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SML 86

BLINMAN, WORUMBA AND ORAPARINNA [DIAPIRS] COPPER PROSPECTS

PROGRESS AND TECHNICAL REPORTS TO LICENCE PARTIAL RELINQUISHMENT / FINAL SURRENDER FOR THE PERIOD 1/8/1965 TO MARCH 1967

Submitted by
Metals Exploration NL
1967

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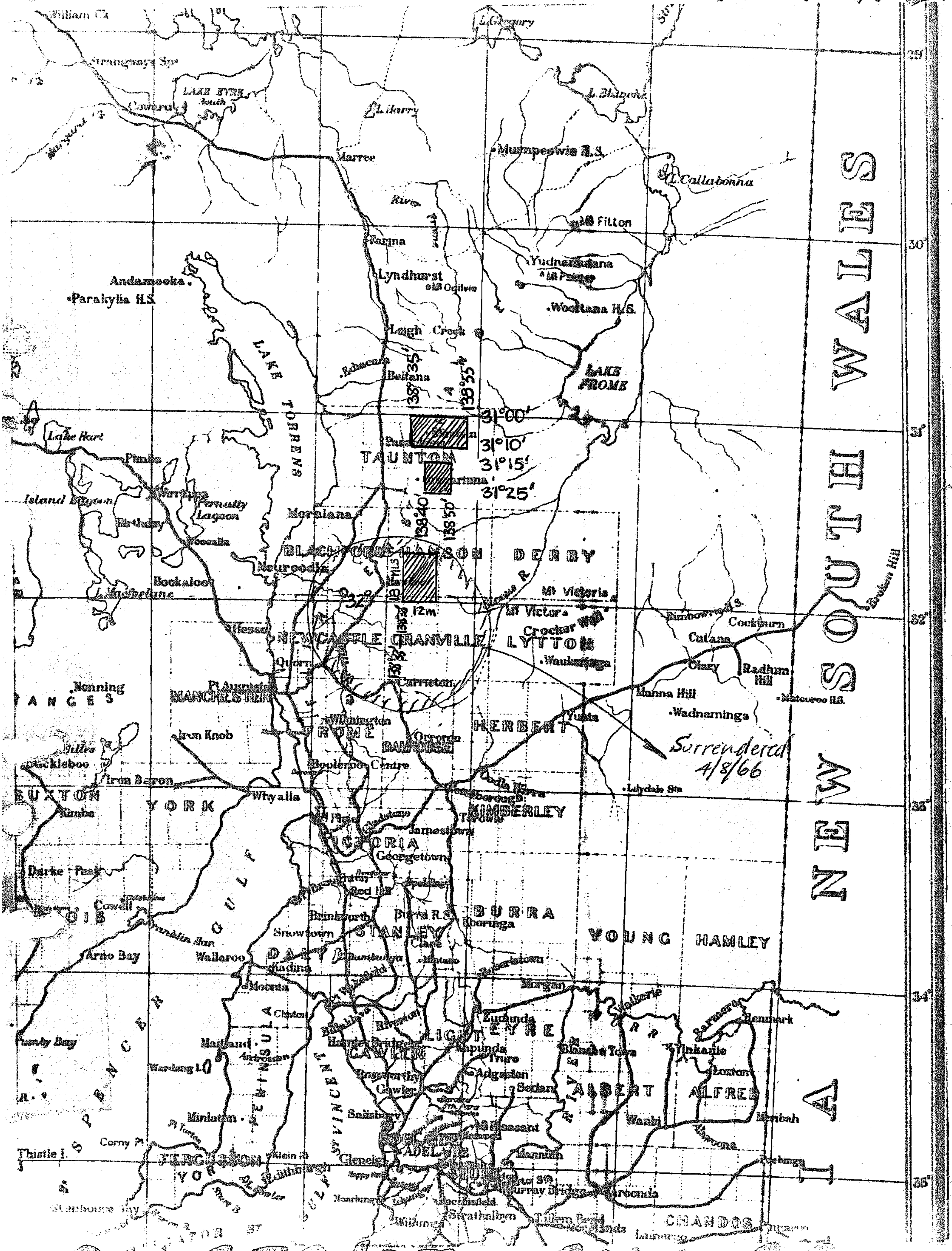
Government of South Australia
Primary Industries and Resources SA

SOUTH ALLIGATOR URANIUM N.L.



D.M. 653/65 S.M.L. 86

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TENEMENT HOLDER: METALS EXPLORATION N.L.

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Anthony, P.J., and McGain, A., 1966 Project Progress Report No. 1 on Blinman Copper Project, Flinders Ranges, S.A. Summary Stage 1 Results and Diamond Drilling Proposal.
R. Hare & Associates (pgs.3-10)

PLANS

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Figure 2 Blinman Copper Prospect (587-9)
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Figure 5 Blinman Copper Prospect
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McGain, A. and Bettles, K., 1966 Project Progress Report No. 1 on Worumba Copper Prospect Flinders Ranges, S.A. Summary Stage 1 Results
R. Hare & Associates (pgs.11-16)

PLANS

Figure 1 Worumba Copper Prospect (620-1)
Geological Plan (July 1966)

McGain, A. and Bettles, K., 1966 Progress Report No. 1 on Oraparinna Copper Prospect Flinders Ranges, S.A.
R. Hare & Associates (pgs.17-23)

PLANS

Figure 1 Oraparinna Copper Prospect Plan of Induced Polarisation Results (June 1966) (587-5)

Figure 2 Oraparinna Copper Prospect Geological Plan showing I.P. Grid Lines (June 1966) (587-1)

McGain, A., 1966 Project Progress Report No. 2 Proposed Diamond Drilling Programme and Budget for Blinman and Oraparinna Copper Prospects Flinders Ranges, S.A.
R. Hare & Associates (pgs.24-26)

PLANS

Figure 1 Blinman Project Diamond Drillhole BL-1
Oratunga Anomaly (plan) (August 1966) (587-10)

Figure 2 Section A-A Looking East (undated) (587-11)

McGain, A., and Bettles, K., 1967 Progress Report No. 3 on Blinman - Oraparinna Copper Prospect Flinders Ranges S.A. R. Hare & Associates Appendix - drill logs (pgs.27-38)

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R. HARE & ASSOCIATES

PROJECT PROGRESS REPORT NO. 1

on

BLINMAN COPPER PROJECT
Flinders Ranges, S.A.

SUMMARY STAGE I RESULTS
&
DIAMOND DRILLING PROPOSAL

by

P. J. Anthony
and
A. McGain
16th March, 1966

Accompanying Report:

Fig. 1	Geological Plan	Scale 1" = 2,000'
Fig. 2	Plan Induced Polarisation Anomalies	1" = 2,000'
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SUMMARY.

Stage I exploration programme is complete. The Induced Polarisation survey has located three major anomalies, while magnetics and geochemistry have proved inconclusive as exploration techniques.

A Stage II Diamond Drilling and Budget proposal are included with this report. The drilling programme involves three holes on separate anomalies to be completed over 6 months [redacted]

INTRODUCTION.

Four diapiric structures located in the Flinders Ranges near Blinman, South Australia, were the subject of Summary Report No. 186 dated the 7th July, 1965. Programmes of exploration were recommended for three of the four structures and the first stage of the initial exploration has now been carried out.

This report covers the results of the exploration of the Blinman diapiric structure only. Results of the exploration of the Oraparinna and Worumbo structures will be the subject of separate reports at later dates.

EXPLORATION RESULTS.

Only check mapping of the dome was carried out, as a reconnaissance geological map of the structure was available from the South Australian Department of Mines.

Exploration took the form of surveying grid lines, geochemical sampling, a magnetometer survey and an induced polarisation survey.

Induced Polarisation Survey.

Total line miles covered	42
Number of anomalies detailed	5

The final report on the IP survey has been received from McPhar Geophysics who undertook the work. The reconnaissance survey employed 500 ft. separations on the cross lines using AC; 1,000 ft. separations on the base-line and 22,500 crossline using both AC and DC.

The object of this survey was to locate anomalies which could be due to a large low grade ore deposit.

The IP survey of the Blinman Dome has shown at least two areas are of definite interest. The anomalous patterns in both areas have been compared with a similar effect obtained over the Copper Mountain Orebody near Quebec which is a large low grade (0.9% Cu) orebody which will soon be mined by the Gaspe Copper Company.

Anomalies of significance are -

(1) "Oratunga" Anomaly.

This anomaly was suspected on reviewing the profiles from the reconnaissance survey on line 15,000E. Follow up detail using 750 ft. spreads on line 15,000E and adjacent lines 13,900E, 14,500E and 15,500E revealed a succession of deep anomalies or a zone of anomalies that are apparently deep seated. These anomalies are indicated in Figure 2 on the lines indicated at approximately 27,500N. Definite anomalies are centred on line 15,000E at 27,500N and line 15,500E at 27,525E. The source of these anomalies is deep enough that they were clearly detected only with 750 ft. electrode intervals. The anomalous zone occurs just to the south of a very definite contact between high and low resistivity rocks and is near the margin of the dome structure. McPhar make comparisons of this anomalous zone with known results of large low grade copper deposits

EXPLORATION RESULTS (contd.)

