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TENEMENT: S.M.L. 292.

TENEMENT HOLDER: North Flinders Mines N.L.

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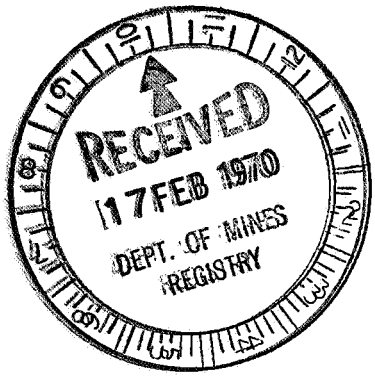
" " " " Copper Results. 1229(II)-2
" " " " Lead " 1229(II)-3
" " " " Zinc " 1229(II)-4
Nilpena Area Sample Locality Map. 1229(II)-5
" " Copper Results. 1229(II)-6
" " Lead " 1229(II)-7
" " Zinc " 1229(II)-8

ENV 1229.

03



NORTH FLINDERS MINES N.L.

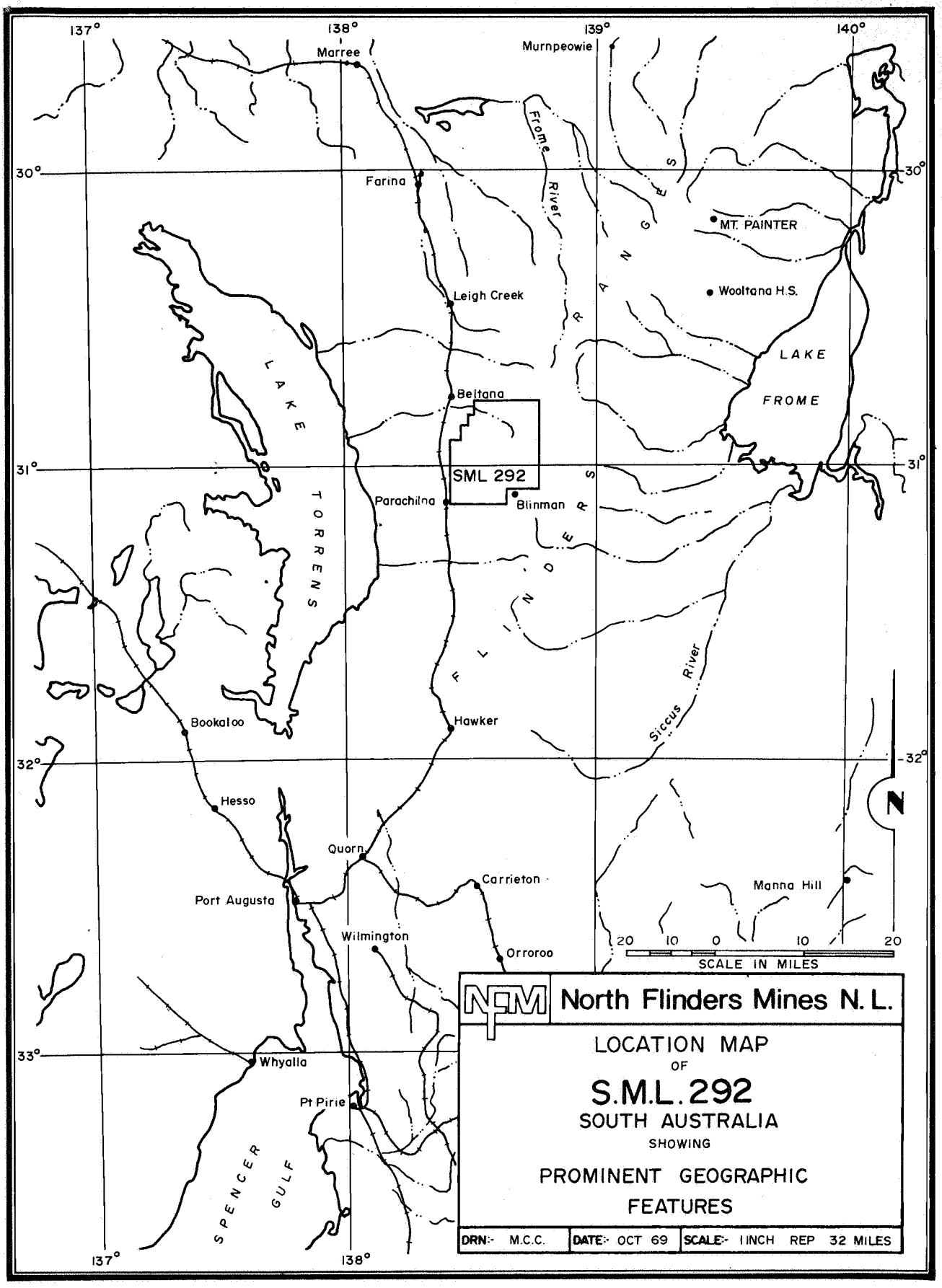
EXPLORATION REPORT

S.M.L. 292

For the six month period ending 19th November, 1969

CONTENTS

* Note: This report refers also to areas outside of S.M.L. 292 It has, therefore, been suitably edited.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Murnpeowie
Farina
Frome River
RANGES
MT. PAINTER
Wooltana H.S.
Leigh Creek
LAKE FROME
LAKE TORRENS
Beltana
SML 292
Parachilna
Blinman
FLINDERS
Siccus River
Bookaloo
Hawker
Hesso
Quorn
Carrieton
Manna Hill
Port Augusta
Wilmington
Orroroo
Whyalla
Pt Pirie
SPENCER GULF
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SCALE IN MILES
North Flinders Mines N.L.
LOCATION MAP
OF
S.M.L. 292
SOUTH AUSTRALIA
SHOWING
PROMINENT GEOGRAPHIC
FEATURES
DRN:- M.C.C.
DATE:- OCT 69
SCALE:- 1 INCH REP 32 MILES

BURRILL AND ASSOCIATES PTY. LTD.

Directors:
G.H.R. Burrill
W.R.K. Jones

Suite 7, Capitol House, 10 William Street
Perth, Western Australia. 6000

POSTAL ADDRESS
BOX X2285 G.P.O.
PERTH. 6001

TELEPHONE: 23 2402
TELEGRAMS: "BURMINEX"

10th February, 1970 - WRK:JEU

Director of Mines,
169 Rundle Street,
ADELAIDE
SOUTH AUSTRALIA

Dear Sir,

SML. 292 - Progress Report for 6 months ending 19th November, 1969

On behalf of North Flinders Mines N.L., we present the following synopsis:-

Compilation of data of previous workers was attempted mainly by staff of Geosurveys of Australia until the establishment of drafting and office facilities at 25 Greenhill Road, Wayville.

Much difficulty was encountered in assessing the results of earlier samplers, in particular those of the Anaconda company had not been acquired nor plotted by 19th November.

Dr. Donovan of McPhar's assessed the work done by . C.R.A. and his report is attached.

Detailed stream sediment sampling was completed over the Cambrian limestone belt on the western side of the SML. The Zinc anomalies found are to be checked

Expenditure transferred
to DM 629/69

Yours faithfully,
BURRILL & ASSOCIATES PTY. LTD.

W.R.K. Jones

.....
W.R.K. JONES
Director.

CABLE ADDRESS
"PHARGEO"
ADELAIDE

McPHAR GEOPHYSICS

PTY. LTD.
INCORPORATED IN VICTORIA

TELEPHONE
72 2133

bam

50 MARY STREET, UNLEY, SOUTH AUSTRALIA
Postal Address: P.O. Box 42, UNLEY, SOUTH AUSTRALIA 5061

MEMORANDUM TO: NORTH FLINDERS MINES N.L.

MEMORANDUM FROM: DR. P.R. DONOVAN

SUBJECT: STREAM SEDIMENT RECONNAISSANCE SURVEY, PARACHILNA AREA, S.M.L. 292, SOUTH AUSTRALIA.

DATE: OCTOBER 16TH, 1969

INTRODUCTION

This area of approximately 10 square miles was completed in 5 days. In all, a total of 210 samples were collected, giving a sample density of approximately 21 per square miles.

ANALYSIS

All samples were sieved to minus 80-mesh and analysed by AAS for Cu, Pb, and Zn following a hot 25% HNO_3 leach on a 0.25 g sample. Results are given in Batch G1329 (25th September, 1969) and G1404 (15th October, 1969)

RESULTS

The results are presented on Dwg's 2001A (sample location) 2002A (Cu), 2003A (Pb) and 2004A (Zn).

The target of the sediment survey was possible base metal mineralization, either sulphide or oxide (silicate) in the Lower Cambrian carbonate sequence.

There were two Cu occurrences known at the beginning of the survey at the Northern end of the area. In addition two other diggings were located, A near sample 196 and B near sample 73. The nature of these is not known, but A may be a manganese "blow". This gave a Zn anomaly of 290 ppm and should be visited by a geologist. B gave no anomalous values.

Cu The highest Cu value was 95 ppm below one of the northern workings. Apart from this the next highest values were 30 ppm in two samples. One of these is associated with the Zn anomaly mentioned above, and it was therefore considered that the southern value (sample 900049) might be worth following up, although normally a value of 30 ppm Cu would be considered background.

A size analysis was performed on this sample and geochemical analysis showed a maximum of 130 ppm Cu in the + 20 fraction, and this is now considered to be anomalous.

Pb The highest Pb results were 60 ppm in two samples, 900106 and 900117. These are not considered to be anomalous.

Zn Taking the threshold value for Zn to be 90 ppm, there are 5 anomalous samples in two groups.

The northern group consists of samples 900124 (90 ppm) and 900126 (95 ppm). The southern group consists of samples 900020 (90 ppm), 900034 (90 ppm) and 900035 (110 ppm).

One sample from each of these anomalies was size analysed.

Sample 900035 showed the highest Zn values in the coarsest fraction (270 ppm) and the Pb values rose to 90 ppm in this fraction.

Sample 900124 showed similar behaviour, with 240 ppm Zn and 85 ppm Pb in the coarsest fraction.

These anomalies are therefore considered worth following up, initially by 100' spread creek sampling to the top of the anomalous drainages, and by geological inspection subsequently.

P.R. DONOVAN Ph.D.

McPHAR

GEOCHEMICAL RESULTS

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CABLE: "PHARGEO"
ADELAIDE

10

Samples from: NORTH FLINDERS MINES

Area: SML 292 PARACHILNA

Sheet No.: 1

Samples of: STREAM SEDIMENT

Batch No.: G 1404 (G1329)

Date: 15.10.69

Assay (A)/Geochem (G): G

Sample	Description	Cu, ppm	Pb, ppm	Zn, ppm
900035	+20	25	90	270
	-20	25	90	260
	-40	25	65	220
	-80	15	50	140
	-120	15	40	120
	-200	20	45	160
900049	+20	130 ✓	70	50
	-20	60	45	35
	-40	25	20	20
	-80	40	40	35
	-120	35	35	30
	-200	45	60	55
900124	+20	30	85	240
	-20	20	90	230
	-40	15	70	190
	-80	15	55	140
	-120	15	40	110
900124	-200	15	40	120

Fractions coarser than 80 mesh were pulverized prior to analysis.

ANALYTICAL METHODS: Cu, Pb, Zn, by AAS following hot 25% HNO_3 leach for 1 hour on 0.25 gm sample.

(copies to
Dr Donovan)

Signed: S.A. Nowicki

CABLE ADDRESS "PHARGEO" ADELAIDE

McPHAR GEOPHYSICS

PTY. LTD.

INCORPORATED IN VICTORIA

TELEPHONE 72 2133

bam

50 MARY STREET, UNLEY, SOUTH AUSTRALIA

Postal Address: P.O. Box 42, UNLEY, SOUTH AUSTRALIA 5061

MEMORANDUM TO: NORTH FLINDERS MINES N.L.

MEMORANDUM FROM: DR. P.R. DONOVAN

SUBJECT: REVIEW OF C.R.A. EXPLORATION PTY LIMITED'S STREAM SEDIMENT RECONNAISSANCE WORK ON PART OF S.M.L's 290, 292 AND 293.

DATE: OCTOBER 21ST, 1969

INTRODUCTION

The writer was requested by North Flinders Mines N.L. to review the available geochemical data obtained by C.R.A. Exploration Pty Ltd. on C.R.A's S.M.L. 202.

This S.M.L. covered 5 areas A, B, C, D, and E only two of which cover ground held by North Flinders, namely B and C.

A report dated 31st October, 1968 by A.F. McQueen was filed with the Mines Department.

METHOD USED

No reference is made to the methods used in McQueen's report.

Generally less than 5 samples were collected per square mile.

The pH was recorded (method not given) for each sample. This was generally 8.5 - 9.0 but some values as low as 7.5 were recorded. These pH values are all too high to allow any hydromorphic migration.

Samples were analysed for Cu, Pb, Zn, and Co at AMDEL. The method used was probably AAS following a perchloric acid leach, and it is assumed that the mesh fraction was minue 80-mesh.

Two C.R.A. maps are available for each area, (a) sample location and (b) Zn values. The writer has been through all the analytical sheets and added anomalous Pb values (80 ppm threshold) and Cu values (30 ppm threshold) to the Zn map. A threshold of 90 ppm Zn was used in the following discussion.

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AREA B

This area covers a substantial part of SML 293 on the Balcanoona, Arrowie and Cadnia 1-mile geological sheets.

The results will be treated sheet by sheet.

CADNIA 292, 293

Sampling was virtually restricted to the northern lines of the Arrowie Snycline in the NE corner of the sheet within the Wilkawillina limestone. There were no Cu, Pb, nor Zn anomalies.

DISCUSSION

C.R.A. obviously set out to test the Wilkawillina limestone, and they largely ignored the overlying Nepabunna siltstone and Parara Limestone.

Within the Wilkawillina limestone, the coverage by stream sediment sampling was not complete nor systematic.

It is interesting to note that Electrolytic Zinc are reputed to have made a significant discovery of willemite within Area A subsequent to C.R.A's abandonment of the area.

../3

S.M.L. 292 (Cadina Sheet)

Three high Zn values near Narina Spring located during the reconnaissance work were considered worth following up by more detailed sampling.

Ironically, although the 3 high Zn sample locations turned out to be background on resampling (possibly indicating incorrect analytical results) 9 other Zn anomalies were found. These were not followed up, although a rock sample showed 350 ppm Zn and 40 ppm Cu in a background stream.

DISCUSSION

The resampling of C.R.A. in S.M.L. 292 indicated how easily significant anomalies could have been missed in other areas by the widely spaced, unsystematic sampling used by that company.

RECOMMENDATIONS

At this stage work should be concentrated on following up the few anomalies found by C.R.A. At a later stage it may be considered worthwhile to resample the untested Wilkawillina Limestone areas on a density of 15 samples per square mile.

S.M.L. 292

Samples 805, 822, 825, 830, 835, 836 and 844 in C.R.A's resampled area should be followed-up by closely spread sampling to the head of the drainage.

