CRA EXPLORATION PTY.LIMITED

HEEMSKIRK FALLS EL 30/79

GEOLOGICAL REPORT FOR YEAR ENDING 15TH OCTOBER, 1982.

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Date: 7th October, 1982.

Copies: CRAE Melbourne
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Mines Department, Tasmania

CONTENTS

1. SUMMARY

Since data from the Mines Department West Coast aeromagnetic data became available in June, three of what were considered the most favourably sited anomalies have been investigated by ground magnetic and geochemical traversing.

A very prominent anomaly in the south-western corner of the EL is almost certainly caused by Tertiary Basalt, while two less intense anomalies alongthe south-central boundary have been attributed to formational geological features rather than being indicative of mineralisation.

Previous stream sediment data from the area was also reviewed as part of a wider study of North-West Tasmania. A number of strongly anomalous areas were located in the south-eastern section of the Licence area south of the Pieman River and these are to be followed up in detail over the next 12 months period.

2. INTRODUCTION

EL 30/79 was granted on 15th November, 1979, and was taken to cover two distinct features:-

1. An area of anomalous tin pan concentrate samples south of the Pieman River and
2. A magnetic anomaly which was thought to be coincident with a small outcrop of Gordon Limestone adjacent to the large Dolerite sill.

Both targets were investigated in 1980-1981. The source of tin being perched Tertiary gravels with alluvial cassiterite, while the aeromagnetic anomaly at Healey Creek was attributed to an "edge effect" of the dolerite sill.

The Gordon Limestone outcrop did contain some anomalous lead values but the strike extent is severely limited.

More recent work has concentrated on evaluation of the most prominent of the aeromagnetic anomalies from the Mines Department West Coast aeromagnetic survey and a computer review of previous stream sediment geochemical surveys.

3. CONCLUSIONS

1. Traversing and mapping in the south-west corner of the EL indicates the most likely source of the aeromagnetic anomaly is Tertiary basalt. The small subsidiary anomaly to the north however is not characteristic of basalt and further traversing is required.

2. There is no obvious source for the Piney Creek anomaly but geochemical sampling indicates Pb,Zn,Cu,As and Sn values are below background values.

3. The Big Ben Creek anomaly was only just reproduced by ground magnetic traversing. No deep seated source is indicated and the effect is probably formational.

4. The area of Precambrian sediments south of the Pieman River and east of the Dolerite sill is strongly anomalous in lead. Although zinc values are low, the coincidence of high background values of "cold extractable copper" suggests the lead could have a sulphide source.

4. RECOMMENDATIONS

1. Additional ground magnetic traversing is required to allow detailed modelling of northern section of the south-west aeromagnetic anomaly.

2. Aeromagnetic anomalies at Pieman River and Healey Creek North are to be located and investigated by ground magnetics and geochemical sampling.

3. Detailed follow-up of stream sediment sampling and geological traversing is required to locate a source for the strongly anomalous lead values in the south-east section of the Licence.

5. GEOLOGICAL SETTING

The area lies immediately north of the Heemskirk Granite and north-west of the Zeehan Mineral Field. (Fig.1) Basement rock types are almost exclusively quartzites and slates of the Precambrian Oonah quartzite with just a small fault bounded block of ? Gordon Lime-stone located on Healey Creek.

A large dolerite sill of Jurassic age dominates the central section of the licence and several areas of perched Tertiary gravels occur south of the Pieman River.

6. GEOPHYSICAL FOLLOW-UP

The initial aeromagnetic coverage of the Heemskirk Falls area was carried out by Rio Australian Exploration in 1956 (Plan No.TASh 912) and the Healey Creek anomaly was located from this survey.

Data from the Mines Department West Coast survey was made available in June this year (Plan No.TASh 913). The survey is more detailed than the Rio Australian survey but the basic pattern is the same. An intensely disturbed area is coincident with the Jurassic Dolerite while the area of Oonah quartzite displays very low gradients and is magnetically undisturbed.

Six anomalies within the Oonah quartzite area were selected for follow-up work. (Plan No.TASh 914)

6.1 Pieman River Anomaly.

A circular anomaly approximately 30 nT above background. - Still to be ground evaluated.

6.2 Healey Creek North.

A 60 nT anomaly. Still to be investigated.

6.3 Healey Creek Grid.

Investigated 1981 R and N Poltock.

6.4 South West Anomaly.

One traverse line of 2100 metres was run north-south over the main anomaly and the subsidiary anomaly immediately to the north. (Plan No.TASh 915).

There is an obvious close relationship between outcropping basalt and the typical strong 'spikey' variations in magnetic intensity. The profile shape over the Tertiary Sands also suggests the basalt is continuous below the sand and gravel cover.

The subsidiary northern anomaly between 1500 and 1600N however is not typical of a basalt source and further cross traversing is required to better define the target.

Sand cover in the area is too thick to allow auger bedrock geochemical sampling.

6.5 Piney Creek Anomaly

Circular anomaly of approximately 100nT an area of Upper Proterozoic Oonah quartzite. A small creek cuts virtually straight through the anomaly and was sampled and geologically mapped. No obvious sources for the anomaly was observed. Results of the geochemical sampling are given in Appendix I. but they indicate no significant values.

The highest tin value was 25ppm in a panned concentrate with other values ranging from 2 to 14 ppm. Peak values for Pb, Zn,Cu, and As were below regional background. No further work is planned.

6.6 Big Ben Creek Anomaly

Two traverses each of 1300 metres length were cut across this feature. The feature is very weak and can only just be recognised on the ground magnetic traverses (Plan TASh916). No further work is planned.

