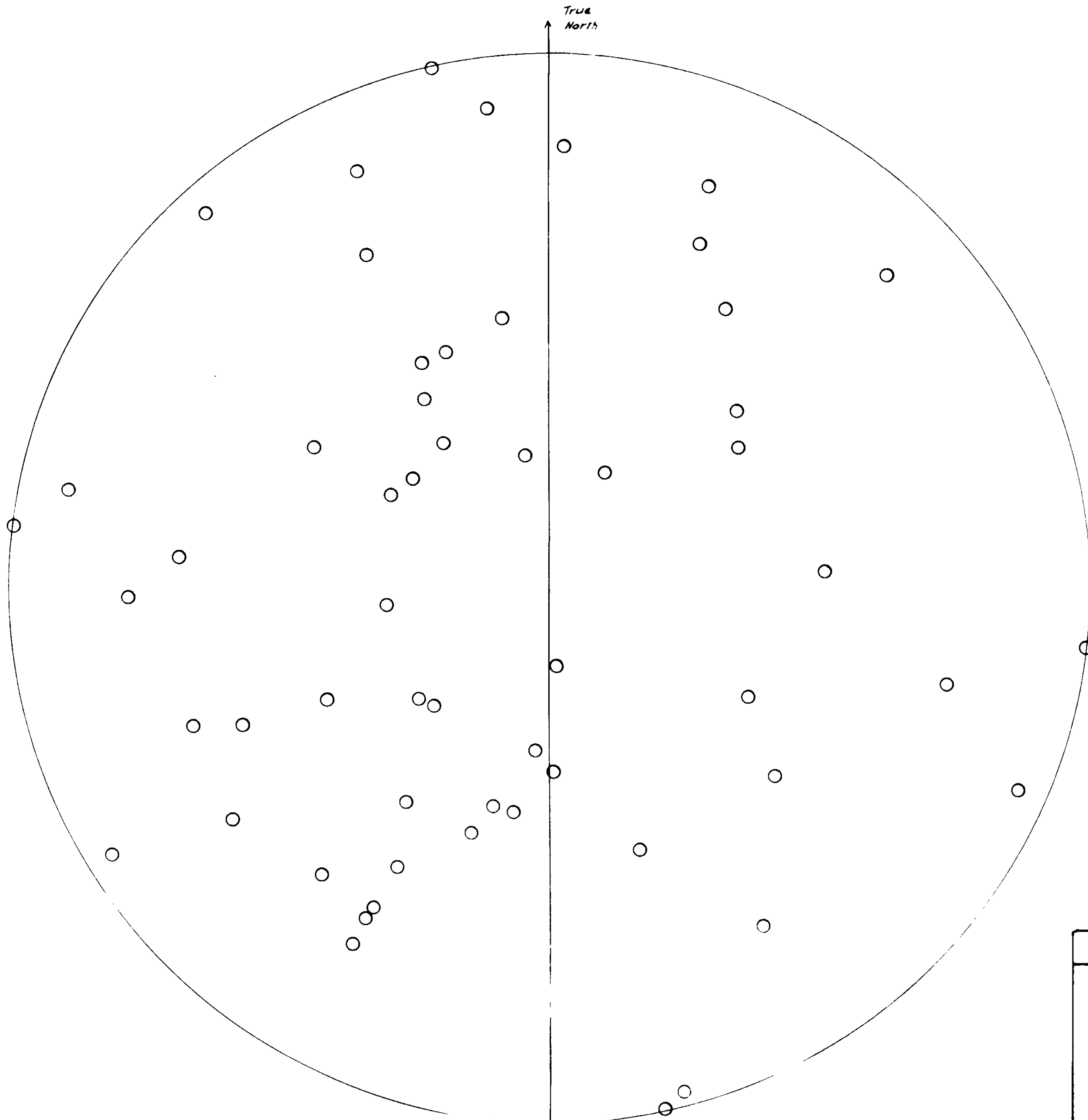


FIGURE 13

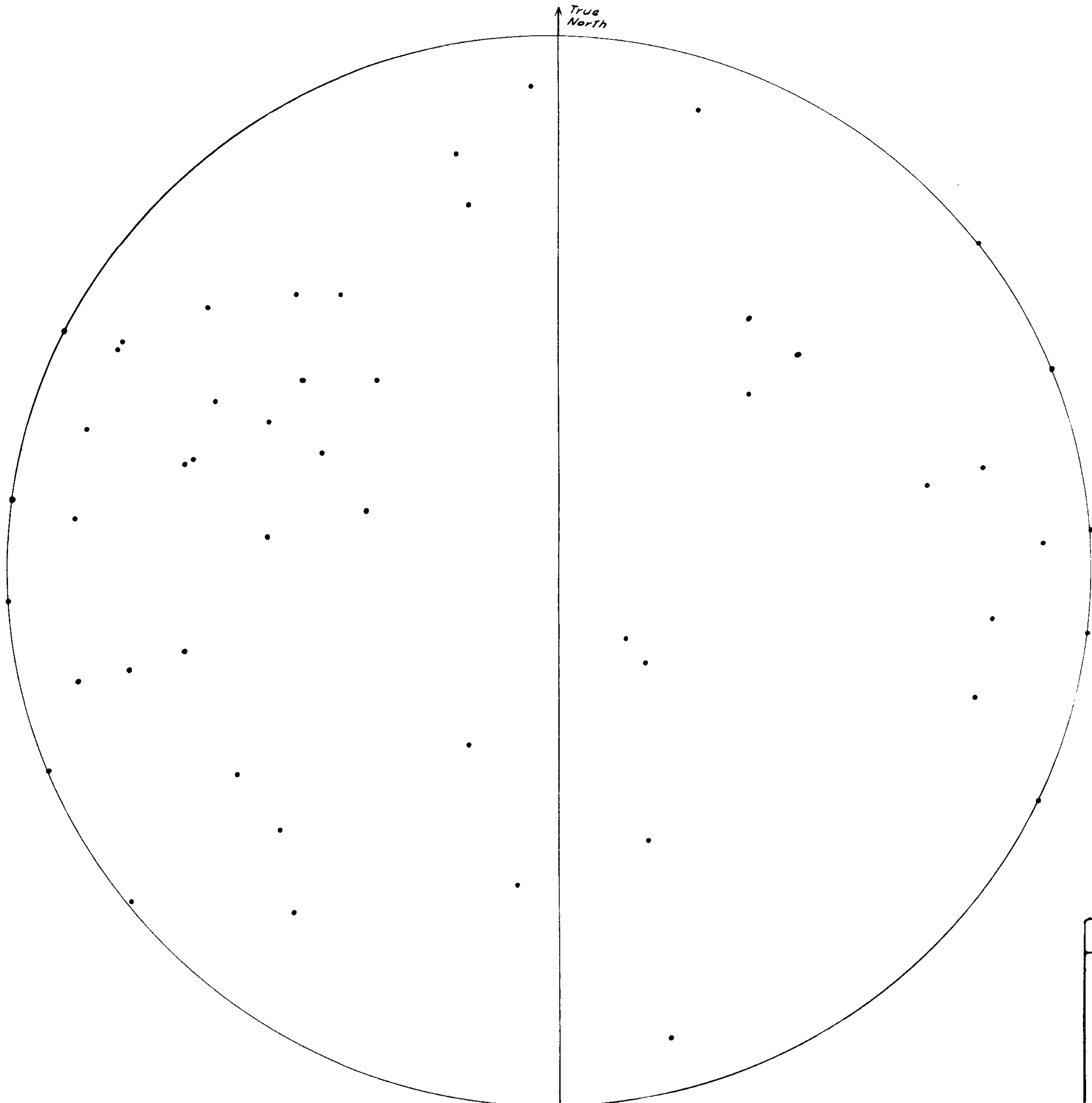
CARPENTARIA EXPLORATION COMPANY PTY LTD.

PLOT OF POLES TO BEDDING
ANGEPENA NORTH BRECCIA
54 POLES
W.G. HARVEY
JANUARY, 1969
SCHMIDT NET

SCALE	GEOL. W.G.H.	DATE Feb. 1969.
CHECKED:	DRAWN: J.C.N.	3671

ENV 928

ENV 928-20



CARPENTARIA EXPLORATION COMPANY PTY. LTD.