(1) "Oratunga" Anomaly (contd.)

elsewhere and suggest that the effects could be due to 2% to 5% metallic mineralisation.

An anomalous zone then has been indicated to extend over a length of 1,500 feet with an indicated but unknown width of the order of 1,000 feet. The source is apparently between 400 and 750 feet below the surface but may be deeper.

Surface inspection of the rocks in the area of the anomalies revealed no indication as to the source of the anomalies.

(2) "Alpana" Anomaly.

A broad and shallow anomaly was detected on line 40,000E and extends from about 8,000N to 13,500N using 500 ft. electrode spacings. Because of the length of the anomaly the apparent IP effects must nearly equal the true IP effects in the source. As the IP effects are not great, metallic mineralisation that might be expected could be in the range of 2% to 5%. The anomaly has been checked with DC and confirmed using 300 feet separations with parallel lines at 39,500E and 40,500E.

Rock types within the anomalous zone were checked for surface indications of mineralisation that may have given rise to the anomaly. Most of the area is covered by creek gravel and alluvium and nothing was observed at the surface that could hint at the source of the anomaly.

According to the "Alpana" Station owner, salt water seepage is known in the vicinity of this anomaly. Ionic concentration effects, as could be expected if salt water is present, have little influence with IP equipment. One of the advantages of IP over EM in Australia is that IP can separate out effects from ionic conductors as against metallic conductors, whereas EM methods generally cannot. It is therefore thought that the salt water seepage in the area would in no way detract from the importance of the anomaly.

(3) "Central" Anomaly.

Crossline 22,500E was used to check a possible anomaly indicated on the baseline 20,000N. Electrode intervals of 1,000 feet were employed. The suspected anomaly at 20,000N on line 22,500E subsequently proved to be of no interest; however, another broad deep seated anomaly was indicated between 15,000N to 17,000N on line 22,500E. When employing 1,000 ft. electrode intervals inductive coupling effects can give rise to effects that are indistinguishable from IP effects. Thus the apparent anomaly was suspect. By employing DC, however, these coupling effects are markedly reduced or eliminated. The location of this

EXPLORATION RESULTS (Contd.) 008

(3) "Central" Anomaly (Contd.)

anomaly near the centre of a major gravity low is an interesting feature. Since the anomaly is broad, fairly weak and deep seated, even when using 1,000 separations, it is difficult to interpret the source of such an anomaly which has been classified as 'probable' by McPhar.

Other minor anomalies, of low interest at this stage, were located in and around the structure.

Gravity Survey.

An aerial gravimetric survey was carried out in the Blinman area by I. A. Mumme in 1961, and a marked regional gravity low was located over the centre of the Blinman Dome. This survey was carried out independently and prior to the M. E. N. L. programme. Please refer to Fig. 5.

Magnetometer Orientation Survey.

Number of readings taken - 276
Grid line miles covered - 24.2 miles
Instrument hired from McPhar Geophysics Pty. Ltd.

Readings were taken every 500 feet along each grid line to determine if the area gave any significant response to a magnetometer, and to correlate any possible anomalous areas with IP anomalies. No significant anomalous areas or readings can be correlated with IP results. The occasional very high readings are probably due to dolerites or heavy mineral sediments. Broad areas of the structure have monotonously similar readings which indicate that much of the area that could be covered with a detailed survey would yield insignificant results. No further magnetometer work is planned for the immediate future.

Geochemical Orientation Survey.

Number of samples taken:	281
Elements assayed:	Cu Pb Zn Co
Assayers:	The Australian Mineral Development Laboratories

A soil sample was taken 8" below the surface at each magnetometer survey point. It was anticipated that the assay results could be compared with the magnetometer and IP readings or be significant in themselves. Occasional high anomalous values were obtained which are apparently unrelated to any IP or magnetometer results. No broad or continous areas of possibly anomalous metal values are indicated and there is a low average copper content in parts per million for all samples. There is no apparent relationship between high values of one metal to high values of any other metal.

No further geochemistry is planned.

STAGE II - PROPOSED DIAMOND DRILLING PROGRAMME.

Hole BL/1 - "Alpana" Anomaly.

Aim:

To test for economic disseminated mineralisation approximately 300' below the surface, which could be giving rise to the IP anomaly.

Specification:

A vertical hole located at 11,700N 40,000E to be drilled to 350' should adequately test the anomaly for mineralisation.

Positioning time - 2 weeks
Drilling time estimate - 4 weeks

Hole BL/2 - "Central" Anomaly.

Aim:

To test for economic disseminated mineralisation approximately 700' to 1,000' below the surface which could be giving rise to the IP anomaly.

Specification:

A vertical hole located at 16,000N 22,500E to reach 1,000' using the largest core size practicable.

Drilling time - about 2 months.

Hole BL/3 - "Oratunga" Anomaly.

Aim:

To test the more strongly anomalous zone indicated over this anomaly for economic mineralisation and the width of the source.

Specification:

An inclined hole collared at 27,100N 15,500E dip -50° to reach a depth of 1,200 feet. The drill hole should intersect a point 700 to 800 feet vertically below 27,700N 15,500E.

Drilling time estimate - 2½ months.

5000W 00 5000E 10000E 15000E 20000E 25000E 30000E 35000E 40000E 45000E 50000E 55000E

35000N

30000N

25000N

20000N

15000N

10000N

5000N

00

5000S

750' 750' 750' 750'

Orebings Anomaly

B

1000' 1000'

139E 145E 155E

1000' 1000' 1000 1000 OC & 12.5 CPS

500' 500' 500'

Central Anomaly

225E

395E 465E

300' 300' 300'

Albana Anomaly

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

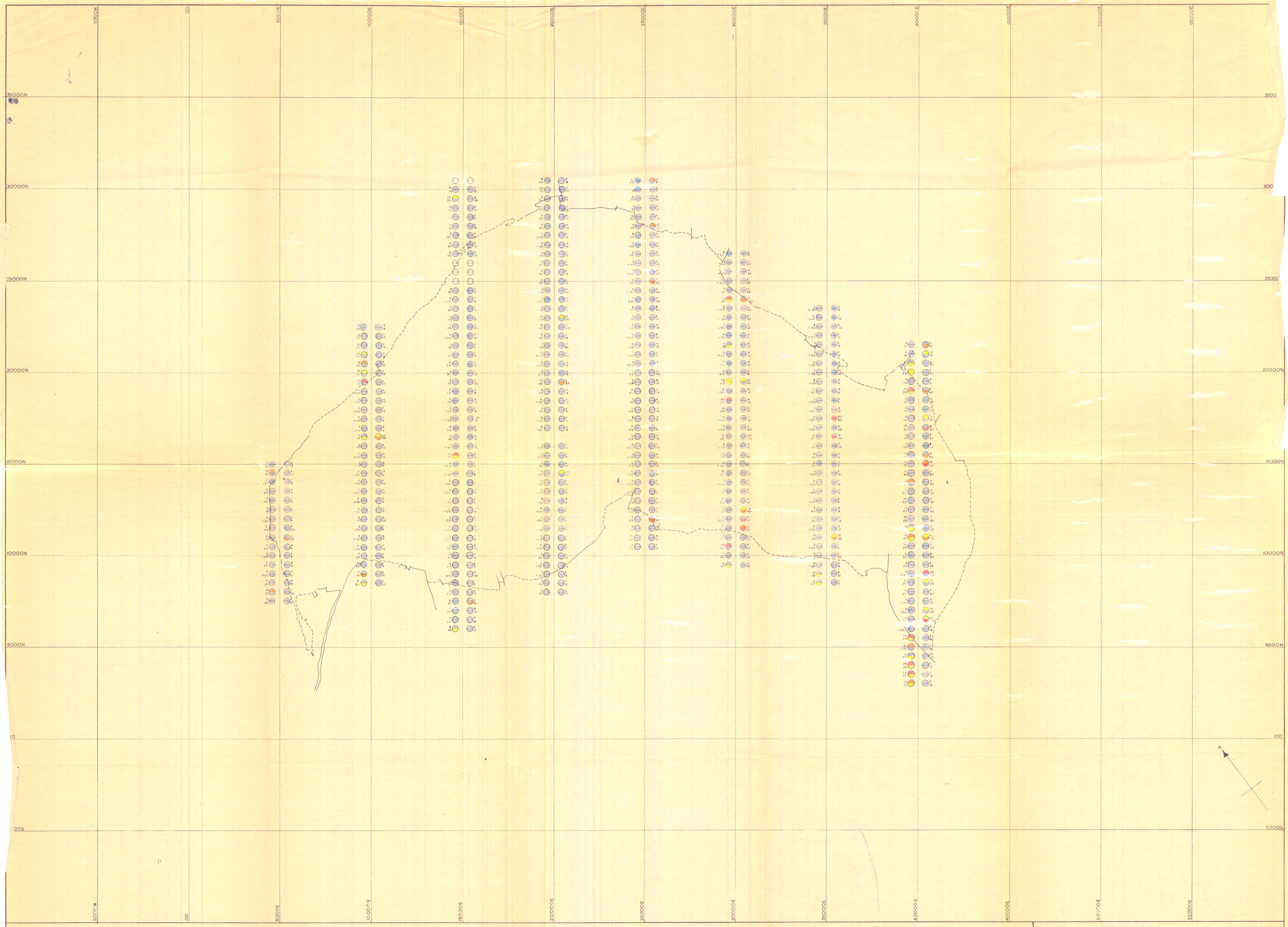
METALS EXPLORATION N.L.