P.R. DONOVAN

EHV 1229

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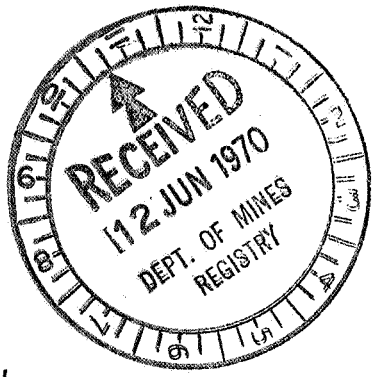


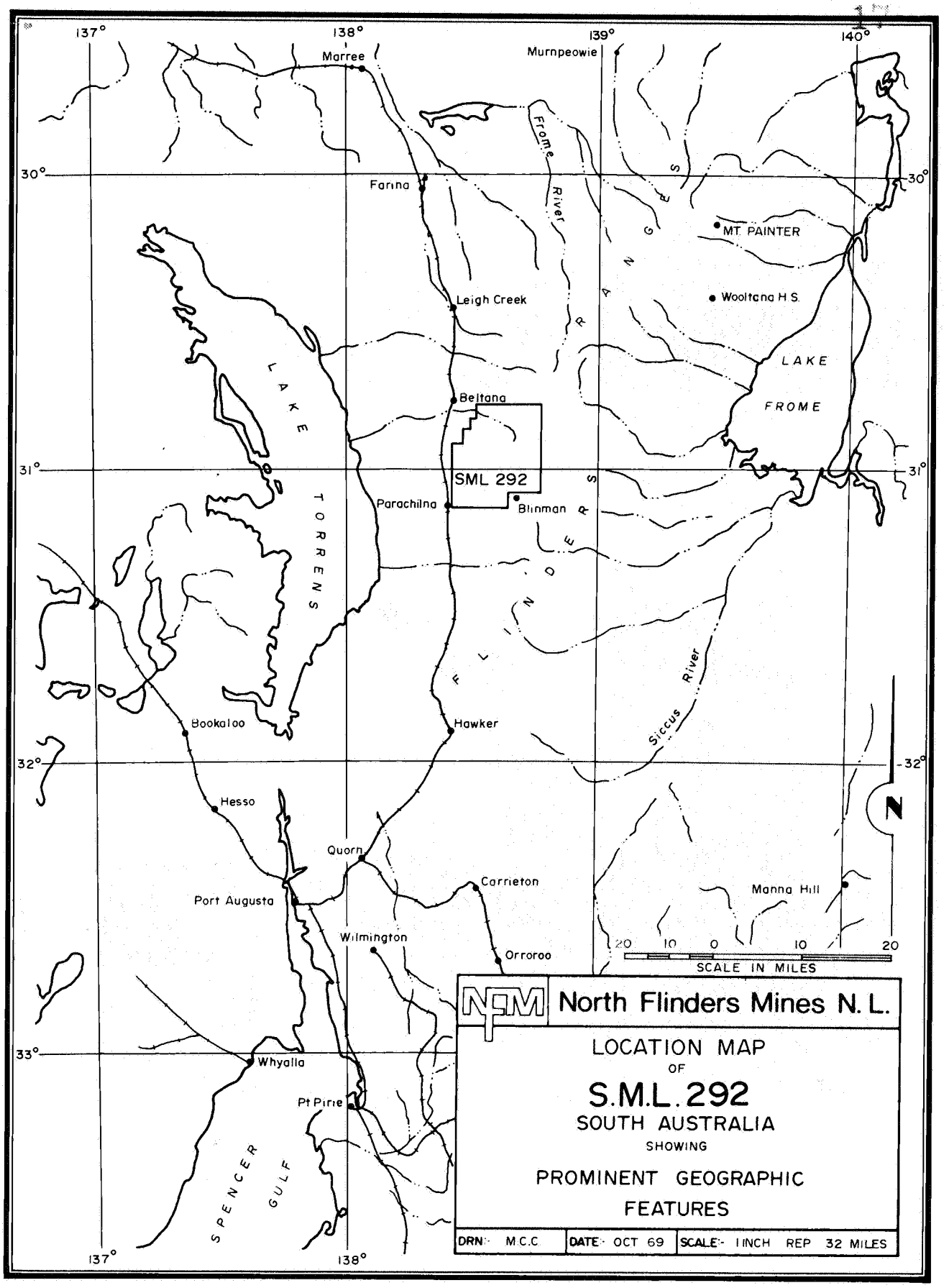
NORTH FLINDERS MINES N.L.

EXPLORATION REPORT

S.M.L. 292

For six month period ending May 19th, 1970

CONTENTS: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MT. PAINTER
Woolteana H.S.
Leigh Creek
LAKE FROME
LAKE TORRENS
Beltana
SML 292
Parachilna
Blinman
FLINDERS
Siccus River
Bookaloo
Hawker
Hesso
Quorn
Carrieton
Manna Hill
Port Augusta
Wilmington
Orroroo
Whyalla
Pt Pirie
SPENCER GULF
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NFM North Flinders Mines N. L.
LOCATION MAP
OF
S.M.L. 292
SOUTH AUSTRALIA
SHOWING
PROMINENT GEOGRAPHIC
FEATURES
DRN:- M.C.C.
DATE:- OCT 69
SCALE:- 1 INCH REP 32 MILES

REPORT ON INVESTIGATION OF STREAM SEDIMENT GEOCHEMICAL ANOMALIES IN S. M. L. 'S 290 AND 292 FOR NORTH FLINDERS MINES N. L.

Sydney
January 19, 1970

M. R. W. Garman, B. Sc. (Geol.)
Watts, Griffis & McOuat (Australia) Pty. Ltd

TABLE OF CONTENTS

This report refers also to areas outside of SML. 292 It has, therefore, been suitably edited.

SUMMARY

The stream sediment anomalies located within S. M. L.'s 290 and 292 were investigated by the writer during November, 1969. There were a large number of anomalous samples in S. M. L. 290 and a few in S. M. L. 292. However, none led to any interesting concentrations of zinc.

One group of zinc rich samples in S. M. L. 290 led to the discovery of a possibly economic phosphate occurrence. Further work on this deposit and the search for others like it is recommended.

INTRODUCTION

At the request of North Flinders Mines N.L., approximately two weeks in November, 1969, were spent by the writer investigating stream sediment anomalies in S.M.L.'s 290 and 292. The purpose of the investigation was to determine whether mineralisation of the willemite type was the cause of the stream sediment geochemical anomalies.

LOCATION AND ACCESS

S.M.L. 292 is located about 15 miles due west of Blinman near the main Adelaide - Leigh Creek road. It is possible to traverse the western side of the Cambrian limestone across country in a 4-wheel drive vehicle.

GENERAL GEOLOGY

The areas of interest within both S.M.L.'s are the Cambrian limestones which constitute the uppermost beds of the largely Proterozoic Adelaide - geosynclinal sediments. These sediments are regionally folded into broad synclines and anticlines. The Cambrian limestones occupy the synclinal and basinal areas. Varying degrees of faulting have taken place and in some areas diapirs have been "intruded" along zones of weakness.

MINERALISATION

The main types of mineralisation to be found to date in the Cambrian limestone have been willemite (Zn_2SiO_4) and galena. There are three known

occurrences of willemite in the North Flinders region; two are held by Electrolytic Zinc Industries at Beltana and Aroona and the third is within S. M. L. 290 at Third Plain. The main target of exploration within these S. M. L.'s is to detect the presence of another willemite body.

GEOCHEMISTRY

The stream sediment geochemistry in these S. M. L.'s was done by McPhar Geophysics Pty. Ltd. The area sampled was restricted to the Cambrian limestones and dolomites. Samples were taken at a density of about 20 to 25 per square mile over areas selected from previous stream sediment work. The samples were analysed for Cu, Pb and Zn by A. A. S. following 25% HNO_3 leach for 1 hour on 0.25 gm. sample of minus 80 mesh. Because of the large number of samples above the threshold value of 90 p.p.m. Zn suggested by Dr. P. R. Donovan of McPhar Geophysics Pty. Ltd., an arbitrary grading into first, second and third order anomalies was made by the writer. First order anomalies are from 90 to 249 p.p.m. Zn, second order anomalies are from 250 to 499 p.p.m. Zn and third order anomalies are those above 500 p.p.m. Zn.

S. M. L. 292 ANOMALY INVESTIGATIONS

There were only three slightly anomalous areas within S. M. L. 292.

The southernmost was indicated by stream sediment samples numbered 900020, 900034 and 900035.

Four samples were taken in this area to try to determine the cause of the anomalies. These samples were chip samples F17 and F18 and stream sediments F19 and F20.

The stream sediments were taken to make sure that the anomaly was downstream in the area of the chip samples. This proved to be correct with both stream sediments having 75 p.p.m. Zn.

The anomalous sample 900020 which has 98 p.p.m. Zn is adequately accounted for by chip sample F17 which contained 190 p.p.m. Zn. This rock type covers most of the catchment area above sample 900020.

Stream sediments 900034 and 900035 are probably both from the sample source as they drain the same beds.

Chip sample F18 which contains 3,300 p.p.m. Zn was from one of these beds upstream of the anomalous stream sediment samples so this adequately explains the anomalous stream sediments.

As the anomalous limestone area is of small extent, no further work on this anomaly is recommended.

The next anomaly north is almost in the centre of S.M.L. 292 and is indicated by stream sediment samples 900124 and 900126. These contained 90 p.p.m. Zn and 95 p.p.m. Zn respectively.

Four samples were taken to try to explain these two anomalous samples. The samples taken were F13 to F16. All samples were sufficiently high in zinc to explain the two anomalous stream sediment samples.

Sample F13 which contains 3,700 p.p.m. Zn is iron stone scree sample from the Ajax limestone-Parachilna Formation boundary and appears to adequately explain the 95 p.p.m. Zn stream sediment in sample 900126.

Chip sample F14 which contains 110 p.p.m. Zn is iron impregnated silcrete.

Sample F15 which contains 480 p.p.m. Zn is an iron rich limestone.

Sample F16 which contains 500 p.p.m. Zn is from a small patch of black manganese.

Any of the three samples F14 to F16 could explain the 90 p.p.m. in stream sediment value of sample 900126. However, the anomalous zinc area is small and not of a very high order and no further work is recommended on this anomaly.

The third anomaly in this S.M.L. is about 1 mile north of the second anomaly. This anomaly is from a single stream sediment sample number 900200 and contains 290 p.p.m. Zn. Four samples were taken in this area. The samples were F21 to F24.

Samples F21, F22 and F23 are chip samples.

Sample F24 is a stream sediment taken above the anomalous sample to try to determine the upper limit of the anomaly.

Sample F24 contained only 25 p.p.m. Zn which must be above the anomalous zone.

Sample F21 was from a patch of red crystalline dolomite but only contained 80 p.p.m. Zn so does not appear to be the cause of the anomaly.

Sample F22 contains 220 p.p.m. Zn but it is a sample of the iron manganese blow and this is downstream from the anomalous stream sediment so does not explain the anomaly.

Sample F23 which contains 25 p.p.m. Zn is a sample of a yellow-brown iron enriched dolomite. This does not appear to be the source of the anomaly.

It is probable that the source of the anomaly is rather obscure but close to the stream sediment sample location.

To find this source a few detail stream sediments should be taken and a few chip samples in the region of the anomalous sample. Once the cause of this anomaly has been found and if nothing of interest is brought to light, it is recommended that the area be relinquished.

S.M.L. 292 CONCLUSIONS

There is very little zinc enrichment of any part of the limestone in this S.M.L. and following the finding of the reason for the anomalous sample 900200, if nothing significant is found, it is recommended that the area be relinquished.

NORTH FLINDERS MINES N.L.

REPORT ON STREAM SEDIMENT ANOMALY INVESTIGATION IN S.M.L.'S 290, 292 AND 293

M. R. W. Garman, B.Sc.
Watts, Griffis & McOuat (Australia) Pty. Ltd.

Sydney
March 10, 1970

CONTENTS

This report refers also to areas outside S.M.L. 292
It has, therefore, been suitably edited.

SUMMARY

Methods of locating and delineating phosphate occurrences were investigated. These included the investigation of stream sediments analysed for P_2O_5 and the traversing of known deposits with a scintillometer.

Anomalous stream sediment samples were investigated and most were found to be adequately explained by lead and zinc rich limestones or iron blows containing absorbed lead and zinc.

INTRODUCTION

At the request of North Flinders Mines N.L., ten days were spent in the North Flinders Ranges between February 1 and 11, 1970. The purpose of the visit was to determine the phosphate potential of S.M.L.'s 290, 292 and 293 and to investigate the anomalous stream sediment samples in the Moro Spring area of S.M.L. 293.

P_2O_5 IN STREAM SEDIMENT SAMPLES

In an attempt to determine whether phosphate could be picked up directly by stream sediment sampling an area of S.M.L. 290, including the phosphate already located, was selected. The stream sediment samples from this area were analysed for P_2O_5. Apart from one sample, just below the actual phosphate deposit, which assayed 2.7% P_2O_5, a number of samples assayed between 1% and 1.5% P_2O_5. These were followed up in the field but no significantly phosphate-rich rocks were located. However, it was noted that the exposed edges of the rocks and weathered joint faces were phosphate rich.

One or more of three theories are thought to explain the high phosphate values in the stream sediment samples. The theories are:-

(i) That there is a concentration of finer P_2O_5 material which came from the weathered surfaces. The samples analysed were -80 mesh fraction.

(ii) That the rocks in the areas sampled mostly contain between 1% and 2% P_2O_5 and, therefore, the stream values are much the same as the rock values. This appears rather doubtful as not many rocks tested with vanado-molybdate solution gave a positive reaction and a rock with 1% P_2O_5 would give a positive reaction.

(iii) The P_2O_5 is being instantly fixed on the stream sediment grains when it is washed from the rocks by the rain storms. This would cause a concentration in the stream sediments, possibly to an even greater percentage than in the rocks.

CONCLUSIONS

It is considered that there is a potential for phosphate deposits in the Cambrian limestones in S.M.L.'s 290, 292 and 293, and a method of exploration will have to be determined which can be used to investigate the Cambrian limestones in these areas. It appears that direct analysis for P_2O_5 of stream sediments may not be a suitable technique. However, the technique should be tried over a larger area than has been investigated thus far before any decision is made.

Most of the anomalies in the Moro Spring area were satisfactorily explained as being due to either zinc-rich limestones, or ironstone blows and joint fillings containing absorbed zinc and lead. The anomalies that have not been satisfactorily explained are to be re-investigated.

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CABLE
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TELEX
"PHARGEO" AA82623

JR

MEMORANDUM TO: NORTH FLINDERS MINES N.L. AND STURTS MEADOWS PROSPECTING SYNDICATE N.L.

MEMORANDUM FROM: DR. P.R. DONOVAN, McPHAR GEOPHYSICS PTY. LTD.

SUBJECT: STREAM SEDIMENT RECONNAISSANCE SURVEY, NUCCALEENA JOINT VENTURE AREA (PART OF S.M.L. 292), SOUTH AUSTRALIA.

DATE: 23RD JULY, 1970.

INTRODUCTION

This area of approximately 36 square miles was covered almost entirely by stream sediment sampling with the exception of approximately 2 square miles on the northern edge of the Parachilna Sheet and a small stream system on the NE corner of the area, which remain to be sampled.

In all 497 samples were collected, giving a sample density of approximately 14.6 samples per square mile.

ANALYSIS

All samples were sieved to minus 80-mesh, and this material analysed by AAS for Cu, Pb and Zn following a hot 25% HNO_3 leach on 0.25 g. sample.

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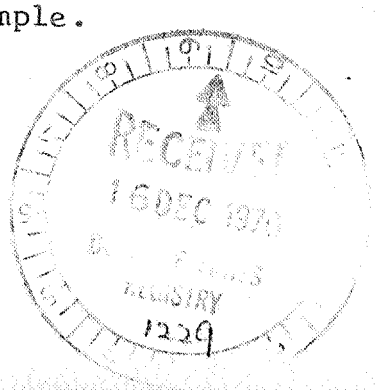

The results are given in Batches G2226, G2248, G2333 and G2563 dated 22/4/70, 28/4/70, 15/5/70 and 2/7/70.

RESULTS

The sample locations and metal values are plotted on Dwgs. G2054A - 2057A.

Copper

Copper values ranged from 5 - 140 ppm. The threshold value was set at 35 ppm. There was a group of anomalous values (samples 1300, 1326, 1464) around an unnamed copper mining area in the eastern half of the area.

A feature of the work was that neither the Nuccaleena Cu mine nor copper mine A were picked up by the sampling due to their proximity to large creeks.

Copper mine B, however, should have been picked up in sample 1880.

Lead

Lead values ranged from - 20 to 35 ppm. None of these are considered to be anomalous.

Zinc

Zinc values ranged from 10 to 80 ppm. None of these are considered to be anomalous.

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RECOMMENDATIONS

A geologist/geochemist should visit the eastern Cu area for sketch mapping and assessment of its economic potential.

During this visit the Cu occurrences at A and B should also be visited and the reasons for their non-detection established.

For sake of completeness the two small unsampled areas in the NE and SW corners should be finished by the crew presently sampling S.M.L. 292 for North Flinders Mines. It is due to the fact that the Nuccaleena area was excised out of a larger sampling programme that these were not sampled in the first place.

If the above steps do not produce any encouragement, the joint venture activity will then be restricted to the area of the Nuccaleena Mine.

Signed
McPHAR GEOPHYSICS PTY. LTD.

P.R. DONOVAN Ph.D.

c.c. North Flinders (1) Sturts Meadows (1)
Files

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CABLE "PHARGEO" ADELAIDE
TELEX "PHARGEO" AA82668

JR

MEMORANDUM TO: SURPRISE MEADOWS PROSPECTING SYNDICATE N.L.
NORTH FLINDERS MINES N.L.

MEMORANDUM FROM: [illegible] SNIDER,
[illegible] GEOPHYSICS PTY. LTD.

SUBJECT: GEOCHEMICAL FOLLOW-UP, NUCCALEENA MINE AREA, S.M.L. 292.

DATE: 9TH OCTOBER, 1970.

INTRODUCTION

Following the completion of the stream sediment reconnaissance survey, the writer was requested to assess the mineralisation within the lease in the manner suggested by Dr. F.R. Donovan in his memorandum of July 2nd summarizing the results of the geochemistry.