PLOT OF POLES TO BEDDING

ANGEPENA CENTRAL BRECCIA

45 POLES

RE. READ

DECEMBER, 1968

SCHMIDT NET

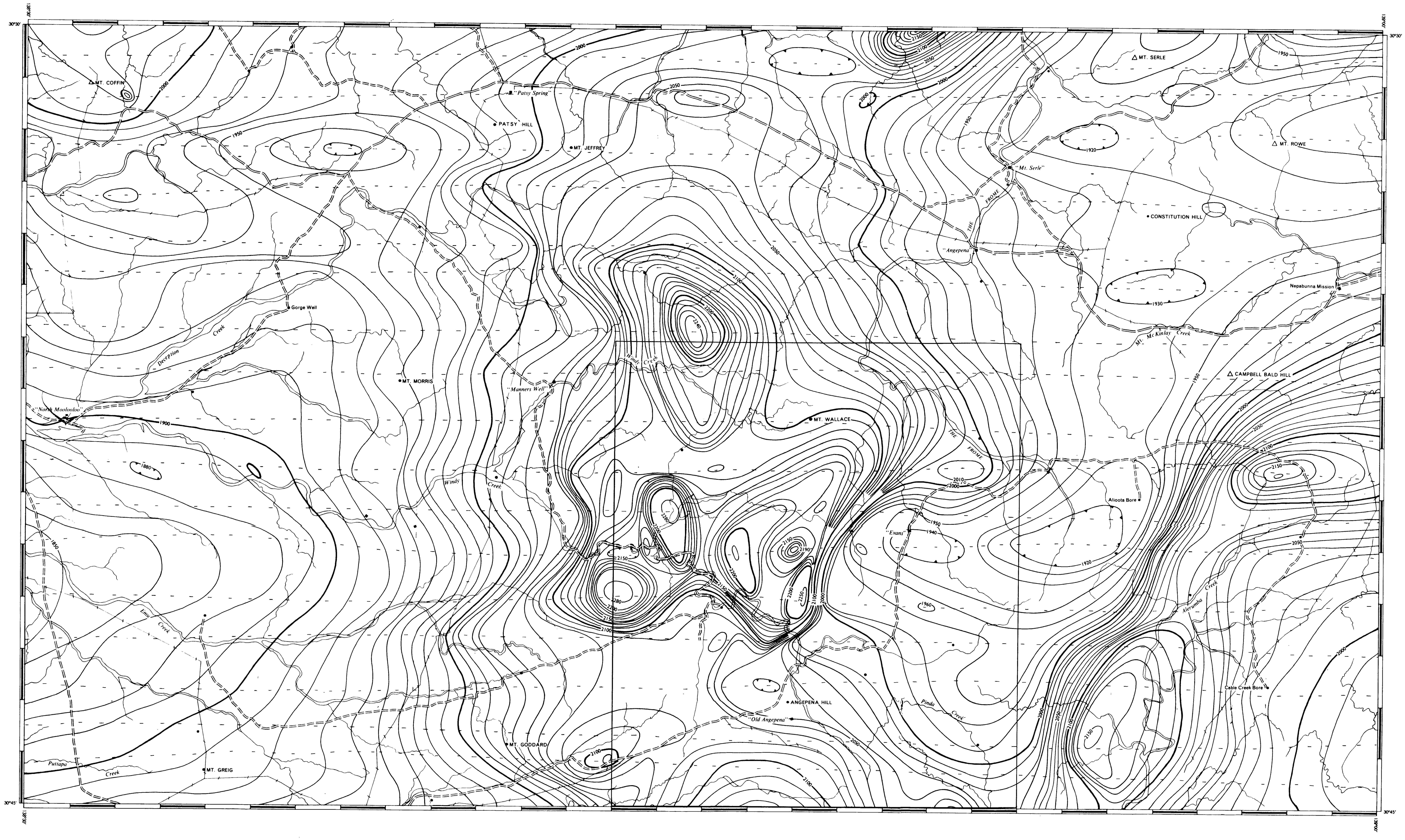
FIG 4

SCALE	GEOL. R.E.R	DATE Feb. 1969.
CHECKED	DRAWN. J.C.N.	3670

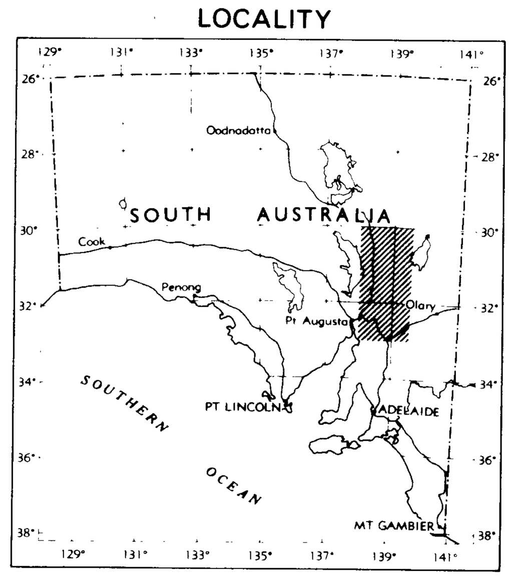
928-21

ANGEPENA

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES ADELAIDE



LOCALITY



INDEX TO ADJOINING SHEETS

WILLOURAN	WILPOORINNA	APOLLINARIS	GARDINER	MOOLAWATANA
WITCHELINA	FARINA	LYNDHURST	UMBERATANA	PARALANA
EDIACARA	MYRTLE	SERLE	WOOLTANA	CALDINA
SCOTT	COPLEY	ANGEPENA	BALCANOONA	ARKAROOLA
MURDIE	BELTANA	CADNIA	ARROWIE	FROME
CARRAPATENA	PARACHILNA	BLINMAN	WIRREALPA	SICCUS

SCALE

1 : 63,360 — 1 INCH TO 1 MILE

CHAINS 80 60 40 20 0 1 2 3 4 5 6 7 8 9 MILES

METRES 1000 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 KILOMETRES

Published 1967

FIG 5 **AEROMAGNETIC MAP OF TOTAL INTENSITY**

Note

This map is compiled from an air-borne magnetometer survey conducted by the Bureau of Mineral Resources on behalf of the S.A. Department of Mines. The total magnetic intensity at 500 feet above ground level was recorded continuously.
Uncontrolled photomosaic assemblies were used to navigate flight lines at a spacing of one mile and semi-controlled base maps indicate the aircraft's actual flight course as recorded by continuous strip on a 35 m.m. Vinten camera.

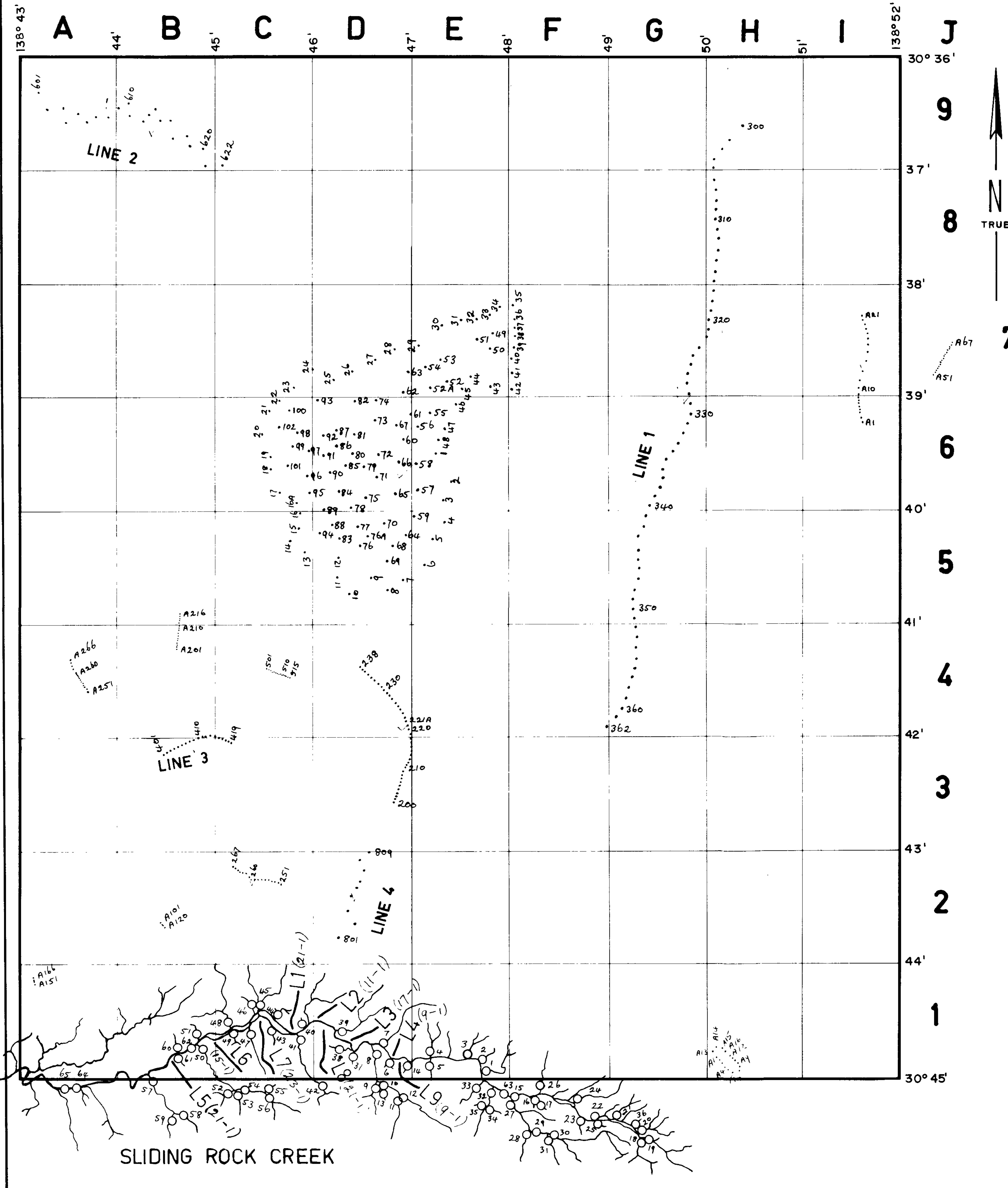
Results reduced and contours corrected for normal regional gradient by Exploration Geophysics Section, S.A. Dept. of Mines, B. E. Milton, M.Sc., Senior Geophysicist.