BLINMAN COPPER PROSPECT

PLAN OF INDUCED POLARISATION RESULTS

Ew 587-9 FIG. 2

Prepared by	Date 5-4-66	DRG. NO
Drawn by D J MORGAN	Scale 1:2000 ft	FILE NO



ORDER OF GEOCHEMICAL ANOMALIES

		THRESHOLD	M. BACKGROUND.
BLUE = LESS THAN THRESHOLD	COBALT =	9	5
YELLOW = LESS THAN TWICE BACKGROUND	COPPER =	27	14
ORANGE = LESS THAN THREE TIMES BACKGROUND	LEAD =	10	6
RED = GREATER THAN 3 TIMES BACKGROUND	ZINC =	∠25	∠20

LEAD ZINC — COBALT COPPER

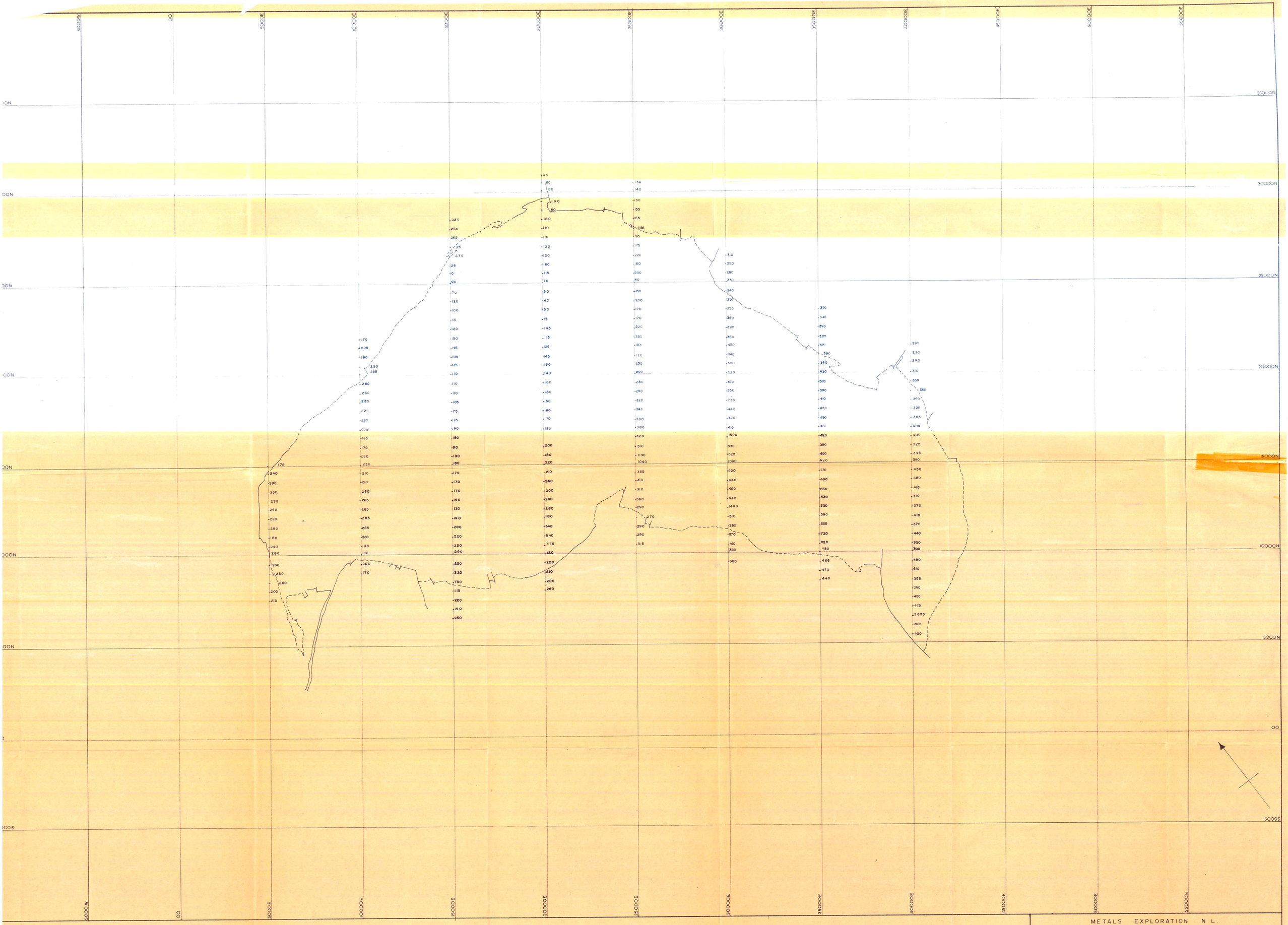
METALS EXPLORATION N.L.

BLINMAN COPPER PROSPECT

GEOCHEMICAL RESULTS.

Env 587-4 FIG. 3.

Prepared by K. H. BETTLES	Date 17 March 1966	DRG. NO.
Drawn by S.J.K.	Scale 1 = 2000 ft	FILE NO.



METALS EXPLORATION N.L.

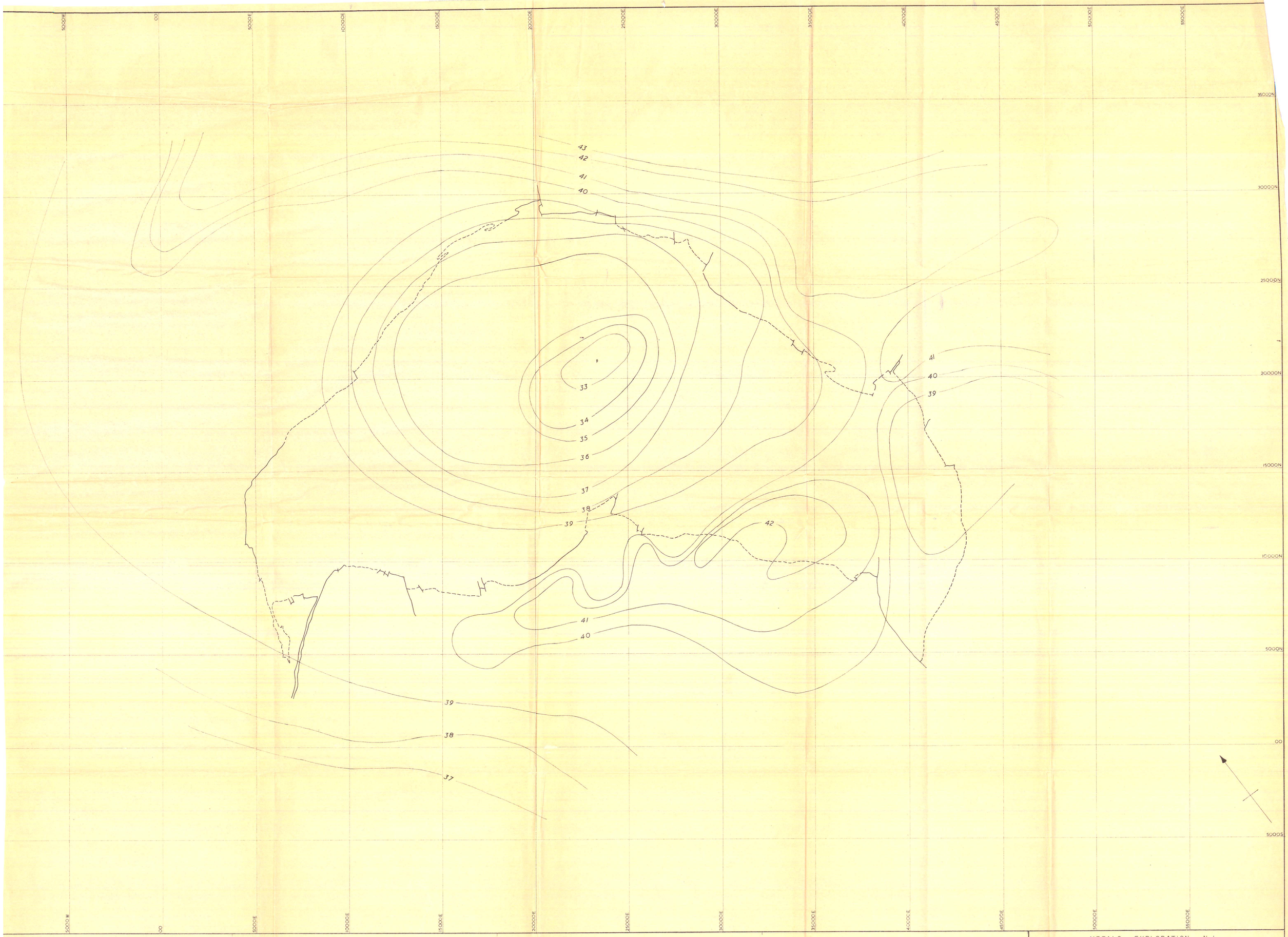
BLINMAN COPPER PROSPECT

PLAN MAGNETOMETER RESULTS

FIG. 4.