SURVEY.

"Mine A" is situated in a small diapiric intrusion. The rocks, mainly quartzites and [illegible] are characteristically shattered and [illegible] extensively mineralised, in fact to the [illegible] "super mine" was seen. It is highly probable that copper mineralisation exists at the site but if it is confined to such a small area as to be undetectable, it is not likely to present particularly good prospects for further exploration.

/....2

At "Mine B", two shafts were found along with a number of pits. The more northerly of the two shafts is situated in the nose of a small fold. A pattern of minor shears associated with the fold have become filled with quartz and minor copper mineralisation. Malachite is the principal copper mineral present but chalcocite and a little chalcopyrite are also found.

The more southerly shaft is set in a 400' long quartz reef which is sporadically and weakly mineralised. The reef is generally quite narrow and would not exceed 4' in width. The reef is controlled by a minor flexure.

Considering the low grade of the material ($< 1\%$) and the small size of the controlling geological features, these do not present encouraging pictures for further work.

In the eastern part of the area, a third copper mine had been located. Unfortunately poor light prevented a thorough examination but from what was observed and from that which can be inferred from the data available, the mine is similar in most respects to those mentioned earlier in the report.

RECOMMENDATIONS

From the observations made, it would appear that the Nuccaleena mine holds the most promise as an exploration prospect. A more thorough examination of the last of the mines visited will be made as soon as practical.

It is suggested before any survey work be attempted, the Nuccaleena area should be gridded. A base line should be set out along the line of lode and cross lines pegged every 200' along it. The interval between pegs should be no more than 200' and the lines should extend at least 1000' either side of the base line and preferably 2,200'. All known mineralisation should fall well inside the grid area.

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Having established the grid, soil geochemistry could be carried out over it at very little cost and could provide useful information away from the mine area. Contamination will have to be minimised to obtain useful results.

An induced polarization survey should then be carried out. Geological mapping at a large scale would allow the most promising of the anomalies to be selected for drilling.

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R.W. FIDLER
GEOLOGIST

McPHAR GEOPHYSICS PTY. LTD.

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MEMORANDUM TO: NORTH FLINDERS MINES N.L.

MEMORANDUM FROM: DR. P.R. DONOVAN, McPHAR GEOPHYSICS PTY. LTD.

SUBJECT: STREAM SEDIMENT RECONNAISSANCE SURVEY, NILPENA AREA, S.M.L. 292, SOUTH AUSTRALIA.

DATE: 12TH NOVEMBER, 1970.

INTRODUCTION

S.M.L. 292, in the central Flinders Ranges, comprises approximately 442 square miles. It was named the Nilpena by the S.A. Mines Department, although the Railway Station of that name lies just outside the western boundary of the area.

Two areas of S.M.L. 292 have already been covered by small stream sediment reconnaissance programmes by North Flinders Mines:

(1) Parachilna area (10 square miles). See memorandum by writer dated October 16th, 1969.

(2) Nuccaleena Joint Venture (36 square miles). See memorandum by writer dated July 23rd 1970.

The present programme covers the remainder of the S.M.L. apart from the western fringe of Quaternary deposits - a total of approximately 376 square miles. A total of 5161 samples were collected, yielding a sample density of approximately 13.7 samples per square mile.

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PREVIOUS GEOCHEMICAL RECONNAISSANCE WORK

There have been several episodes of stream sediment reconnaissance by other exploration companies in parts of the area covered by S.M.L. 292.

(1) Anaconda Australia Inc. (S.M.L. 113) sampled selected parts of the Beltana and Copley Sheet areas now covered by S.M.L. 292. They located copper and zinc anomalies west of Patawarta Hill which have been confirmed and expanded by North Flinders present programme (see below). Judging by the levels of metal values, Anaconda appear to have used two different analytical methods in their programme.

(2) C.R.A. Exploration Pty. Limited sampled part of the Cadnia Sheet under their S.M.L. 202 in 1967-1968 (Area C). This work has already been commented on by the writer (Memorandum dated October 21st, 1969). A few anomalous Zn values were located near Narina Spring on the eastern side of the S.M.L. and their location is shown on DWG. G.C. 4091A (See below under zinc).

(3) The S.A. Mines Department (P.J. Binks, Mining Review 128, p. 86-90) carried out a drainage survey of the Blinman Dome Diapir in October and November 1967. Samples were sieved to minus 80-mesh (following an orientation survey) and analysed for Cu, Pb, Zn, Ni and Co.

It is interesting to note that the thresholds calculated by the Mines Department were as follows:

Cu 50 ppm, Pb 30 ppm, Zn 45 ppm, Co 25 ppm and Ni 35 ppm.

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The thresholds for Pb and Zn are considered to be unrealistically low by the writer.

The analysis was by AAS but the leach (not mentioned in the paper) was probably hot perchloric acid. This tends to give slightly higher values than hot 25% HNO_3 but the contrast is approximately the same. Only Cu anomalies were found within the S.M.L. 292 area (See below under copper). Using higher thresholds for Pb and Zn (80 and 100 ppm) no anomalies were found in these metals.

ANALYSIS

All samples were sieved to minus 80-mesh and analysed for Cu, Pb and Zn following a hot 25% HNO_3 leach on 0.25 g. sample.

The results are given in the following batches:

280001 - 1050	G 2126	6 - 4 - 1970
281051 - 1375	G 2226	22 - 4 - 1970
281376 - 1442	G 2248	28 - 4 - 1970
281443 - 1816	G 2333	15 - 5 - 1970
281817 - 1894	G 2563	2 - 7 - 1970
281895 - 2577	CH 0156	5 - 8 - 1970
282578 - 3027	CH 0201	10 - 8 - 1970
283028 - 3925	CH 0252	27 - 8 - 1970
283926 - 3950	CH 0277	31 - 8 - 1970
283951 - 3975	CH 0252	27 - 8 - 1970
283976 - 4375	CH 0277	31 - 8 - 1970
284376 - 4400	CH 0387	11 - 9 - 1970
284401 - 4500	CH 0277	31 - 8 - 1970
284501 - 4550	CH 0387	11 - 9 - 1970
284551 - 4600	CH 0277	31 - 8 - 1970
284601 - 4650	CH 0325	3 - 9 - 1970
284651 - 4725	CH 0277	31 - 8 - 1970
284726 - 4925	CH 0325	3 - 9 - 1970
284926 - 4950	CH 0387	11 - 9 - 1970
284951 - 5000	CH 0325	3 - 9 - 1970
285001 - 5601	CH 0387	11 - 9 - 1970

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In addition, 20 samples, in which there was insufficient minus 80-mesh material for analysis, were sieved to minus 40-mesh and pulverized prior to analysis as above. (Batch CH 0783). Their values are distinguished on the metal maps by circles.

RESULTS

The sample locations and metal values are shown on DWGs. G.C. 4088A - 4091A.

Copper (DWG. G.C. 4089A)

Values ranged from 2 - 400 ppm.

A value of 35 ppm was selected as threshold. In all there were 37 anomalous samples, of which 28 were possibly anomalous (35 - 65 ppm), 5 were probably anomalous (70 - 105 ppm) and 4 were definitely anomalous (110 ppm and above).

Beltana Sheet

There were two possible anomalies in adjacent creeks, 281145 and 281146, just south of Walter's Well. These are underlain by the Enorama Shale.

Cadnia Sheet

There is a large zone of copper anomalies including definite and probable anomalies between Melbourne Well and Patawarta Hill. However the geological explanation for this zone, according to the published Cadnia Sheet, is not simple. The Lady Lehman Copper mine, not shown on this sheet, although within this zone, appears not to give rise to an anomalous value. However there are other anomalous values within this diapir. The remaining anomalous streams in this zone drain Marinoan sediments of various lithologies. Some of the copper could be related to the cupriferous Wearing Dolomite Member of the Bunyeroo Formation, which has not been distinguished in the geological mapping on this sheet. Near Patawarta Hill sample 283183 is also anomalous in Zn, and there is a zone of Zn anomalies running E-W to the south of the copper zone.

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The maximum Cu value in this zone was 400 ppm (283257). This sample is also anomalous in Zn (160 ppm). Anaconda located twelve Cu anomalies within this zone, and these coincide exactly with NFM's anomalies. Anaconda, however, did not sample near Patawarta Hill (See DWG. G.C. 4089A).

Apart from this the only Cu anomaly on this sheet is 284587 (65 ppm) which lies approximately 3 miles west of Dunbar Well, also within the Marinoan Sediments.

Parachilna Sheet

There were no Cu anomalies within the area sampled on this sheet.

Blinman Sheet

There were a number of known old copper mines within this sheet, as well as several known occurrences. Of the mines, the Wheal Butler, The Ivy Queen and the Mt. Mary Mines showed anomalous Cu values in their vicinity, but the Ladder and Oratunga and "Mt. Elkington" mines did not show up.

Of the twelve copper occurrences shown within and around the Blinman diapir on the one mile geologic sheet and on Binks' map, only three gave anomalous values. However within the diapir there are four anomalous values that have no known source at this stage (280107, 280203, 280213 and 280990).

It is interesting to note that the S.A. Mines Department also failed to detect nine of the known occurrences in this area. Two of their successes were in creeks where NFM obtained background values. The Mines Department also located two Cu anomalies near Mt. Elkington which were not detected during the current survey.

It is thought that many of the mapped occurrences are just small areas of malachite staining, located in an area of intensive geologic and geochemical investigations.

Apart from the areas mentioned above there are a number of one-sample anomalies:

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282862 (45 ppm) is within the Oratunga diapir.

282610 (200 ppm) a definite anomaly, occurs within the Etina Formation.

283240 (40 ppm) occurs approximately one mile southwest of Mt. Lucius, ½ mile along strike from a Cu occurrence in the Wearing Dolomite Member of the Bunyeroo Formation.

280008 (80 ppm) and 280020 (50 ppm) occur just west of the Ango Cu Mine in the SE corner of the S.M.L. within the Angorichina diapir.

C.R.A. obtained no anomalous Cu values in the area sampled by them.

Lead (DWG. G.C. 4090A)

Values ranged from < 20 to 140 ppm.

A threshold value of 60 ppm was selected. There were seven anomalous values of which six were possibly anomalous (60 - 115 ppm) and one was probably anomalous (120 - 175 ppm). There were no definite anomalies.

There were no anomalies on the Beltana or Parachilna Sheets.

On the Cadnia Sheet sample 285446, the probable anomaly (140 ppm) is located near an E-W fault within the Marinoan sequence in the NE corner of the S.M.L. Sample 283172 (60 ppm), in the Patawarta zone, is also anomalous in Zn (250 ppm).

Sample 285347 (60 ppm) is within the Marinoan.

Sample 284965 (75 ppm) is within the Sturtian near Mt. Stuart in the vicinity of a diapir. Sample 284398 (60 ppm on minus 40-mesh) is within the Marinoan near a NE-SW fault associated with diapiricism.

On the Blinman Sheet sample 282711 (60 ppm) is below the Wepowie lead mine. There are several other occurrences shown in this vicinity. Sample 280404, which is also anomalous in Zn (150 ppm) is also located near a E-W fault in the Marinoan.

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It should be noted that there is a possible lead occurrence approximately 3 miles west of the Wheal Butler which did not give rise to an anomaly. The Ivy Queen mine also reputedly yielded lead and silver ores, but this was also not detected.

Neither Anaconda nor C.R.A. located any Pb values of over 100 ppm in the areas sampled by them.

Zinc (DWG. G.C. 4091A)

Values ranged from 10 to 250 ppm.

A value of 90 ppm was selected as threshold. In all there were 29 anomalous values, of which 26 were possibly anomalous (90 - 175 ppm) and 3 were probably anomalous (180 - 265 ppm). There were no definite anomalies.

There is no known zinc mineralisation within the S.M.L. at this stage.

Beltana Sheet

There was one possible anomaly 281103 (90 ppm) located within the Brachina Formation.

Cadnia Sheet

The anomalies on this sheet may be subdivided into those within the Cambrian (carbonate) sequence and those in older rocks.

In the Cambrian, sampling by NFM generally verified the anomalies discovered by C.R.A., but additional anomalous creeks were found. Most of these were within the lower unit - the Wilkawillina Limestone - but one, 283889 appears to have its source within the Parara Limestone.

The maximum value within the Wilkawillina Limestone was 240 ppm.

The anomalous copper-zinc zone between Melbourne Well and Patawarta Hill has already been referred to. Anaconda also located four Zn anomalies in this zone which were not found by N.F.M. due to non-sampling in part.

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Apart from this there were three one-sample anomalies (in the same stratigraphic position, i.e. within the Marinoan just below the Pound Quartzite). These are samples 285592 (150 ppm), 285456 (220 ppm) and 284364 (170 ppm).

Blinman Sheet

There is a group of 3 possible anomalies (281976, 281979 and 281980) northeast of the Ladder Cu Mine. The source lies within the Tapley Hill Formation and the Wockera-wirra Dolomite.

Samples 280836* (90 ppm) and 280839* (95 ppm) lie within the Etina Formation within a zone of NE-SW faulting.

Sample 280404 also lies within this zone of faulting and has been mentioned under Pb above.

Sample 282610* (150 ppm) also occurs within the Etina Formation but there is no faulting known at this location.

The values marked with an asterisk above were not checked by reanalysis due to mislaid samples.

Parachilna Sheet

There were no Zn anomalies on this sheet.

CONCLUSIONS

All the area of S.M.L. 292 which is amenable to the stream sediment reconnaissance survey technique has now been tested, and areas of interest defined for follow-up work.

The most impressive anomalous copper area is that around the Lady Lehman Mine between Melbourne Well and Patawarta Hill. This has a strike length of approximately four miles. The associated zinc anomaly in this area is intriguing.

There are several zinc anomalies within the Wilkawillina Limestone near Narina Spring which may be related to willemite mineralisation, but there is known faulting in these areas at present.

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There are a number of smaller copper and zinc anomalies to be followed-up as well as several one-sample anomalies in copper, lead or zinc.

Most of the area of S.M.L. 292 is of no further interest in the search for base metals, however, and large tracts may be dropped in the near future.

RECOMMENDATIONS

1. The main copper-zinc anomaly between Patawarta Hill and Melbourne Well should be investigated by detailed sediment sampling and geologic mapping. The two Anaconda Cu anomalies should be followed up at the same time.

2. The zone of copper anomalies (both N.F.M. and Mines Department) and copper occurrences in and around the Blinman diapir should be investigated by detailed sediment sampling and geologic mapping. The reason for non-detection of many of the known occurrences, including "Mt. Elkington" should be investigated, particularly by size analysis.

3. The following copper anomalies should be followed up by 100 foot sediment sampling to the heads of creeks: 280008, 280020, 281145, 281146, 282610, 282862, 283240 and 284587.

4. The reason for non-detection of the Ladder and Oratunga Cu mines should be established.

5. The economic potential of the known mines should be reappraised by North Flinders Mines N.L. There have been investigations by other exploration companies at the Lady Lehman and Ivy Queen mines within the last five years.

6. The Wepowie Pb mine(s) and the Mn-Pb (?) occurrence 3 miles west of the Wheal ~~Turner~~ BUTLER (P.R.D) should be investigated for their economic potential. The reason for the non-detection of the latter, and also of the Ivy Queen mine, should be investigated by a geochemist.

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7. The following five one-sample Pb anomalies should be initially followed-up by 100 foot samples to the head of the creek: 285446, 285347, 284965, 284398, 280404.

8. The following eight anomalous Zn samples should be tested by HM separation and willemite sought by microscopic study: 283585, 283588, 283815, 283871, 283883, 283887, 283889, 283893.

9. The following isolated Zn anomalies should be followed-up by 100' sampling to the head of the creek: 280836, 280839, 281103, 281976, 281979, 281980, 282610, 284364, 285456 and 285592.

SIGNED
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P.R. DONOVAN Ph.D.

McPHAR GEOPHYSICS PTY. LTD.

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MEMORANDUM TO: NORTH FLINDERS MINES N.L.
MEMORANDUM FROM: DR. P.R. DONOVAN, McPHAR GEOPHYSICS PTY. LTD.
SUBJECT: FOLLOW-UP SEDIMENT SURVEY, NILPENA AREA, S.M.L. 292, SOUTH AUSTRALIA
DATE: 20TH JANUARY, 1971

INTRODUCTION

A McPhar crew, led by Mr. G. Rogers, carried out part of the follow-up contained in the recommendations in the writer's memorandum on this area dated 12th November, 1970.

Recommendations (3), (7) and (9) together with the detailed sediment sampling of recommendation (1) were carried out.