G. F. Whitten, M.Sc., Supervising Geologist, Exploration Services Division. Compiled under the direction of T. A. Barnes, M.Sc., Government Geologist. Issued under the authority of the Honourable S. C. Bevan, M.L.C., Minister of Mines.

LEGEND

Magnetic contours (values in gammas) 2300
Flight line (showing photo positions) ....
Magnetic low ....
Main roads ....
Secondary roads, tracks ....
Watercourse, swamp ....
Fence ....

Map preparation by Cartographic Division, S.A. Department of Mines.



LEGEND

· 300 SOIL SAMPLE SITE AND NUMBER.

o 19 STREAM SEDIMENT SAMPLE SITE AND NUMBER IN HAWKER GROUP.

—L1(21-1). SOIL SAMPLE LINES AND TERMINAL SAMPLE NUMBERS IN HAWKER GROUP.

CARPENTARIA EXPLORATION COMPANY PTY. LTD.		
SML. 171. ANGEPENA. S.A. FIGURE 6 SHOWING SOIL AND STREAM SEDIMENT SAMPLE LOCATIONS.		
SCALE: 1" = 1mile	GEOL.: W.D.S.	DATE: August '69
CHECKED W.D.S.	DRAWN W.D.S. K.L.M.	

ENV 928-6

ANGEPENA GOLD FIELD AND GOSSAN

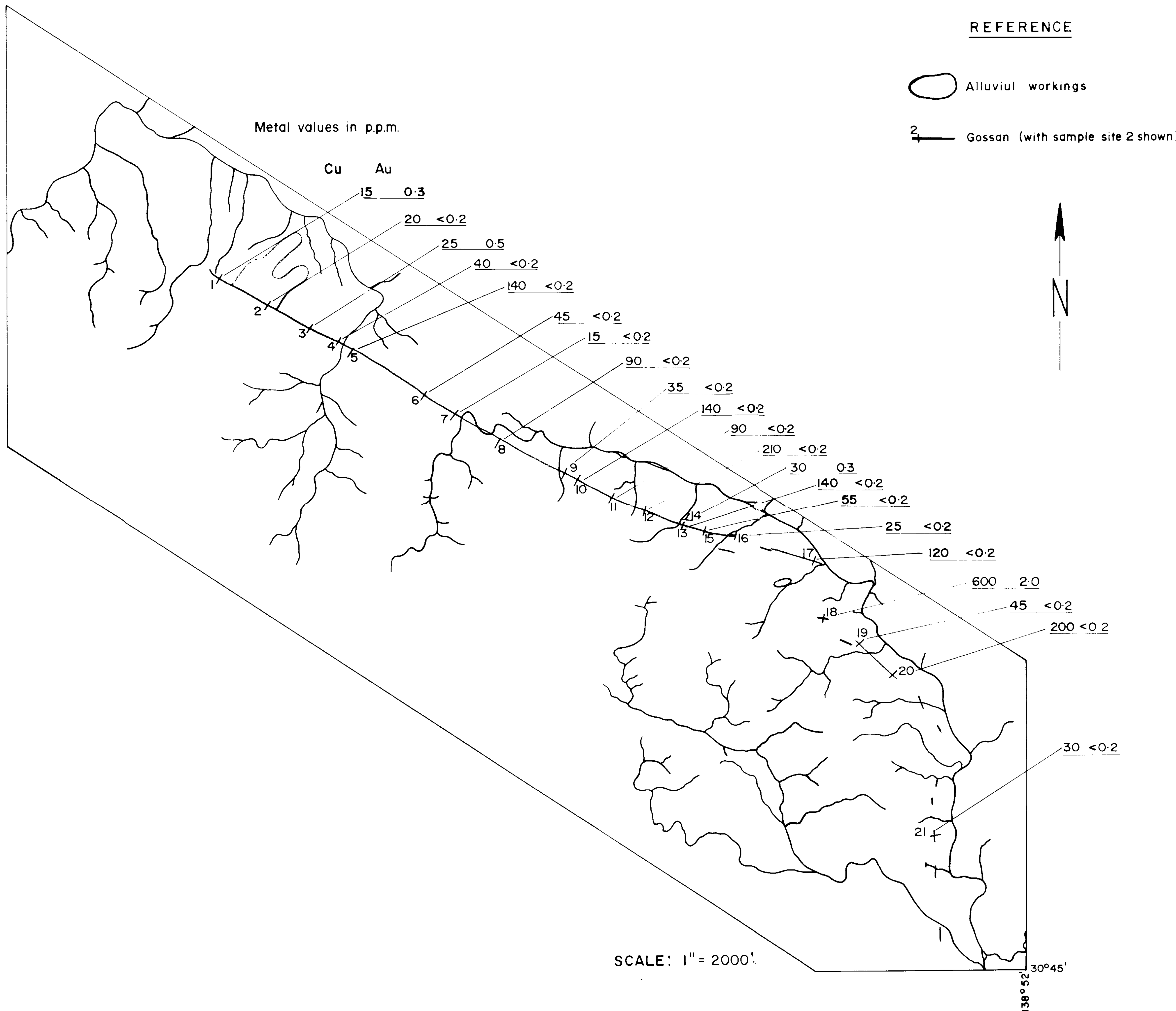
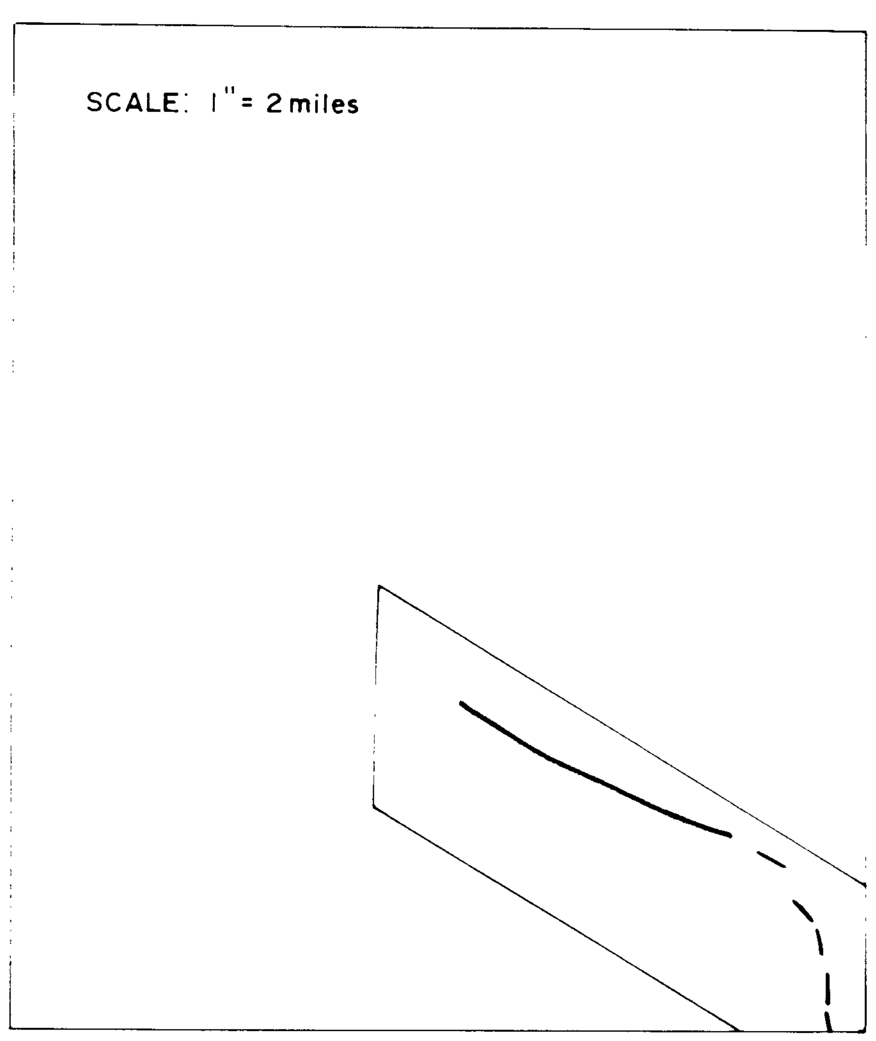


