855001

CRA EXPLORATION PTY. LIMITED
ACN 000 057 125

MOUNT FRANKLAND EL18/92, REPORT ON EXPLORATION FOR THE SECOND YEAR OF TENURE, 6/10/93 TO 5/10/94.

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DATE: OCTOBER, 1994

LICENCE HOLDER: CRA EXPLORATION PTY. LIMITED

A.C.N.: 000 057 125

SUBMITTED TO: T.W. DICKSON

ACCEPTED BY:

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CRAE CANBERRA
CRAE PRESTON

CRAE REPORT NO. 20308

855002

CONTENTS

1. SUMMARY

CRA Exploration Pty. Limited (CRAE) is exploring Mount Frankland EL18/92 for sediment hosted Cu deposits in a range of lithological and structural settings. Numerous small vein-hosted Cu workings along a 30km NNW trend centred on Balfour indicated that Cu mineralising processes were active in the area, hence there may be some potential for larger Cu bodies of interest to CRAE.

Two Cu targets are under consideration, stratiform concentrations within favourable sedimentary units, and large irregular, stratabound silica-dolomite bodies on the Balfour Cu trend.

Work completed during the second year of tenure included geological mapping, soil and rockchip geochemistry.

Mapping within EL18/92 during the year has identified two sedimentary contacts that may be favourable for developing stratiform Cu mineralisation caused by redox reactions, the quartzite - carbonaceous siltstone contact, and the carbonaceous siltstone- chloritic siltstone contact. To date no significant geochemical anomalies have been identified on these contacts, however, sampling has been very selective, and limited in extent.

Additional soil sampling at the W end of The Gap prospect failed to locate anomalous Cu geochemistry. No further work is required at this prospect.

Prospects for exploration in 1995 are:-

- quartzite - carbonaceous siltstone contact between Specimen Hill and Nelson Bay River, strike length 8km
- carbonaceous siltstone - chloritic siltstone contact between Murray's Reward and The Clump, strike length 8km
- intersections of Roger River Fault and Balfour Transform with the above stratigraphic zones

Activities in 1995 will include the establishment of cut grid lines over selected portions of the identified prospects, dipole-dipole IP and ground magnetic surveys, and soil or bedrock geochemical traverses.

2. INTRODUCTION

Mount Frankland EL18/92 was granted to CRA Exploration Pty. Limited (CRAE) on 6th November 1992. The EL covers 177sqkm located at Balfour, in the NW of Tasmania (Plan Tv451). During the first two years of tenure, CRAE has a statutory obligation to expend $70800.

CRAE's principal commodity of interest in the area is Cu. Regional studies of Cu potential in Proterozoic sequences Australia-wide by CRAE drew attention to NW Tasmania as being prospective for stratiform/stratabound Cu mineralisation in a variety of lithological and structural settings within the Rocky Cape Group and the Smithton Trough. Numerous small vein-hosted Cu workings along a 30km NNW trend centred on Balfour indicated that Cu mineralising processes were active in the area, hence there may be some potential for larger Cu bodies of interest to CRAE.

Work completed during the second year of tenure included geological mapping, soil and rockchip geochemistry. This report details all exploration activities conducted within EL18/92 by CRAE during 1993/94.

3. CONCLUSIONS

Mapping within EL18/92 during the year has identified two sedimentary contacts that may be favourable for developing stratiform Cu mineralisation caused by redox chemical reactions, the quartzite - carbonaceous siltstone contact, and the carbonaceous siltstone- chloritic siltstone contact. To date no significant geochemical anomalies have been identified on these contacts, however, sampling has been very selective, and limited in extent.

Mapping has also accurately located the position of the Roger River Fault and other major structures that may play a role in focussing mineralisation.

Soil sampling at the W end of The Gap prospect has failed to identify significant Cu anomalism. No further work is required at The Gap.

4. RECOMMENDATIONS

The Balfour area has some difficulties that complicate exploration. The area is heavily leached near the surface to the stage that only quartz lag remains. Tertiary gravels cover portions of the area. As a consequence, soil and surface rockchip sampling have been demonstrated to be unreliable indicators of known mineralisation. Stream sediment geochemistry is largely ineffective as topography is too subdued to allow creeks to incise through this leached zone.

Fortunately, heavy surface leaching is not penetrative, allowing geophysics to be employed with some success. Magnetic surveys have been effective in delineating pyrrhotitic and magnetite-rich sequences, and IP has clearly identified conductors and chargeable zones.

Prospects for exploration in 1995 are (Plan Tv844):-

- quartzite - carbonaceous siltstone contact between Specimen Hill and Nelson Bay River, strike length 8km
- carbonaceous siltstone - chloritic siltstone contact between Murray's Reward and The Clump, strike length 8km
- intersections of Roger River Fault and Balfour Transform with the above stratigraphic zones

Activities in 1995 will include the establishment of cut grid lines over selected portions of the identified prospects. Dipole-dipole IP and ground magnetic surveys will be completed over these lines to identify chargeable or conductive zones possibly indicating sulphide accumulations. If possible, soil or bedrock geochemistry will also be collected. Best targets from each area defined by the above program will be tested with a diamond drill hole.

5. REGIONAL GEOLOGY

See Parkinson (1993).

6. MINERALISATION

See Parkinson (1993).

7. PREVIOUS EXPLORATION BY COMPETITORS

See Parkinson (1993).

8. PREVIOUS EXPLORATION ON EL18/92

Year 1: Activities during Year 1 included a literature review and data compilation of relevant past exploration. Regional soil, rockchip and ground magnetic traverses were carried out over the suspected location of the pyrrhotitic siltstone in the S part of the EL. Detailed soil geochemistry was collected at The Gap prospect where a break in the magnetic response coincident with an E-W fault was thought to be prospective for stratiform sediment-hosted Cu mineralisation. A detailed airborne magnetic and radiometric survey was flown to aid geological mapping.

9. EXPLORATION ACTIVITIES FOR THE PERIOD 6/10/93 TO 5/10/94.

9.1 Exploration Philosophy

Copper mineralisation in the Balfour area has been known since the late 19th century. Numerous small mines were worked on discordant quartz-dolomite-sulphide lodes from The Clump to the Interview River, a distance of nearly 40km. These transgressive lodes form a linear trend that is parallel to stratigraphy, and in particular lie close to a prominent magnetic marker. The largest of these discordant bodies, Murray's Reward, contains 0.5MT @ 0.8% Cu.

CRAE's philosphy in the Balfour area is that these discordant Cu lodes may be the brittle, cross-cutting, late-stage manifestation of a larger but more subtle Cu-mineralising event. Alternatively they may have been remobilised from a pre-existing source.

Two targets that potentially may host large Cu deposits are recognised in the Balfour area:-

- stratabound at boundaries between oxidising and reducing sediments
- structurally controlled where major structures intersect favourable sedimentary horizons

Stratabound targets
Two sedimentary contacts have been identified that could potentially form the locus for stratabound sediment-hosted Cu mineralisation. The first is the contact between the Lagoon River Quartzite with overlying carbonaceous siltstones. A prominent magnetic siltstone horizon which extends for about 60 km through the Rocky Cape Province marks this boundary. In the Balfour area this siltstone contains several percent pyrrhotite. Conceptually, copper-rich hydrothermal fluids migrating through the quartzite or via major faults may have replaced Fe in the pyrrhotitic siltstone to form a copper sulphide horizon.

In the vicinity of Specimen Hill, the quartzite - siltstone contact is marked by a strongly conductive (IP and DigHEM) linear. Soil geochemistry records erratic elevated Cu from the same area although sampling was incomplete and, in some cases ineffective. Despite detailed work by previous explorers at Specimen Hill, no drilling has been completed on this target.

The second sedimentary contact is the boundary between carbonaceous, sulphidic siltstone and chloritic, Fe oxide-bearing siltstone. In the N of the project area elevated Cu to 1100ppm has been recorded in rockchips from this zone. Near The Clump prospect, semi-massive sulphides (pyrite) have been located in subcrop at the contact from two localities 1km apart. An intense IP conductor probably coincides with this sulphide zone, and is traceable over 1.5km, open along strike. The exact location of the IP anomaly cannot be pinpointed to an accuracy better than 100m as the original survey locations have been lost (ACI Limited survey from 1970). ACI drilling did not test the sulphide - IP conductor ,but focussed on the adjacent discordant quartz-dolomite-chalcopyrite lodes. Their best drilling result was 13m @ 0.45% Cu.

Structurally controlled targets
Two major structures cut the Balfour area, the Roger River Fault and the Balfour Transform.
The NNE-trending Roger River Fault has been active periodically up to the present time. It was active during the Devonian, probably influenced or controlled volcanism and sedimentation in the early Cambrian, and may have been some early crustal weakness present in the Late Proterozoic. The Proterozoic carbonaceous siltstone appears to thin across this structure, possibly suggesting the fault was contolling sedimentation even in Adelaidian times.

The Balfour Transform is one of a set of WNW linears called "enigmatic cross-structures". These features are clearly seen in magnetic data and satellite imagery, but are elusive on the ground. A number of evenly-spaced "enigmatic cross-structures" cut Tasmania. It is likely that these linears are transfer faults that have controlled the tectonic architecture of Tasmania from the Late Proterozoic to at least the Devonian.

These structures may have acted as major conduits to introduce metal-rich fluids into favourable stratigraphic or structural locations. Geometry of possible ore-bodies related to these structures may be sheet-like within the faults, irregular massive replacements like the Mount Isa silica-dolomite body, or stratabound layer replacements.

Both structures cut the quartzite - carbonaceous siltstone - chloritic siltstone sequence between The Clump and Murray's Reward.

9.2 Literature review and data compilation

All available CRAE and competitor soil, rock and stream sediment geochemistry is being compiled to identify any subtle trends that may not be readily apparent in detailed prospect-scale data sets. This work is still in progress. The bulk of the geochemical surveys lie within EL4/94.

Geology student Laurence Veska completed an Honours Project on the Murray's Reward area in 1993. Laurie believes there may be potential to use S and Pb isotopes to discriminate between Devonian vein-style and remobilised Precambrian stratiform mineralisation. A discussion on isotopes is appended (Appendix 4).

9.3 Geological mapping

Contract geologist Mr Nicol Turner was engaged to produce a geological framework for the Mount Frankland EL (Plan Tv673). This work partly complements the detailed stratigraphic descriptions for the Specimen Hill area given in Parkinson (1993), but was principally aimed at providing a reliable base for more detailed prospect-scale mapping as exploration evolved. Turner's reports are presented in Appendix 1.