7. COMPUTER GEOCHEMICAL STUDY

As part of a larger survey of the Rocky Cape region, CRA Exploration Pty.Limited, has carried out a detailed computor study of all previous stream sediment geochemical data. The data was processed on MICROGAS, a micro computor based geochemical analysis system which was developed at Queens University for CRAE. The package contains 13 user interactive programmes for use on Digital PDP 11/23 or 11/34 computers.

The programs can be divided into two categories; namely data management and statistical.

(a) Data Management

1. CRUNCH — Converts data from its original form (ASCII) into a binary form useable by the remaining programs in the package.

2. UNCRUNCH — Converts a binary file back into ASCII format.

3. SORT — Sorts a binary file with reference to sample number.

4. MERGES — Merges two data files that contain the same variables for different samples.

5. MERGEV — Merges two data files that contain different variables.

6. LISTER — Produces a listing on the printer for a data set or selected portions of it.

(b) Statistical

1. DSTATS — Calculations sample univariate statistical parameters and plots a histogram on the terminal screen and the printer.

2. XYPLOT — Contructs xy plots or "scatter diagrams" on the screen and printer and calculates a correlation matrix.

3. MAPLOT — Contructs a geochemical symbol map on the printer at any scale.

4. PROFILE — Plots geochemical values against distance for one or more variables.

5. FACTOR — Determines the principal relationships between variables and calculates factor scores, (R-mode analysis).

6. MULREG — Determines a functional relationship between dependent and independent variables. (Stepwise multiple regression).

7. DISCRIM — Calculates a function that will discriminate between different groups of samples on the basis of a weighted combination of variables, (Discriminant analysis) and calculates discriminant scores.

All programs within MICROGAS except for MERGES, MERGEV, SORT AND UNCRUNCH, allow for data management in the form of transformations and/or selections. Up to 25 transformations are allowed in any program except CRUNCH, which allows 200.

The types of transformations used are simple arithmetic statements; more complex calculations can be performed by a series of simple, sequential arithmetic statements.

Up to 15 selection criteria can be made within any one program. These criteria must be met for a sample to be included in the ensueing analysis. For further information on MICROGAS, a summary is given by O.P.Lavin and I.Nichol (1981).

7.1 Computer Coding for Microgas

All the stream sediment data was obtained from open file reports held at the Tasmanian Mines Dept. as well as from CRAE internal reports. Sample locations were plotted on to 1:100 000 topographical sheets and were digitised into AMG co-ordinates in Adelaide. Analytical data was directly coded on to RL01 disc whilst geological variables were manually prepared and later coded on to disc, both on a free format basis. Each company's data was coded as a seperate data file to enable later comparison.

7.1.1. Analytical Variables

The following 8 elements are those which have been most commonly analysed: Cu,Pb,Zn,Ni,Co,As,Mo,Sn. Values below detection limit have been inserted as half detection limit. Values of -1 indicate that a sample has not been analysed for a specific element. Minus 1 values are ignored by the statistical calculations.

EAST, NORTH
: AMG metric co-ordinates.

SMPTYP
: Refers to sample type, whether stream sediment or panned concentrate.

STRMORD
: Refers to stream order and will give an estimate of catchment size. This variable was obtained by inspection of topographic sheets.

TOPO

Refers to a topographical index rated 1 - 5 based on inspection of topographic sheets.

7.1.2. Geological Variables

Three variables have been used to account for Mines Dept. mapping (FORMGEOL), Prof.Carey's photo-interpretational study (PROFCAR) and site geology (SITEGEOL). SITEGEOL refers to either the dominant outcrop or float recorded at each sample site and obviously varies a great deal since in many instances it was never recorded. Values of -1 indicate that no geological information was recorded.

7.1.3 Methodology

Individual files of each Company data were prepared so that "fudge factors" could be applied if necessary to allow for variations in age of sample, analytical technique, collection methods and differences in detection limits. Actually the data was surprisingly compatable and directly merged (using MERGES) to produce a single file labelled NWTASSS (N.W.Tasmania, Stream Sediment Samples). This file which contained all the most common analytical variables was then transformed logarithmically and processed by DSTATS to determine population cut offs.

Having manually selected the most suitable cut points, file NWTASS was recycled through the MAPLOT routine to produce geochemical symbol maps for each element at a scale of 1:100 000.

The total number of samples within the Heemskirk Falls EL is sufficient to allow a seperate detailed statistical analysis and the data has therefore been treated as part of the whole North-West Province. A listing of the statistics for each element for the Province is given in Appendix II while the bounds for each MAPLOT symbol is listed on the individual plans.

Plotting errors, because of print size, are in the order of 423m height and 250m width.

Anomalous, possibly anomalous, and high background categories, again for the whole N.W.Province, as follows:-

High Background = HBG
Possibly Anomalous = PA
Anomalous = A

		Log Units	PPM
Lead (0-100ppm only)	HBG	0.8 - 1.25	6.3 - 17.8
	P.A.	1.25- 1.60	17.8 - 39.8
	A.	>1.60	>39.8
Zinc	HBG	1.75- 2.1	56 - 125
	P.A.	2.1 - 2.7	125 - 501
	A.	> 2.7	>501
Copper	HBG	1.25 - 1.6	17.8 - 39.8
	P.A.	1.6 - 2.05	39.8 - 125
	A.	> 2.05	>112
Nickel	HBG	1.75 - 2.0	65 - 100
	P.A.	2.0 - 2.35	100 - 223
	A.	>2.35	>223
Cobalt	HBG	1.25 - 1.6	17.7 - 39.8
	P.A.	1.6 - 2.1	39.8 - 125
	A.	>2.1	>125
Arsenic	HBG	0.8 - 1.2	6.3 - 15.8
	P.A.	1.2 - 2.6	15.8 - 398
	A.	>2.6	>398