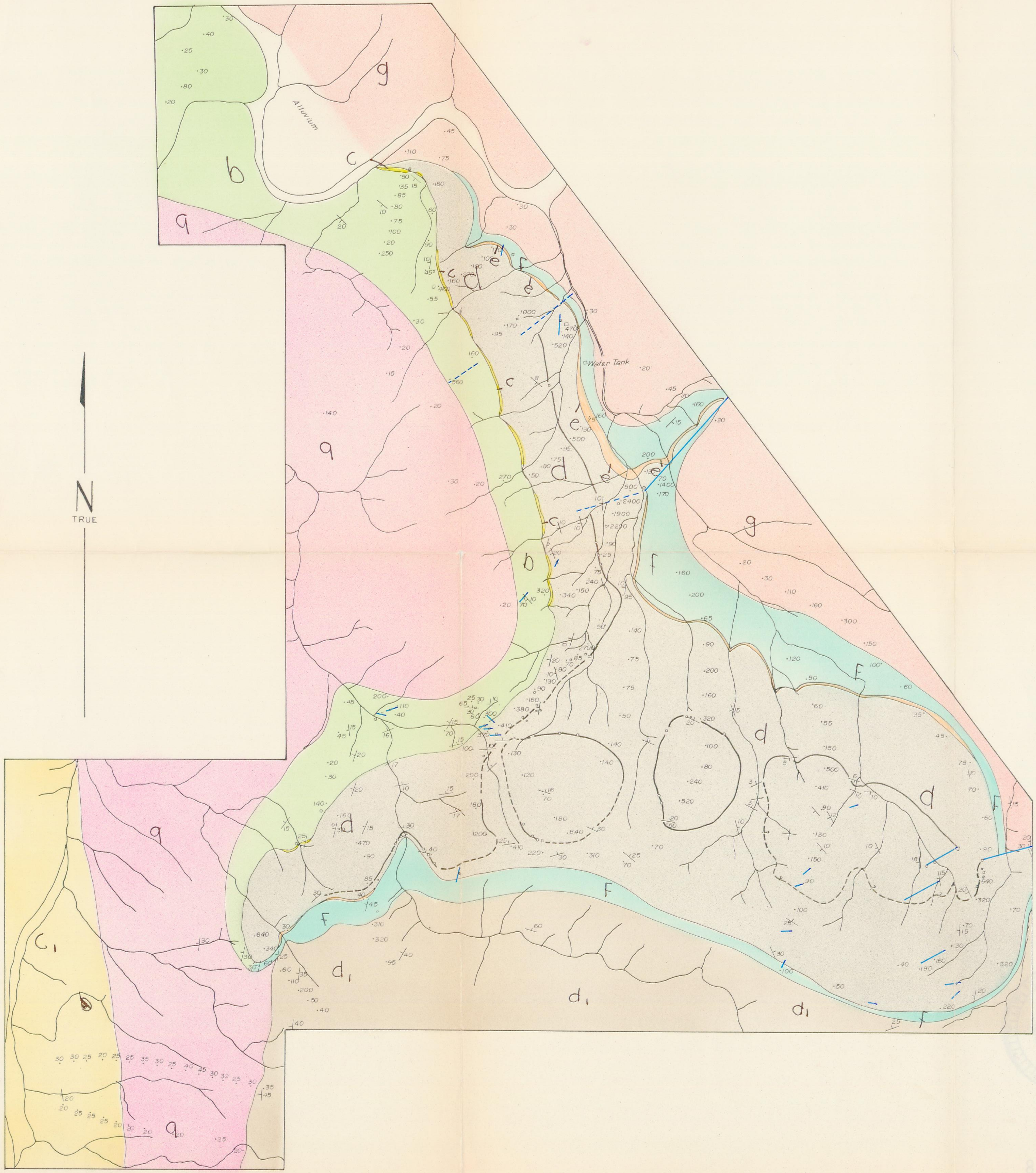
Diagram showing position of inset within SML 171



CARPENTARIA EXPLORATION COMPANY PTY. LTD.
FIGURE 7 SML 171 ANGEPENA (SOUTH AUSTRALIA) ROCK-CHIP SAMPLING ANGEPENA GOSSAN GOLD, COPPER

SCALE: AS SHOWN	GEOL.: B.C.S.	DATE: NOV 1969
CHECKED:	DRAWN: D.J.F.	3960

ENV 928-7



MAPPING UNITS

a Wonoka Formation

Bunyeroo Formation — Ewb:
- g Upper Red Shale
- b Upper Green Shale
- c Upper Dolomite
- d Grey Shale — Cupriferous Horizon
- e Lower Dolomite
- f Lower Green Shale
- g Lower Red Shale

d₁ A.B.C Range Quartzite — Ewa

SYMBOLS

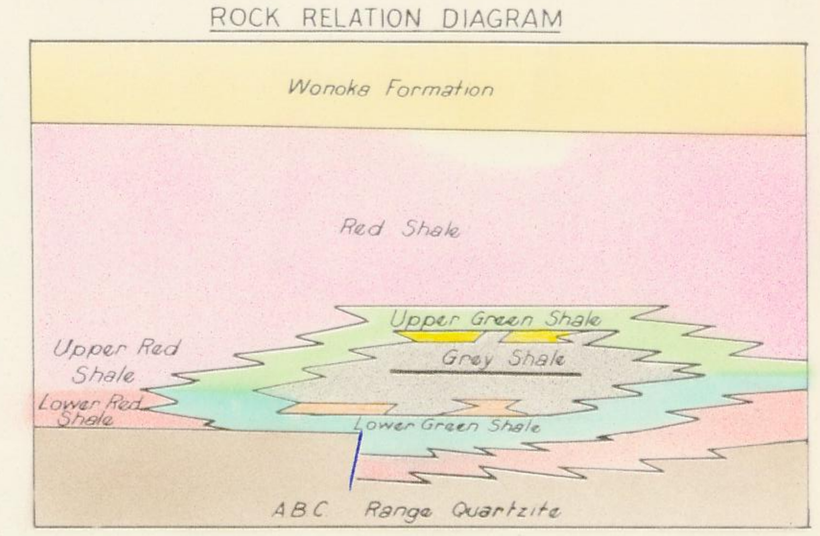
Fault — Inferred Fault

□ Major workings — ○ Minor workings

·340 Soil sample site (minus 80 mesh from 6-9" depth) with copper values given as p.p.m.

—?——?— Extrapolated position of the cupriferous horizon.

ROCK RELATION DIAGRAM



CARPENTARIA EXPLORATION COMPANY PTY. LTD.