A simplified stratigraphic column for the Mount Frankland EL and adjacent areas, from youngest to oldest, is:-

Tertiary	gravels, sands and basalt.	
Devonian	(granite)	
Cambrian	Smithton Volcanics	
	(Black River Dolomite)	
	Forest Conglomerate	
Proterozoic	black siltstone	(Cowrie Siltstone correlate)
	slaty to phyllitic siltstone and mudstone	(possible Cowrie correlate)
	green (chloritic) siltstone	(Interview Siltstone correlate)
	dark grey (carbonaceous) siltstone	(Interview Siltstone correlate)
	quartzite	(Lagoon River Quartzite correlate)

The quartzites (Lagoon River correlates) are best exposed toward the W coast near Couta Rocks. Quartzite also dominates the sequence near Mount Balfour and Little Frenchman, and forms the buttresses to the Lindsay River bridge, but it is not clear if these arenites are equivalent to the Couta Rocks quartzites or are interbedded with the dark grey (carbonaceous) siltstone.

Dark grey (carbonaceous) siltstone overlies the quartzite, the boundary being marked in part by magnetic pyrrhotitic siltstone. There is considerable confusion when using the aeromagnetic data to define this boundary as other magnetic units in the area tend to have a similar response. To the S of Balfour, and extending N of Specimen Hill to the Roger River Fault, the prominent magnetic feature is the pyrrhotitic siltstone that defines the contact. North of the fault, the contact swings W-ward and the dips flatten, which cause the magnetic response to become more diffuse. The prominent magnetic response N of the fault is due to magnetite bands in the stratigraphically higher green (chloritic) siltstone.

Dark grey siltstone is well represented at Specimen Hill and on Blackwater Road near the Heemskirk Road junction. Cordierite porphyroblasts are developed at the Clump, and greisen veinlets have been observed on Blackwater Road immediately N of the Clump, suggesting a granite ridge may underlie the area at shallow depth. There also appears to be a marked thickening of the siltstone from the Specimen Hill area to the Clump area, possibly indicating either the Roger River Fault or the Balfour Transform (or precursor structures) had a controlling influence on sedimentation.

Green (chloritic) siltstone overlies the carbonaceous siltstone and is exposed on Blackwater Road, at Murray's Reward, and further S at The Gap. At the base of the green siltstone in the Clump area, semi-massive pyrite has been observed. Presently it is unclear whether the sulphide is stratiform. North of the Roger River Fault, narrow bands of disseminated magnetite in the green siltstone give rise to a prominent magnetic signature for part of this unit. These magnetite bands are visible on Blackwater Road near the Frankland River bridge.

Slaty siltstones and mudstones, dominated by dark grey siltstone, overlie the chloritic siltstone. This unit is more strongly cleaved than the remainder of the mapped sequence, and may be fault-bounded. The slaty siltstones and mudstones can be variable although are not dissimilar to units within the Cowrie Siltstone. They may be a structurally modified part of the lowermost Cowrie Siltstone.

Black laminated and pyritic siltstones are the uppermost formation seen in the area, and are unconformably overlain by Forest Conglomerate. The formation is very similar to sections of Cowrie Siltstone to the E of the Smithton Trough, and a correlation is suggested. If the black siltstones do correlate with the Cowrie Siltstone then the Proterozoic W coast sequence underlies the defined Rocky Cape Group. This implies a substantial sedimentary thickness for the whole Rocky Cape Block.

Cambrian Forest Conglomerate crops out on Blackwater Road, and can be traced to the Roger River Fault where it is displaced by 2km to the SW. A thick exposure forms Mount Frankland.

Black River Dolomite has not been observed in the mapped area.

Red-orange lithic wackes and mudstones of the Smithton Volcanics are mapped on the Blackwater Road within the now relinquished Trowutta EL. No Smithton Volcanics correlates are preserved on Mount Frankland.

Devonian granites have intruded the Rocky Cape Association from Sandy Cape to Pieman Heads. No granites are known from the Balfour area even though there is a strong spatial association of Sn mineralisation and granites throughout Tasmania. Turner (Appendix 1) has located griesen veinlets near Specimen Hill, and griesen veinlets and cordierite porphyroblasts near The Clump, suggesting a granite may be present in the subsurface at shallow depth.

Tertiary sands and gravels are locally developed throughout the area, particularly in a section of the Blackwater Road. Tertiary basalts occur at Balfour townsite and at the Clump.

Dip and strike readings collected by Colin Price in year 1 but not available for inclusion in that year's report, are shown on Plan Tv 635.

9.4 Rockchip geochemistry

A number of rockchip samples have been collected during the year from various localities. Samples were submitted to Analabs, Burnie and analysed by AAS (aqua regia-perchloric acid digest) for Ag-As-Cu-Fe-Mn-Pb-Zn, Au by fire assay, and Sn-W by XRF. Ledgers and assay results are listed in Appendix 2, locations and Mn-Fe-As-Zn-Cu geochemistry are plotted on Plans Tv854, and Tv855 to Tv859.

Significantly elevated results were only recorded from dump samples at old workings or elsewhere along the Cu trend. The highest Cu result was 7000ppm Cu from a quartz vein near The Gap. This is not significant for a vein. Weakly elevated Cu-As-Au values, up to 122ppm Cu, 696ppm As and 0.028ppm Au, were recorded in carbonaceous siltstone at the chloritic siltstone contact on Frankland Road. This suggests that the chloritic - carbonaceous boundary may be favourable for stratiform mineralisation, but not at this particular location.

9.5 Soil geochemistry

A total of 101 hand-augered C-horizon soil samples were collected at 25m intervals along W extensions to lines at The Gap. Lines were extended to cover the interpreted position of the quartzite-grey siltstone contact.

Samples were assayed at Analabs Burnie by AAS (aqua regia-perchloric acid digest) for Ag-As-Co-Cu-Ni-Pb-Zn-Fe-Mn. Locations and Cu-Zn-Fe-Mn geochemistry are plotted on Plans Tv848 to Tv852. Ledgers and assays are included in Appendix 3. Geology derived from soil pit observations is shown on Plan Tv585.

Elevated Cu geochemistry around 324000E 5426000N is patchy and does not appear to define a coherant anomaly. Zinc-Fe-Mn (and Co-Ni, not plotted) clearly differentiate the carbonaceous and chloritic siltstones to the E from the quartzites and grey siltstones in the W. Further, Mn offers some discrimination between the carbonaceous and the chloritic siltstones, as well as identifing a weak lithochemical contrast between siltstones and quartzites.

The quartzite-grey siltstone contact near the E-W fault at The Gap has now been adequately tested. Although there is patchy weakly elevated Cu values in soil, this is not considered to represent mineralisation. No further work is required at The Gap.

10. ENVIRONMENT AND REHABILITATION

During the year exploration having an environmental impact was confined to augered soil sampling. Soil pits were refilled at the time of sampling. No additional rehabilitation is required.

REFERENCES

PARKINSON R.G. 1993: Mount Frankland EL18/92. Report on exploration for the first year of tenure 6/11/92 to 5/10/93. *CRAE Report* 19240.

VESKA L.T. 1993: Geology, Mineralisation and Structure of the Balfour Copper Occurrence, North-western Tasmania. *Univ. Tas. Honours Thesis* (Unpubl.).

KEYWORDS

TASMANIA, PROTEROZOIC, SOIL SAMPLING, ROCKCHIP SAMPLING, GEOLOGICAL MAPPING, COPPER

LOCATION

BURNIE	SK55-3	1:250000
SANDY CAPE	7815	1:100000
BLUFF POINT	7815N	1:50000
BALFOUR	7815S	1:50000
SUMAC	3244	1:25000
DEMPSTER	3243	1:25000
BALFOUR	3242	1:25000
LILY	3241	1:25000
SUNDOWN	3044	1:25000
TEMMA	3043	1:25000

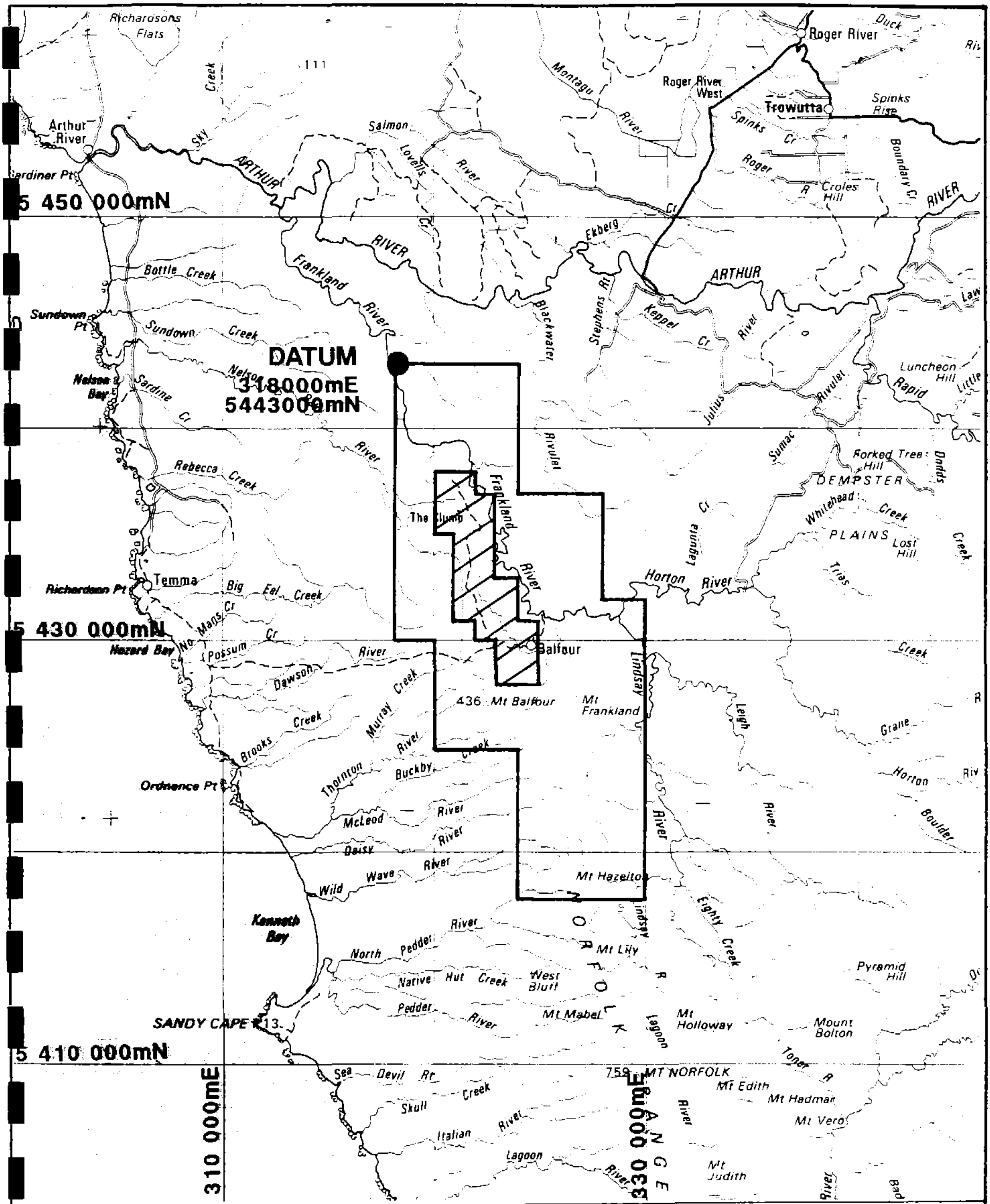
LIST OF DPOs

77114, 77115, 77118, 77662, 77667, 77676

LIST OF APPENDICES

LIST OF PLANS

Tv 850	Mt Frankland EL 18/92 "The Gap" Soil Geochemistry - Zn ppm	1:5,000
Tv 851	Mt Frankland EL 18/92 "The Gap" Soil Geochemistry - Fe%	1:5,000
Tv 852	Mt Frankland EL 18/92 "The Gap" Soil Geochemistry - Mn ppm	1:5,000
Tv 585	Mt Frankland EL 18/92 The Gap Prospect Interpreted Geology	1:5,000