Molybdenum	HBG	0.55 - 0.85	3.5 - 7.1
	P.A.	0.85 - 1.25	7.1 -17.8
	A.	>1.25	>17.8
Tin	HBG	1.2 - 1.72	15.8 - 52.5
	P.A.	1.72 - 2.30	52.5 -199.5
	A.	>2.3	>199.5
CxCopper	HBG	0.5 - 0.8	3.2 - 6.3
	P.A.	0.8 - 1.2	6.3 - 15.8
	A.	> 1.2	> 15.8
Lead (Full range)	HBG	1.0 - 1.3	10 - 20
	P.A.	1.3 - 1.55	20 - 35.4
	A.	> 1.55	> 35.4

		Ratio
Cu/Ni	HBG	3.0 - 8.5
	P.A.	8.5 - 14.0
	A.	>14.0
Free Copper $\frac{(CxCu + Cu)}{Cu}$	HBG	1.4 - 1.7
	P.A.	1.7 - 2.1
	A.	>2.1

8. INTERPRETATION

8.1 Lead Plan TASh 900

The south-eastern section of EL 30/79 is strongly anomalous in lead with respect to most other areas of North-West Tasmania. Most samples fall in the range of high background and above. There is no known mineralisation in the area, Big Ben and Montanna Silver-Lead Mines lie just to the south.

There appears to be no major faulting and the area is magnetically very flat. The major anomalous streams occur over a wide area and definately warrant detailed follow-up.

8.2 Lead With Selections Plan TASh 901

This plan looks only at values 0-100ppm and increases the number of cut points within that range to greater sensitivity in the MAPLOT programme. This indicates that there are two larger areas with values in the range 40-71 ppm and two smaller areas with values +100 ppm. All areas indicate high values from a number of adjacent streams and there is no suggestion of contamination from old workings.

8.3 Zinc Plan TASh 902

Values are generally very low although two small areas south of the Pieman River show strongly elevated values, Both these areas are coincident with the highest lead anomalies.

8.4 Copper Plan TASh 903

Values are very low with majority below 9 ppm. Higher values along the Pieman River are probably due to contamination.

8.5 Nickel Plan TASh 904

Very low values which reflect lack of basic rocks within source area. Some unexplained higher values along Pieman River.

8.6 Cobalt Plan TASh 905

As above.

8.7 Arsenic Plan TASh 906

Values again low but small area of elevated values near Piney Creek is coincident with area of elevated lead-zinc values.

8.8 Molybdenum Plan TASh 907

Samples only along Pieman River. Nothing of significance.

8.9 Tin Plan TASh 908

Samples only along Pieman River. High values in central section of Licence area due to cassiterite in high level Tertiary gravels.

8.10 Cold Extractable Copper Plan TASh 909

Values are generally very low but there is some aerial correspondence with high lead areas south of Pieman River.

8.11 Copper-Nickel Ratio Plan TASh 910

Higher values generally restricted to Pieman River and probably reflect contamination and additions from the Dolerite Sill. A small area of higher values in Piney Creek area correlates with high lead values in this area.

8.12 Free Copper Plan TASh 911

A ratio of $\frac{CxCu + \dot{C}u}{Cu}$ which is suggested will enchance sulphide copper and depress copper held in silicate lattices.

Most values very low but some increased values in area of high lead values.

9. LIST OF REFERENCES

Lavin, O.P. and Nichol,I. 1981 — Q'Gas: A Mini computer - Based System to Aid in the interpretation of Exploration Oriented Geochemical Data. J.Chemical Exploration V.15 No.1-3 pp 521-539.

Poltock, N. & R. 1981 — EL 30/79 Healey Creek Grid Unpublished Report for CRAE.

Weir, D.J. 1982. — Rocky Cape EL 1/77 Lead-Zinc Computer Study - Stream Sediments. Unpublished Report CRAE No. 11586.

10. KEYWORDS

Geochem-drainage, stream sediments, computer, statistical methods, regional geology, geophysics - mag.

11. LOCATION

Queenstown SK 55-5.

12. LIST OF PLANS

Key Map Heemskirk Falls EL 30/79		Tv 252 •
Heemskirk Falls area -		
Stream Geochemistry -	Lead	TASh 900 •
	Lead with Selections	TASh 901 •
	Zinc	TASh 902 •
	Copper	TASh 903 •
	Nickel	TASh 904 •
	Cobalt	TASh 905 •
	Arsenic	TASh 906 •
	Molybdenum	TASh 907 •
	Tin	TASh 908 •

Cold Extractable Copper	TASh 909
Copper - Nickel Ratio	TASh 910
Free Copper	TASh 911

Heemskirk Falls area RTZ Aeromagnetic Survey	TASh 912
" " " Aeromagnetic Survey Mines Dept. '82	TASh 913
" " " Location Map of Ground Magnetic Traverses, Stream Sediment Samples and Aeromagnetic Anomalies	TASh 914
Heemskirk Falls Ground Magnetic Traverse South West Anom.	TASh 915
" " " " " Big Ben Anomaly	TASh 916

13. LIST OF APPENDICES

Appendix I Geochemical Sample Ledger Samples
1056021 - 032 Piney Creek area.