FIGURE 8

SML 171 ANGEPENA (SA)

MUCATOONA

GEOLOGY AND GEOCHEMISTRY

SCALE: 1" = 500'	GEOL.: B.S	DATE: OCT 1969
CHECKED:	DRAWN: RT	3955

ENV 928-5

061

CARPENTARIA EXPLORATION COMPANY PTY. LTD.

TECHNICAL REPORT No. 175

Title	DRILLING REPORT - ANGEPENA, MUCATOONA SML 171
Author	B.C. SEVERNE
Investigations Conducted By	B.C. SEVERNE
Submitted By	W.D. SMITH
Date	DECEMBER 1969

W.D. Smith
for BC SEVERNE.

NB Additional assay information
(Pb, Zn, Au, Ag + S for Mucatoona holes
1-6 is given in report for quarter
ending 18-3-70 and contained in
envelope 1289

928

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4. SPARE

S.M.L. 171 AIR-BLAST DRILLING PROGRAMME

1. INTRODUCTION

Preparatory work reported in C.E.C. Technical Report No. 173 culminated in an initial rotary-percussion air-blast drilling programme being undertaken in two areas of S.M.L. 171. The aim of this drilling was to test:-

(1) The limonitic zone which is suspected of having been the source of the Angepena gold,

and,

(2) The cupriferous horizon which was mapped in the Mucatoona Mines area.

Results from both areas to date have failed to indicate any economic mineralisation.

2. LIMONITIC ZONE ON THE ANGEPENA GOLD FIELD

Four drill holes were planned initially to test the limonitic zone on the Angepena Goldfield at depths of about 100 feet. The positions of these are shown in Figure 1. An additional four holes were drilled, giving a total footage of 1094 feet and the positions of these holes are given in the individual drilling logs below. Samples were taken at 5 or 10 foot intervals as shown.

The drilling confirmed that the limonitic zone is conformable with bedding, dipping about 50° towards the north-east. The true width of this zone appears to vary from about 20 to 50 feet. The deepest intersection made in the limonitic zone was 188 foot, and in this and all other intersections, no sulphides were revealed.

However, a pyritic origin for the limonite is suggested by the presence of pyritohedrons in several intersections. All intersections were made in dry ground above the water table.

Samples from the limonitic zone were submitted for analysis for gold, copper and sulphur. The assay data with other relevant information is shown in the individual drilling logs below.

Gold values are very low, all being less than 0.3 dwt./ton. Copper is present in trace amounts with a maximum of 200 p.p.m. and sulphur is generally about 0.01%.

All of the intersections are in wholly oxidised ground and no fresh or even transitional material was obtained from the limonitic zone.

3. CUPRIFEROUS HORIZON IN THE MUCATOONA MINES AREA

Six holes were drilled in the Mucatoona Mines area for a total footage of 750 feet. The positions of these drill holes are shown in Figure 2.

Samples were taken at 10 foot intervals and all were submitted for copper analysis. Assay data and other pertinent information for each drill hole is recorded in the individual drilling logs below.

As expected the weathered grey-white shale (see Technical Report No.173) represented fresh black pyritic shale in depth. The pyrite content appears, by visual estimation, to be always less than 1%.

Copper mineralisation (malachite) was seen in only two of the samples, and these both assayed at less than 0.3% copper.

The six holes intersected the cupriferous horizon and in all cases copper content maxima coincided with its projected position.

The best intersection for the cupriferous horizon indicates an average grade of about 0.2% copper over a true width of 30 feet. The available data suggests that copper mineralisation in this area is below economic levels.

4. EXPLANATORY TABLE TO ACCOMPANY DRILLING LOGS

Symbol	Meaning	Symbol	Meaning
G	60-100% recovery	py	pyrite
R	20-60% recovery	stst	siltstone
P	less than 20% recovery	lst	limestono
HW	60-100% weathered	qtz	quartz
MW	10-60% weathered	tr.	less than 20%
F	less than 10% weathered	(	less than
n.d.	not determined	massive	moro than 80%
w.	with	diss.	more than 20%
lim.	limonite		

In the Geological Field Log the predominant lithology is listed first.

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 1

LOCATION:- On the Angepena Goldfield in the vicinity of long. 138° 49', lat. 30° 42', as shown in Figure 1.

DEPTH AND DIRECTION OF HOLE:-

148 feet at -52° bearing 215°M.

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
582	4-10	6	R	30	(0.3	0.07	HW brown-red stst
3	10-20	10	R	n.d.	n.d.	n.d.	HW yellow-red stst
4	20-30	10	G	"	"	"	HW red stst
5	30-40	10	G	"	"	"	MW brown stst
6	40-50	10	G	"	"	"	MW stst w. qtz
7	50-60	10	G	"	"	"	MW red-brown stst
8	60-70	10	G	"	"	"	MW brown stst
9	70-80	10	G	25	(0.3	(0.01	HW stst w.tr. lim.
590	80-85	5	G	25	"	0.02	HW diss.lim.w.stst
1	85-90	5	G	30	"	0.02	Massive lim.
2	90-95	5	G	45	"	0.01	Massive lim.
3	95-100	5	G	35	"	0.01	Massive lim.
4	100-105	5	G	35	"	0.02	Massive lim.
5	105-110	5	G	35	"	0.01	Massive lim.
6	110-115	5	G	35	"	0.01	Massive lim.
7	115-120	5	G	35	"	0.01	Massive lim.
8	120-125	5	R	35	"	(0.01	Massive lim.
9	125-130	5	G	40	"	(0.01	Massive lim.
600	130-135	5	R	55	"	0.02	Massive lim.
1	135-140	5	G	35	"	(0.01	Massive lim.
2	140-145	5	G	30	"	(0.01	Massive lim.
603	145-148	3	R	40	"	(0.01	HW diss. lim.

WATER - Entire hole in dry ground.

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 1a.

LOCATION:- On the Angepena Goldfield, in the vicinity of long. 138° 49', lat. 30° 42', and 31 feet at 082°M from Angepena 1.

DEPTH AND DIRECTION OF HOLE:-
170 feet at -60° bearing 215°M.

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
604	2-10	8	R	20	(0.3	.01	HW Colluvium
5	10-20	10	R	5	"	.01	HW Colluvium
6	20-30	10	R	n.d.	n.d.	n.d.	HW red-grey stst
7	30-40	10	G	"	"	"	HW red-grey stst
8	40-50	10	G	"	"	"	MW red-grey stst
9	50-60	10	R	"	"	"	MW brown stst
610	60-70	10	G	"	"	"	MW brown stst
1	70-80	10	G	"	"	"	MW brown stst
2	80-90	10	G	"	"	"	MW grey-brownstst
3	90-100	10	G	30	(0.3	(0.01	MW 40% qtz stst
4	100-106	6	G	55	"	(0.01	Massive lim.
5	106-110	4	G	35	"	0.01	Massive lim.
6	110-115	5	G	65	"	0.01	Massive lim.
7	115-120	5	G	30	"	0.01	Massive lim.
8	120-125	5	R	40	"	(0.01	Massive lim.
9	125-130	5	R	25	"	0.02	Massive lim.
620	130-135	5	R	45	"	0.01	Massive lim.
1	135-140	5	G	35	"	(0.01	Massive lim.
2	140-145	5	G	45	"	(0.01	Massive lim.
3	145-150	5	G	55	"	(0.01	Massive lim.
4	150-155	5	G	55	"	(0.01	HW diss. lim. w. 30% stst
5	155-160	5	G	55	"	0.01	HW diss. lim.
6	160-165	5	R	50	"	(0.01	HW diss. lim.
627	165-170	5	G	35	"	(0.01	HW diss. lim.

WATER: Entire hole in dry ground

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DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 1b.

LOCATION:- On the Angepena Goldfield, in the vicinity of long. 138° 49', lat. 30° 42', and 12 feet at 150°M from A1.

DEPTH AND DIRECTION OF HOLE:-
188 feet at -90°.

WATER:- Very damp ground at 183 feet.