CRA EXPLORATION PTY. LIMITED

Application for Exploration Licence

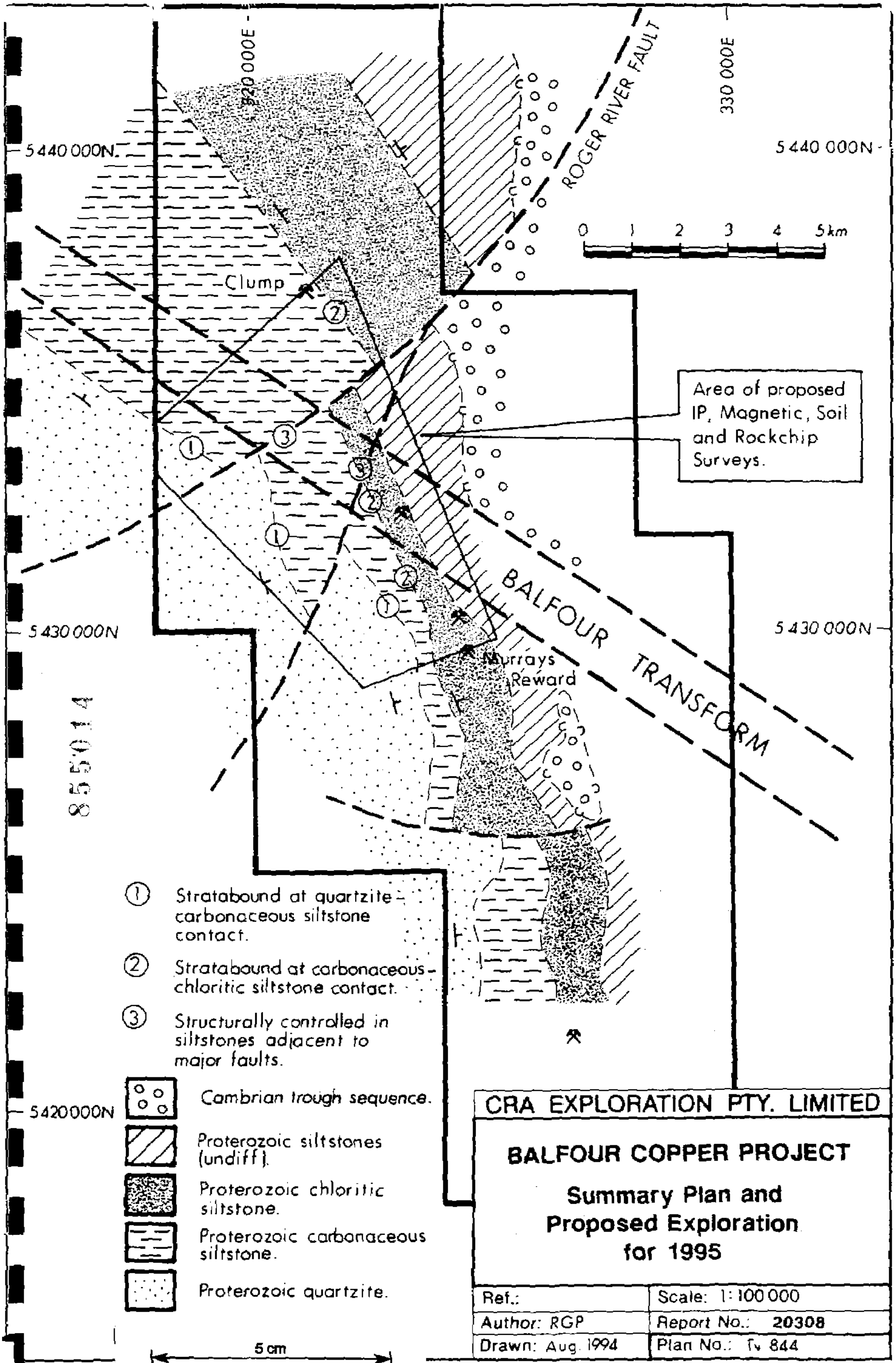
MT. FRANKLAND 177 km²

Ref.: SK55-03	Scale: 1:250 000
Author T.W.DICKSON	Report No.: 20308
Drawn R.TRAVIERSO	Plan No.: Tv 451

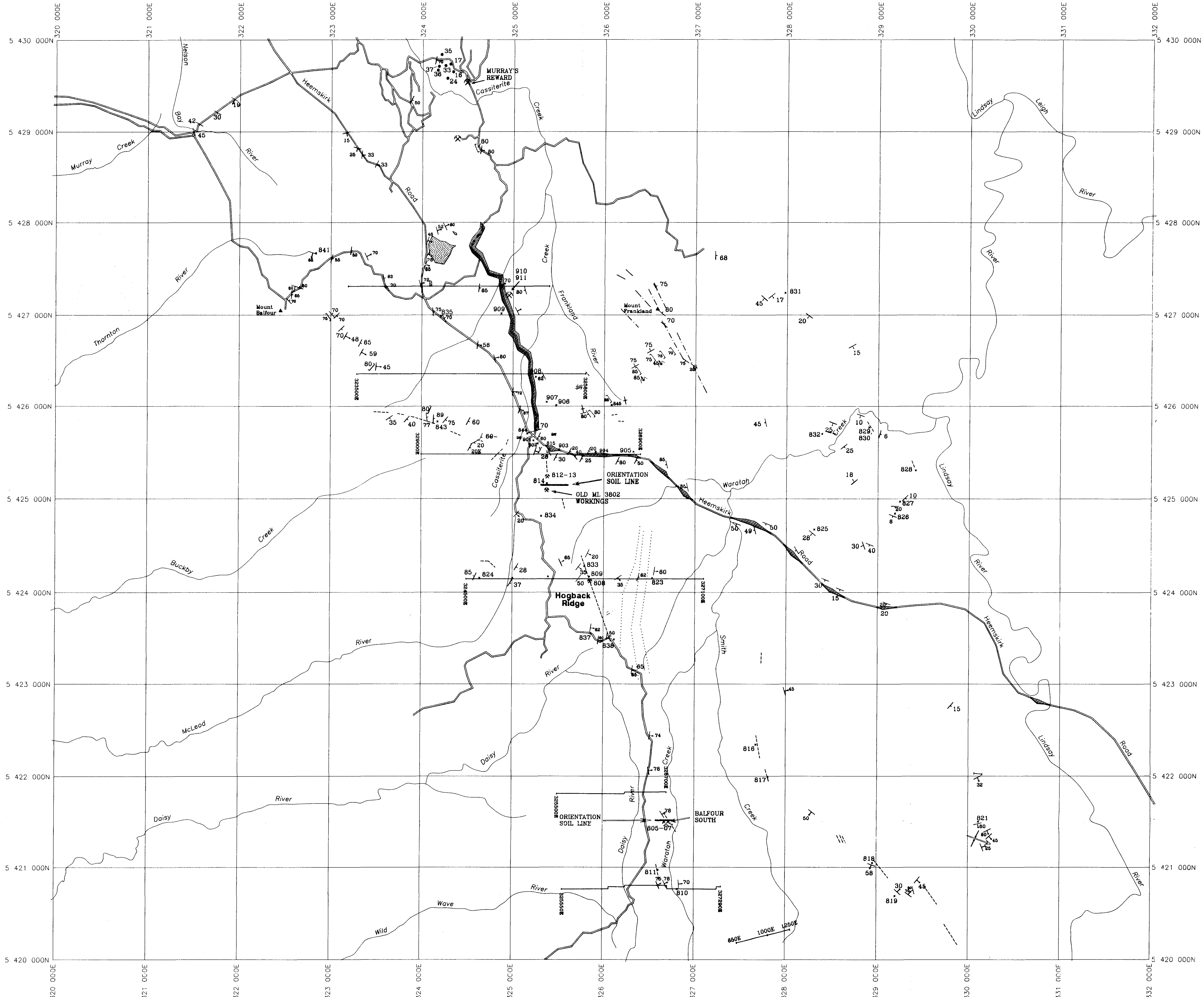
855013

EXCLUDED AREA
EXISTING EL 53/88

5 cm


320 000E
330 000E
ROGER RIVER FAULT
5 440 000N
5 440 000N
0 1 2 3 4 5 km
Clump
Area of proposed IP, Magnetic, Soil and Rockchip Surveys.
BALFOUR TRANSFORM
5 430 000N
5 430 000N
Murrays Reward
855014
1 Stratabound at quartzite - carbonaceous siltstone contact.
2 Stratabound at carbonaceous - chloritic siltstone contact.
3 Structurally controlled in siltstones adjacent to major faults.
5420000N
Cambrian trough sequence.
Proterozoic siltstones (undiff).
Proterozoic chloritic siltstone.
Proterozoic carbonaceous siltstone.
Proterozoic quartzite.
5 cm
CRA EXPLORATION PTY. LIMITED
BALFOUR COPPER PROJECT
Summary Plan and Proposed Exploration for 1995
Ref.:
Scale: 1:100 000
Author: RGP
Report No.: 20308
Drawn: Aug. 1994
Plan No.: Tv 844