RESULTS

The analytical results are given in Batch CH 1267 (6/1/71) and are presented on two sets of maps. Dwgs. G.C. 4110A - 4113A show the sample locations and Cu, Pb and Zn values for the individual anomalies, and Dwgs. G.C. 2077A - 2080A show the detailed sampling around the Lady Lehman Mine area (previously referred to as the Patawarta Hill - Melbourne Well area).

INDIVIDUAL ANOMALIES

Copper (Dwg. G.C. 4111A)

Of the eight copper anomalies followed-up, two were not substantiated (282610 and 283240).

Anomaly 284578 led to the rediscovery of an old copper mine, probably the Warrioota Mine (Mines of S.A., p. 145), and specimens collected here showed up to 20 percent Cu.

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4.

Anomalies 281145 and 281146 were both confirmed and the sources appear to occur at the top of each drainage with a possible third source near the bottom of creek 281145. Three probable and one definite anomaly were obtained.

Anomaly 282862 was confirmed with a spread of possibly anomalous values.

Anomaly 280008 became definitely anomalous with a value of 240 ppm at the head of drainage and a further probable anomaly in another tributary.

Anomaly 280020 showed two sources, one probably anomalous on a tributary and one possibly anomalous at the head of the creek.

Lead (Dwg. G.C. 4112A)

Three of the five one-sample anomalies were not substantiated, namely 280404, 284398 and 285446.

Anomaly 284965, near Mt. Stuart, gave a sharp cut-off above a definite anomaly of 370 ppm Pb.

Anomaly 285347 also gave a sharp cut-off above a definite anomaly of 230 ppm Pb.

Both these sources should be easy to locate.

These results show once again the very limited length of dispersion trains of Pb that have been observed in other areas of the Flinders ranges, namely in the order of a few hundred feet. This problem should be further investigated by the geochemist who follows up these anomalies, particularly by size analysis and heavy mineral separation.

Zinc (Dwg. G.C. 4113A)

Of the eleven original one-sample anomalies that were followed up, eight were not substantiated. Of these only one (285456) was probably anomalous originally (180 - 265 ppm), the others all being possibly anomalous (90 - 175 ppm).

The group of three anomalies near the Ladder Mine were all confirmed with possibly anomalous values occurring throughout all three creeks, but only one value becoming probably anomalous (in creek 281976). The source appears to be a Zn-rich bed within either the Tapley Hill formation and/or the Wockerawirra

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Dolomite, but the anomalies could possibly be due to a phosphate horizon or some other source.

LADY LEHMAN MINE AREA

In all 167 follow-up samples were collected in this area and analysed for Cu, Pb and Zn (Dwgs. G.C. 2077A - 2080A).

The Lady Lehman mine was slightly out of position on the original reconnaissance map and it is not shown at all on the Cadnia 1 mile geologic sheets. The correct location is shown on the follow-up maps.

Without going into detail, it may be simply stated that copper is widespread throughout the area. Nine copper diggings were located apart from the Lady Lehman mine, together with six copper occurrences, four in the creeks.

The original possible Pb anomaly (283172) in the area was not confirmed but two additional Pb anomalies were located, a one-sample possible anomaly near the Lady Lehman mine and a cluster of possible anomalies leading to a definite anomaly one mile east of the mine.

Zn anomalies fall into three groups, the first near the Lady Lehman mine, the second corresponding to the definite Pb anomaly mentioned above, and the third west of Patawarta Hill. The latter is apparently unrelated to Cu anomalies and there are no anomalous Pb values in this area.

CONCLUSIONS

The follow-up survey has indicated that there are some anomalies which require further detailed work by a geologist-geochemist. One copper mine was rediscovered. The Lady Lehman mine area has developed into an interesting exploration target principally for Cu, but with some interest for Pb and Zn.

RECOMMENDATIONS

1. The Warrioota Mine area requires evaluation and mapping by a geologist. A soil survey should be considered.

2. Copper anomalies 281145, 281146, 282862, 280008 and 280020 should be sketch-mapped on aerial photographs by a geologist-geochemist and further developed.

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3. Lead anomalies 284965 and 285347 should be dealt with in the same way.

4. Zinc anomalies 281976, 281979 and 281980 should be dealt with in the same way.

5. The Lady Lehman mine area should be mapped initially at 1" = 1000 feet on aerial photographs before a decision on gridding the area for further detailed geochemical, geological and geophysical work is made.

SIGNED

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P.R. DONOVAN, Ph.D., M.A.E.G.

c.c. North Flinders Mines N.L. (2)

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50

Mr. B. Wilson,
North Flinders Mines N.L.,
25 Greenhill Road,
WAYVILLE, S.A. 5034.

25th January, 1971

Dear Bruce,

As suggested by Peter last Thursday, I checked the heavy mineral concentrates with a U.V. light. None of the samples in which the presence of willemite was not either suspected or observed contained any quantity of fluorescent grains. In sample 917123, in which willemite had been positively identified, numerous fluorescent grains were observed. A somewhat weaker fluorescence was found in sample 900034 in which willemite was probably present.

The fluorescence was not greatly dependent on which of the two available wavelengths was used and was a creamy colour rather than the typical green fluorescence of willemite, indicating that secondary minerals were probably responsible.

As the mineral concentrates were calcite free, it is not possible to evaluate the usefulness of U.V. work under field conditions from these results; however it may provide a method of confirming suspected zinc mineralization in future concentrates.

Yours sincerely,
McPHAR GEOPHYSICS PTY. LTD.

R.W. Fidler

R.W. FIDLER
GEOLOGIST

c.c. Dr. P.R. Donovan
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JMP

51

Mr. B. Wilson,
North Flinders Mines N.L.,
25 Greenhill Road,
WAYVILLE. 5034.

20th January 1971

Dear Bruce,

Following the receipt of the results of heavy mineral separation and microscopic examination of the anomalous Zn values from our mineralogy department, (Mineralogical Report No. 413 by D. McColl), I am adding my own observations. Previous correspondence on this matter may be found in my letters of 24th June and 28th July, 1970.

It should be noted that the HM separations were carried out on the -20 +80-inch fraction only. On the next batch of work on S.M.L. 290, we will try HM separation on the mms 20-mesh fraction, i.e. the minus 80-mesh fraction will be recombined with the sample.

S.M.L. 292 - PARACHILNA AREA.

Samples 900034 and 90035 possibly contained willemite. These samples were only possibly anomalous (90 and 110 ppm). More detailed sampling of sediments, soils and rocks should take

place in this area. I assume that Mike Garman has reported on the digging near sample 900200 which gave 290 ppm Zn but was not examined microscopically.

S.M.L. 290 - WIRREALPA AREA.

1. E - W Strip.

No willemite was seen in the 7 samples investigated.

2. Zone A.

No willemite was seen in the 14 samples investigated.

3. Zone B.

In the samples investigated one possibly contained willemite, namely 900806 (1000 ppm). Another (900732 - 530 ppm) contained a manganese mineral. These should be followed up in the field.

4. Isolated Anomalies.

Anomaly 1754 possibly showed a trace of willemite in sample 1754/1 that gave only 110 ppm Zn on the minus 80-mesh fraction.

Anomaly 1970-1971 showed possible willemite in sample 1971/13. This should be followed up in the field. The highest Zn values (e.g. 1970/27 - 600 ppm) were negative.

Anomalies 1766, 1783 and 1910 showed no signs of willemite, although 1910/3 did show a manganese mineral.

Anomaly 1796 was not tested due to missing samples, and 1783/23, the highest Zn value in 1783, was not tested for the same reason. This sample could be important as it is in a different creek system to the other 1783 samples submitted.

S.M.L. 293 - MORO SPRINGS AREA

Sample 917123, north of Moro Springs, showed willemite although the sample was originally only possibly anomalous on the minus 80-mesh fractions.

Sample 917029 showed possible willemite against an original value of 120 ppm Zn on the minus 80-mesh fraction.

These should both be followed up in the field.

The remaining 18 samples showed no willemite.

GENERAL OBSERVATIONS

All the samples contained limonite. This could have been further subdivided into two types:

(1) Pseudomorphs after pyrite

(2) Indeterminate iron-rich non-magnetic material.

All samples contained some limonite.

The maghemite, according to D. McColl, is probably due to Tertiary weathering. It is strongly magnetic.

Ferrocrete is also due to Tertiary weathering. It consists of aggregations of material cemented by iron.

Haematite may have several origins, amongst them primary specular haematite.

Obviously the non-recognition of willemite in a sample does not rule out the possibility that it may be present in the creek system, nor does it rule out the possibility of sulphide deposits either of Zn or other types.

Yours sincerely,

McPHAR GEOPHYSICS PTY. LTD.

P.R. DONOVAN.
Ph.D. M.A.E.G.

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bl

15th January 1971.

MINERALOGICAL REPORT NO. 413

by D.H.McColl

TO: Dr. P. Donovan,
on behalf of North Flinders Mines, N.L.,
23 Greenhill Road,
WAYVILLE. S.A. 5034

YOUR REFERENCE: Memorandum of 10/12/70
Letter to B. Wilson 28/7/70

MATERIAL: Soil samples with anomalous zinc content.

IDENTIFICATION NUMBERS:

900020	900604	900944	917019	917123
900034	900612	900948	917022	917128
900035	900659	900950	917024	917142
900126	900676	900967	917025	917187
900421	900682	901754/1	917028	
900425	900728	901766/6	917029	
900431	900732	901783/4	917033	
900432	900741	901783/8	917034	
900435	900743	901783/17	917038	
900442	900747	901910/3	917052	
900451	900756	901970/14	917053	
900499	900801	901970/19	917055	
900506				
900508	900806	901970/26	917065	
900524	900811	901970/27	917090	
900526	900852	901971/6	917118	
900577	900866	901971/13	917121	

Numbers: 900124, 900466, 900625, 900979, 900995, 901783/23, 901796/11, 901796/13 did not arrive with the above samples.

WORK REQUESTED: Washing, sieving, heavy mineral separation and mineralogical inspection of heavy fraction for willemite or other zincian components.

SAMPLES: Held pending your further advice.

D.H. McColl
Signed

Number	Components observed in heavy fraction (in order of abundance)
900020	limonite, maghemite, haematite, ferrocrete, ferruginous quartz, dolomite.
900034	zircon, limonite, tourmaline, ferrocrete, trace willemite (?)
900035	zircon, limonite, ferrocrete, trace willemite(?)
900126	zircon, limonite, ferrocrete, haematite, tourmaline.
900421	ferrocrete, limonite, haematite, zircon.
900425	ferrocrete, limonite, haematite, zircon, maghemite.
900431	limonite, ferrocrete, haematite, maghemite.
900432	limonite, maghemite, haematite, ferrocrete.
900435	limonite, maghemite, haematite, ferrocrete, dolomite (or magnesite).
900442	zircon, ferrocrete, limonite, topaz (?).
900451	maghemite, limonite, ferrocrete, haematite, zircon.
900499	limonite, maghemite, ferrocrete, haematite, zircon.
900506	limonite, ferrocrete, maghemite.
900508	maghemite, limonite, ferrocrete, zircon.
900524	ferrocrete, limonite, maghemite, haematite, zircon, amphibole.
900526	ferrocrete, limonite, maghemite, haematite, zircon.
900577	limonite, ferrocrete, maghemite, haematite.
900604	ferrocrete, limonite, maghemite, haematite.
900612	limonite, maghemite, ferrocrete, haematite, zircon.
900659	limonite, ferrocrete, maghemite, dolomite (or magnesite
900676	limonite, ferrocrete, maghemite, zircon.
900682	limonite, ferrocrete, maghemite, haematite, dolomite (or magnesite), zircon.
900728	limonite, ferrocrete, maghemite, zircon.
900732	pyrolusite (or similar Manganese mineral), ferrocrete, limonite.
900741	maghemite, limonite, ferrocrete, zircon.
900743	limonite, maghemite, zircon, ferrocrete.
900747	limonite, maghemite, zircon, ferrocrete.

900756	limonite, maghemite, haematite, ferrocrete, zircon.
900801	pyrolusite, limonite, maghemite, ferrocrete, hae...
900806	limonite, ferrocrete, maghemite, pyrolusite (?), haematite, trace willemite (?).
900811	ferrocrete, limonite, dolomite (or magnesite), maghemite, zircon.
900852	limonite, ferrocrete, maghemite, haematite.
900866	ferrocrete, limonite, maghemite, haematite, zircon.
900944	ferrocrete, limonite, maghemite, haematite, dolomite (or magnesite), zircon.
900948	limonite, maghemite, ferrocrete, haematite, zircon.
900950	ferrocrete, limonite, maghemite, haematite, zircon.
900967	ferrocrete, limonite, maghemite, haematite, zircon.
901754/1	ferrocrete, maghemite, limonite, haematite, zircon, trace willemite (?).
901766/6	limonite, maghemite, zircon, ferrocrete, dolomite (or magnesite).
901783/4	limonite, ferrocrete, maghemite, zircon.
901783/8	ferrocrete, limonite, maghemite, zircon.
901783/17	ferrocrete (manganiferous?) limonite, maghemite, zircon
901910/3	pyrolusite, limonite, haematite, maghemite.
901970/14	ferrocrete, limonite, pyrolusite, maghemite, zircon.
901970/19	limonite, ferrocrete, maghemite, haematite.
901970/26	limonite, ferrocrete, maghemite, zircon, barite (?).
901970/27	limonite, ferrocrete, maghemite, zircon.
901971/6	limonite, ferrocrete, maghemite, haematite, zircon.
901971/13	limonite, ferrocrete, haematite, maghemite, zircon, trace (willemite (?).

Number	Heavy Minerals SG > 2.96	Fraction (in order of abundance)
917019	2.89	ferrocrete, limonite, haematite, calcrete, maghemite.
917022	3.60	limonite, ferrocrete, haematite, maghemite.
917024	0.11	limonite, maghemite, ferrocrete, calcrete, haematite.
917025	0.01	limonite, haematite, rhodocrosite(?), ferrocrete.
917028	1.91	limonite, maghemite, ferrocrete, calcrete (?).
917029	0.09	limonite, maghemite, calcrete(?), amphibole, willemite (?).
917033	0.06	limonite, maghemite, ferrocrete, calcrete (?), haematite.
917034	0.54	limonite, ferrocrete, calcrete, haematite.
917038	1.25	limonite (after pyrite), haematite, maghemite, zircon (?), ferrocrete.
917052	0.04	limonite, haematite, argillaceous ferrocretes.
917053	5.70	limonite, ferrocrete, maghemite, calcre
917055	18.80	manganiferous limonite, ferrocrete, haematite, maghemite, calcrete.
917065	1.06	ferrocrete, limonite, haematite.
917090	1.12	limonite, ferrocrete, haematite, maghemite, calcrete.
917118	0.09	limonite, haematite, ferrocrete, maghemite, calcrete (?).
917121	3.20	limonite, haematite, maghemite, ferrocrete, calcrete (?).
917123	0.06	limonite, haematite, calcrete (?), willemite, ferrocrete.
917128	0.09	limonite, haematite, maghemite, calcrete, ferrocrete.
917142	1.10	limonite, haematite, minor maghemite ferrocrete.
917187	1.01	limonite, haematite, maghemite, ferrocrete, zircon (?), mica.