Appendix II Statistics for File NWTASSS

APPENDIX I

GEOCHEMICAL SAMPLE LEDGER

SAMPLES 1056021 - 032 PINEY CREEK AREA

707019 018

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name. HEEMSKIRK FALLS No 30/79 Sample numbers 1056021 – 030 Collected by G. BROADBENT Sheet no. 1/2

Area / Prospect PINEY CREEK AREA – STREAM TRAVERSE, thru small magnetic anomaly. Date 8.9.82

Map / Photo reference PIEMAN SHEET Nº 7914 (1:100,000 topo.) Analysed by ANALABS DPO no. 30352

Sample No.	Type ss* oc f s	ss channel ** fl	wi	al	co	ca	pH	Carbon	Metal content ppm or % Cu	Pb	Zn	As	Mo	Mn	Au	Sn			Grid ref All prefixed 7914 (Pieman 1:100,000 topo. sheet).	Geological Observations
		o/c sample type ***																		
		s sample type ****																		
1056021	ss		0.6m			0.4			12	6	21	5				4			552691	o/c pale grey and greenish grey quartzites and slightly sericitic(?) impure siltstones and sandstones extensively qtz veined – thin irregular stringers + lenses. Float – same + minor grey micaceous sheared shaley siltstones with qtz veining.
022	ss		0.6m			0.4			5	0.5	7	0.5				2				200 m upstream from 021. o/c grey quartzites and hard siltstones as above, float same.
023	ss		0.3m			0.1			5	3	8	1				2				Small tributary from west – oc., float same.
024	ss		1.0m		/	0.3			4	1	7	0.5				14				400m upstream from 021 Marshy, boggy creek – no o/c, float white angular qtz, rounded qtz pebbles, minor rare qtzite.
025	pan-con		0.6m			0.4			5	3	20	0.5				29			552691	Same location as 021 – 2 level pans reduced to
026	oc	3m	x 0.5m		r.c.				11	9	27	15				16			37m upstream from 021	Sheared black pyritic (1-2%) shale with small pyritic qtzite lenses to 10 cm thick str 105°
027	oc	g.s.							14	10	12	13				2				Grab sample of thin pyrite – qtz – qtzite lens within black shale.
028	f	g.s.							8	14	45	8				2				130 m. upstream from 021 Finely bedded grey siltstone – micaceous parting, slightly dolomitic?
029	oc	g.s.							38	3	49	9				2				185 m up from 021. Finely bedded grey ?dolomitic siltstone. str 150°, dip 85° south.
030	oc	g.s.							11	4	47	9				5				142 m upstream from 021. Grey ?dolomitic shale with 1-2% pyrite str 260°.

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed. sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

707020 012

C.R.A. EXPLORATION . GEOCHEMICAL SAMPLE LEDGER

Tenement name HEEMSKIRK FALLS No 30/79 Sample numbers 1056031- Collected by G. BROADBENT Sheet no. 2/2

Area / Prospect PINEY CREEK AREA - STREAM TRAVERSE thru small magnetic anomaly. Date 8.9.82

Map / Photo reference PIEMAN SHEET Nº 7914 (1:100,000 topo.) Analysed by ANALABS DPO no. 30352

Sample No.	Type ss * oc f s	ss channel ** fl	wi	al	co	ca	pH	o/c sample type ***	s sample type ****	Carbon	Metal content ppm or % Cu	Pb	Zn	As	Mo	Mn	Au	Sn			Grid ref	Geological Observations
1056031	oc	g.s.									8	4	8	7				2				180 m upstream from 021. Hard grey silicified siltstone, impregnated with thin qtz stringers.
032	oc	g.s.									19	17	41	11				2				265 m upstream from 021. Unusual sheared ?conglomerate. Grey f.gr. matrix, with rounded chert & black shale, granite.

* Sample type ss = stream sediment oc = outcrop f = float s = soil

** Stream sed sample description fl = flow m3/sec wi = width m al = alluvial co = colluvial ca = catchment km2

APPENDIX II

STATISTICS FOR FILE NWTASSS

STATISTICS FOR FILE NWTASSS

Selection of histogram intervals was narrowed down to 0.1 and 0.05 log units by a process of trial and error. Any interval less than 0.05 log units tended to create a wide distribution interpreted as analytical reading errors rather than natural distribution.

1. Lead

Lead was considered the most important element within this study for two reasons:

(a) Lead and zinc are the most suitable indicators in Canada for the discovery of Selwyn Basin type deposits.

(b) Within the Tasmanian geochemical environment lead was considered to be the most insoluble element and therefore the most likely to give an identifiable dispersion train within a drainage system.

Two sets of histograms were produced, one treating the whole data, the other based on a selected portion of the data between 0-100 ppm to examine its distribution more closely as lead values greater than 100 ppm were considered to be greatly anomalous.

1.1 Total Distribution

Four significant populations are defined by the histogram under 2.1 log units (125.9 ppm) which account for over 2/3 of the samples analysed. A significant tailing off of values is apparent above 2.1 log units (125 ppm). Population cut offs have been defined as follows:

0.9, 1.3, 1.55, 2.1, 3.1, log units

Mean = 0.93
Standard deviation = 0.55
Mean + 1 SD = 1.48
Mean + 2 SD = 2.03

1.2 Lead Distribution with Selections of 0-100 ppm

Values of lead between 0 and 2.0 log units were selected. In this case, 6 cut offs were proposed as follows:

0.5, 0.8, 1.25, 1.6, 1.85, 2.0 log units

Mean = 0.86
Standard deviation = 0.45
Mean + 1 SD = 1.31
Mean + 2 SD = 1.76

This set of statistics was considered to be more accurate and was used for later interpretation in preference to those outlined to section 1.1

2. Zinc

The zinc distribution is quite complex under 2.7 log units (500ppm) and could be interpreted either as one single population or as four overlapping ones. The latter interpretation is preferred. Although several extra populations could be defined below 1.55 log units (35 ppm), these were considered to be insignificant.

Population cut offs were selected as follows:

1.55, 1.75, 2.1, 2.7 log units

Mean = 1.46
Standard Deviation = 0.61
Mean + 1 SD = 2.07
Mean + 2 SD = 2.68

3. Copper

Copper exhibits a relatively simple distribution with six populations evident at the following cut offs:

0.5, 0.95, 1.25, 1.60, 2.05 log units

Mean = 0.95
Standard deviation = 0.45
Mean + 1 SD = 1.40
Mean + 2 SD = 1.85

4. Nickel

Nickel is quite complex with a number of overlapping populations between 1.0 and 2.5 log units (10 - 316 ppm) at a histogram interval of 0.1 log units. Selections were based on an interval of 0.05 log units.