CRA EXPLORATION PTY. LIMITED
MT FRANKLAND EL 18/92
GEOLOGICAL PLAN
Ref.: SK 55-03
File: MtFrank\616
Scale: 1 : 25,000
Date: October 1993
Author: Rob Parkinson
Report No.: 20308
Drawn: R.Travierso / A. Jelen
Plan No.: Tv 673
NOTE:
Geology by N.J. Turner Geological Services
5 cm
AMG North
Mag. North
11°
855015
0 500 1000 1500 2000
metres
GEOLOGICAL LEGEND
QUATERNARY
Qhd Windblown sand
TERTIARY
Tb Basalt and derived soil
Tsp Spongolite lag at 316100E 5436700N
Tg Quartzose gravel, sand and minor lignite
Unconformity
Ps Basalt, volcaniclastics and red-brown mudstone (Smithton Volcanics correlate)
Pf Conglomerate and chert breccia (Forest Conglomerate correlate) White to pink quartz arenite, pebbly quartz arenite and minor conglomerate on Mt Frankland (probable Forest Conglomerate correlate)
PROTEROZOIC
Unconformity
Prc Dark grey siltstone with cream and maroon, fine grained quartzose sandstone (probable Cowrie Siltstone correlate)
Pp Dark grey, cream, green and maroon, slaty to phyllitic siltstone and mudstone
LATE
Rebecca Road Blackwater Road to Balfour
Png Py Pn Pnq Py Pyq Pyq Pn Pnq Py Pyq
Thin banded green to olive siltstone with dark grey siltstone and minor mudstone, bedding is usually planar though thin, lenticular, graded beds of fine grained sandstone are locally present (Pn); with common interbeds of medium grained quartz arenite (Pnq); predominantly planar banded pale- and medium-green siltstone (Png), with chlorite spots, magnetite at 320000E 5439600N. Banded dark grey siltstone with common thin lenticular, graded beds of fine grained sandstone (Py), with grey metamorphic spots ; with common to abundant interbeds of medium grained quartz arenite (Pyq)
INTRUSIVE
Pd Dolerite
Geological boundary - position approximate
Geological boundary - inferred
Fault - position approximate
Fault - inferred
Strike and dip of bedding - right way up, facing unknown
Strike and dip of cleavage (Si) vertical
Strike and dip of observed fault, vertical
Field station for adjacent readings
Trend of quartz vein
Tourmalinised breccia on Specimen Hill
Very pyrite rich
Sparse quartz arenite lag
Frankland River
Dark Creek
Siliceous interval
Disseminated magnetite
Wuthering Heights Road
Old Balfour track - walking
Black River Dolomite absent or very thin
Quartz/chlorite and Cu sulphide veins. Probable thermal metamorphism in dotted locality.
Sparse lag of quartz arenite
MT BALFOUR MINING CO. SHAFT
Cyril Creek
Fault zone contains Cu mineralisation. Note: This symbol represents a fault located at the dot indicating the field station.
4WD track
THE CLUMP
ROGER RIVER FAULT
Bulldozed
SEE 1:10 000 MAP
Minor lag of quartz arenite containing pyrite and sphalerite.
Shear zone
Old workings in quartz/Cu sulphide veins. (Gully Cu Prospect).
Extent of track system beyond this point is unknown.
No outcrop - absence of quartz arenite lag suggests that the area is underlain by siltstone.
THE DEVELOPMENT Cu PROSPECT
THE BLOCKS Cu PROSPECT
Old walking track difficult to identify north of this point.
No outcrop found in this area.
No outcrop
LITTLE FRENCHMAN
EMMETTS Cu PROSPECT
CENTRAL MT. BALFOUR SHAFT
Walking track from Balfour to the Frankland River.
Source of magnetic anomaly not established. Crosses mark the anomaly maximum.
BALFOUR
Quartz chlorite veinlets
MURRAYS REWARD SHAFT
SPECIMEN HILL
TATLOWS SHAFT
SOUTHERN SHAFT
ROBBIES WORKINGS
4WD tracks
To Temma
Chloritic spotting and fractures
Brown clay soil after ?Pd
SEE 1:10 000 MAP
MT. BALFOUR
PIERPONT MORGAN Cu PROSPECT
MT. FRANKLAND
Pebbly mudstone underlies the basal conglomerate
Copper sulphides in shear zone
EL 18/92
WARATAH Cu PROSPECT
Chlorite spots
Lindsay River
BALFOUR SOUTH Cu PROSPECT
DOHERTY'S PIMPLE
NOTE: Several copper prospects occur between Doherty's Pimple and the Lindsay River, some 2kms to the East (see Ward, 1911)
5 440 000mN
5 435 000mN
5 430 000mN
5 425 000mN
5 420 000mN
315 000mE
320 000mE
325 000mE
94-3644



94-3644

	Recent conglomerate > terrace, course sandstone to cobblestone, flat lying.
	Laminated black shale & qtz-rich siltstone/fine sandstone (pyjama rock), black-grey & white beds 1 - 10mm thick, 1-3% fine disseminated pyrite, slaty cleavage.
- - - - - - -	Quartz lode.
_ . _ . _	Mt Frankland grit & conglomerate beds, pink, resistant, veined quartzite & laminated sandstone/shale cobbles > probably young eastward.
	Magnetic line
	Mine workings
x 816	Rock chip sample, Prefix 3529---.
• 35	Soil samples, Prefix 3530---.
73	Bedding dip & strike.
42	Bedding dip & strike with facing.
70	Cleavage dip & strike.
40	Syncline with plunge.
50	Small scale tight folding with plunge.

5 cm

0 500 1000 1500 2000

metres

85[illegible]016

CRA EXPLORATION PTY. LIMITED

MT. FRANKLAND EL 18/92

Rock & Soil Sample Location Plan

(Balfour Sheet)

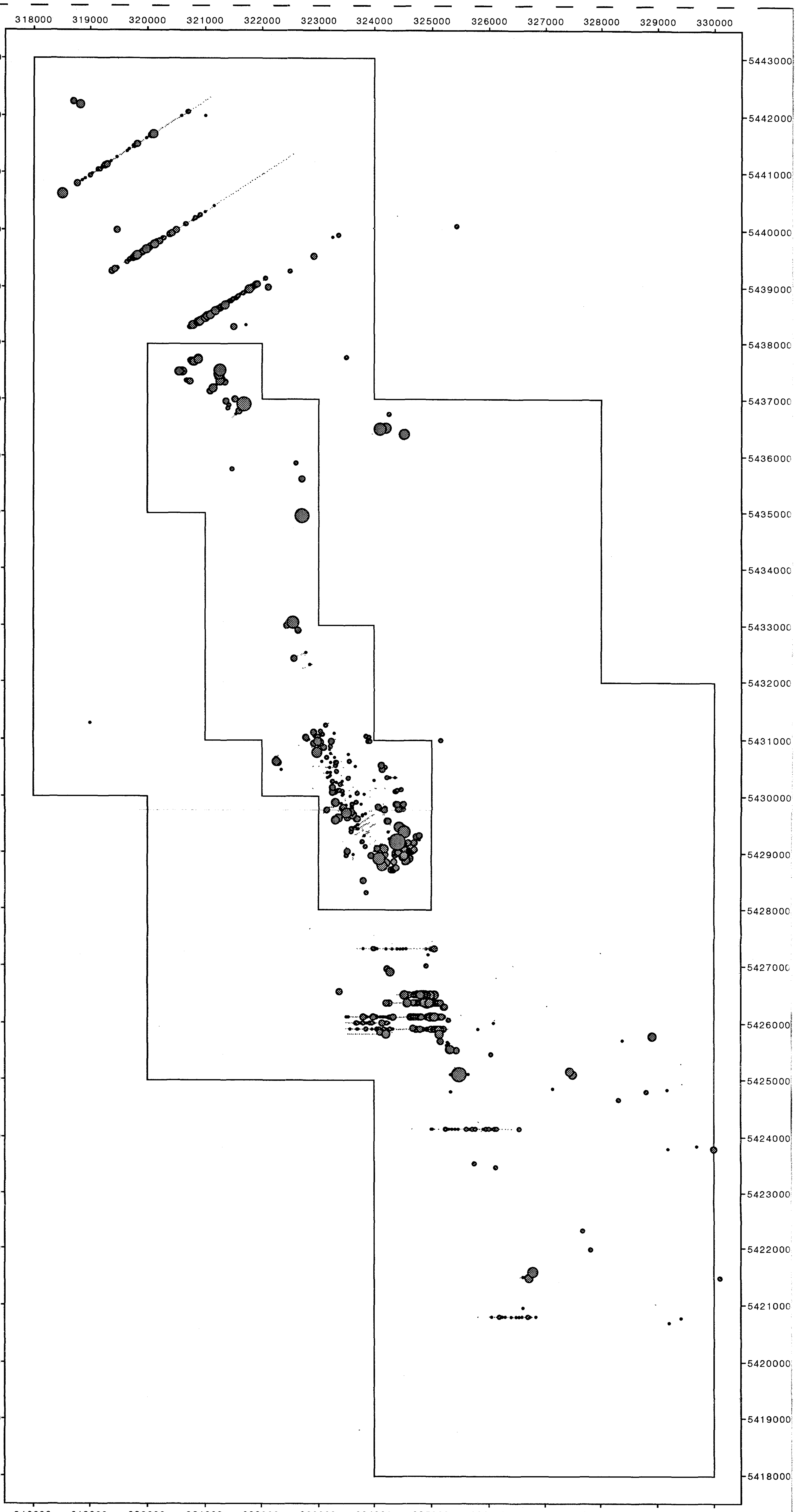
Ref.: Burnie SK55-03	File: MtFrank/TV635
Scale: 1 : 25 000	Date: November, 1993
Author: Colin Price	Report No.: **20308**
Drawn: S. J. Brook	Plan No.: Tv 635

855017

CRA EXPLORATION PTY. LIMITED

MT FRANKLAND EL 18/92
1993/94 SOIL & ROCK CHIP SAMPLE LOCATIONS

Ref.:	SK 55-03	File:	Tv854R
Scale:	1 : 25,000	Date:	September 1994
Author:	Rob Parkinson	Report No.:	**20308**
Drawn:	Rocco Travierso	Plan No.:	Tv 854



-50 · 50-100 · 100-200 · 200-500

500-1000 · 1000-2000 · 2000-5000 · 5000-10000 · +10000

855018

All Samples

jmap

1000m

5 cm

CRA Exploration Pty Limited

BALFOUR Cu PROJECT - EL18/92 & EL4/94

SOIL & ROCK GEOCHEM - Mn ppm

Geol: RGP	Scale: 1:50000	Report: **20308**
Drawn: RGP	Date:26/9/1994	Plan: Tv **855**