FINAL SUMMARY EXPLORATION REPORT

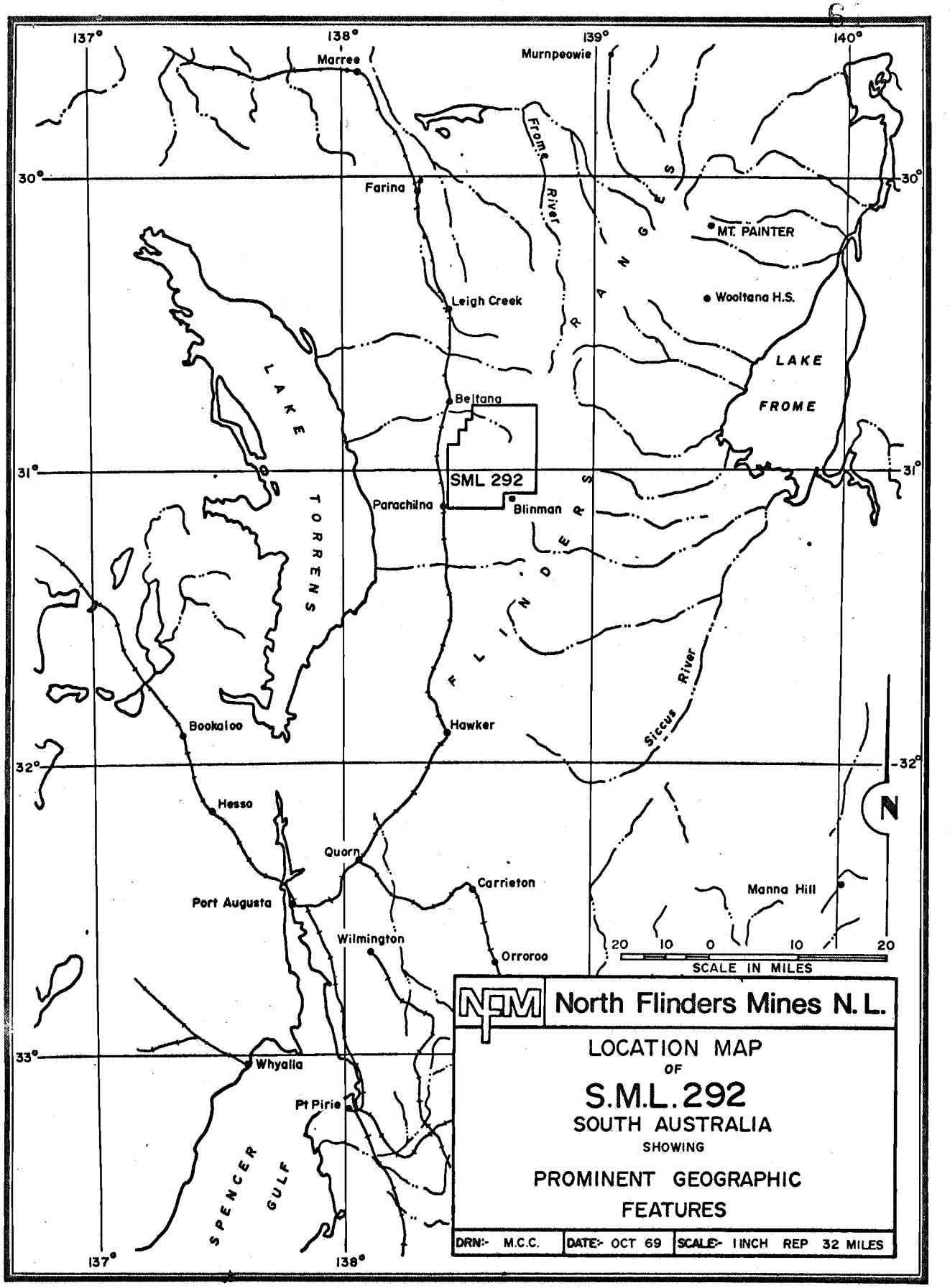
S.M.L. 292

FLINDERS RANGE S.A.

by R.B. WILSON

NORTH FLINDERS MINES N.L.

CONTENTS:


137°
138°
139°
140°
30°
31°
32°
33°
Marree
Murnpeowie
Farina
Frome River
FLINDERS RANGES
MT. PAINTER
Wooltana H.S.
Leigh Creek
LAKE FROME
Beltana
LAKE TORRENS
SML 292
Parachilna
Blinman
FLINDERS
Siccus River
Bookaloo
Hawker
Hesso
Quorn
Carrieton
Port Augusta
Manna Hill
Wilmington
Orroroo
Whyalla
Pt Pirie
SPENCER GULF
N
20 10 0 10 20
SCALE IN MILES
NFM North Flinders Mines N.L.
LOCATION MAP
OF
S.M.L. 292
SOUTH AUSTRALIA
SHOWING
PROMINENT GEOGRAPHIC
FEATURES
DRN:- M.C.C.
DATE:- OCT 69
SCALE:- 1 INCH REP 32 MILES

DWG:292-1

I INTRODUCTION AND PREVIOUS INVESTIGATIONS

S.M.L. 292 of approximately 444 square miles in area is situated west and principally north of the township of Blinman in the Central Flinders Ranges.

Within the S.M.L., an area of approximately 36 square miles, centered around the old Nuccaleena Copper Mine, is the subject of a joint exploration agreement between North Flinders Mines N.L. and Sturt Meadows Prospecting Syndicate N.L.

Portions of the area have been previously held by other exploration Companies, notably C.R.A. Exploration Pty. Ltd. Dr. P.R. Donovan in a review of previous work on the areas on behalf of North Flinders Mines, concluded that the C.R.A. sampling was too widely-spaced and relatively unsystematic.

The following Exploration-Reports on S.M.L. 292 have previously been submitted to the Director of Mines:-

i) Exploration report for 6 - month period ending 19th November, 1969

This report contains:-

1. Location map of S.M.L. 292
2. Report of activities by W.R.K. Jones, Consultant Geologist to the Company.
3. Review of C.R.A. Exploration Ltd.'s stream sediment reconnaissance work by Dr. P.R. Donovan of McPhar Geophysics.
4. Report on stream sediment reconnaissance survey by Dr. P.R. Donovan of McPhar Geophysics.

...../2

ii) Exploration Report for 6 - month Period ending 19.5.70

1) Location map S.M.L. 292.

2) Report on investigation of stream-sediment Geochemical Anomalies in S.M.L. 292 by M. Garman of Watts, Griffis, & McQuat (Aust) Pty. Ltd. January, 1970.

3) Report on stream-sediment anomaly investigation by M. Garman B.Sc - Watts, Griffis, McQuat Pty. Ltd.

iii) Exploration Report for the period ending 19.11.70

This report contains:-

1) Stream-sediment reconnaissance survey Nilpena Area S.M.L. 292 by Dr. P.R. Donovan, McPhar Geophysics Pty. Ltd. - November, 1970

2) Stream-sediment reconnaissance survey Nuccaleena Joint Venture area S.M.L. 292 by Dr. P.R. Donovan, McPhar Geophysics Pty. Ltd. July, 1970.

3) Geochemical follow-up report of the Nuccaleena Mine Area - R.W. Fiddler, McPhar Geophysics Pty. Ltd. - October, 1970.

iV) Exploration Report for period 19.11.70 to 31.1.71 (In form of letter)

One Report is included herewith:-

1) "Follow-up Sediment Survey, Nilpena Area, S.M.L. 292, South Australia for North Flinders Mines N.L. by P.R. Donovan, Ph.D. - McPhar Geophysics Pty.Ltd."

...../3

II SUMMARY OF EXPLORATION (S.M.L. 292, Period May 1969 - January, 1971)

The compilation of data of previous workers in the area was carried out by Geosurveys of Aust. Pty. Ltd. prior to the establishment of an office and acquisition of staff by North Flinders Mines N.L. Assessment of the previous stream-sediment and follow-up surveys carried out by C.R.A. Exploration Pty. Ltd., was done by Dr. P.R. Donovan, who concluded generally that their coverage over the Cambrian Limestones by stream sediment sampling was neither complete nor systematic.

Stream-sediment sampling was initially conducted over the strip of Ajax Limestone along the western margin of S.M.L. 292, northeast of Parachilna township. Three slightly anomalous areas were investigated by M. Garman (Watts, Griffis, McQuat) who apparently adequately explained the stream-sediment anomalies without finding any outcropping willemite. From microscopic study of heavy fractions from stream sediment samples, McPhar Geophysics report the possible presence of willemite in samples 900034 and 900035. Although Garman has reported on follow-up of this area, it seems that further detailed sampling and follow-up work is required.

During 1970, reconnaissance stream-sediment sampling of the Nuccaleena Joint Venture area was completed and reported on by P.R. Donovan. This showed generally low values except for the immediate vicinity of the old Nuccaleena Mine, and minor anomalies were followed-up by R. Biddler with negative results.

Later in the year, the whole of Special Mining Lease 292 was covered by reconnaissance stream-sediment sampling. In all, a total of 5161 samples were taken covering an area of 376 square miles giving a sample density of some 13.7 samples per square mile.

...../4

Several copper anomalies were shown in this survey, most being one or two-sample anomalies, often being related to old workings. One extensive area from near Melbourne Well, southwards through the old Lady Lehman Mine and swining southeastwards towards 'Patawarta Hill, is consistently anomalous in copper with an area of anomalous zinc values lying to the south. This area has been sediment-sampled in detail, which confirmed the earlier work and resulted in the re-discovery of nine copper diggings, apart from the Lady Lehman Mine and the discovery of six outcropping copper occurrences. Several anomalous zinc and lead values are also apparent in the area.

A one-sample anomaly toward the northwestern corner of the S.M.L. was also re-sampled and resulted in the finding of old workings which are related to the old Warioota Mine. Detailed follow-up work and geological mapping are at present in progress on the above-mentioned two anomalous areas as well as normal follow-up and field-checking of other more isolated anomalies.

Total expenditure on S.M.L. 292, from the date of issue to 31.1.71 has been $33,970. This includes compilation of previous data, reconn-aissance and detailed stream sediment surveys, follow-up geological and geochemical surveys, laboratory studies etc.

...../5

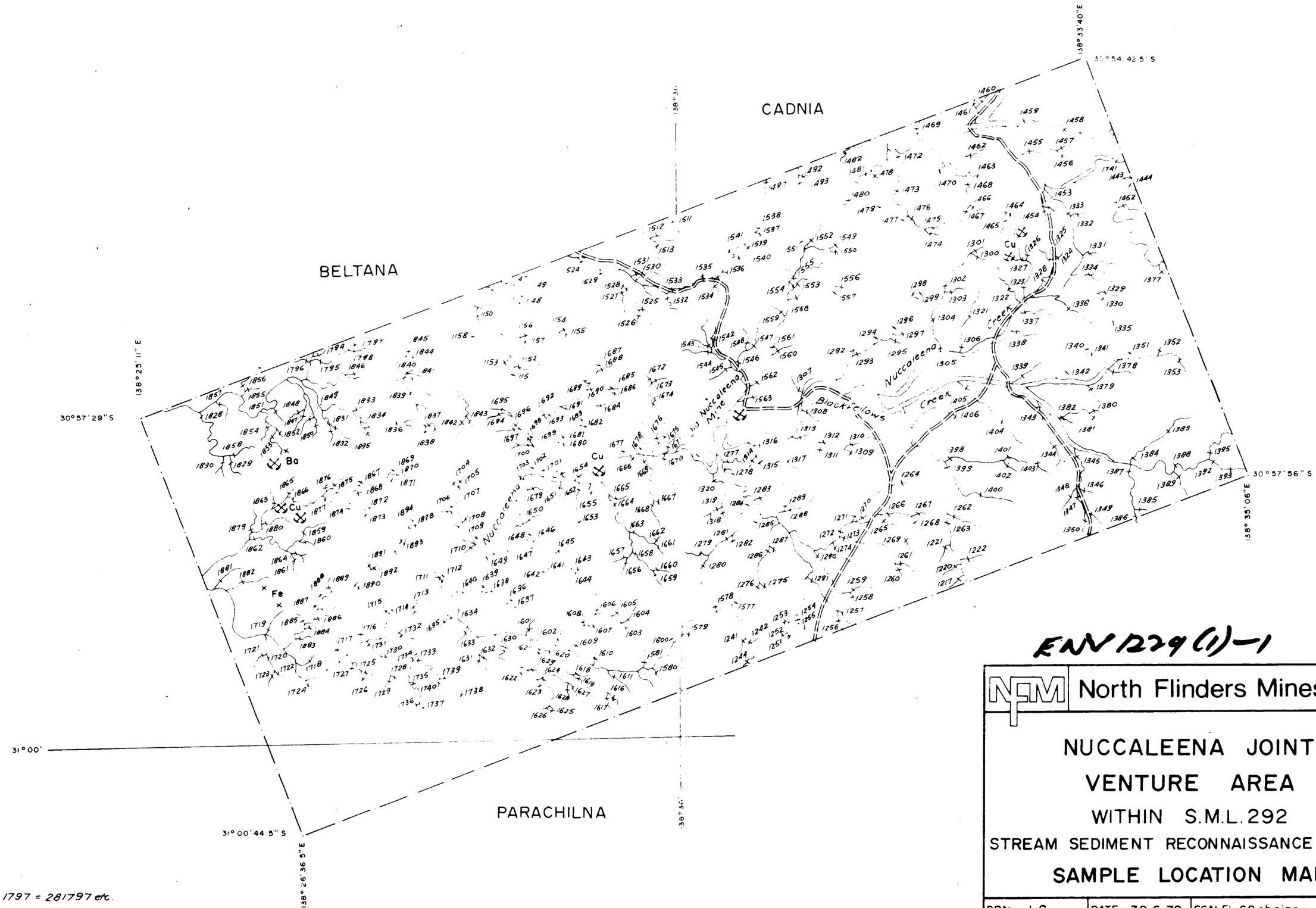
III FUTURE PROGRAMMES (as portion of the larger S.M.L. currently under application) ..

The principal immediate future programmes for the area are:-

1. Completion of general follow-up investigations of stream-sediment anomalies, possible gridding, geological mapping and assessment of economic potential prior to reconnaissance drilling.
2. Completion of detailed follow-up work and geological mapping of the Lady Lehman - Patawarta Hill area. Possible gridding, detailed mapping and assessment prior to reconnaissance drilling.
3. Programmes as above for the old Warioota Mine area.
4. Geological assessment of all known mines and mineral occurrences in the area.
5. Heavy-mineral investigation for willemite and follow-up work on anomalous zinc samples associated with Cambrian Limestone.
6. Survey-gridding and detailed geological mapping and sampling prior to possible rotary-percussion drilling (anomalous zinc areas).

R.B. Wilson
NORTH FLINDERS MINES N.L.

McPHAR GEOPHYSICS PTY. LTD.



1797 = 281797 etc.

ENV 1229 (1)-1

NFM	North Flinders Mines N. L.

NUCCALEENA JOINT VENTURE AREA

WITHIN S.M.L. 292

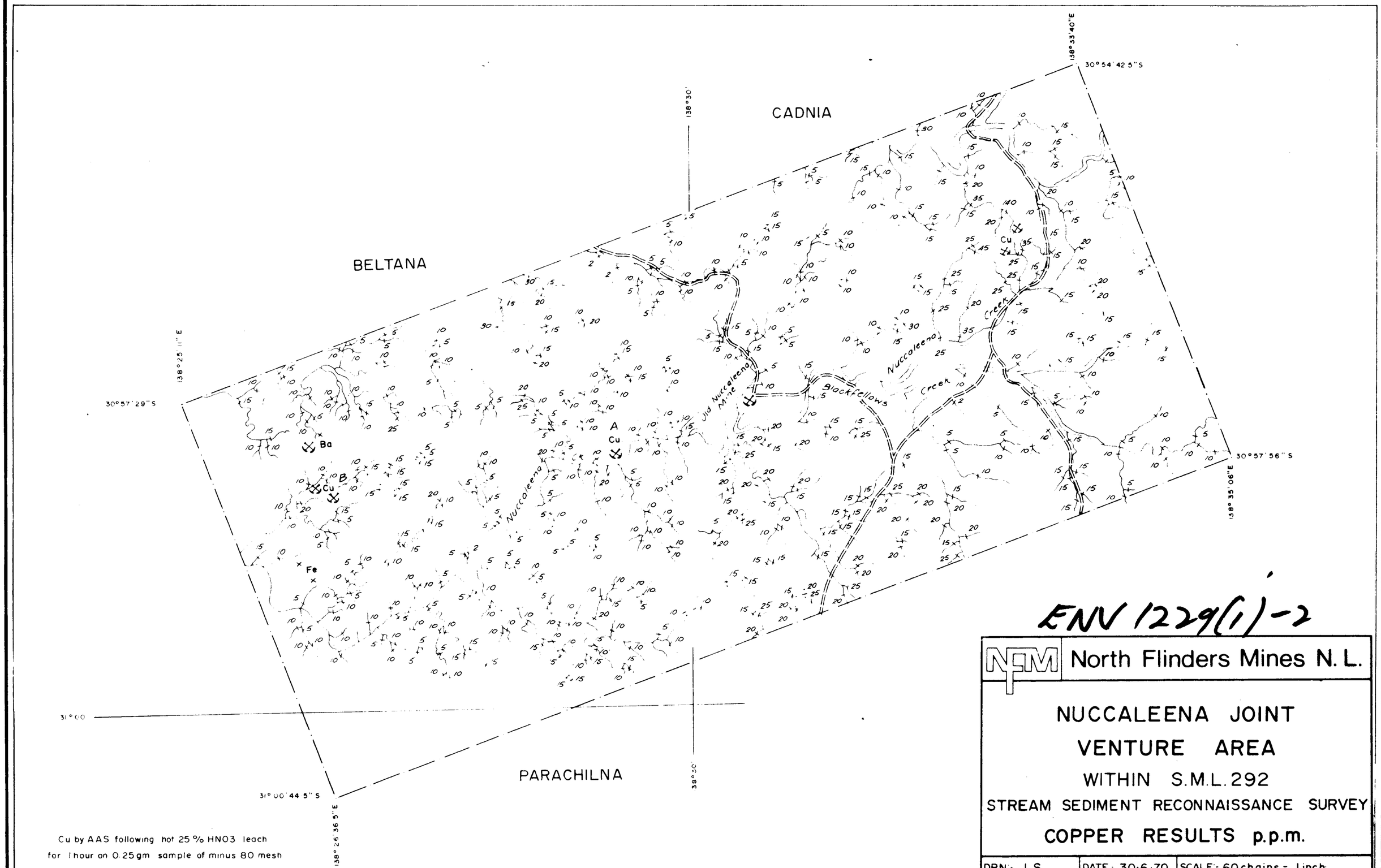
STREAM SEDIMENT RECONNAISSANCE SURVEY

SAMPLE LOCATION MAP.