QS Sample Number	FOOTAGE From To	Inter-val	RECOV-ERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
628	1-10	9	R	25	(0.3	0.04	MW brown stst
9	10-20	10	G	10	(0.3	0.02	HW red stst
630	20-30	10	G	n.d.	n.d.	n.d.	HW red stst
1	30-40	10	G	"	"	"	HW red stst
2	40-50	10	G	"	"	"	MW brown stst
3	50-60	10	G	"	"	"	MW brown stst
4	60-70	10	G	"	"	"	MW brown stst
5	70-80	10	G	"	"	"	MW brown stst
6	80-90	10	G	"	"	"	HW brown stst w. 20% qtz fragments
7	90-100	10	G	"	"	"	HW as above
8	100-110	10	G	"	"	"	HW brown stst w. 50% qtz fragments
9	110-120	10	G	30	(0.3	(0.01	HW as above but lim. tr.
640	120-130	10	G	35	"	(0.01	Massive lim.
1	130-135	5	G	20	"	0.02	Massive lim.
2	135-140	5	G	15	"	0.02	Massive lim.
3	140-145	5	G	20	"	(0.01	Massive lim.
4	145-150	5	G	15	"	0.02	Massive lim.
5	150-155	5	G	15	"	0.02	Massive lim.
6	155-160	5	G	25	"	(0.01	Massive lim.w.25% stst
7	160-165	5	R	25	"	0.02	HW diss lim.w.30% stst
8	165-170	5	G	25	"	0.01	HW diss lim.w. 50% stst
9	170-175	5	R	30	"	0.01	HW diss lim.w.25% stst
650	175-180	5	G	25	"	0.01	HW diss lim.w.50% stst
1	180-185	5	P	45	"	0.02	HW diss lim.w.30% stst
652	185-188	3	P	35	"	0.02	HW diss lim.

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 2.

LOCATION:- On the Angepena Goldfield in the vicinity of long. 138° 49', lat. 30° 42', as shown in Figure 1.

DEPTH AND DIRECTION OF HOLE:-

162 feet at -52° bearing 215°M.

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
550	0-10	10	G	n.d.	n.d.	n.d.	HW colluvium
1	10-20	10	R	"	"	"	HW colluvium
2	20-30	10	R	"	"	"	MW brown lst
3	30-40	10	R	"	"	"	MW stst w. lst
4	40-50	10	R	"	"	"	MW stst w. lst
5	50-60	10	R	"	"	"	MW stst
6	60-70	10	R	"	"	"	MW stst clayey
7	70-80	10	R	"	"	"	MW stst clayey
8	80-90	10	R	35	(0.3	(0.01	MW stst w. diss. lim.
9	90-95	5	R	65	"	"	Massive lim.
560	95-100	5	R	85	"	"	Massive lim.
1	100-105	5	R	45	"	"	Massive lim.
2	105-110	5	G	35	"	"	Massive lim.
3	110-115	5	R	75	"	"	Massive lim.
4	115-120	5	R	40	"	"	HW diss.lim.w.lst, stst
5	120-125	5	R	65	"	"	HW stst,lst,tr.lim.
6	125-130	5	G	55	"	"	HW stst,lst,tr.lim.
7	130-135	5	R	50	"	"	HW stst,lst,tr.lim.
8	135-140	5	R	25	"	"	HW stst, tr. lim.
9	140-145	5	R	40	"	"	HW stst, tr. lim.
570	145-150	5	R	30	"	"	HW stst, tr. lim.
1	150-155	5	R	75	"	"	HW stst, tr. lim.
2	155-160	5	R	45	"	"	HW stst, tr. lim.
573	160-162	2	P	85	"	"	HW stst, tr. lim.

WATER: Entire hole in dry ground

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 2a.

LOCATION:- On the Angepena Goldfield 21 feet at 035°M from Angepena 2.

DEPTH AND DIRECTION OF HOLE:-

80 feet at -70° bearing 215°M

QS Sample Number	FOOTAGE From To	Inter- val	RECOV- ERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
574	2-10	8	R	n.d.	n.d.	n.d.	MW brown stst
5	10-20	10	R	"	"	"	MW brown stst
6	20-30	10	R	"	"	"	MW brown, yellow, stst
7	30-40	10	G	45	(0.3	(0.01	MW stst lim. tr.
8	40-50	10	R	50	"	"	MW stst, lst
9	50-60	10	R	70	"	"	MW stst, lst
580	60-70	10	G	75	"	"	MW stst, lst
581	70-80	10	R	55	"	"	MW stst, lst

WATER: Entire hole in dry ground

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 3.

LOCATION:- On the Angepena Goldfield, in the vicinity of long. 138° 49' lat. 30° 42', as shown in Figure 1.

DEPTH AND DIRECTION OF HOLE:-

130 feet at -59° bearing 225°M

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
530	0-10	10	P	55	(0.3	0.195	HW colluvium
1	10-20	10	R	n.d.	n.d.	n.d.	F lst, stst
2	20-30	10	G	"	"	"	F lst, stst
3	30-40	10	G	"	"	"	F lst, stst
4	40-45	5	G	"	"	"	F lst, stst, minor lim. zone
5	45-50	5	G	"	"	"	F lst, stst
6	50-60	10	G	"	"	"	MW lst, stst
7	60-70	10	R	"	"	"	MW lst, stst
8	70-75	5	G	55	(0.3	(0.01	MW lst, lim.
9	75-80	5	G	55	"	0.02	HW diss.lim. lst
540	80-85	5	G	55	"	0.01	Massive lim.
1	85-90	5	G	45	"	0.01	Massive lim.
2	90-95	5	R	60	"	(0.01	HW diss. lim.lst
3	95-100	5	G	35	"	"	MW traces lim.
4	100-105	5	G	20	"	"	F lst, traces lim.
5	105-110	5	G	15	"	"	F lst, tr. lim.
6	110-115	5	G	20	"	"	F lst, tr. lim.
7	115-120	5	G	n.d.	n.d.	n.d.	F lst, tr. lim.
8	120-125	5	G	"	"	"	F lst, tr. lim.
549	125-130	5	P	"	"	"	MW lst, tr. lim.

WATER: Entire hole in dry ground

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 4.

LOCATION:- On the Angepena Goldfield in the vicinity of long. 138° 49', lat. 30° 42', as shown on Figure 1.

DEPTH AND DIRECTION OF HOLE:-
98 feet at -65° bearing 219°M.

QS Sample Number	FOOTAGE From To	FOOTAGE Interval	RECOVERY	ASSAY DATA Cu ppm	ASSAY DATA Au dwt/ton	ASSAY DATA S %	GEOLOGICAL FIELD LOG
501	0-10	10	G	n.d.	n.d.	n.d.	F pink,brown lst
2	10-20	10	G	"	"	"	F pink,brown lst
3	20-30	10	G	"	"	"	F pink,brown lst
4	30-40	10	R	"	"	"	F pink,brown lst
5	40-50	10	R	"	"	"	F pink,brown lst
6	50-60	10	G	"	"	"	F grey lst
7	60-70	10	G	"	"	"	F brown lst
8	70-80	10	G	35	(0.3	(0.01	MW brown lst, tr. lim.
9	80-85	5	G	190	"	0.01	Black massive lim.
510	85-90	5	R	140	"	0.01	Massive lim.
1	90-95	5	R	200	"	0.01	Massive lim.
512	95-98	3	P	190	"	(0.01	Massive lim.

WATER: Entire hole in dry ground

DRILLING LOG FOR ANGEPENA GOLDFIELD

DRILL HOLE:- Angepena 4a.

LOCATION:- On the Angepena Goldfield in the vicinity of long. 138° 49', lat. 30° 42' (see Figure 1) and 32 feet at 300°M from Angepena 4.

DEPTH AND DIRECTION OF HOLE:-

118 feet at -65° bearing 219°M.

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	Au dwt/ton	S %	GEOLOGICAL FIELD LOG
513	0-10	10	G	35	(0.3	(0.01	F brown lst
4	10-20	10	G	n.d.	n.d.	n.d.	F brown lst
5	20-30	10	G	"	"	"	F brown lst
6	30-40	10	G	"	"	"	F pink lst
7	40-50	10	G	"	"	"	F red lst
8	50-60	10	G	"	"	"	F pink lst
9	60-70	10	R	"	"	"	F pink lst
520	70-75	5	R	"	"	"	F brown lst
1	75-80	5	R	"	"	"	MW brown lst, lim. tr.
2	80-85	5	R	75	(0.3	(0.01	HW lst, tr. lim.
3	85-90	5	G	70	"	(0.01	Massive lim.
4	90-95	5	G	80	"	0.01	Massive lim.
5	95-100	5	G	120	"	0.01	Massive lim.
6	100-105	5	G	55	"	(0.01	Massive lim.
7	105-110	5	G	50	"	"	Massive lim.
8	110-115	5	R	30	"	"	Massive lim.
529	115-118	3	R	25	"	"	Massive lim. tr. lst

WATER: Entire hole in dry ground.