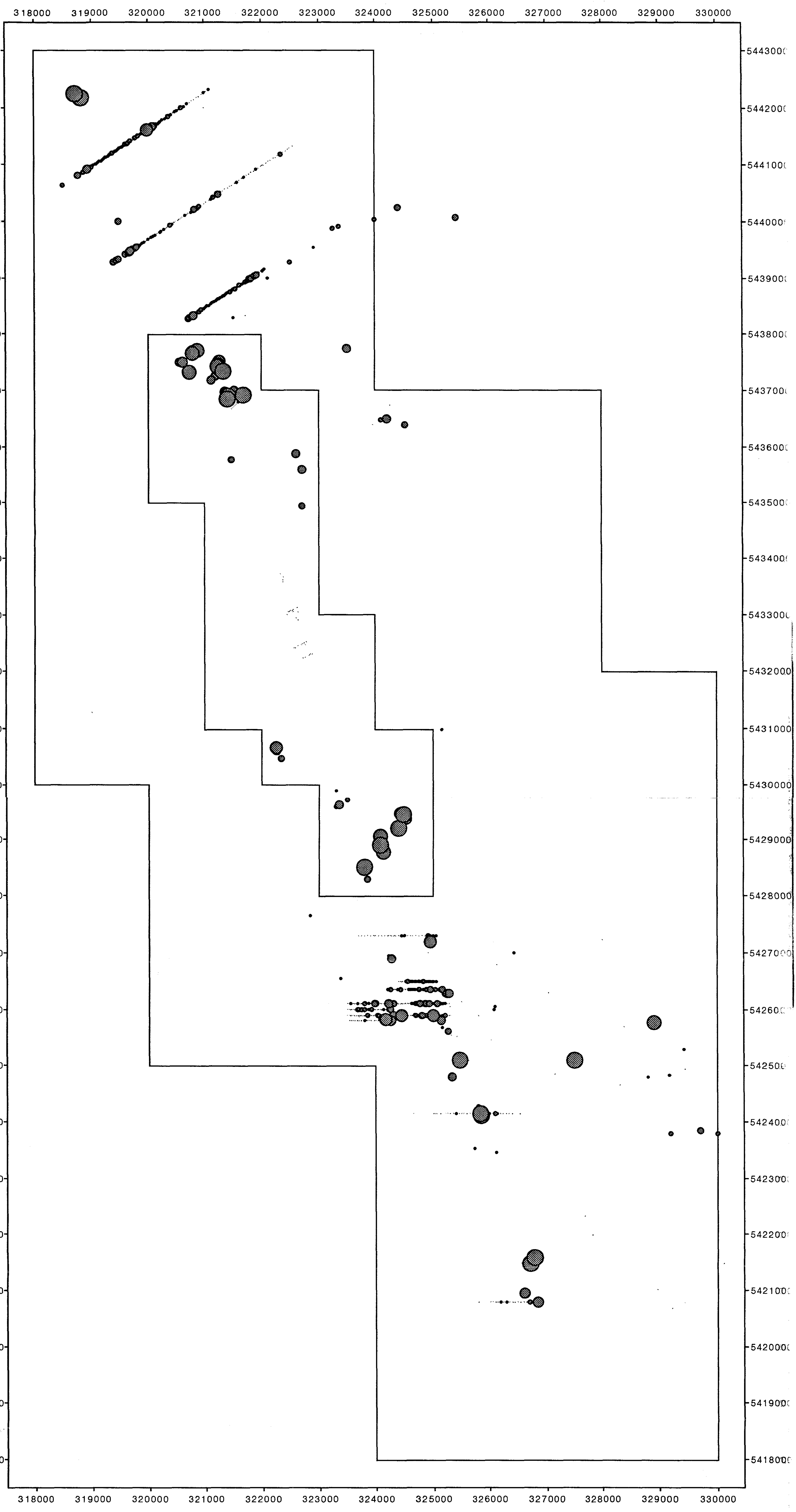
855019

CRA Exploration Pty Limited

BALFOUR Cu PROJECT - EL18/92 & EL4/94

SOIL & ROCK GEOCHEM - Fe%

Geol: RGP	Scale: 1:50000	Report: 20308
Drawn: RGP	Date:26/9/1994	Plan: Tv 856



· -2 • 2-5 • 5-10 • 10-20

20-50 50-100 100-200 200-500 +500

855020

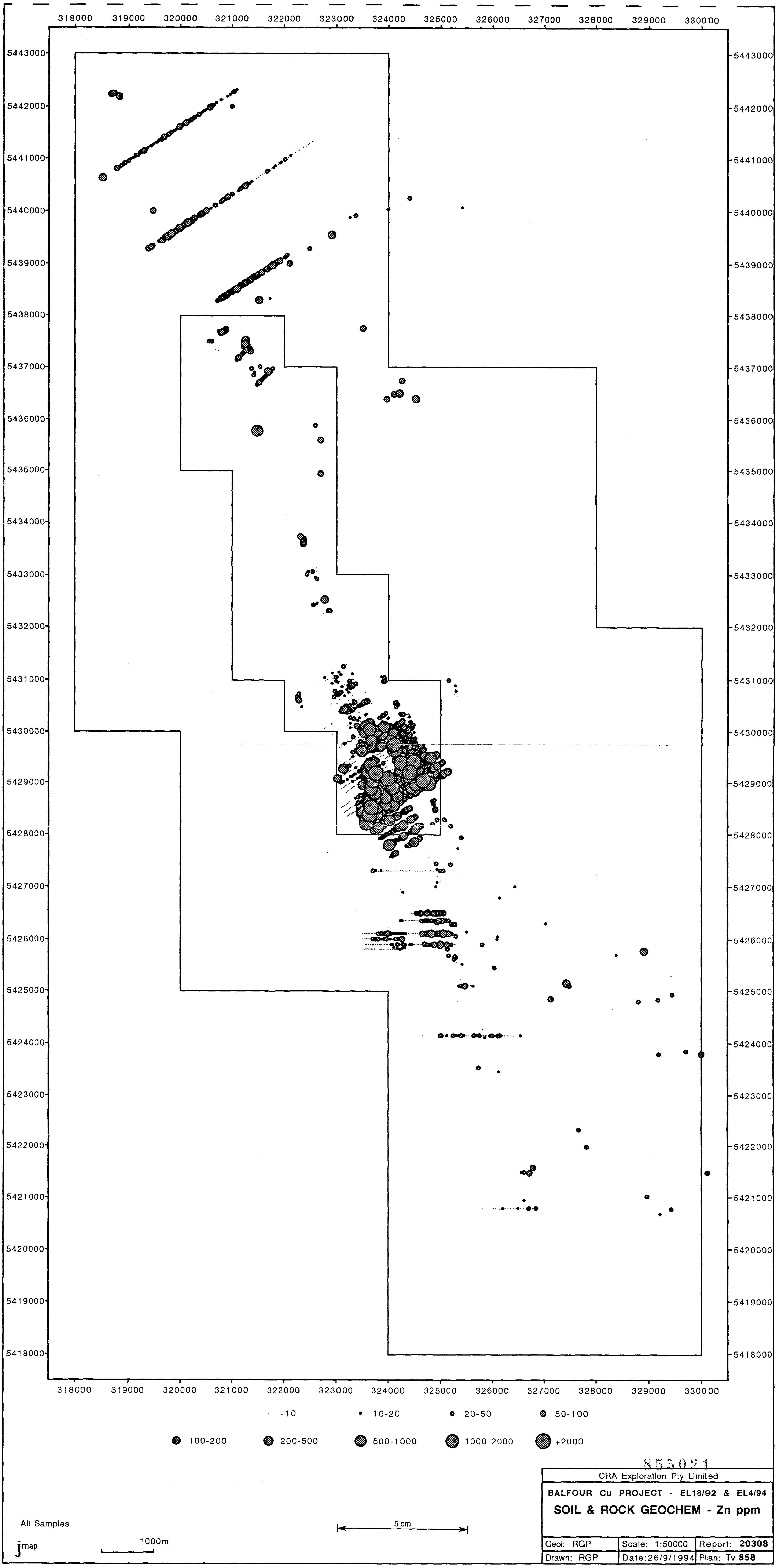
CRA Exploration Pty Limited		
BALFOUR Cu PROJECT - EL18/92 & EL4/94		
SOIL & ROCK GEOCHEM - As ppm		
Geol: RGP	Scale: 1:50000	Report: **20308**
Drawn: RGP	Date:26/9/1994	Plan: Tv **857**

All Samples

jmap

1000m

5 cm



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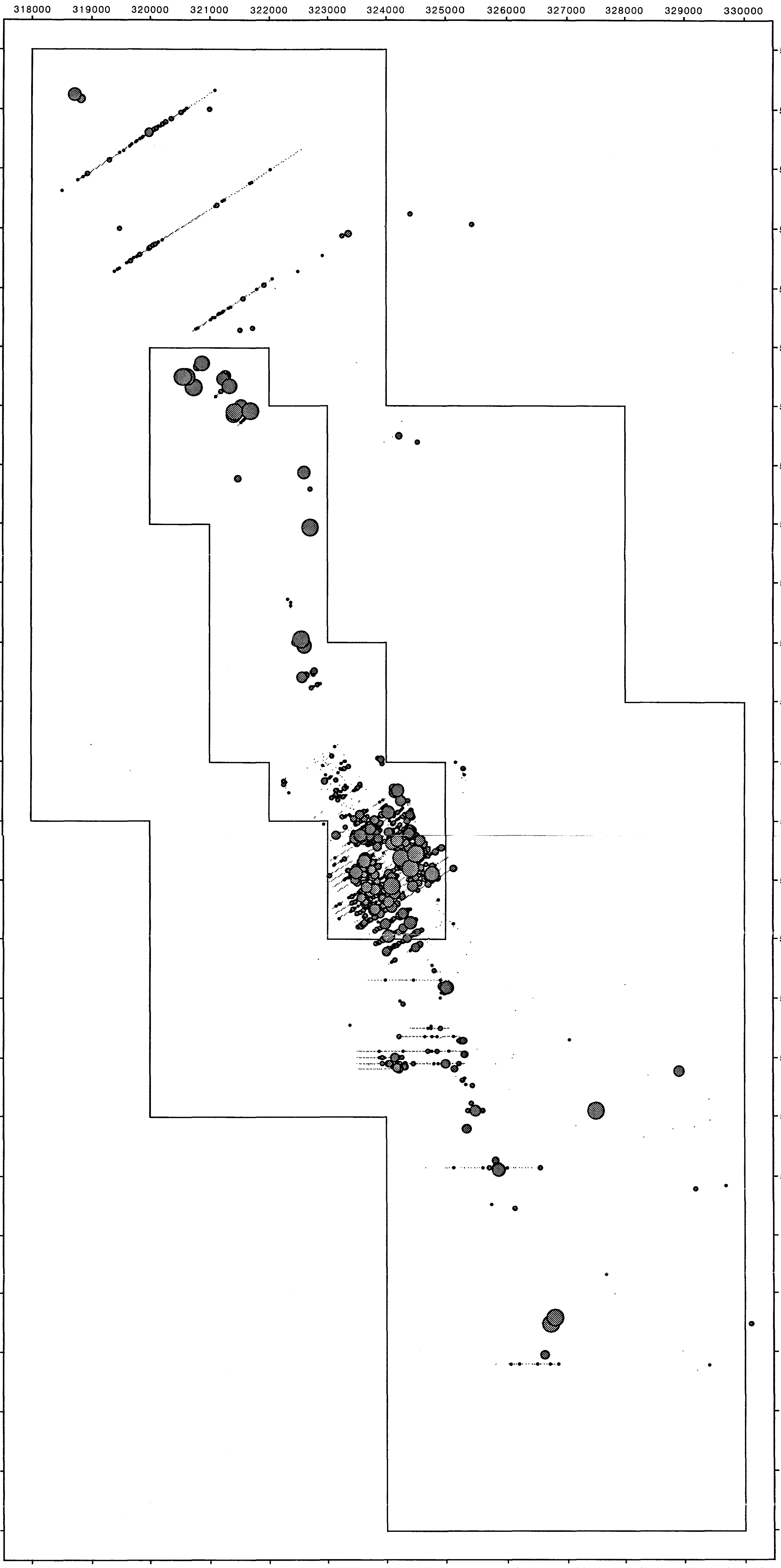
CRA Exploration Pty Limited