Env 587-2

Prepared by	Date 17 March 1966	DRG. NO
Drawn by S.B.W.	Scale 1=2000 ft	FILE NO



Gravity conteurs 40

(interval 1 milligal)

METALS EXPLORATION N.L.

BLINMAN COPPER PROSPECT

GRAVITY SURVEY RESULTS

Env 587-3 FIG. 5.

Prepared by	Date	DRG. NO
Drawn by D.J Morgan	Scale 1"= 2000'	FILE NO

620

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R. HARE & ASSOCIATES

PROJECT PROGRESS REPORT NO. 1

on

WORUMBA COPPER PROSPECT

FLINDERS RANGES, S.A.

SUMMARY STAGE I RESULTS

by

A. McGain
K. Bettles

18th July, 1966

Accompanying Report:

Fig. I Geological Plan

Scale 1" = 4,000'

COPY NO...15.....

CONTENTS

SUMMARY

Stage I exploration programme is complete. The Geological mapping programme has shown that the Worumba diapir is a less favourable host to economic mineralisation than the Blinman and Oraparinna diapirs.

It is recommended that no further work be done on the prospect and the area be relinquished.

INTRODUCTION

Four diapiric structures in the Flinders Ranges, S.A., were the subject of Summary Report No. 186, dated 7th July, 1965.

This report covers the results of preliminary geological mapping carried out over the Worumba diapir.

LOCATION & ACCESS

The area is approximately 12 road miles from Hawker - the nearest railhead. Good unsealed roads lead to the area, but the rugged terrain makes vehicle travel very difficult within the diapir itself.

POWER & WATER RESOURCES

The closest power line is the Port Augusta - Leigh Creek line, approximately 30 miles to the west. Water supplies would have to be developed, either by bores or by dam construction.

GENERAL GEOLOGY

The Worumba diapir has an area of approximately 40 square miles.

It forms an elongated area of disturbed rocks, within the axial zone of the Worumba Anticline. Large areas within the diapir consist of steep dipping, unbrecciated sediments. These have a fairly consistent northerly strike and individual members may extend over quite large distances of up to 3 miles. The sediments appear to be lithologically related, and in general, evidence can be discerned for a relatively undisturbed stratigraphic succession.

Along the eastern contact, and in the extreme northern and southern areas of the diapir, brecciation is more extensive; with well brecciated clastic and dolomitic sediments being common. The breccia is generally strongly crushed and fractured segments of the undeformed sediments found elsewhere in the diapir. Strongly brecciated dolomites, mudstones and sandstones can all be recognized. In some cases the breccia contains occasional scattered vughs.

The diapir is intruded by small dolerite masses of variable grain size and mineralogy. Intrusive contacts can be seen in some cases, though it is possible that some of the dolerites are non-intrusive.

The western contact of the diapir is obscured over most of its length by outwash gravels and alluvium and, therefore, the actual position of this contact is conjectural.

ECONOMIC GEOLOGY

Small showings of copper occur throughout the diapir. The copper mineralization present is usually malachite though rare azurite and chalcopyrite have been seen in dumps.

The mode of occurrence of copper mineralization can be summarized as follows.

1. Directly associated with dolerites; often in the form of copper bearing carbonate-haematite veins, at or near the contact of the dolerite and surrounding rock.

2. Associated with carbonate-haematite or quartz veins usually intruded into breccia or dolomitic sediments. However, these deposits are generally found in fairly close proximity to dolerite intrusions.

3. Minor occurrences of malachite as stainings and vugh fillings in dolomitic sediments and breccia.

Prospectors have sunk quite a few shafts to 100 feet and two adits up to 300 feet are known. All these workings are on very poor mineralization.

DISCUSSION

The localization of the copper mineralization, and its frequent association with carbonate-haematite veins, leads to the tentative conclusion that the copper mineralization is directly associated with the intrusive dolerites. It is also noted that the dolerites and the copper mineralization tend to occur in the western half of the diapir.

The distribution of zones of brecciation and the existence of large unbrecciated masses indicates a diapiric structure in which the rocks have acted as a rigid block, brecciated along the margins where differential movement has been greatest. The sediments within the diapir have been moved from a lower stratigraphic position; but in the process they have not been as well brecciated and distributed as at Oraparinna and Blinman.

This could be interpreted as being due to a weaker, or only partial, diapiric action at Worumba; or alternatively the present topographic expression of the diapir is structurally much higher than at Blinman or Oraparinna. Either way the Worumba Dome is less favourable than Blinman or Oraparinna.

It was also noted that the large areas of unbrecciated sediments appear to be relatively unfavourable as host rock for mineralization.

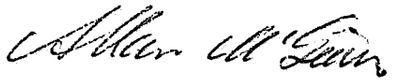
CONCLUSIONS

It is concluded that the Worumba Dome is a less favourable host to an orebody than the similar structures at Blinman and Oraparinna.

RECOMMENDATIONS

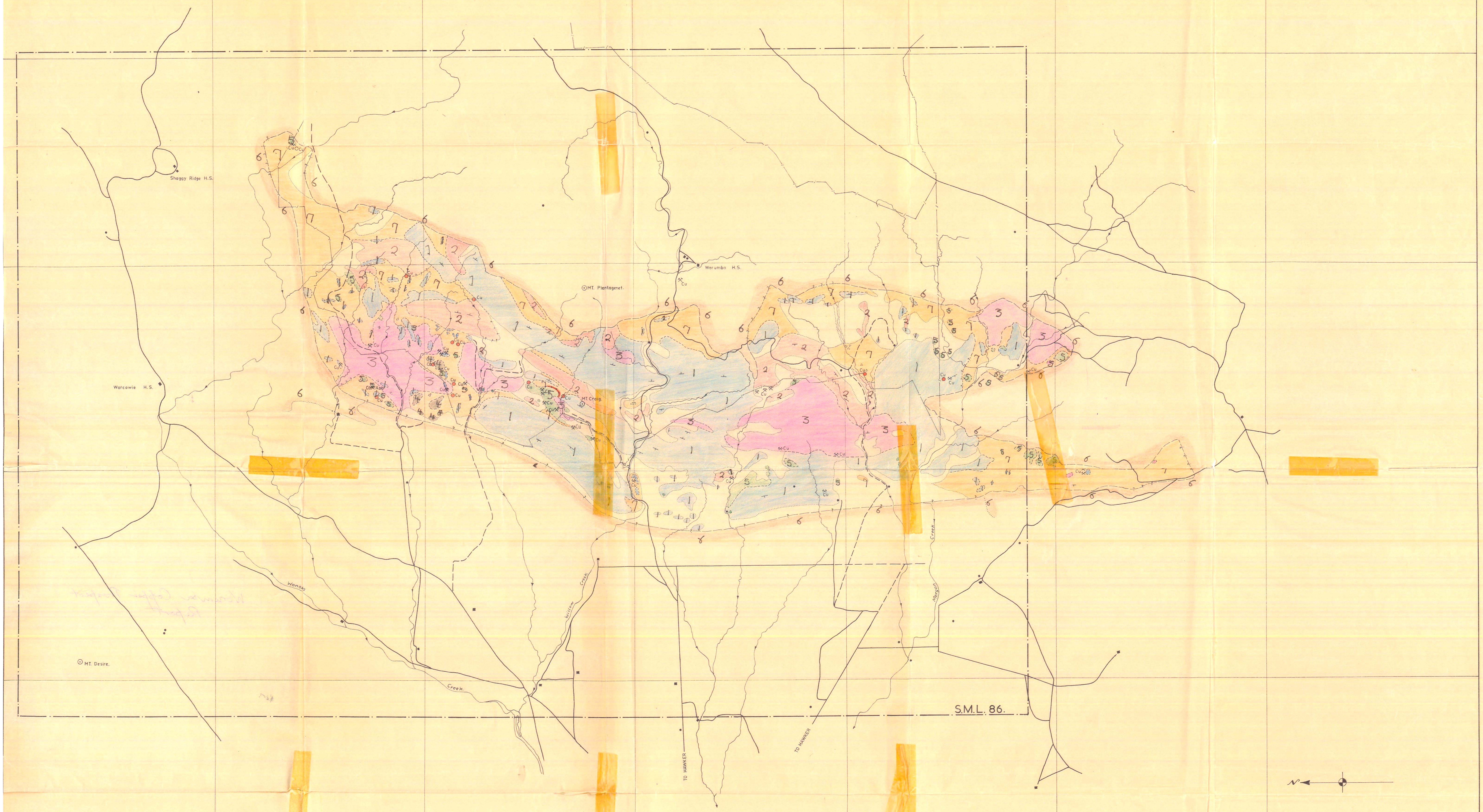
It is recommended that no further work be carried out on the Worumba Dome and the area be relinquished.