Population selections were made as follows:

1.2, 1.55, 1.75, 2.0, 2.35, 2.8 log units

Although 2 well defined populations exist below 1.0 log units, these were considered too low to be of significance and probably fall into the areas of detection limit.

Mean = 1.13
Standard deviation = 0.61
Mean + 1 SD = 1.74
Mean + 2 SD = 2.35

5. Cobalt

Cobalt exhibits a simple distribution with population cut points selected as follows:

0.9, 1.25, 1.6, 1.8, 2.1, 2.6 log units

Mean = 0.85
Standard deviation = 0.51
Mean + 1 SD = 1.36
Mean + 2 SD = 1.87

6. Arsenic

Arsenic has a poorly defined distribution between 1.3 and 2.6 log units (20-400 ppm) and is very difficult to subdivide. Since over 2/3 of the data fall under 0.8 log units (6.3 ppm) one can only assume that this represents a single population.

Cut offs have been defined as follows:

024

0.8, 1.20, 2.6, 3.1 log units

Mean = 0.55
Standard deviation = 0.37
Mean + 1 SD = 0.92
Mean + 2 SD = 1.29

7. Molybdenum

Molybdenum shows a wide distribution with the majority of samples below 0.2 log units (1.6 ppm). Population cut offs have been selected as follows:

0.25, 0.55, 0.85, 1.25, 1.55 log units

Mean = 0.21
Standard deviation = 0.21
Mean + 1 SD = 0.42
Mean + 2 SD = 0.63

8. Tin

Tin has a wide distribution with no well defined population breaks between 1.2 - 2.5 log units. This can be interpreted as either a single population or one composed of many smaller populations. The latter interpretation is preferred and cut offs are as follows:

0.7, 1.2, 1.72, 2.3, 2.7 log units

Mean = 0.98
Standard deviation = 0.86
Mean + 1 SD = 1.84
Mean + 2 SD = 2.70

9. CxCu

Cold extraction copper exhibits a wide distribution with poorly defined populations between 0.6 - 2.0 log units. Cut points between populations have been defined as follows:

0.1, 0.5, 0.8, 1.2 log units

Mean = 0.18
Standard deviation = 0.30
Mean + 1 SD = 0.48
Mean + 2 SD = 0.78

10. Copper/Nickel Ratio

This variable was chosen to try to distinguish basic rocks from the remainder and was obtained by simple transformation of the data. A reasonable distribution was obtained and cut offs selected as follows:

3.0, 5.0, 8.5, 14.0, 20.5, 30.0, log units

Mean = 1.41
Standard deviation = 2.56
Mean + 1 SD = 3.86
Mean + 2 SD = 6.31

11. Free Copper, FCU

Free copper was calculated by the formula -

$$FCU = \frac{CxCu + Cu}{Cu}$$

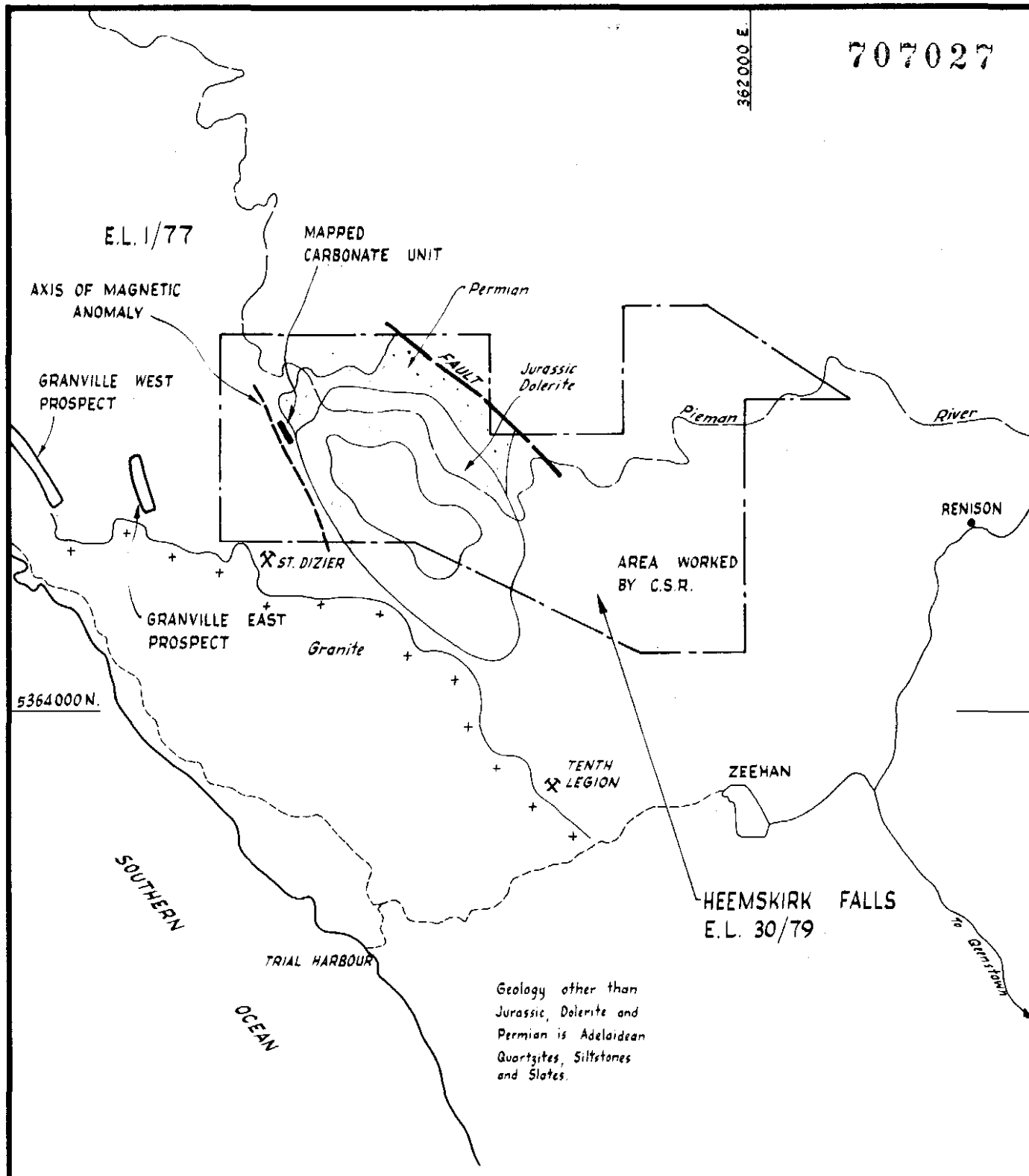
- to enhance any copper anomalies. It reflects the amount of copper absorbed on to clay particles rather than copper held in mineral lattices.