BALFOUR Cu PROJECT - EL18/92 & EL4/94

SOIL & ROCK GEOCHEM - Zn ppm

Geol: RGP	Scale: 1:50000	Report: **20308**
Drawn: RGP	Date:26/9/1994	Plan: Tv **858**



· -10 • 10-20 • 20-50 • 50-100

100-200 200-500 500-1000 1000-2000 +2000

855022

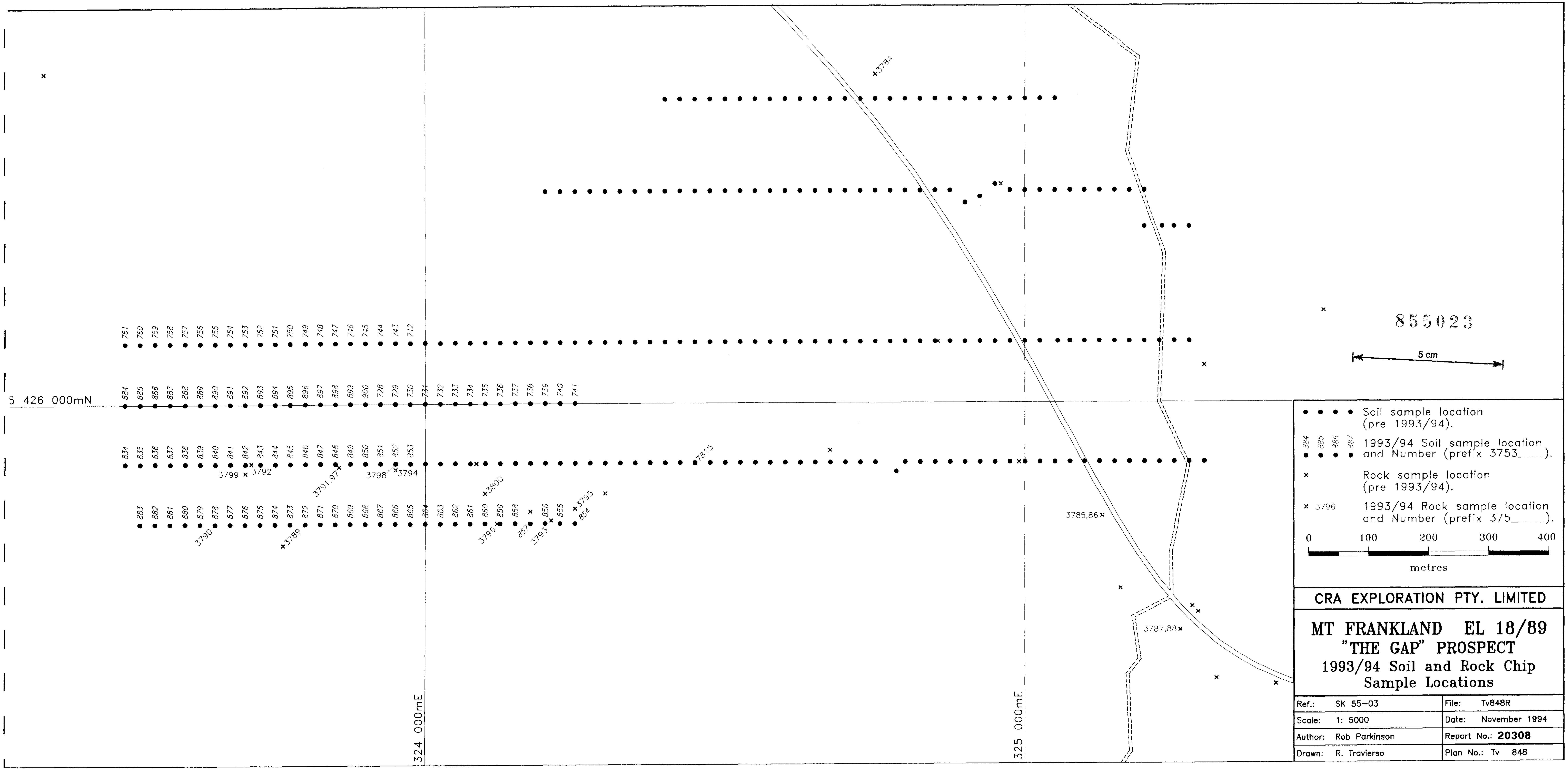
CRA Exploration Pty Limited		
BALFOUR Cu PROJECT - EL18/92 & EL4/94		
SOIL & ROCK GEOCHEM - Cu ppm		
Geol: RGP	Scale: 1:50000	Report: **20308**
Drawn: RGP	Date:26/9/1994	Plan: Tv **859**

5 cm

All Samples

1000m

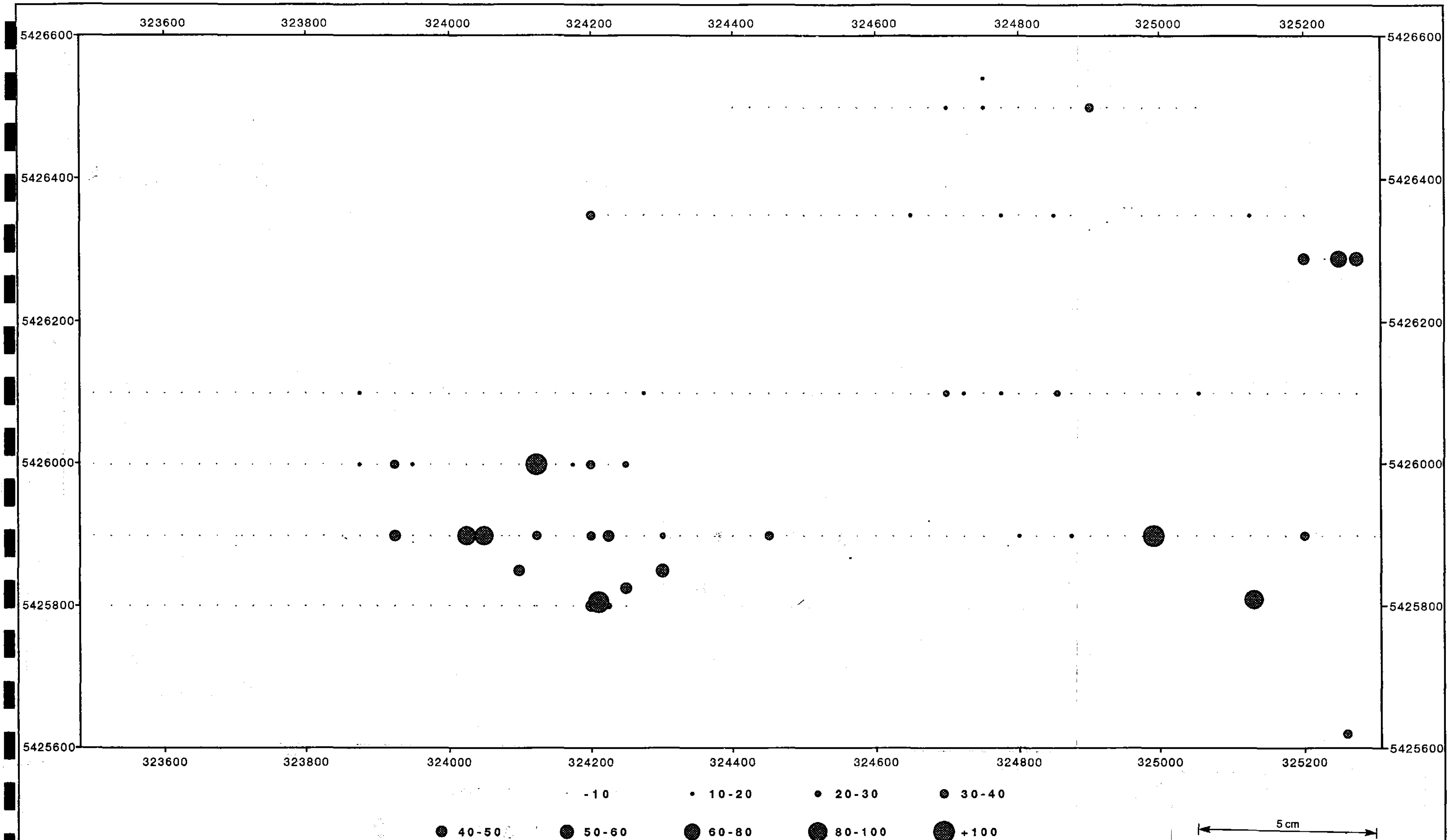
jmap



CRA EXPLORATION PTY. LIMITED

MT FRANKLAND EL 18/89
"THE GAP" PROSPECT
1993/94 Soil and Rock Chip Sample Locations

Ref.:	SK 55-03	File:	Tv848R
Scale:	1: 5000	Date:	November 1994
Author:	Rob Parkinson	Report No.:	**20308**
Drawn:	R. Travierso	Plan No.:	Tv 848