A. McGain



K. Bettles

18th July, 1966.



BRECCIA BLOCKS
1 Dolomites, dolomitic mudstones, minor mudstones, Siltstones & quartzites. (At times slightly brecciated.)
2 Micaceous siltstones, arkosic sandstones, Minor dolomites.
3 Green siltstones, mudstones, Minor dolomites.
4 Melaphyres
5 Dolerites - undifferentiated
Areas of no outcrop

RIM ROCKS 6 Clastic sediments including glacial member.
BRECCIA 7 Brecciated sediments, minor diapiric breccia

Geological boundary
" " inferred
Diapir boundary
Outcrop "
Lease "
Quartz vein
Stream

Bores & wells
Cu Mineral occurances
Cu Mine shaft
Strike & dip of bedding
Unsealed road
Jeep track

METALS EXPLORATION N.L.

WORUMBA COPPER PROSPECT
GEOLOGICAL PLAN

620-1
Env [redacted]

Prepared by.	K. Bettles. & B. Menzel.	Date.	July. 1966	DRG Nº	
Drawn by.	D. J. Morgan.	Scale	1" = 4000' Approx.	File Nº	

R. HARE & ASSOCIATES

PROGRESS REPORT NO. 1

on

ORAPARINNA COPPER PROSPECT

Flinders Ranges, S.A.

by

A. McGain
K. Bettles

21st July, 1966

Accompanying Report:

Plan Induced Polarisation Anomalies	1" = 2000'
Geological Plan	1" = 2000'

CONTENTS

SUMMARY

Stage I Exploration Programme is complete. Geologic mapping has located small and poorly mineralised copper occurrences within the diapir. The Induced Polarisation survey located 9 anomalies of varying importance. Although the aim of locating typical porphyry copper I.P. anomalies was not attained, several smaller anomalies of interest were obtained. A report on the proposed follow-up exploration programme will follow.

INTRODUCTION

Four diapiric structures located in the Flinders Ranges between Hawker and Blinman were the subject of Summary Report No. 186 dated 7th July, 1965. Programmes of exploration were recommended for three of the four structures and the first stage of the initial exploration has now been carried out.

This report covers the results of the exploration of the Oraparinna diapiric structure only. Results of the Blinman work are the subject of a separate report while results at Hawker will be included in a separate report when Stage I is complete there.

EXPLORATION RESULTS

A programme of geologic mapping and an Induced Polarisation survey were carried out over the structure. Geologic mapping emphasised locating all mineral occurrences and associated rock types. The I.P. survey was designed as a reconnaissance survey on widely spread lines.

GEOLOGIC MAPPING

The Oraparinna diapir has an approximate area of 32 square miles and is irregularly shaped with a northern extension known as the Enorama diapir. The presence of boulder trains and local unconformities in the rim rocks of the Enorama structure indicates that it is a later diapiric extension on the main Oraparinna structure. The diapiric breccia consists of a calcareous matrix, enclosing fragments of sediments of greatly varying size, which grade into the large breccia blocks of sediments and melaphyre. In some areas the typical diapiric breccia with calcareous matrix is subordinate in amount to fractured and brecciated dolomitic siltstones. The breccia blocks are relatively small, seldom exceeding half a mile in width, with the exception of the south-west corner of the diapir where large blocks of rim rock sediments and melaphyre occur. There is extensive faulting in this area, and the structural features may be more related to faulting than to intrusive diapirism.

Dolerites of varying petrological character occur throughout the dome. They are usually small in size, tending to circular in outcrop, and in some cases may be intrusive into the diapiric breccia. No evidence of intrusive acid igneous rocks was seen in the area. Refer to 2000 scale Geological Plan.

ECONOMIC GEOLOGY

Small showings of copper and barium are common throughout the diapir. Approximately 30 copper localities have been noted. The copper minerals present are generally malachite and azurite,

though specimens of chalcopyrite, bornite and native copper were seen in dumps around some small workings.

The mode of occurrence of copper mineralisation is very varied, and can be summarised as:-

(a) Stainings, disseminations and vugh fillings in dolomites and dolomitic siltstones. These occurrences are probably analogous to the mine type dolomite of the Blinman diapir.

(b) Vugh fillings in melaphyre, or associated with small quartz or calcite veins intruding the melaphyre.

(c) Associated with veins rich in quartz, calcite, siderite or hematite. Quartz veins containing copper in appreciable amounts occur at the Mt. Emily Mine and the Appealinna Mine. In the south-west corner of the Oraparinna diapir siderite veinlets containing copper occur in fractured or brecciated sediments.

(d) Occurring as malachite and azurite in the diapiric breccia. One such locality occurs near the centre of the main Oraparinna dome. Copper showings extend over a linear distance of approximately 200 feet and occur within the breccia itself, but along the edge of a large block of inter-bedded dolomites and calcareous grits.

In general no surface evidence of leaching or widespread mineralisation was noted which could be indicative of porphyry type copper deposit near the surface.

The absence of such indications, and the lack of surface evidence to suggest the presence of an underlying granitic mass, does not absolutely rule out the possibility of an orebody occurring in depth. However, this possibility is now more remote.

INDUCED POLARISATION SURVEY

Number of lines : 11

Total line miles covered : 38.5

The final report on the I.P. survey has been received from McPhar Geophysics who undertook the work. The reconnaissance programme was carried out with AC only, using 500 foot spreads on lines spaced 5,000' apart. No cross lines were surveyed across the diapir in the narrow neck between the Enorama and Oraparinna diapirs. The object of the survey was to locate anomalies which could be due to a large low grade ore deposit.

Numerous anomalies have been located but no detail work has been done on them. McPhar Geophysics strongly recommend that

further work be done on at least 9 of the more interesting anomalies. These include two broad zones and several smaller narrow ones. The broader zones have been compared with I.P. results from known broadly disseminated mineral deposits containing from 2% to 4% sulphide mineralisation. The comparisons are strikingly similar and indicate that further work should be done on the anomalies. Refer to 2000 scale plan of I.P. Anomalies.

Anomalies of major interest:

(a) Line 550E - 35,000 N to 45,000 N

Much of this 10,000 foot long zone is slightly anomalous but several definite zones occur within it. Metal factors within the definite zones are up to twice background. McPhar Geophysics recommend parallel lines using 500' spreads to confirm the anomaly.

(b) Line 550E - 24,000 N to 30,000 N

This broad anomaly is weakly anomalous over much of its length but two definite shallow anomalies occur within it where metal factors are up to twice background. McPhar have recommended 300' spreads using parallel lines to check it.

(c) Line 650E - 26,000 N to 27,000 N

These two anomalies are shallow and narrow and have MF up to 4 times background. The lines should be checked with shorter spreads.

(d) Line 700E - 34,500 N to +35,000 N

High metal factors up to 3 times background occur at the end of the surveyed line. The anomaly appears to be deep and occurs in the rim rocks of diapir near an extensive outcrop of highly ferruginous shales. It is probable that the anomaly is due to finely divided pyrite within the shale at depth.

DISCUSSION

Generally, metal factors in the "definite" anomalies are up to 2 or 3 times background and are not typical of the anomalies which could be expected from a large near-surface low grade porphyry copper deposit. The lack of large strong anomalies somewhat detracts from the importance of the prospect. However, several smaller anomalies were located and McPhar have indicated that they could be worthwhile exploration targets.

A detailed I.P. survey, geochemistry survey and follow up drilling of the anomalies should be done, the more significant anomalies being drilled first.

As the geologic environments of the Oraparinna and Blinman domes are similar and as they are separated by only 20 miles, exploration of the two domes could be done simultaneously. However, by comparison of exploration results of the two domes, it can be seen that slightly more encouraging I.P. results have been obtained from the Blinman area than from the Oraparinna area.

SUMMARY

(a) The major I.P. anomalies sought by the I.P. survey have not been obtained but several smaller anomalies have been located within the diapir. These anomalies can be further tested by detailed I.P., geochemistry and perhaps diamond drilling.

(b) Evidence of copper mineralisation occurs within the breccia and breccia blocks of the diapir. However, most copper indications are small, isolated, and very weak.

(c) Surface copper occurrences are associated with a variety of rock types and vein type deposits. No definite conclusions as to origin of the mineralisation or to its preferential replacement or association of rocks within the diapir can be made at this stage.

(d) There appears to be no common association of rock types with I.P. anomalies.

CONCLUSION

The geological mapping and I.P. survey carried out over the Oraparinna structure shows that there is no evidence to suggest that a large low grade copper orebody exists at or near the surface. Several small I.P. anomalies were obtained and some of these could be detailed further.