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 1.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat. 30° 42' as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

100 feet at -70° bearing 075°M.

QS Sample Number	FOOTAGE From To	FOOTAGE Inter-val	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
653	0-10	10	G	40	MW grey & black shale
4	10-20	10	G	55	MW grey & black shale
5	20-30	10	G	50	MW grey & black shale
6	30-40	10	G	45	F black py. shale
7	40-50	10	G	65	F black py. shale
8	50-60	10	P	290	F black py. shale
9	60-70	10	P	1600	F black py. shale
660	70-80	10	P	200	F black py. shale
1	80-90	10	P	440	F black py. shale
662	90-100	10	P	310	F black py. shale

WATER: Water table at 50 feet.

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 2.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat. 30° 42' as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

110 feet at -70° bearing 075°M.

QS Sample Number	FOOTAGE From To	Inter-val	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
663	0-10	10	G	100	HW grey white shale
4	10-20	10	G	65	HW grey white shale
5	20-30	10	R	90	HW grey white shale
6	30-40	10	G	55	HW grey white shale
7	40-50	10	G	55	MW grey black shale py. (0.1%
8	50-60	10	G	95	F black py. shale
9	60-70	10	G	460	F black py. shale
670	70-80	10	G	75	F black py. shale
1	80-90	10	R	90	F black py. shale
2	90-100	10	G	75	F black py. shale
673	100-110	10	R	110	F black py. shale

WATER: Water seeped in overnight at 110 feet.

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 3.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat. 30° 42' as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

70 feet at -80° bearing 110°M.

QS Sample Number	FOOTAGE From To	Interval	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
674	0-10	10	R	410	HW grey white shale
5	10-20	10	R	1600	HW white brown shale
6	20-30	10	G	2600	HW brown shale with tr. malachite
7	30-40	10	G	2200	HW brown shale with 5% lim.
8	40-50	10	G	220	MW brown black shale
9	50-60	10	G	130	F black py. shale
680	60-70	10	G	550	F black py. shale

WATER: Entire hole in dry ground.

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 4.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat 30° 42', as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

190 feet at -90°.

QS Sample Number	FOOTAGE From To	FOOTAGE Inter-val	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
698	0-10	10	G	110	HW red grey shale
9	10-20	10	G	140	HW red grey shale
700	20-30	10	G	150	HW red brown shale
1	30-40	10	G	300	HW grey green shale
2	40-50	10	G	200	HW red grey shale
3	50-60	10	G	170	HW red brown shale
4	60-70	10	G	220	HW red brown shale
5	70-80	10	G	980	MW red black shale
6	80-90	10	G	320	MW grey black shale
7	90-100	10	G	900	F black shale
8	100-110	10	G	370	F black shale
9	110-120	10	G	160	F black shale
710	120-130	10	G	95	F black shale
1	130-140	10	G	85	F black shale
2	140-150	10	G	80	F black shale
3	150-160	10	G	120	F black shale
4	160-170	10	G	110	F black shale
5	170-180	10	R	210	F grey green shale
716	180-190	10	G	160	F grey green shale

WATER: Entire hole in dry ground

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 5.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat. 30° 42', as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

170 feet at -84° bearing 180°M.

QS Sample Number	FOOTAGE From To	FOOTAGE Interval	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
681	0-10	10	R	95	MW red grey shale
2	10-20	10	G	60	MW red grey shale
3	20-30	10	G	90	MW grey white shale
4	30-40	10	G	290	HW grey white shale
5	40-50	10	G	600	MW dark grey shale
6	50-60	10	G	230	HW grey red shale
7	60-70	10	G	80	MW grey black shale
8	70-80	10	G	60	MW grey shale
9	80-90	10	G	55	MW grey black shale
690	90-100	10	G	120	HW red white shale
1	100-110	10	G	180	MW grey black shale
2	110-120	10	G	140	MW green brown shale
3	120-130	10	G	95	HW yellow white shale
4	130-140	10	G	120	HW red white shale
5	140-150	10	G	120	MW red white shale
6	150-160	10	G	120	MW grey brown shale
697	160-170	10	G	200	MW grey brown shale

WATER: Entire hole in dry ground.

DRILLING LOG FOR MUCATOONA

DRILL HOLE:- Mucatoona 6.

LOCATION:- Within the Mucatoona Mines area in the vicinity of long. 138° 46', lat. 30° 42' as shown in Figure 2.

DEPTH AND DIRECTION OF HOLE:-

110 feet at -65° bearing 124°M.

QS Sample Number	FOOTAGE From To	Inter-val	RECOVERY	ASSAY DATA Cu ppm	GEOLOGICAL FIELD LOG
717	0-10	10	G	130	MW green brown shale
8	10-20	10	G	90	HW grey green shale
9	20-30	10	G	40	HW grey white shale
720	30-40	10	G	60	MW grey brown shale
1	40-50	10	G	50	MW brown grey shale
2	50-60	10	G	60	MW red brown shale
3	60-70	10	G	75	MW brown green shale
4	70-80	10	G	470	MW red brown shale
5	80-90	10	G	470	MW grey white shale
6	90-100	10	G	50	HW brown white shale
727	100-110	10	G	55	HW white brown shale