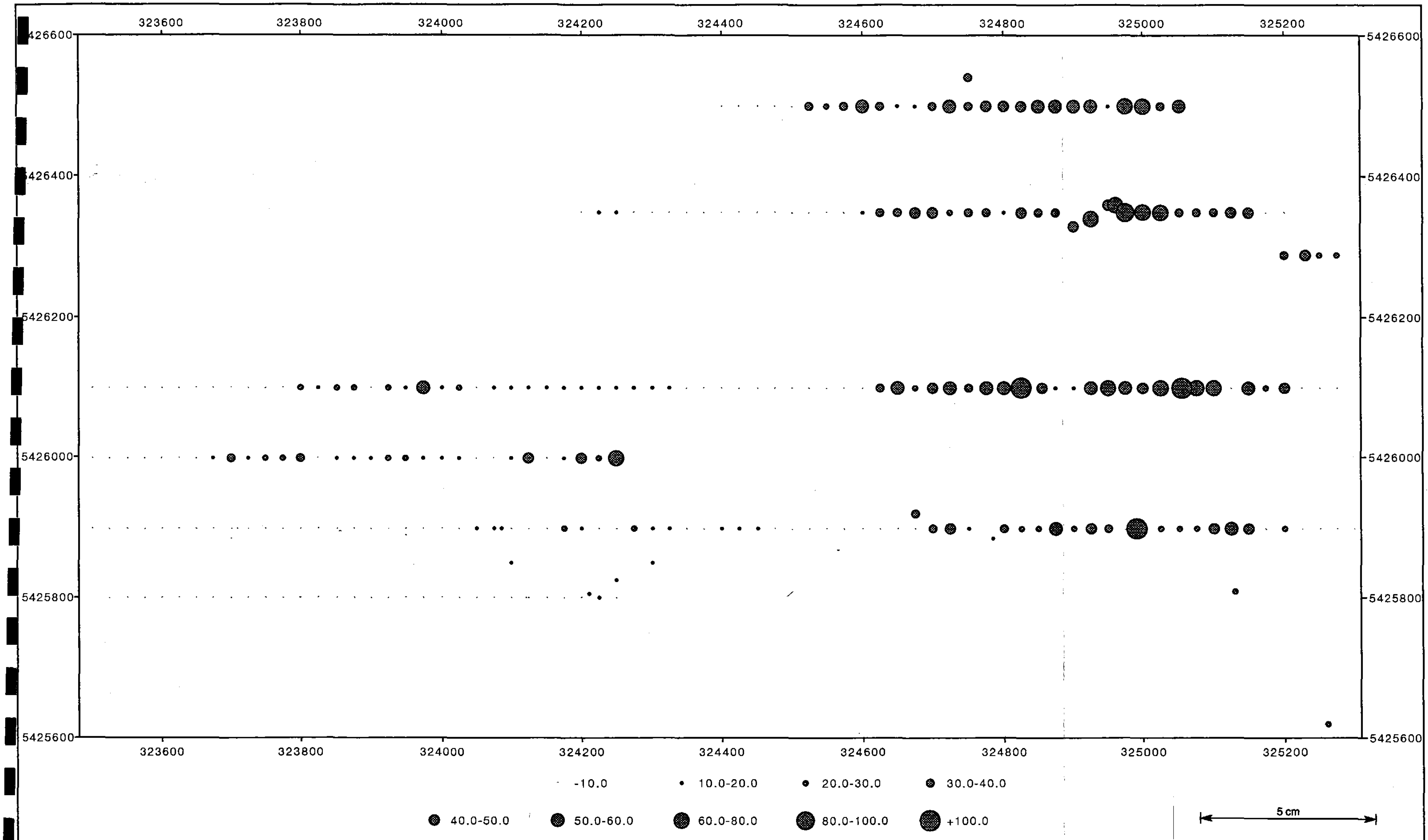
855024

All CRAE soil and rock samples

jmap

100m

CRA Exploration Pty Limited		
MT FRANKLAND EL18/92 - "THE GAP"		
SOIL GEOCHEMISTRY - Cu ppm		
Geol: RGP	Scale: 1:5000	Report: 20308
Drawn: RGP	Date: 19/9/1994	Plan: Tv 849



355025

All CRAE soil and rock samples

jmap 100m

CRA Exploration Pty Limited		
MT FRANKLAND EL18/92 - "THE GAP"		
SOIL GEOCHEMISTRY - Zn ppm		
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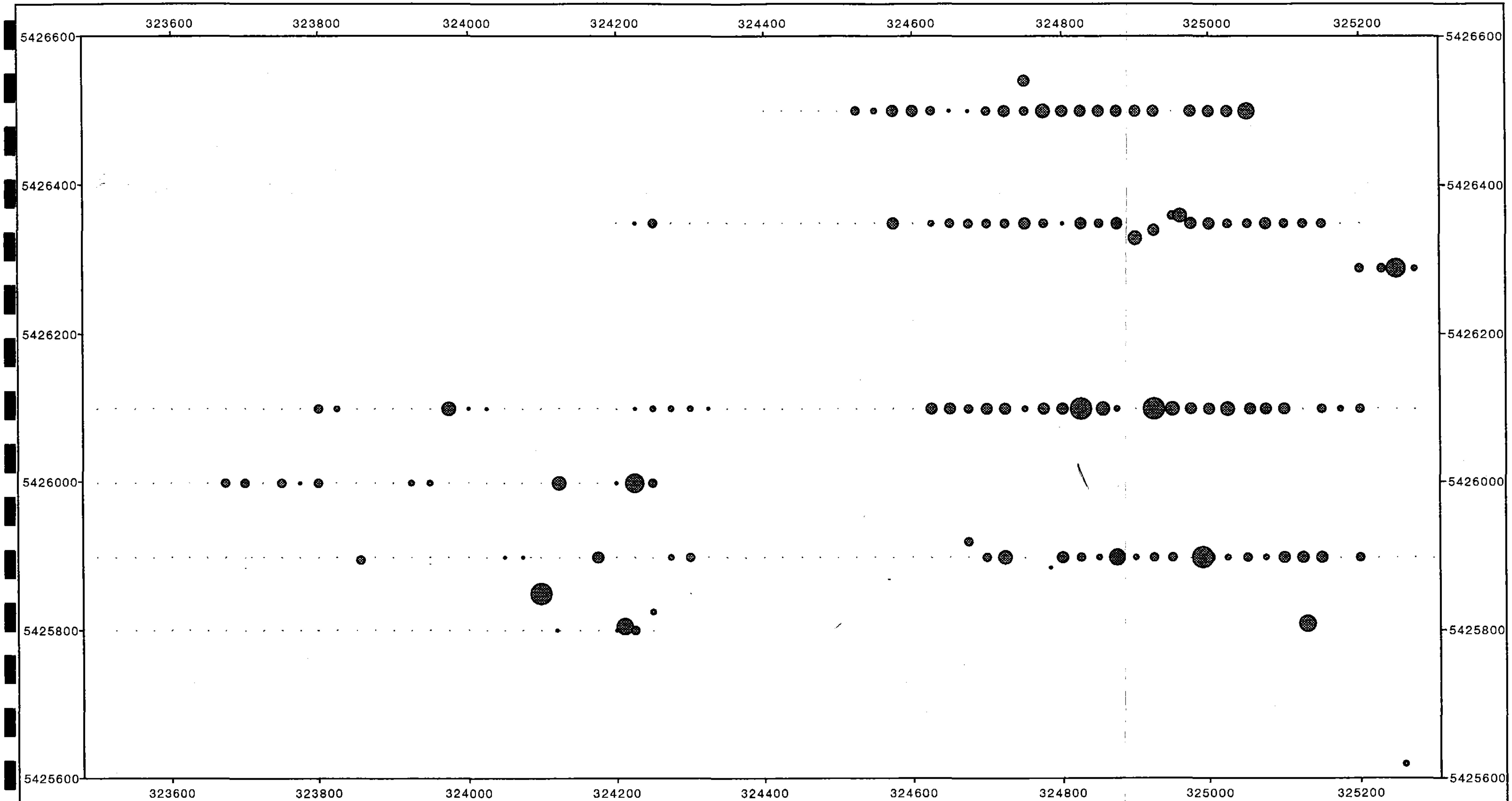