RECOMMENDATIONS

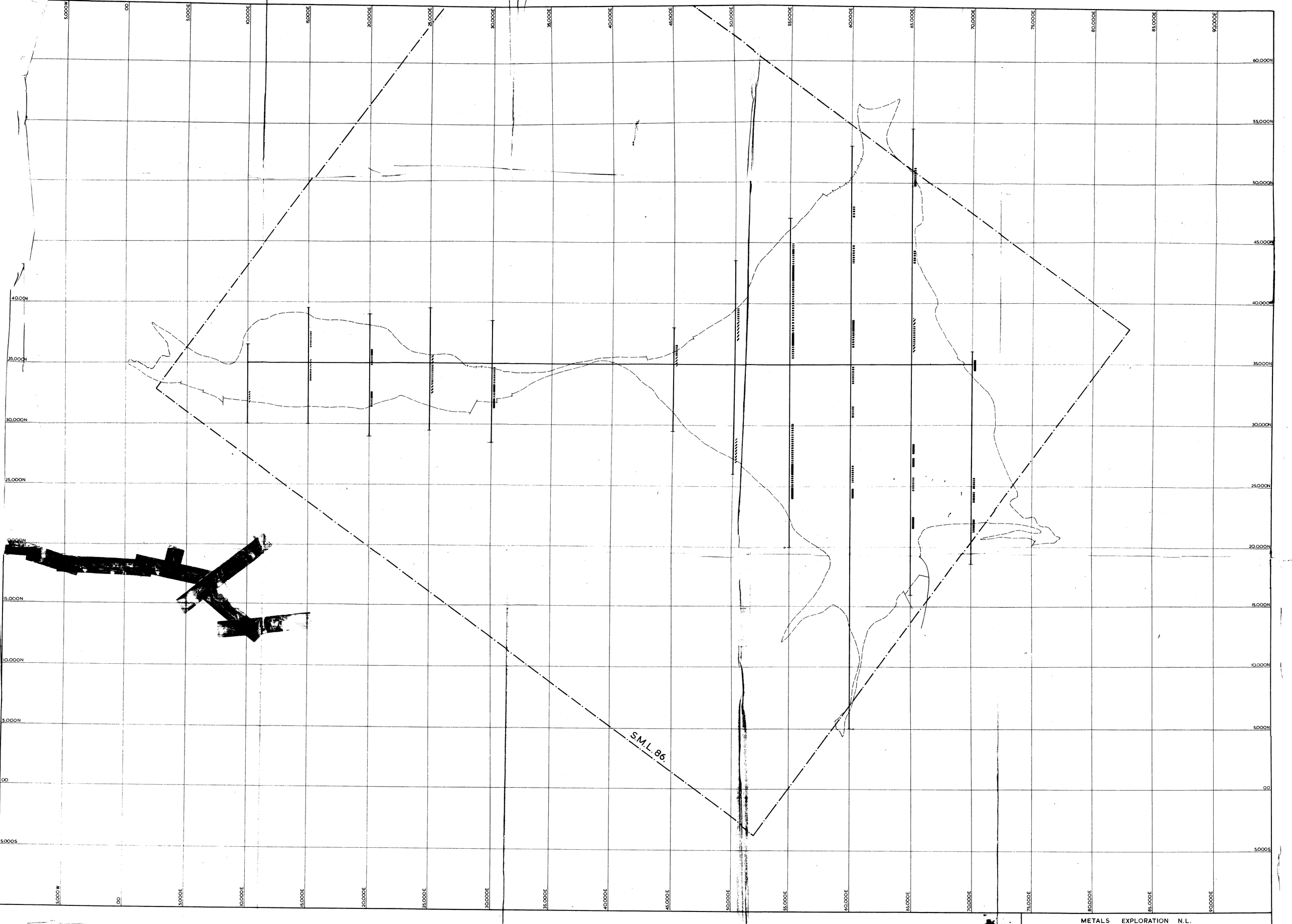
It is recommended that further testing of the I.P. anomalies be undertaken, and the prospect be retained.

Allan McGain

A. McGain

21st July, 1965.

K. Bettles



LEGEND

Diapir boundry.
inferred.
Lease boundry.
Fault observed.

SURFACE PROJECTION OF ANOMALOUS ZONES

Definite
Probable
Possible

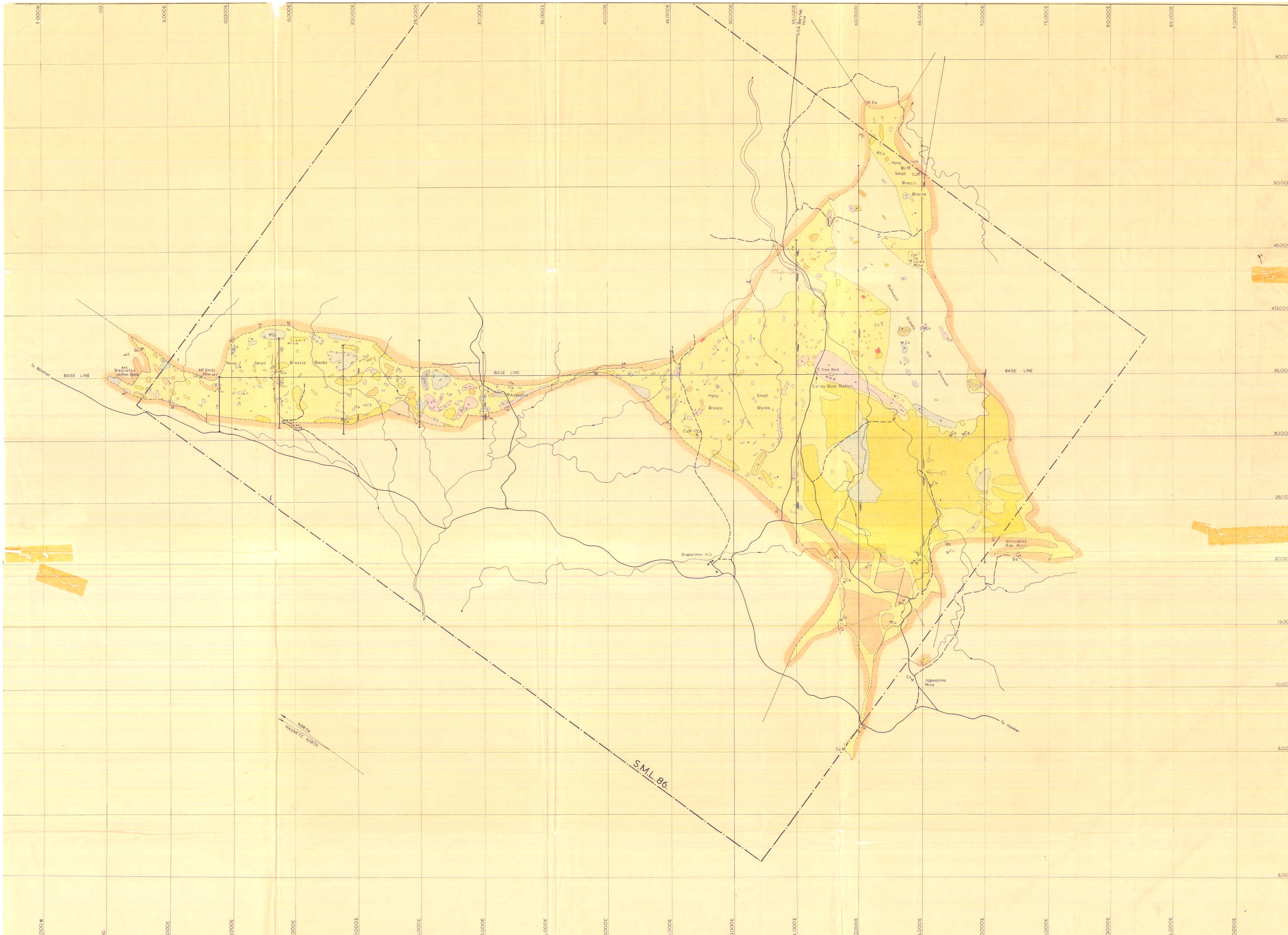
METALS EXPLORATION N.L.

ORAPARINNA COPPER PROSPECT

PLAN OF INDUCED POLARIZATION RESULTS

Enr 587-5

Prepared by K Bettles	Date June 1966	DRG N°
Drawn by D J Morgan	Scale 1" = 3200' Approx	File N°



BRECCIA BLOCKS	Heavy mineral siltstones, fine sandstones & tuffs
	Interbedded shales, siltstones & dolomites Minor limestones & calcareous grits
	Quartzites & sandstones
	Melaphyres Associated tuffs, siltstones & arkoses
	Minor metasediments, stressed gabbro & gneisses
	Dolerites - undifferentiated
	Areas of no outcrop

RIM ROCKS	Clastic sediments including glacial member
DIAPIRIC BRECCIA	Breccia - with calcareous matrix

H	Heavy mineral content in sediments
D	Dolomitic sediments
-	Quartz vein
----	Geological boundry
— — —	Diapir boundry
--?--?	Geological boundry nferred
—·—	Lease boundry

15	Strike & dip of bedding
——	Fault observed
⚒Cu	Mine shaft or trench
——	Unsealed road
— —	Jeep track
	Stream

METALS EXPLORATION N.L.