Cut points were chosen at the following intervals:

1.4, 1.7, 2.1 log units

Mean = 1.24
Standard deviation = 0.23
Mean + 1 SD = 1.47
Mean + 2 SD = 1.70

707027



82-1838

C.R.A. EXPLORATION PTY. LIMITED

KEY MAP
HEEMSKIRK FALLS E.L. 30/79
GRANVILLE PROSPECT

geologist: A.M.	scale: 1:200000 (approx)	report no:
drawn: T.G.D.S.	date: Feb. 1980	plan no: Tv 252

707028

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	LEAD (ppm)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.1	-	0
0.1	10	1	2213
10	20	2	404
20	36	3	363
36	126	4	296
126	1000	5	102
1000	100 000	6	12
ABOVE	100 000	*	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

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HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA 2545
STREAM GEOCHEMISTRY
LEAD (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	900

707029

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: LEAD with SELECTIONS (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	1	-	22
1	3	1	1269
3	6	2	307
6	18	3	989
18	28	4	310
28	40	5	89
40	71	6	198
71	100	7	73
ABOVE	100	+	133

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER:
WIDTH = 1 INCHES OR 254mm
HEIGHT = .167 INCHES OR 423mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA 82-1838
E.L. 30/79 W. TASMANIA 2546
STREAM GEOCHEMISTRY
LEAD WITH SELECTIONS (ppm)

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	901

707030

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	ZINC (ppm)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.1	-	0
0.1	36	1	1937
36	56	2	394
56	126	3	641
126	501	4	337
510	100 000	5	76
ABOVE	100 000	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 4·23 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA 2547
STREAM GEOCHEMISTRY
ZINC (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	902

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	COPPER (ppm)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.1	-	0
0.1	3	1	754
3	9	2	992
9	18	3	1143
18	40	4	535
40	112	5	326
112	10.000	6	91
ABOVE	10.000	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA 2548
STREAM GEOCHEMISTRY
COPPER (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	903

707032

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: NICKEL (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	1	-	5
1	16	1	1809
16	36	2	457
36	56	3	212
56	100	4	270
100	224	5	281
224	631	6	49
ABOVE	631	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY
NICKEL (ppm)

2543

82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	904

707053

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: COBALT (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	1	-	8
1	8	1	1376
8	18	2	278
18	40	3	318
40	63	4	196
63	126	5	101
126	398	6	13
ABOVE	398	*	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA 2550
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY
COBALT (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	905

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	ARSENIC (ppm)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW 1	1	-	0
1	6	1	2454
6	16	2	124
16	398	3	158
398	1259	4	6
1259	5012	5	1
ABOVE 5012	5012	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY 2551
ARSENIC (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	906

707035

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: MOLYBDENUM (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	1	.	119
1	2	1	2290
2	4	2	41
4	7	3	44
7	18	4	30
18	36	5	19
36	126	6	20
ABOVE	126	*	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY 2552
MOLYBDENUM (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	907

707036

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: TIN (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.1	.	1
0.1	5	1	1379
5	16	2	185
16	53	3	186
53	200	4	215
200	501	5	117
501	31623	6	68
ABOVE	31623	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 4·23 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY 2553
TIN (ppm) 82-1838

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	908

707037

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR: COLD EXTRACTABLE COPPER (ppm) JULY 1982

LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.1	-	0
0.1	1	1	1715
1	3	2	546
3	6	3	201
6	16	4	80
16	316	5	31
ABOVE	316	+	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = ,167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA 2554
STREAM GEOCHEMISTRY
COLD EXTRACTABLE COPPER (ppm)

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	909

82-1836

707038

340 000 mE

350 000 mE

360 000 mE

370 000 mE

S 380 000 mN

S 370 000 mN

S 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	COPPER / NICKEL (ratio)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.0	-	0
0.0	3.0	1	2757
3.0	5.0	2	157
5.0	8.5	3	82
8.5	14.0	4	39
14.0	20.5	5	20
20.5	30.0	6	13
30.0	1000.0	7	12
ABOVE	1000.0	*	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 4.23 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA 2555
STREAM GEOCHEMISTRY
COPPER / NICKEL (ratio)

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	910

82-1838

707039

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

LEGEND

SYMBOL MAP FOR:	FREE COPPER (ratio)		JULY 1982
LOWER BOUND	UPPER BOUND	SYMBOL	FREQUENCY
BELOW	0.0	-	0
0.0	1.4	1	2165
1.4	1.7	2	306
1.7	2.1	3	90
2.1	17.0	4	9
ABOVE	17.0	*	0