DRN · I.S.	DATE · 30·6·70	SCALE:- 60 chains = 1 inch

DWG: G.C. 2054A. 1229

McPHAR GEOPHYSICS PTY. LTD.



Cu by AAS following hot 25 % HNO3 leach
for 1 hour on 0.25 gm sample of minus 80 mesh

ENV 1229(1)-2

North Flinders Mines N.L.

NUCCALEENA JOINT VENTURE AREA

WITHIN S.M.L. 292

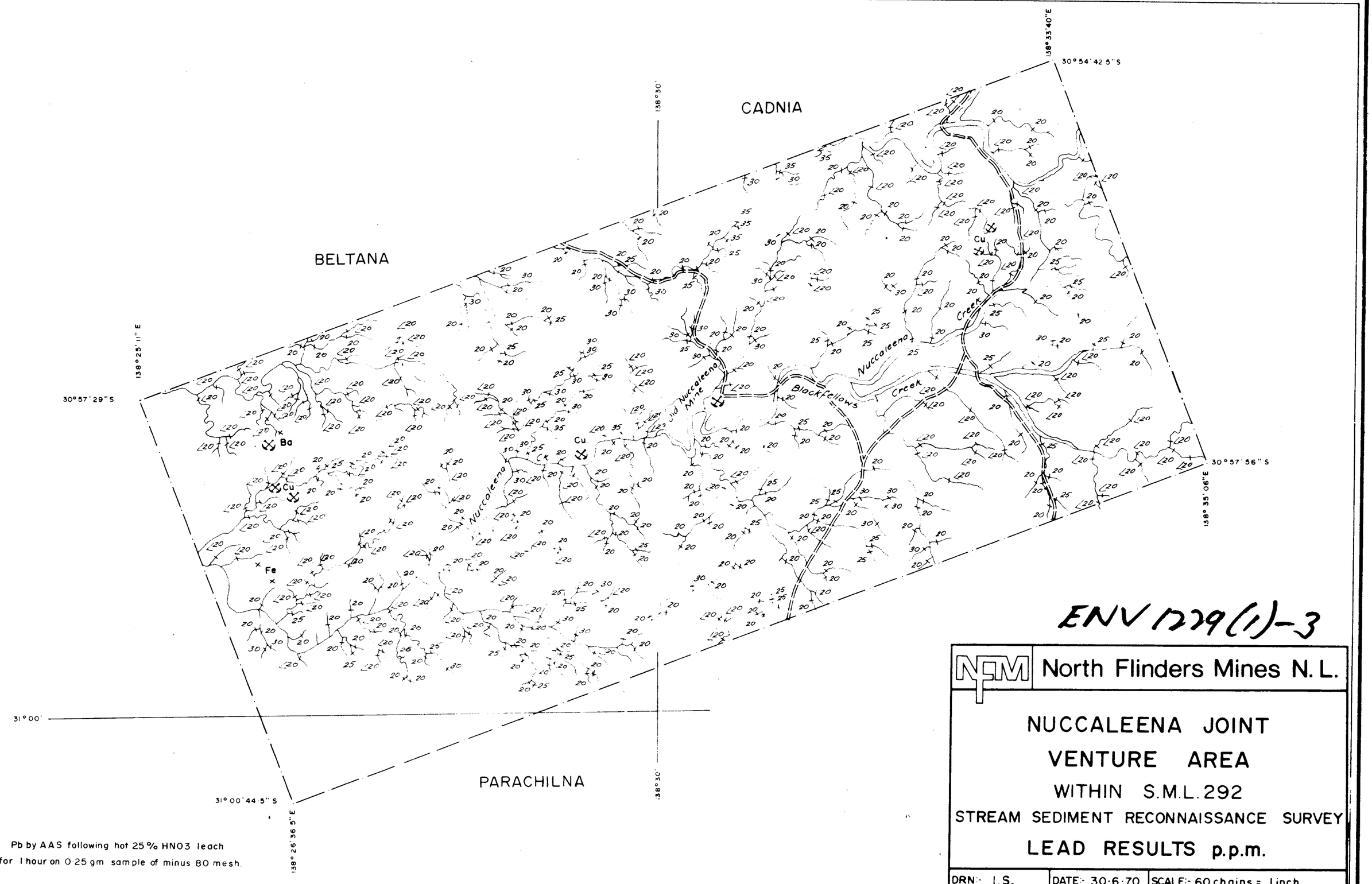
STREAM SEDIMENT RECONNAISSANCE SURVEY

COPPER RESULTS p.p.m.

DRN · I.S.	DATE · 30·6·70	SCALE · 60 chains = 1 inch.

DWG: G.C. 2055A

McPHAR GEOPHYSICS PTY. LTD.



Pb by AAS following hot 25% HNO3 leach for 1 hour on 0.25 gm sample of minus 80 mesh.

ENV 1229(1)-3

North Flinders Mines N.L.

NUCCALEENA JOINT VENTURE AREA

WITHIN S.M.L. 292

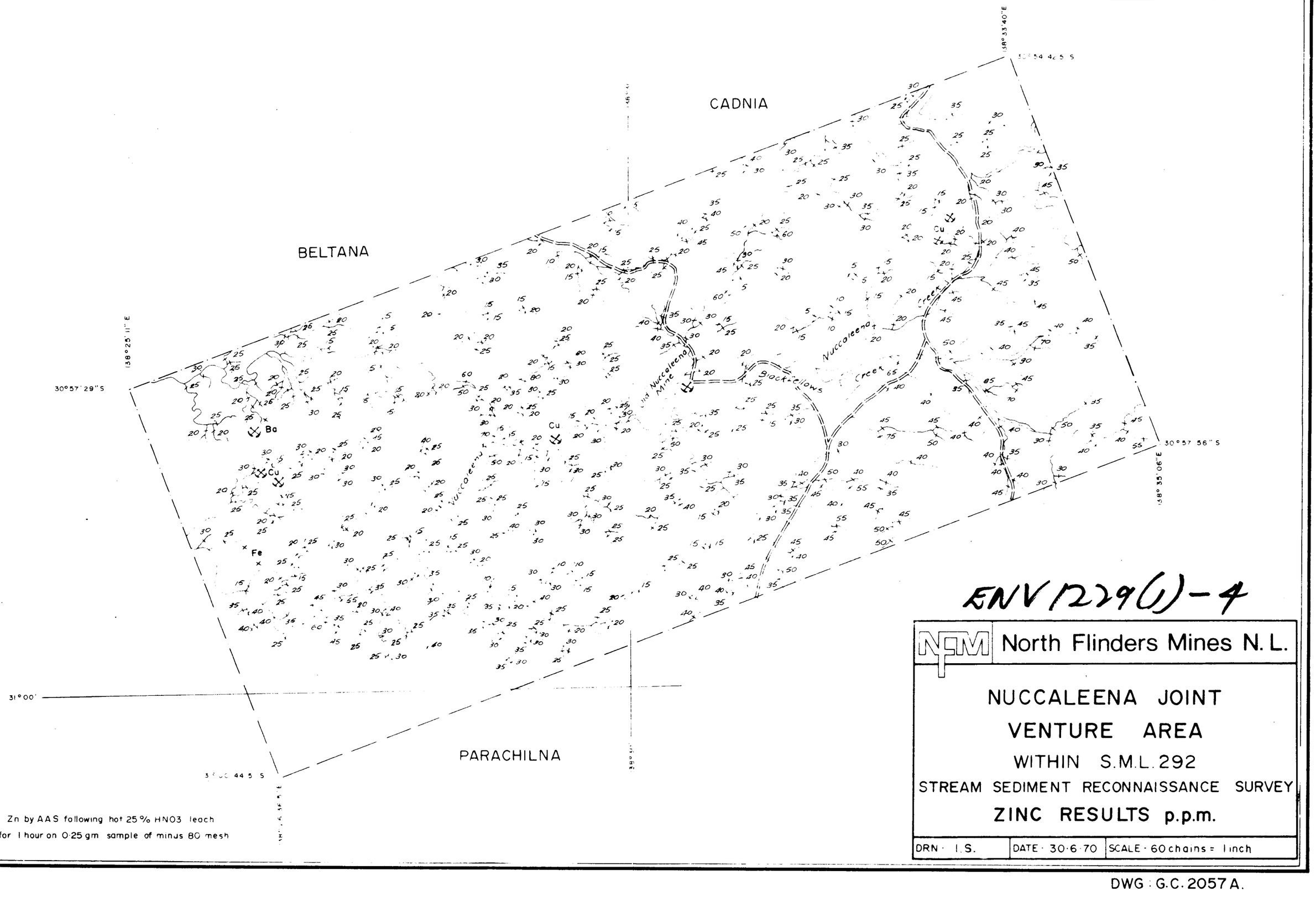
STREAM SEDIMENT RECONNAISSANCE SURVEY

LEAD RESULTS p.p.m.

DRN:- I.S.	DATE:- 30·6·70	SCALE:- 60 chains = 1 inch

DWG: G.C. 2056 A 1229

McPHAR GEOPHYSICS PTY. LTD.



Zn by AAS following hot 25% HNO3 leach
for 1 hour on 0·25 gm sample of minus 80 mesh

ENV 1229(J)-4

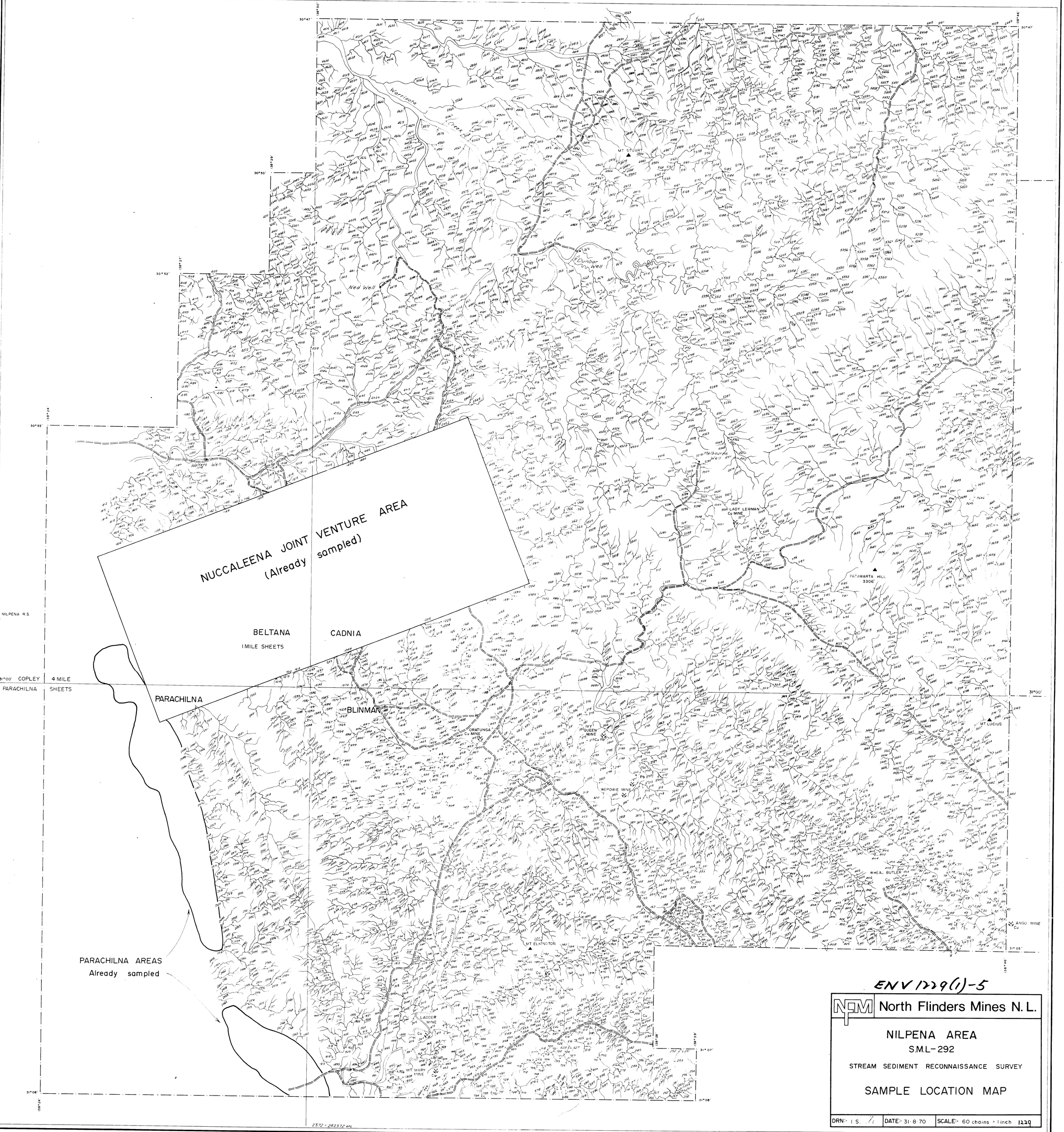
North Flinders Mines N.L.

NUCCALEENA JOINT VENTURE AREA
WITHIN S.M.L. 292
STREAM SEDIMENT RECONNAISSANCE SURVEY
ZINC RESULTS p.p.m.

DRN · I.S.	DATE · 30·6·70	SCALE · 60 chains = 1 inch

DWG : G.C. 2057 A.

McPHAR GEOPHYSICS PTY. LTD.



ENV 1229(1)-5

North Flinders Mines N. L.

NILPENA AREA

S.M.L-292

STREAM SEDIMENT RECONNAISSANCE SURVEY

SAMPLE LOCATION MAP

DRN:- I.S.	DATE:- 31-8-70	SCALE:- 60 chains = 1 inch 1220

DWG: G.C. 4088A

McPHAR GEOPHYSICS PTY. LTD.

NUCCALEENA JOINT VENTURE AREA
(Already sampled)

PARACHILNA AREAS
Already sampled

BELTANA
CADNIA
1 MILE SHEETS

PARACHILNA
BLINMAN

NILPENA R.S.

31°00' COPLEY 4 MILE
PARACHILNA SHEETS

Warrioota Creek
Ned Well
Dunbar Well
Walters Well
Melbourne Well
MT. STUART 4985
LADY LEHMAN Cu MINE
PATAWARTA HILL 3306
MT LUCIUS
ORATUNGA Cu MINE
IVY QUEEN MINE Cu Pb
WEPOWIE MINE Pb
WHEAL BUTLER Cu Pb
ANGO MINE Cu
MT ELKINGTON
LADDER MINE Cu
MT MARY MINE Cu

O 5347 = Anomalous sample number (285347)

Pb by AAS following hot 25% HNO3 leach
for 1 hour on 0·25 gm sample of minus 80 mesh.
20 = 20 ppm Pb on minus 80-mesh (20) = 20 ppm Pb on pulverised minus 40-mesh

ENV 1229(1)-6

NFM North Flinders Mines N.L.

NILPENA AREA
S.M.L-292
STREAM SEDIMENT RECONNAISSANCE SURVEY
LEAD RESULTS p.p.m.

DRN:- I.S. | DATE:- 31·8·70 | SCALE:- 60 chains = 1 inch 1229

DWG:G.C.4090A

McPHAR GEOPHYSICS PTY. LTD.

NUCCALEENA JOINT VENTURE AREA
(Already sampled)

PARACHILNA AREAS
Already sampled

Warriota Creek

Ned Well

Dunbar Well

Smiths Well

Nilpena R.S.