ORAPARINNA COPPER PROSPECT

GEOLOGICAL PLAN

SHOWING I.P. GRID LINES

Env 587-1

Prepared by K. Bettles	Date June 1966	DRG N°
Drawn by D J Morgan	Scale 1" = 3200' Approx	File N°

587

024

R. HARE & ASSOCIATES

PROJECT PROGRESS REPORT NO. 2

PROPOSED DIAMOND DRILLING PROGRAMME AND BUDGET

for

BLINMAN AND ORAPARINNA COPPER PROSPECTS

Flinders Ranges, S.A.

by

A. McGain

4th August, 1966

Copy No ..13.....

INTRODUCTION

It is proposed to carry out one drilling programme in two stages to test the IP anomalies obtained at Blinman and Oraparinna. (See Reports No. 242 and 253).

Stage I involves the drilling of four holes; two at Blinman and two at Oraparinna and totalling 2400 feet. The budget for this work is $38,650.

Stage II allows for four drillholes totalling 2500 feet at an estimated cost of $40,000.

STAGE I DETAILS

BLINMAN DRILLING

(a) DDH BL/3 Oratunga Anomaly.

Aim.

To test for economic mineralisation over the more strongly anomalous zone within the anomaly and to test the width of the source.

Specification.

An inclined hole is to be designed to intersect a point 700 to 800 feet vertically below 27,700 N. 15,500 E. The collar location will be determined after field mapping. Setting up and drilling time estimate - $2\frac{1}{2}$ months.

(b) DDH BL/1 Alpana Anomaly.

Aim.

To test for economic disseminated mineralisation approximately 300 feet below the surface, which could give rise to the anomaly.

Specifications.

A vertical hole located at 11,700 N. 40,000 E. to be drilled to 350 feet.
Positioning time - 2 weeks.
Drilling time estimate - 4 weeks.

ORAPARINNA DRILLING

(c) DDH OR/1 Melaphyre Anomaly.

Aim.

To test for economic disseminated mineralisation approximately 100 to 350 feet below the surface which could give rise to the anomaly.

Specification.

An inclined hole collared at 27,900 N., 65,000 E., dip -50, azimuth due south (mine grid).
Final depth - 450 feet.
Setting up and drilling time estimate - $4\frac{1}{2}$ weeks.

(d) DDH OR/2 42,250 N., 55,000 E. Anomaly.

Aim.

To test for disseminated economic mineralisation over the more strongly anomalous zone within the anomaly.

Specification.

A vertical hole collared at 42,250 N., 55,000 E. to reach a depth of 400 feet.
Setting up and drilling time estimate - 4 weeks.

STAGE II

No details of drillholes or further detailed IP surveys can be given for this stage until results are received from the proposed Stage I drill-holes.

14,500E 15,000E 15,500E 16,000E 16,500E 17,000E

28,500N 28,000N 27,500N 27,000N 26,500N

A A

5080 5100 5120 4980 5000 5020 5040 4960 4940 4920 4900 4880 4860 4840 4820

Cabin

Shaft 40° dips

27 150N
15,590E

Quartz filled Fault.

Collar DDH-BL1

Magnetic North.

METALS EXPLORATION N.L.

BLINMAN PROJECT

DIAMOND DRILL HOLE BL-1.

ORATUNGA ANOMALY

Ew 587 - 10

Prepared by.	A. McGain.	Date	Aug 1966
Drawn by.	D.J. Morgan.	Scale	1" = 200'

15000 E

20000 N

27600 N

15600 E

27600 N

EL 6,500

EL 6,500

SECTION A-A LOOKING EAST.

SCALE 1" = 200'

EL 5,000

EL 5,000

collar DDH-BL 1.

EL 4,500

EL 4,500

Centre of Anomaly.

EL 4,000

EL 4,000

1143.5'

EW 587.-11

587

R. HARE & ASSOCIATES

027

PROGRESS REPORT NO. 3

on

BLINMAN-ORAPARINNA COPPER PROSPECT
Flinders Ranges, S.A.

by

A. McGain
K. Bettles
23rd March, 1967

Accompanying Report:

Appendix	Core Logs
Geological Plan Oratunga Area	1" = 200'
Cross-Section Oratunga Drill Hole	1" = 200'
Geological Plan Alpana Anomaly	1" = 200'

No. 9

SUMMARY.

Two diamond drill holes have been completed on the Alpana and Oratunga induced polarisation anomalies at Blinman. No encouraging results have been obtained and further drilling is considered unwarranted.

It is recommended that the Oraparinna-Blinman prospect be relinquished.

INTRODUCTION.

This report covers the work recommended in Project Progress Report No. 2 on diamond drilling of the Blinman-Oraparinna prospects (R. Hare & Associates' Report No. 264).

Only two of the four drill holes recommended in Report No. 2 have been drilled. No encouraging results were obtained in these holes and the remaining two holes were therefore cancelled.

RESULTS.

Diamond Drilling.

The two holes of Stage I were drilled in the Blinman area on the Oratunga and Alpana anomalies which were better defined than the anomalies at Oraparinna. Drill holes on each anomaly successfully intersected the target zones but no significant mineralisation was encountered.

Drill Hole BL-1 - Oratunga Anomaly.

This drill hole was located 1,000 feet east of a small fault containing chalcopyrite at the contact of a thick greywacke bed and black shales. The drill target was a larger fault where it intersected the shale-greywacke contact approximately 700 feet below the surface lying between and along strike from two I. P. anomalies on lines 15,000E and 15,500E.

The drill hole successfully intersected the target zone but no significant copper or other economic mineralisation was present in the fault, shales, or greywacke.

Graphite has been identified in small amounts on joint planes and small shears in the shales and due to the lack of metallic minerals in the target zone it is assumed that the I. P. anomaly at Oraparinna is due to the graphite.

The hole was drilled on Magnetic North to 1,143 feet at minus 50°. Co-ords of the collar were 27,150N, 15,590E. The hole intersected shales, siltstones and the thick greywacke bed from 718 to 1,079 feet. The fault zone was intersected from approximately 697 to 707 feet.

Only occasional traces of pyrite and chalcopyrite occurred throughout the hole, the highest assay being 0.21% copper over two feet from 1,110 to 1,112 feet.

A detailed core log is appended.

Drill Hole BL-2 - Alpana Anomaly.

This hole was located in the centre of the IP anomaly at 11,775N, 40,020E. Surface mapping over the anomalous area revealed very little outcrop and only small exposures of purple shale and heavy mineral siltstones were located.

APPENDIX

CORE LOG - BLINMAN

Drill Hole BL-1 - ORATUNGA I. P. ANOMALY.

Location	27,150N, 15,590E
Strike	00° Magnetic
Dip	-50°
Final Depth	1,143'6"

0-250	SILTY SHALE - grey/black. Frequent calcite veinlets. Rare trace of pyrite and some chalcopyrite.
250-683	LAMINATED SILTY SHALE. Interbedded grey and dark grey carbonaceous laminations. Calcite veinlets and mineralisation as above.
683-718	INTERBEDDED SILICEOUS GREYWACKE and LAMINATED SILTSTONE. Breccia-calcite vein and crushed sediments at 700-702'.
718-1,079	SILICEOUS GREYWACKE - grey, fine grained, with coarser fragments of chloritic material. Occasional calcite veinlets and dark grey carbonaceous laminae. Traces of pyrite associated with calcite veinlets or dark carbonaceous laminae.
1,079-1,090	LAMINATED SILTY SHALE - interbedded grey and dark grey carbonaceous laminae.
1,090-1,099	ARKOSIC SANDSTONE - light grey, medium grained. Trace pyrite-chalcopyrite in coarser grained beds.
1,099-1,143'6"	INTERBEDDED SILICEOUS GREYWACKE and LAMINATED SILTSTONE. Very slight mineralisation as thin pyrite-chalcopyrite stringers at 1,100 and 1,117'.

END OF HOLE.

Drill Hole BL-2 - ALPANA I. P. ANOMALY.

Location	11,775N, 40,020E
Strike	00°
Dip	~~-50°~~ Vert.
Final Depth	381'8".

0-231	INTERBEDDED SHALE-SILTSTONE-SANDSTONE - grey, purple and greenish. Fractured and oxidised. Sandstone is cross-bedded and contains heavy-mineral bands.
231-235	SANDSTONE-SILTSTONE BRECCIA.

APPENDIX (contd.)

Drill Hole BL-2 - ALPANA I. P. ANOMALY (contd.)

235-346	INTERBEDDED SHALE-SILTSTONE-SANDSTONE. As above, with heavy-mineral cross-bedded sandstone.
346-348	SHALE SANDSTONE BRECCIA.
348-358	INTERBEDDED SANDSTONE-SHALE. As above, with heavy-mineral cross-bedded sandstone.
358-359.5	SHALE SANDSTONE BRECCIA.
359.5-377	SANDSTONE - white. Heavy-mineral cross-bedded sandstone.
377-381.8	SILTSTONE BRECCIA.
	END OF HOLE.