VALUES THAT FALL ON A CLASS BOUND ARE ASSIGNED TO THE LOWER CLASS

PLOT ERROR FOR EACH PLOT CHARACTER :
WIDTH = .1 INCHES OR 254 mm
HEIGHT = .167 INCHES OR 423 mm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
STREAM GEOCHEMISTRY
FREE COPPER (ratio)

2556

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	911

82-1838

707040

340 000 mE

350 000 mE

360 000 mE

370 000 mE

5 380 000 mN

5 370 000 mN

5 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
RTZ AEROMAGNETIC SURVEY
(1956)

2557

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	912

82-1838

340 000 mE

350 000 mE

360 000 mE

370 000 mE

S 380 000 mN

S 370 000 mN

S 360 000 mN

PIEMAN RIVER

RENISON BELL

ZEEHAN

5 cm

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS AREA
E.L. 30/79 W. TASMANIA
AEROMAGNETIC SURVEY
MINES DEPARTMENT 1982

REF.	SK55 - 5		
SCALE.	1 : 100 000	DRAWN.	R. T.
AUTHOR.	J. W.	REPORT N°.	11693
DATE.	OCTOBER 1982	TASh N°.	913

707042

350 000mE

360 000mE

5 480 000mN

5 470 000 mN

STRINGERS CREEK - TULLAH ROAD

Boundary E.L. 30/79

PIEMAN RIVER ANOMALY

HEALY CREEK NORTH ANOMALY

PIEMAN RIVER

HEALY CREEK GRID

SOUTH WEST ANOMALY

ZEEHAN - GRANVILLE ROAD

PINEY CREEK

PINEY CREEK ANOMALY

1056024

1056022

1056023

1056021
025

BIG BEN Ck

BIG BEN CREEK ANOMALY

5 cm

GN

MN

LEGEND

- ROAD
- TRACK
- 1056021 — STREAM SEDIMENT LOCATION & NUMBER
- 100 H — APPROX BOUNDARY AEROMAGNETIC FEATURE
- 2 — GROUND MAGNETIC TRAVERSE & NUMBER
- INFERRED GEOLOGICAL BOUNDARY
- Tb — TERTIARY BASALT
- Ts — TERTIARY SANDS, MINOR GRAVELS (qtz) SILICIFIED IN PART
- DOLERITE SILL

Heemskirk

CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS E.L. 30/79

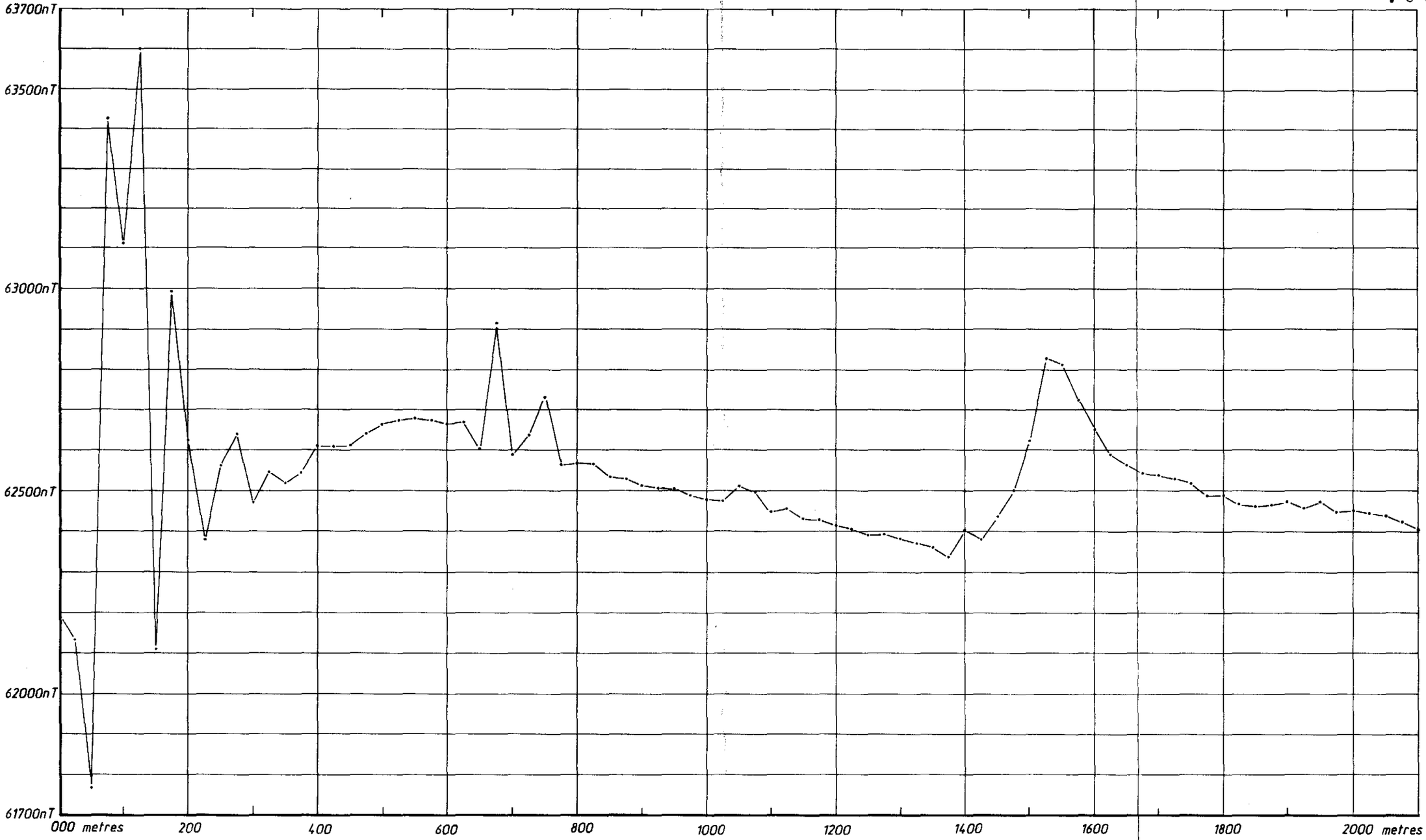
Location Map: GROUND MAGNETIC TRAVERSES
STREAM SEDIMENT SAMPLES
AEROMAGNETIC ANOMALIES