PATAWARTA HILL

MT ELKINGTON

Mt Mary Mine Cu

Wheal Butler Cu

Anja Mine Cu

Correction

BELTANA

CADNIA

PARACHILNA

BLINMAN

138°24' 138°27' 138°29' 138°30' 138°38' 138°41' 138°46'

30°47' 30°50' 30°52' 30°55' 31°00' 31°05' 31°07' 31°08'

Cu by AAS following hot 25% HNO3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

ENV 1229(1)-7

Plus Mines + occurrences on SM maps

North Flinders Mines N. L.

NILPENA AREA
S.M.L-292

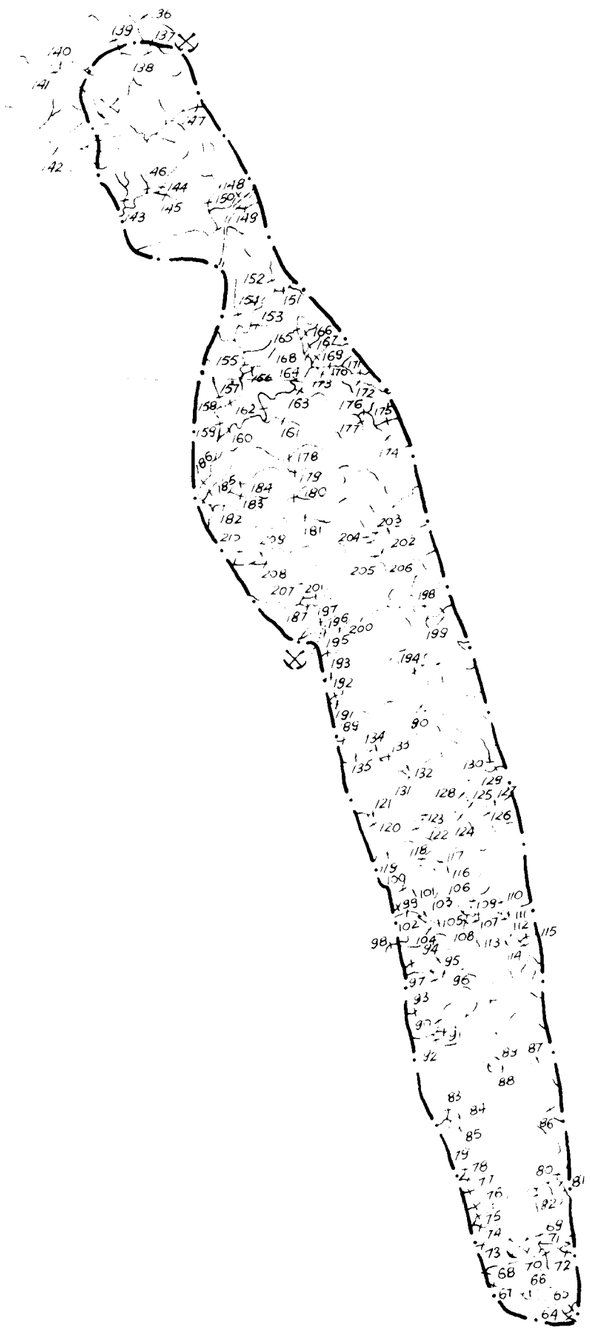
STREAM SEDIMENT RECONNAISSANCE SURVEY

COPPER RESULTS p.p.m.

DRN:- I. S.	DATE:- 31·8·70	SCALE:- 60 chains = 1 inch 1229

DWG: G.C. 4089 A

McPHAR GEOPHYSICS PTY. LTD.



S.M.L. 292.

PARACHILNA

17 FEB 1970

NORTH FLINDERS MINES N.L.

S.M.L. 292 – PARACHILNA AREA

STREAM SEDIMENT RECONNAISSANCE SURVEY.

SAMPLE LOCATION MAP.

SCALE: 60 chains = 1 inch.

DRAWN: J.S.

DATE: 25-9-69.

APPROVED: [illegible]

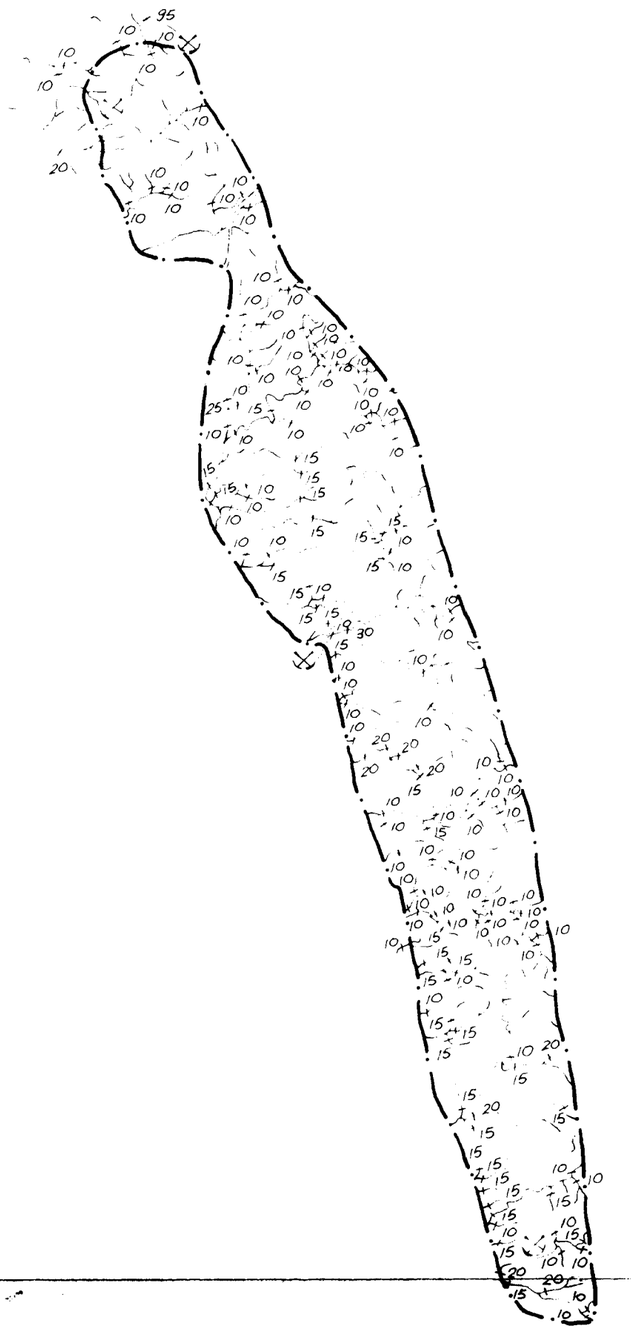
DATE: 1/10/69

DWG: 2001A – G.C.

40 = 900040 etc

EMV 1229(1)-8

McPHAR GEOPHYSICS PTY. LTD.



S.M.L. 292.

PARACHILNA

NORTH FLINDERS MINES N.L.

S.M.L. 292 – PARACHILNA AREA

STREAM SEDIMENT RECONNAISSANCE SURVEY.

COPPER RESULTS p.p.m.

SCALE: 60 chains = 1 inch.

Cu, by A.A.S. following hot 25% HNO3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

DRAWN: J.S.

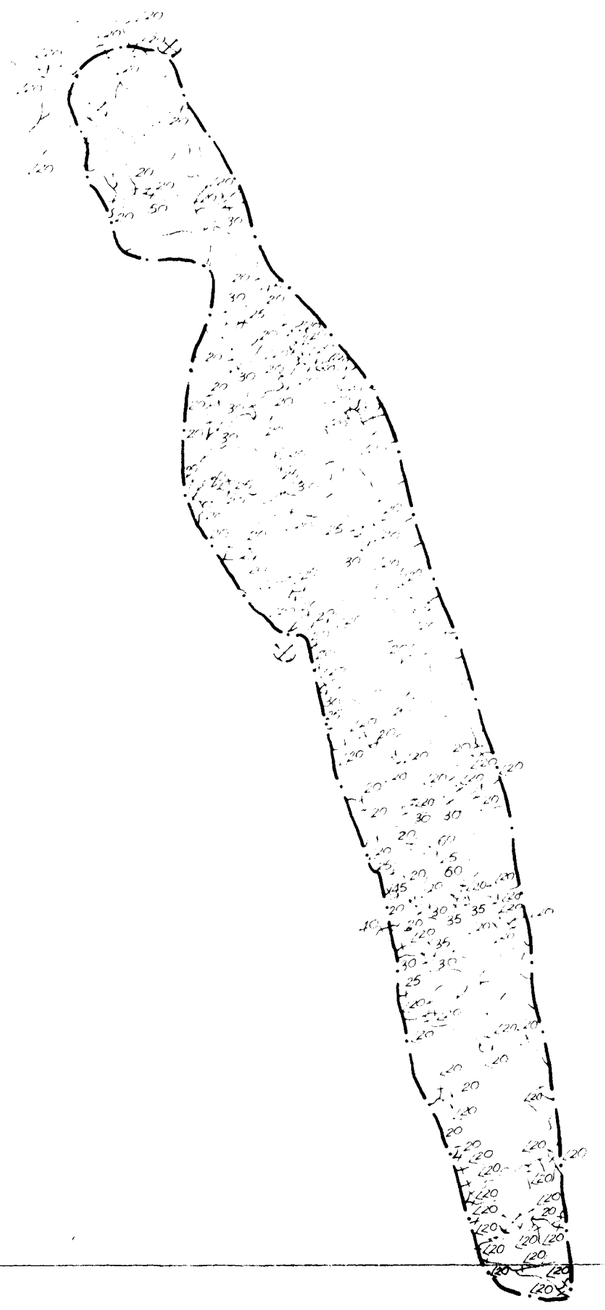
DATE: 25-9-69.

APPROVED: [illegible]

DATE: 1/10/69

DWG: 2002A – G.C.

McPHAR GEOPHYSICS PTY. LTD.



N

S.M.L. 292.

O PARACHILNA

RECEIVED 17 FEB 1970 DEPT. OF MINES REGISTRY

NORTH FLINDERS MINES N.L.

S.M.L. 292 – PARACHILNA AREA

STREAM SEDIMENT RECONNAISSANCE SURVEY.

LEAD RESULTS p.p.m.

SCALE: 60 chains = 1 inch.

Pb, by AAS following hot 25% HNO3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

DRAWN: K.S.

DATE: 25-9-69.

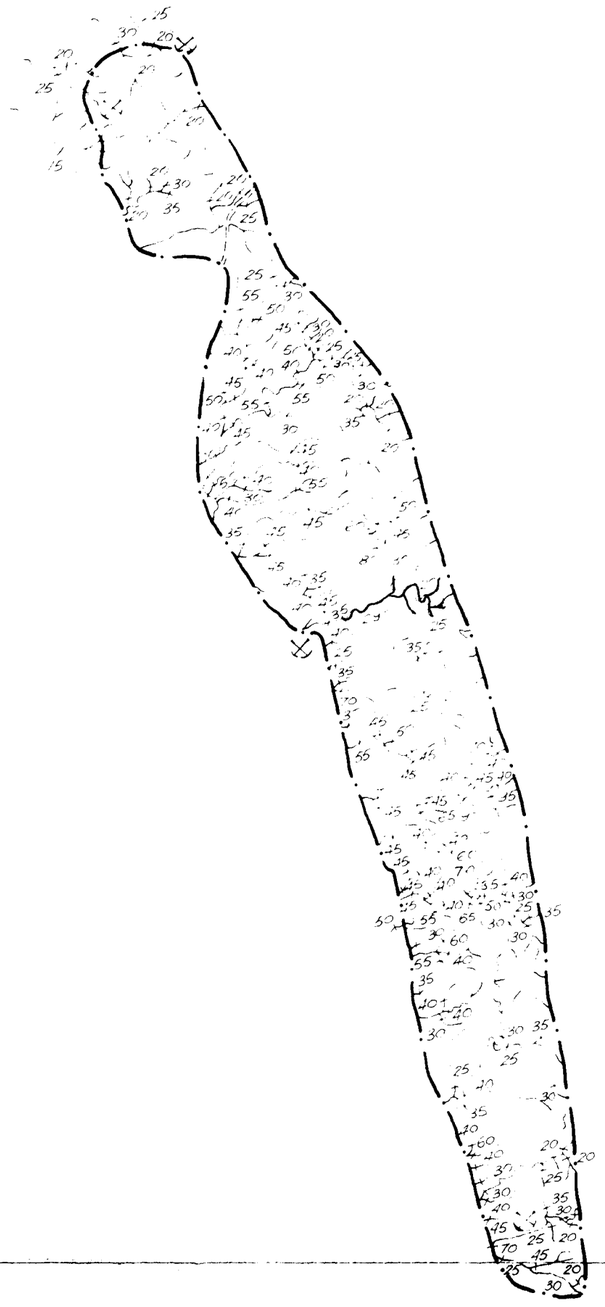
APPROVED: RS

DATE: 4/10/69

DWG: 2003A – G.C.

ENV 1229(1)-10

McPHAR GEOPHYSICS PTY. LTD.



S.M.L. 292.

PARACHILNA

N

NORTH FLINDERS MINES N.L.

S.M.L. 292 – PARACHILNA AREA

STREAM SEDIMENT RECONNAISSANCE SURVEY.

ZINC RESULTS p.p.m.

Zn, by AAS following hot 25% HNO_3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

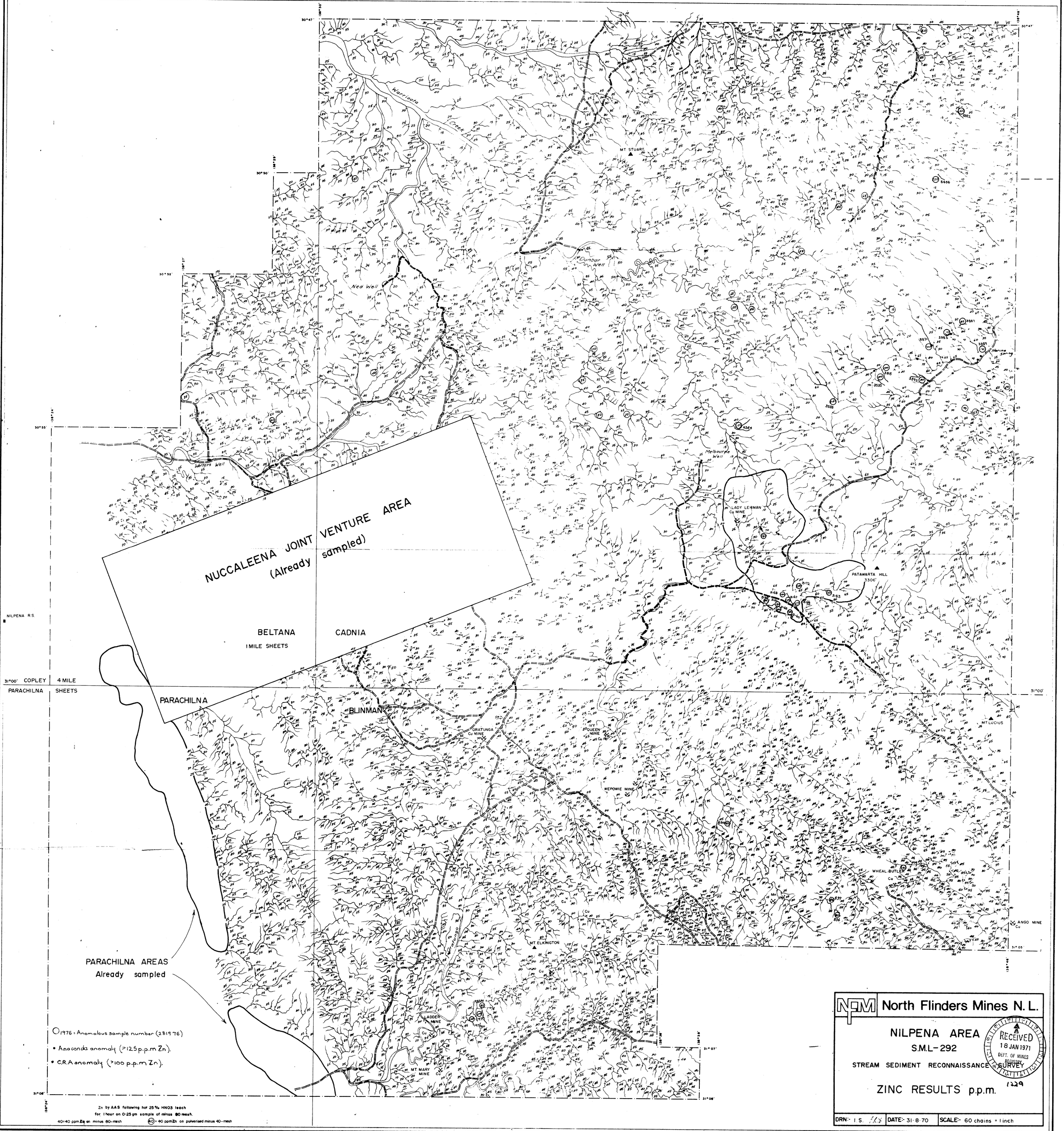
SCALE: 60 chains = 1 inch.
1" = 1 : 47520

DRAWN: J.S.
DATE: 25-9-69.
APPROVED: [illegible]

DATE: 1/10/69

DWG: 2004A – G.C.