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BUNMAN COPPER PROSPECT.

ENV. 587 ✓1 GEOLOGY & I.P. LINES.
✓2 MAGNETOMETER RESULTS.
✓3 GRAVITY "
✓4 GEOCHEMICAL "
✓5 I.P. "
✓6 GEOLOGY - ORATUNGA.
✓7 SECTION A-A "
✓8. GEOLOGY. - ALPANA

R. HARE & ASSOCIATES - DRILL LOG

Form 4516

CLIENT METALS EXPLORATION N.L. HOLE No. DDH-2

PROJECT BLINMAN-ALPANA DATE 29/11/66

LOCATION OF COLLAR 11,775 N 40,020 E SURFACE Elev.

STRIKE - DIP Vertical FINAL DEPTH 381.8 116.37

COMMENCED 14/11/66 COMPLETED 28/11/66 GEOLOGIST A. McGain

Footage From	Footage To	Key	Observations	Sample No.	Assays
0	231		SANDSTONE, SHALE, SILTSTONE: interbedded in thin laminae. Grey, purple and greenish. Highly fractured soft and oxidised. Sandstone beds with heavy mineral "stringers" common. 0-41' L.C. Sandstone approximately 30% of rock from 0-150' and 60% of rock from 150-231'.		
231	235		SANDSTONE-SILTSTONE BRECCIA		
235	332		SILTSTONE AND SANDSTONE; interbedded, grey, purplish and white. Sandstone approximately 40% of rock with heavy mineral "stringers" common. Highly fractured and oxidised.		
332	333		SILTSTONE-SANDSTONE, BRECCIA		
333	346.5		SANDSTONE, SHALE. Interbedded, grey, purplish and white. Sandstone approximately 40% of rock with heavy mineral "stringers" common. Highly fractured and oxidised.		
346.5	348.5		SHALE-SANDSTONE BRECCIA		
348.5	358		SANDSTONE, SHALE. Interbedded, grey, purplish and white. Sandstone		

R. HARE & ASSOCIATES - DRILL LOG

HOLE No. DDH-2

PAGE No. 2

Form No. 4517

Footage from	Footage to	K	Observations	Sample No.	Assay
348.5	358		approximately 40% of rock with heavy mineral "stringers" common. Highly fractured and oxidised.		
358	359.5		SHALE-SANDSTONE BRECCIA		
359.5	377		SANDSTONE; whitish and friable. Heavy mineral bands very common. Fractured and oxidised.		
377	381.8		SILTSTONE BRECCIA; greenish with trace of oxidation.		
			END OF HOLE.		

R. HARE & ASSOCIATES - DRILL LOG [redacted] Oratunga. Form 4516

035

CLIENT METALS EXPLORATION N.L. HOLE No. BL-1

PROJECT BLINMAN DATE September-November 1966

LOCATION OF COLLAR 27150 N 15590 E Elev. 3485.4

STRIKE 00° DIP -50° FINAL DEPTH 1143.5

COMMENCED 9/9/66 COMPLETED 4/11/66 GEOLOGIST M. Schaiowitz K. Bettles

Footage From	Footage To	Key	Observations	Sample No.	Assays Cu
0	19		SILTY SHALE. Fine grained, brown due		
			to oxidation; few faint dendritic markings.		
19	250		SHALE. Blackish grey, fine grained and		
			tending slightly towards being silty.		
			Numerous calcite veinlets up to $\frac{1}{2}$" thick		
			(and occasionally 2") generally regular		
			and parallel, dipping 40° - 60°, and		
			often containing traces pyrite and chalco-		
			pyrite. Fracture planes usually display		
			micaceous sheen. Traces sulphide		
			(pyrite and probably chalcopyrite) occur		
			as follows:		
			(i) Patches of small disseminated crystals		
			(ii) Smeared along fracture planes.		
			Limonitic coatings sometimes present		
			on fracture planes.		
			50'9"-53'11" Brown and rust coloured		
			due to weathering and oxidation.		
			Siderite veinlets up to $\frac{1}{2}$"		
			TRANSITIONAL TO FOLLOWING SECTION		
			73-76	1	.001
			212-217	2	.003
			159-164	3	.002
250	683		SHALE. Blackish grey to grey. Generally		
			as above but increasingly silty. Fine		
			laminations common. Average dip 70°.		

R. HARE & ASSOCIATES - DRILL LOG

HOLE No. BL-1

PAGE No. 2

Form No. 4517

Footage from	Footage to	K	Observations	Sample No.	Assay
250	683		Laminae are alternately blackish grey and grey,		
			the latter being more silty. Coatings on fracture planes at 295.8		
			375' to 375' 2½" Brecciated calcite. Calcite veinlets		
			common throughout. Laminae become coarser and		
			the overall rock more silty with increasing depth.		
			Dark grey black laminae (possibly graphitic)		
			increase from about 550' onwards forming about		
			50% of rock at 620'. Light grey laminae 554-556'	Some brecciation 554- at irregular CO_3 veins	
			Below 600' several light grey fine-medium grain-		
			ed siliceous silty sections are inter-bedded at		
			619-623 623.7-624 626-631 649-651 657-661		
			682-685. These beds are equivalent to siltstone-		
			greywacke.		
			Core angle 35° at 560'		
			262 - 267	4	0.004
			329 - 334	5	0.002
			396 - 401	6	0.002
			464 - 469	7	0.003
			507 - 512	8	0.003
			554 - 559	9	0.001
			595 - 560	10	0.002
			640 - 645	11	0.002
			679 - 684	12	0.001
683	700		INTERBEDDED SILICEOUS & dolomitic GREYWACKE		
			AND LAMINATED SILTSTONE. Transitional		
			to next rock type		
			694 - 699	13	0.001
700	702		BRECCIA - calcite vein and crushed sediments.		
702	718		INTERBEDDED SILICEOUS GREYWACKE AND		
			LAMINATED SILTSTONE Core well brecciated		
			702 - 704		
718	1,079		SILICEOUS GREYWACKE. Grey, even grained		
			siltstone to fine sandstone. Coarse fragments		
			of chloritic ? or graphitic ? material occurs		
			from 987'-991'. Very minor calcite veins		
			throughout. Occasional strong black laminae		
			(graphitic?) 756 - 758' 769 - 770' 845 - 845.5'		
			995 - 1,008' 1,062 - 1,064'		

R. HARE & ASSOCIATES - DRILL LOG 037 HOLE No. BL-1

PAGE No. 3

Form No. 4517

Footage from	Footage to	K	Observations	Sample No.	Assay
			755 - 760	14	0.001
			832 - 837	15	0.002
			998 - 1,003	16	0.003
			Very light pyrite-chalcopyrite mineralisation		
			occasionally occurs as:-		
			(i) Small patches and smears associated with		
			calcite veins or fractures.		
			(ii) Small isolated patches; usually in the laminat-		
			ed siltstone rock-type		
			926' Breccia-calcite vein		
			Core angle 45° at 730' and 35° at 850' and 996'		
1,079	1,090		LAMINATED SILTSTONE. Grey siltstone with		
			fine black laminae (graphite?)		
			1,080 - 1,085'	17	0.001
			1,085 to 1,090	18	0.001
1,090	1,099		ARKOSE . Light grey medium grained, well		
			sorted, sand size grains. Abundant quartz.		
			Felspar and dark chloritic? and graphitic?		
			material.		
			1,093 - to 1,097' the grain is considerably finer.		
			Very light mineralisation occurs as small grains		
			of pyrite and chalcopyrite, distributed throughout		
			the coarser grained beds (i.e., 1,090-1,093'		
			and 1,097-1,099')		
			1,090 - 1,093	19	0.004
			1,093 - 1,097	20	0.005
			1,097 - 1,099	21	0.003
1,099	1,143'	6"	INTERBEDDED SILICEOUS GREYWACKE		
			and LAMINATED SILTSTONE. Contains sections		
			of massive siliceous greywacke and sections with		
			frequent black laminations (graphitic?)		
			Siliceous greywacke bands		
			1123-1,128, 1,130-1,132 1,134.5-1,136		
			and 1,138.5-1,143		
			Very slight mineralisation occurs as -		
			(i) Thin pyrite stringers (½ to 1 mm thick)		
			at 1,100' and 1,117'		

R. HARE & ASSOCIATES - DRILL LOG 038 HOLE No. BL-1.
PAGE No. 4

Form No. 4517

Footage from	Footage to	K	Observations	Sample No.	Assay
1,099	1,143'6"		(ii) Small isolated pyrite patches		
			1,099 - 1,104	22	0.003
			1,110 - 1,112	23	0.021
			1,115 - 1,120	24	0.009
			1,134 - 1,139	25	0.003
			HOLE STOPPED AT 1,143'6"		

PLANS

ARE MISSING