2559

Ref SK55 - 5	
Scale 1 50000	Drawn R. T
Author G B	Report N° 11693
Date 6 - 10 - 1982	TASh N° 914

82-1838

707043



GROUND MAGNETIC TRAVERSE 3 BEARING 346° Magnetic (358° AMG)

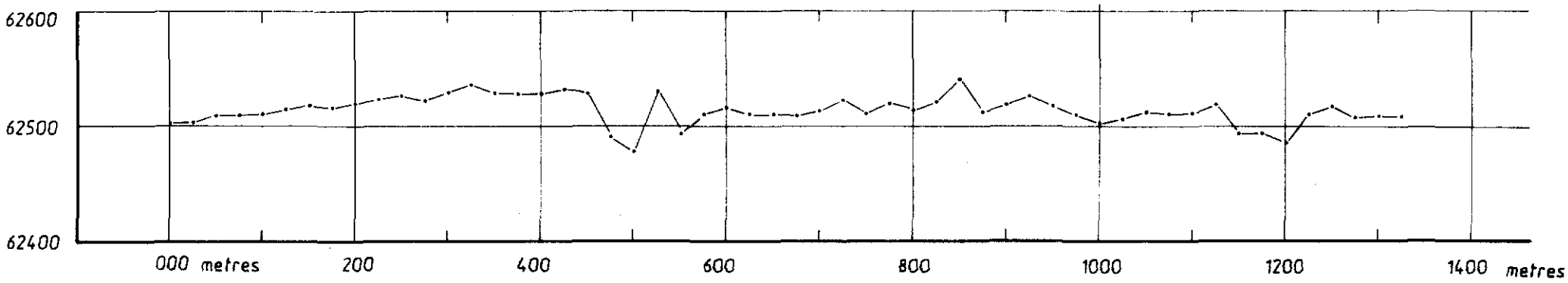
CRA EXPLORATION PTY. LIMITED

HEEMSKIRK FALLS E.L. 30/79
GROUND MAG. TRAVERSE

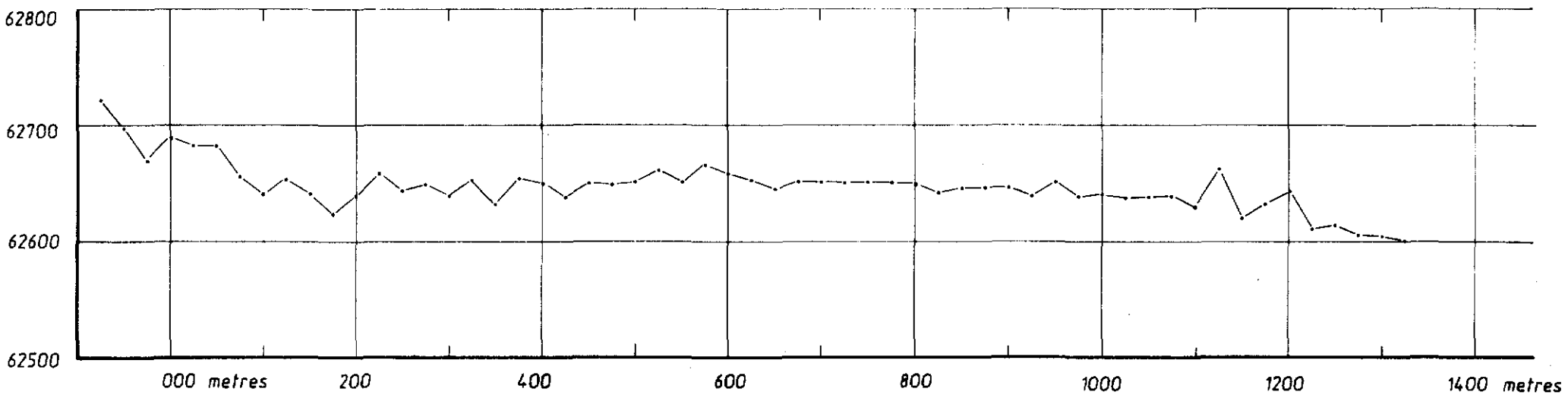
SOUTH - WEST ANOMAL2560

REF. SK55 - 5	
SCALE. AS SHOWN	DRAWN. R. T.
AUTHOR. G. B.	REPORT N°. 11693
DATE. 7 - 10 - 1982	TASh N°. 915

82-1825



HEEMSKIRK FALLS E.L. 30/79 MAG. TRAVERSE 1 BIG BEN CREEK



HEEMSKIRK FALLS E.L. 30/79 MAG. TRAVERSE 2 BIG BEN CREEK

CRA EXPLORATION PTY. LIMITED	
HEEMSKIRK FALLS E.L. 30/79 GROUND MAG. TRAVERSES BIG BEN CREEK ANOMALY	
Ref: SK55 - 5	
Scale: as shown	Drawn: R. T.
Author: G. B.	Report N°. 11693
Date: 6 - 10 - 1982	Plan N°. TASh 916