McPHAR GEOPHYSICS PTY. LTD.



North Flinders Mines N. L.

NILPENA AREA

S.M.L-292

STREAM SEDIMENT RECONNAISSANCE SURVEY

ZINC RESULTS p.p.m.

RECEIVED 18 JAN 1971 DEPT. OF MINES REGISTRY

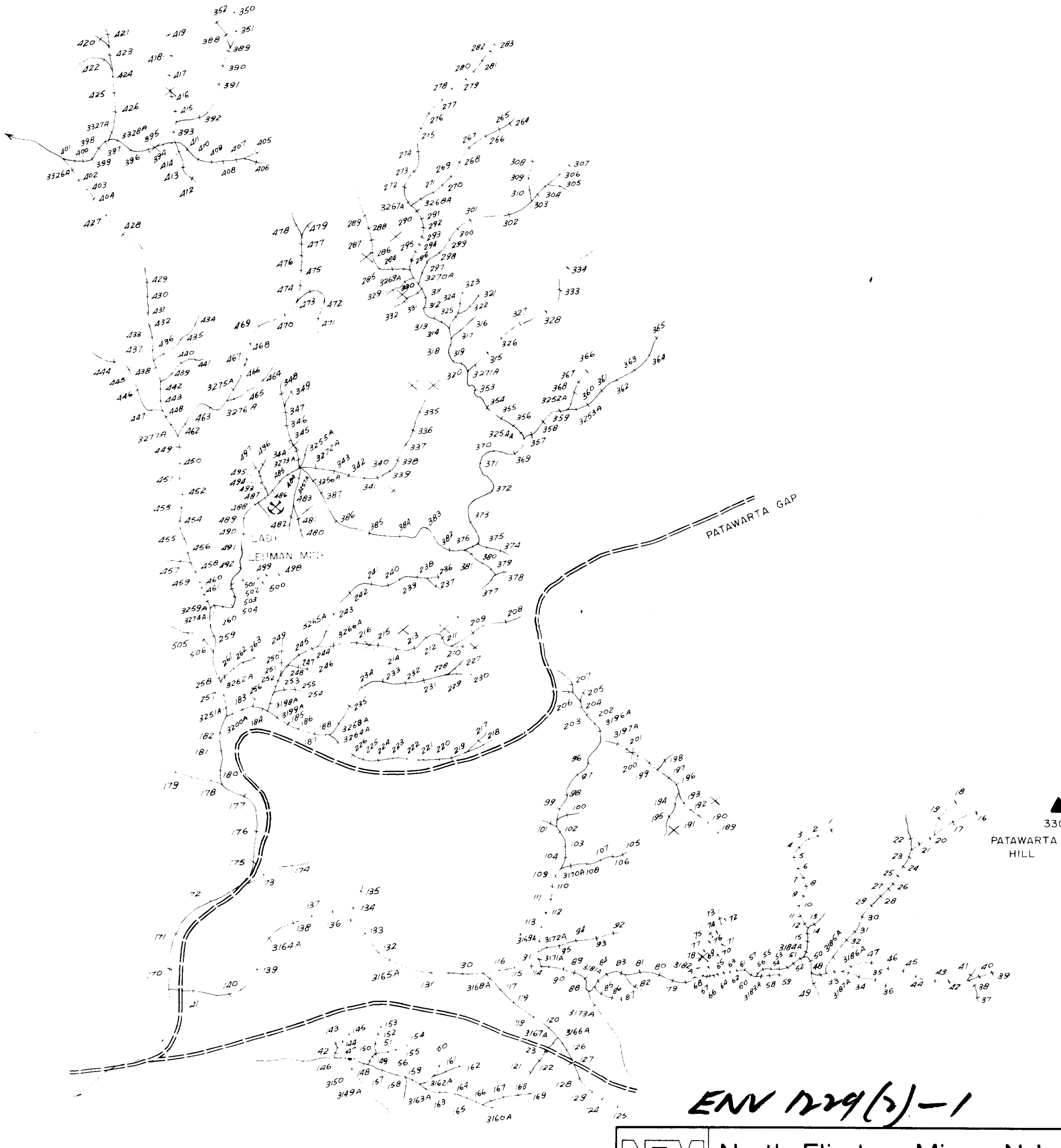
1229

DRN:- I. S.	DATE:- 31·8·70	SCALE:- 60 chains = 1 inch

ENV 1229(1)-12

DWG: G.C.4091A

McPHAR GEOPHYSICS PTY. LTD.



ENV 1229(2)-1

North Flinders Mines N. L.

LADY LEHMAN MINE AREA

S.M.L. 292

SAMPLE LOCATION MAP.

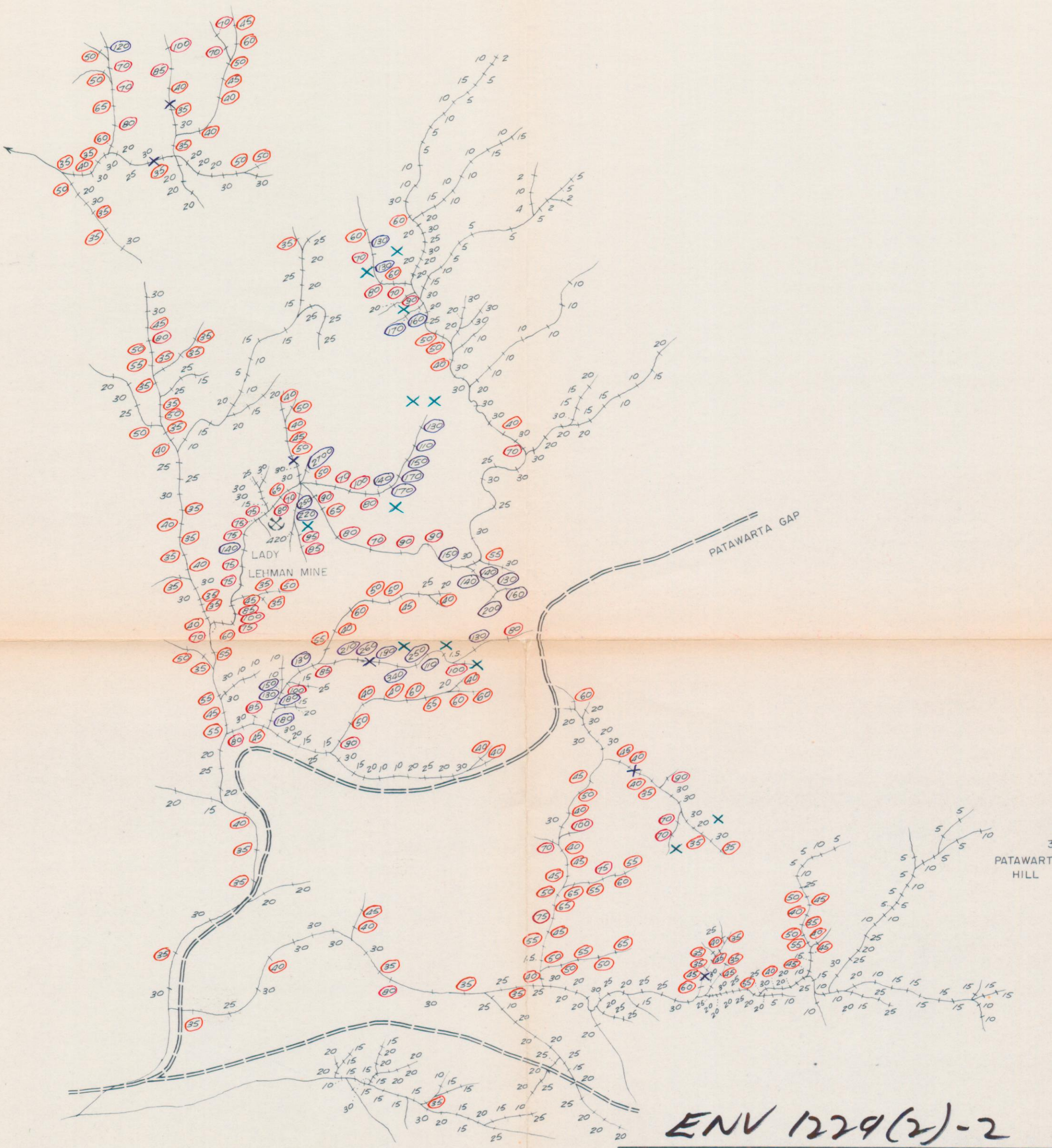
STREAM SEDIMENT FOLLOW-UP SURVEY

DRN:- I. S.	DATE:- 15·1·71	SCALE:- Approx. 1inch = 1800 feet

ENVELOPE No. 1229-11

DWG: G.C. 2077A

McPHAR GEOPHYSICS PTY. LTD.



35 - 65 p.p.m. Possibly anomalous

70 - 105 p.p.m. Probably anomalous

> 110 p.p.m. Definitely anomalous

× Cu found in creek

× Cu diggings

Cu by AAS following hot 25% HNO3 leach for 1 hour on 0.25 gm. sample of minus 80 mesh.

ENV 1229(2)-2

NFM North Flinders Mines N. L.

LADY LEHMAN MINE AREA

S.M.L. 292

COPPER RESULTS p.p.m.

STREAM SEDIMENT FOLLOW-UP SURVEY

DRN:- I. S.	DATE:- 15·1·71	SCALE:- Approx 1 inch = 1800 feet

ENVELOPE No. 1229 II

DWG: G.C.2078A

McPHAR GEOPHYSICS PTY. LTD.

60 - 115 p.p.m. Possibly anomalous

120 - 175 p.p.m. Probably anomalous

> 175 p.p.m. Definitely anomalous

Pb by AAS following hot 5% HNO3 leach for 1 hour on 0.25gm sample of minus 80 mesh

ENV 1229(2)-3

North Flinders Mines N. L.

LADY LEHMAN MINE AREA

S.M.L. 292

LEAD RESULTS p.p.m.

STREAM SEDIMENT FOLLOW-UP SURVEY

DRN I.S	DATE 15-1-71	SCALE - Approx 1 inch 1800 feet

1229 II

DWG G.C.2079 A

McPHAR GEOPHYSICS PTY. LTD.

90 - 175 p.p.m. Possibly anomalous
180 - 265 p.p.m. Probably anomalous
> 265 p.p.m. Definitely anomalous

Zn by AAS following hot 25% HNO3 leach for 1 hour on 0.25 gm sample of minus 80 mesh

ENV 1229(2)-4

North Flinders Mines N.L.

LADY LEHMAN MINE AREA

S.M.L. 292

ZINC RESULTS p.p.m.

STREAM SEDIMENT FOLLOW-UP SURVEY

DRN I.S.	DATE 15-1-71	SCALE - Approx 1 inch = 1800 feet

ENVELOPE No. 1229-11 DWG G.C.2080A

McPHAR GEOPHYSICS PTY. LTD.

NUCCALEENA JOINT VENTURE AREA
(Already sampled)

1MILE SHEETS

NILPENA R.S.

31°00' COPLEY 4MILE
PARACHILNA SHEETS

BELTANA CADNIA

PARACHILNA

BLINMAN

MT STUART

Warrioota Creek

Warrioota M.P.E.

Dunbar Well

Ned Well

Walters Well

Melbourne Well

LADY LEHMAN Cu MINE

PATAWARTA HILL 3306'

MT LUCIUS

IVY QUEEN MINE Cu Pb

WEPOWIE MINE Pb

MT ELKINGTON

LADDER MINE

Mt Mary Mine Cu

ANGO MINE Cu

Wheal Butler Cu

Mn Pb

shafts

trench

X (cu) diggings

small diggings

ENV1229(2)-5

North Flinders Mines N.L.

NILPENA AREA
S.M.L-292

STREAM SEDIMENT
FOLLOW-UP SURVEY
SAMPLE LOCATION MAP

DRN:- I.S. | DATE:- 14.1.71 | SCALE:- 60 chains = 1 inch

1229-II DWG. G.C. 4110A

McPHAR GEOPHYSICS PTY. LTD.

30°47'
138°30'
138°46'
30°50'
138°29'
30°52'
138°27'
30°55'
138°24'
31°00'
31°05'
31°07'
31°08'
138°48'
138°39'
138°28'

Warrioota Creek
MT STUART
Warrioota Mine
Dunbar Well
Ned Well
Waters Well
Melbourne Well
LADY LEHMAN Cu MINE
PATAWARTA HILL 3306'
MT LUCIUS
NILPENA R.S.
NUCCALEENA JOINT VENTURE AREA (Already sampled)
BELTANA CADNIA
1 MILE SHEETS
31°00' COPLEY 4 MILE
PARACHILNA SHEETS
PARACHILNA
BLINMAN
ORATUNGA Cu MINE
IVY QUEEN MINE Cu Pb
WEPOWIE MINE Pb
Oratunga Creek
MT ELKINGTON
LADDER MINE
Mt. Mary Mine Cu
Wheal Butler Cu
Mn Pb
ANGO MINE Cu
Cu x (cu) diggings
282662
282610
280008
280020
269240

35 - 65 p.p.m. Possibly anomalous
70 - 105 p.p.m. Probably anomalous
> 110 p.p.m. Definitely anomalous

Cu by AAS following hot 25% HNO3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

ENV 1179(2)-6

North Flinders Mines N. L.

NILPENA AREA
S.M.L-292

STREAM SEDIMENT
FOLLOW-UP SURVEY
COPPER RESULTS p.p.m.

DRN:- I.S.	DATE:- 14·1·71	SCALE:- 60 chains = 1 inch

1229 II DWG G.C. 4111A

McPHAR GEOPHYSICS PTY. LTD.

NUCCALEENA JOINT VENTURE AREA
(Already sampled)

BELTANA CADNIA
1 MILE SHEETS

PARACHILNA

31°00' COPLEY 4 MILE
PARACHILNA SHEETS

WILPENA R.S.

60 - 115 p.p.m. Possibly anomalous
120 - 175 p.p.m. Probably anomalous
> 175 p.p.m. Definitely anomalous

Pb by AAS following hot 25% HNO3 leach
for 1 hour on 0·25 gm sample of minus 80 mesh.

ENV1229(2)-7

North Flinders Mines N.L.

NILPENA AREA
S.M.L-292

STREAM SEDIMENT
FOLLOW-UP SURVEY
LEAD RESULTS p.p.m.

DRN:- I.S. | DATE:- 14.1.71 | SCALE:- 60 chains = 1 inch

ENVELOPE No. 1229-II DWG:G.C.4112A

McPHAR GEOPHYSICS PTY. LTD.

138°30' 30°47' 138°46'

Warrieeta Creek

MT STUART

30°50' 138°29'

Dunbar Well

Ned Well

30°52' 138°27'

28103

285592

285256

138°24' 30°55'

Melbourne Well

NUCCALEENA JOINT VENTURE AREA
(Already sampled)

BELTANA CADNIA

1 MILE SHEETS

NILPENA R.S.

COPLEY 4 MILE
PARACHILNA SHEETS

PARACHILNA

BLINMAN

LADY LEHMAN Cu MINE

PATAWARTA HILL 3306'

MT LUCIUS

ORATUNGA Cu MINE

IVY QUEEN MINE Cu Pb

WEPOWIE MINE Pb

280834

280836

28260

Wheal Butler Cu

Mn Pb

ANGO MINE Cu

Orotunga Creek

MT ELKINGTON

LADDER MINE

Mt Mary Mine Cu

31°08' 138°24'

28180

28179

28176

90 - 175 p.p.m. Possibly anomalous
180 - 265 p.p.m. Probably anomalous
> 265 p.p.m. Definitely anomalous

Zn by AAS following hot 25% HNO3 leach for 1 hour on 0·25 gm sample of minus 80 mesh.

31°05' 138°46'

31°07' 138°38' 138°39'

31°08'

ENV 1229(2)-8

North Flinders Mines N. L.

NILPENA AREA
S.M.L-292
STREAM SEDIMENT FOLLOW-UP SURVEY
ZINC RESULTS p.p.m.

DRN:- I. S.	DATE:- 14-1-71	SCALE:- 60 chains = 1 inch

ENVELOPE No. 1229(2) DWG: G.C. 4113A