WATER: Entire hole in dry ground

ANGEPENA GOLD FIELD AND GOSSAN

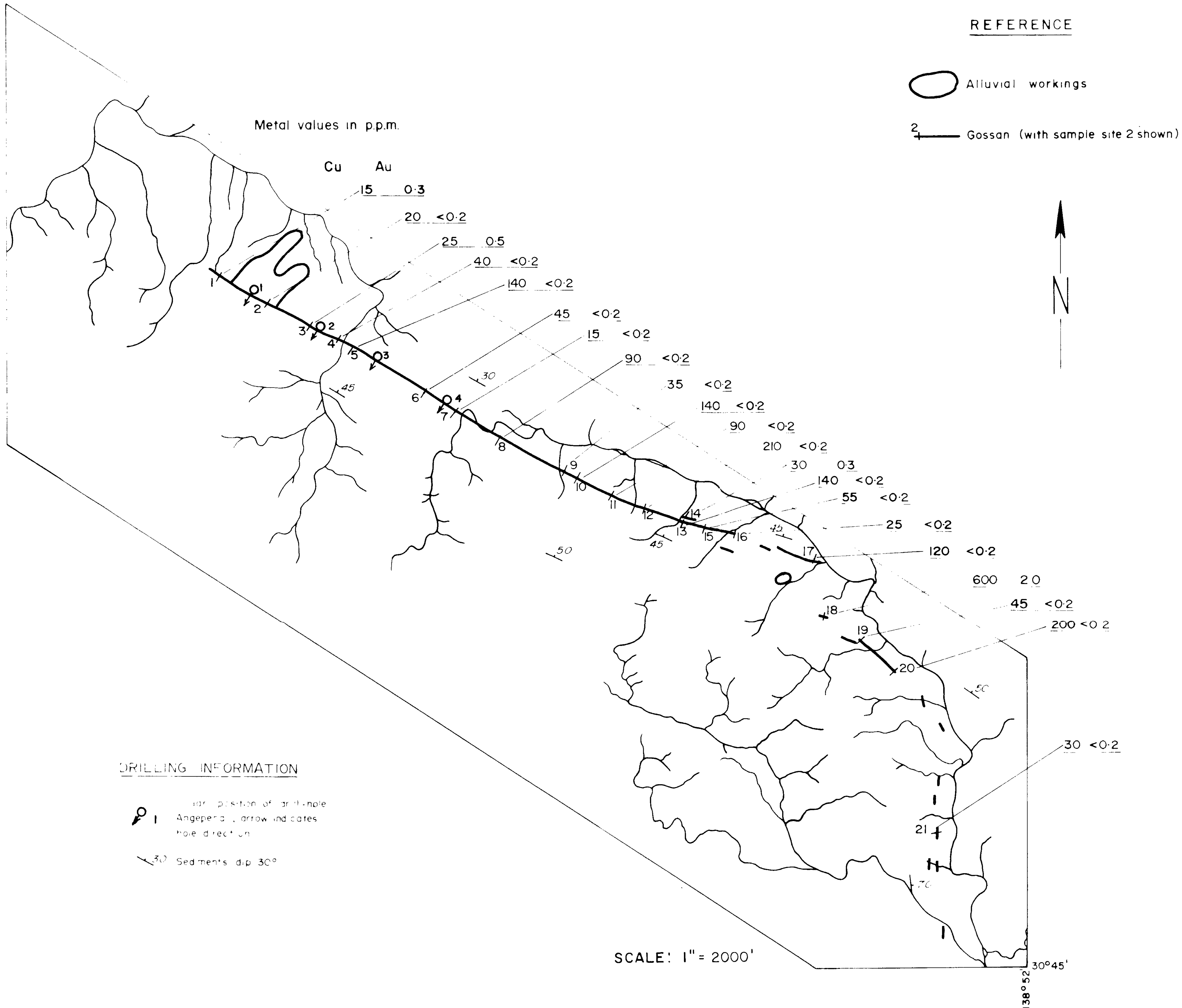
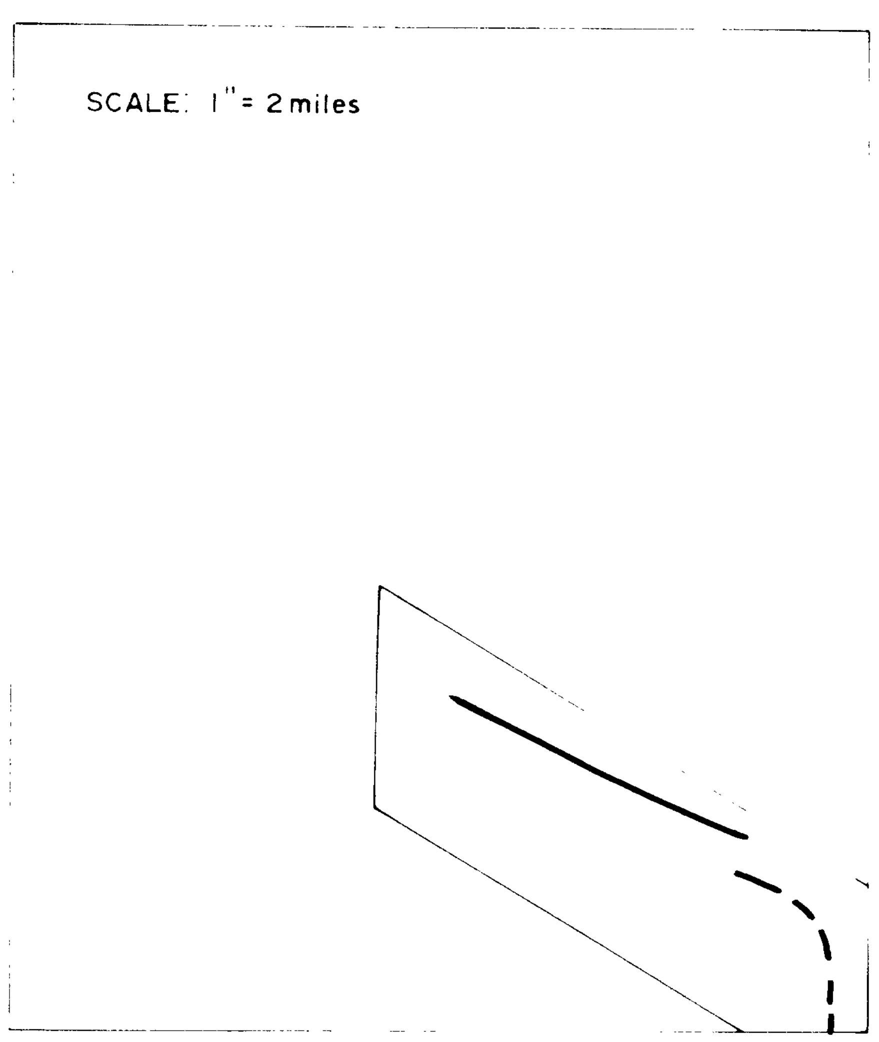
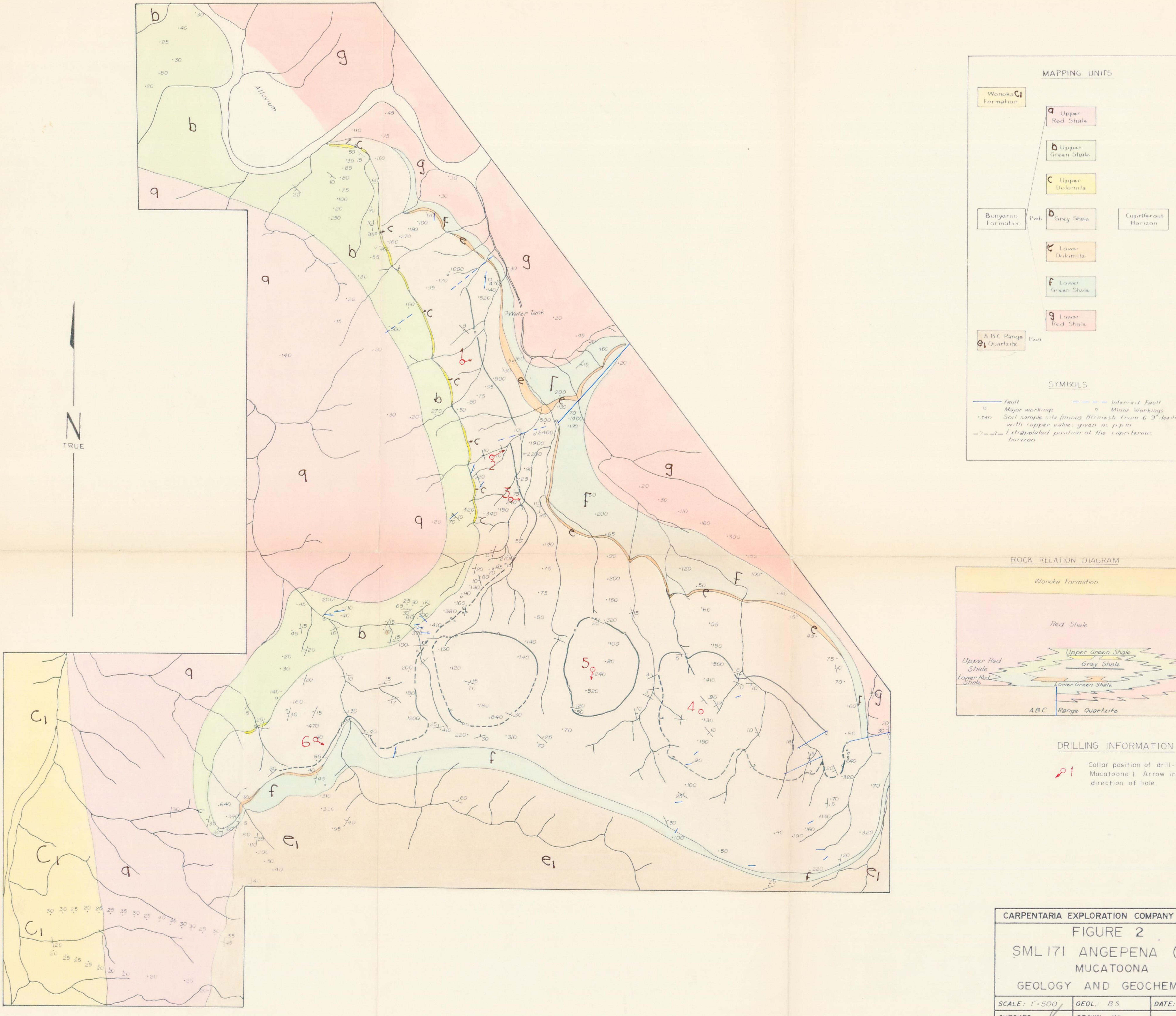


Diagram showing position of inset within SML 171



CARPENTARIA EXPLORATION COMPANY PTY. LTD.		
FIGURE 1 SML171 ANGEPENA (SOUTH AUSTRALIA) ROCK-CHIP SAMPLING ANGEPENA GOSSAN GOLD, COPPER		
SCALE: AS SHOWN	GEOL.: B.C.S.	DATE: NOV 1969
CHECKED	DRAWN: D.J.F.	3960

ENV 928-2



CARPENTARIA EXPLORATION COMPANY PTY. LTD.

FIGURE 2

SML 171 ANGEPENA (SA)

MUCATOONA

GEOLOGY AND GEOCHEMISTRY

SCALE: 1" = 500'	GEOL.: BS	DATE: OCT 1969
CHECKED:	DRAWN: RT	3955

ENV 328 -3