· -1.0 • 1.0-1.5 • 1.5-2.0 ● 2.0-3.0

● 3.0-4.0 ● 4.0-5.0 ● 5.0-6.0 ● 6.0-7.0 ● +7.0

5 cm

855026

All CRAE soil and rock samples

jmap 100m

CRA Exploration Pty Limited		
MT FRANKLAND EL18/92 - "THE GAP"		
SOIL GEOCHEMISTRY - Fe%		
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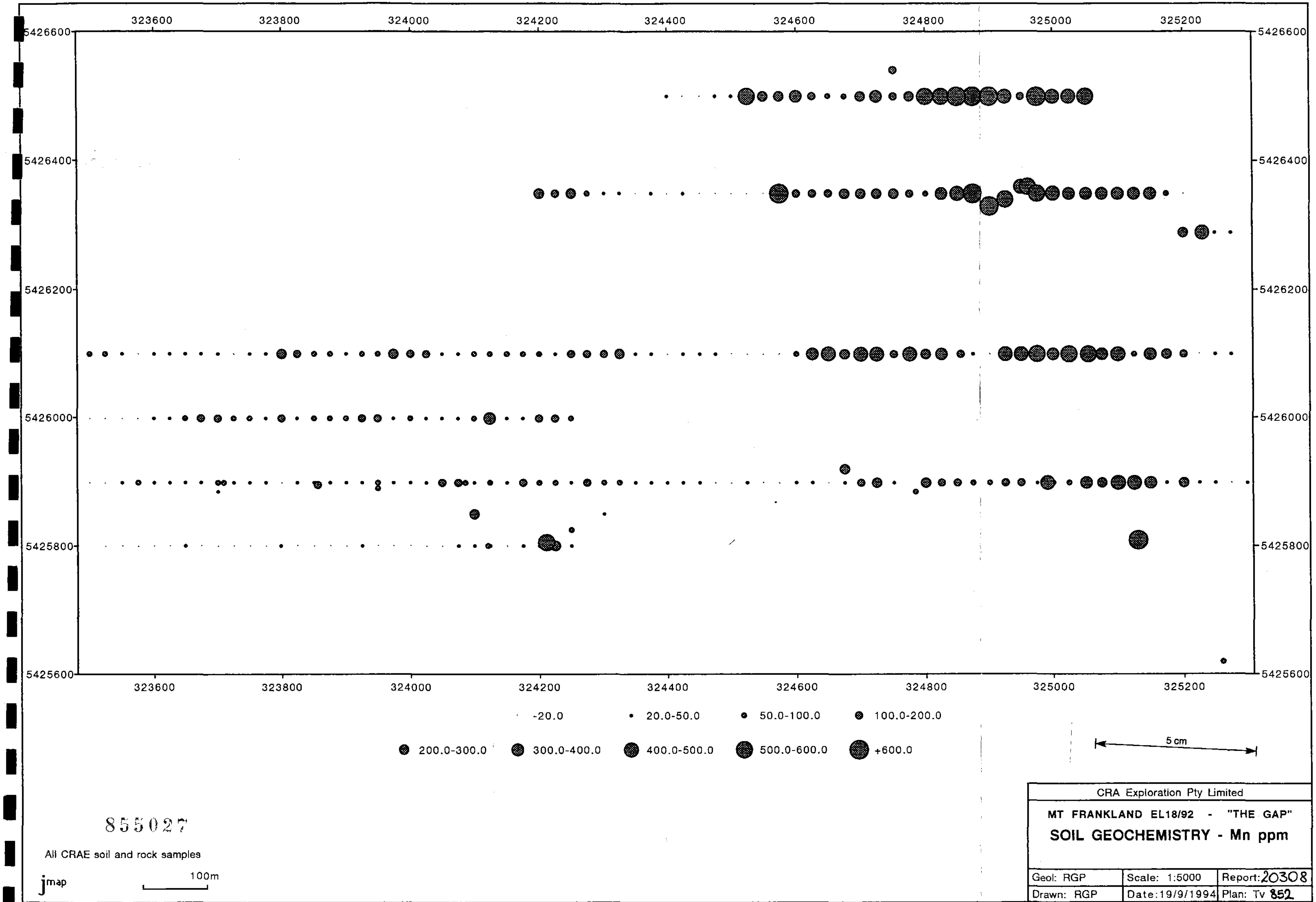
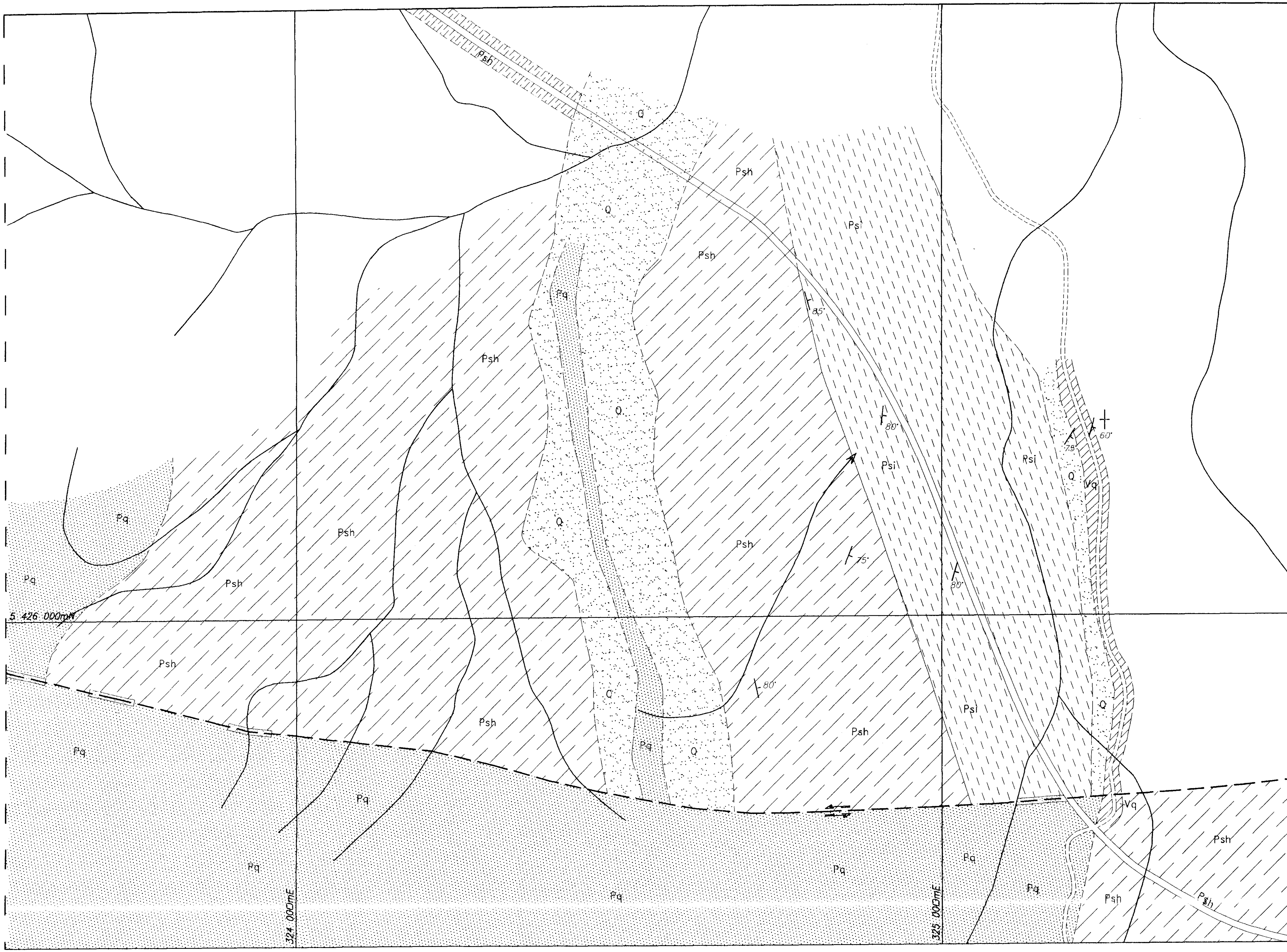
Drawn: RGP	Date: 19/9/1994	Plan: Tv 851



323600
323800
324000
324200
324400
324600
324800
325000
325200
5426600
5426400
5426200
5426000
5425800
5425600
-20.0
20.0-50.0
50.0-100.0
100.0-200.0
200.0-300.0
300.0-400.0
400.0-500.0
500.0-600.0
+600.0
5 cm
CRA Exploration Pty Limited
MT FRANKLAND EL18/92 - "THE GAP"
SOIL GEOCHEMISTRY - Mn ppm
Geol: RGP
Scale: 1:5000
Report: 20308
Drawn: RGP
Date: 19/9/1994
Plan: Tv 852
855027
All CRAE soil and rock samples
jmap
100m



LEGEND

- Q — Quartz scree
- Vq — "Balfour Copper Lode" Quartz vein
- Psl — Laminated green chloritic siltstone
- Pq — Quartzite
- Psh — Dark grey carbonaceous? shale/siltstone
- Dip of sediments
- Fault – position approximate
- Quartz blows on fault

GEOLOGY FROM SOIL PITS AND ROAD MAPPING.

5 cm

AMG North

Mag. North

11°

855028

0 100 200 300 400

metres

CRA EXPLORATION PTY. LIMITED

MT FRANKLAND EL 18/92
The Gap Prospect
Interpreted Geology

Ref.:	SK 55 – 3	File:	MtFrank\585
Scale:	1 : 5000	Date:	August 1993
Author:	R.G. Parkinson	Report No.:	**20308**
Drawn:	R. Travierso	Plan No.:	Tv 585

APPENDIX 1:

Reports by Mr. Nicol Turner

855030

CRA EXPLORATION PTY LTD

1/23 Bell Street, Preston, 3072.

REPORT ON THE STRATIGRAPHIC AND STRUCTURAL SETTING OF ROCKS IN EL18/92, BALFOUR DISTRICT, NORTH WESTERN TASMANIA

Prepared by: N.J. Turner Geological Services

65 Lochner Street

West Hobart 7000

Telephone (002) 342652

12th January, 1994

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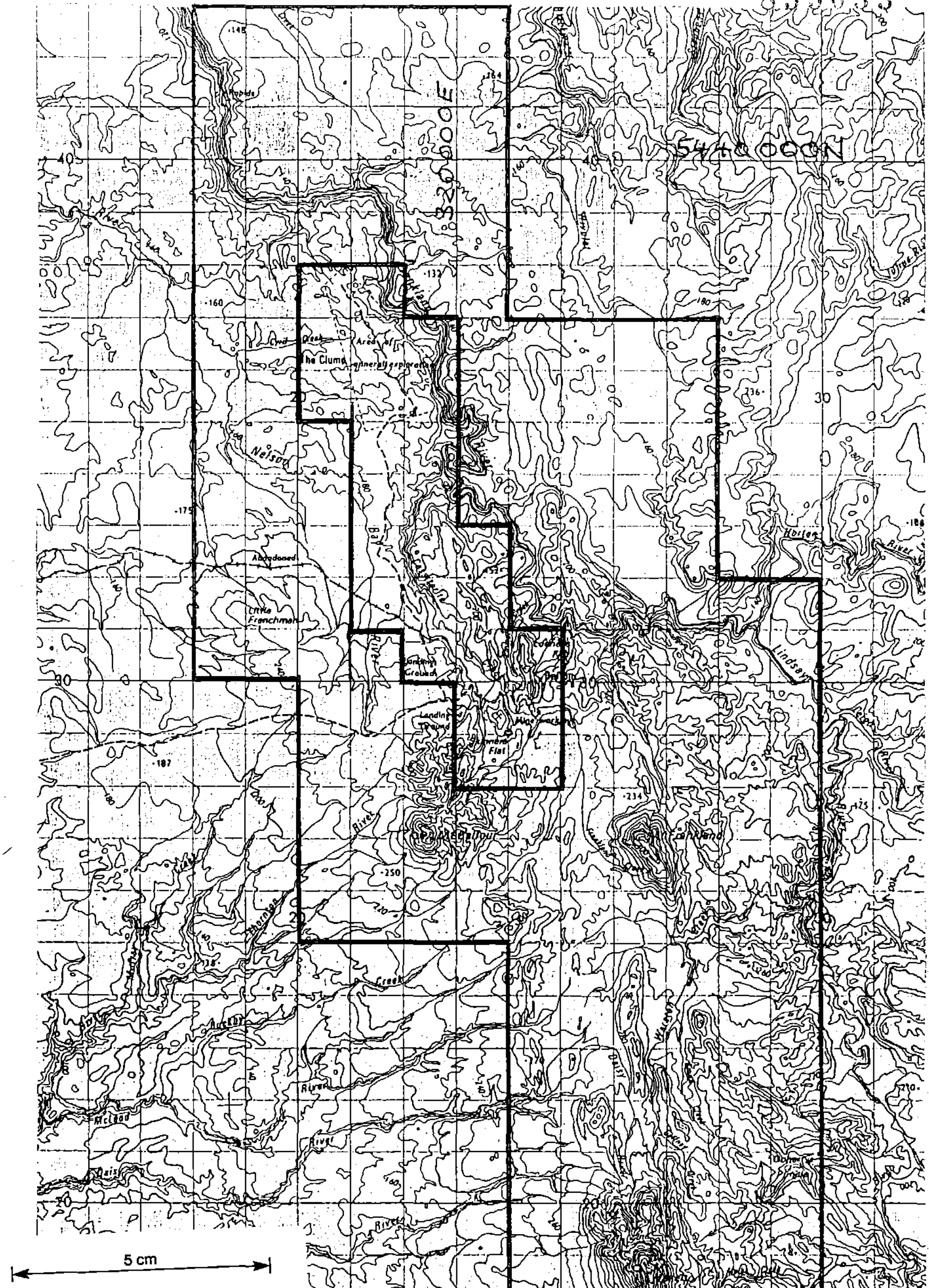
LIST OF FIGURES AND MAPS

Combined as Plan Tv 673

855033



SCALE 1:100000

Fig 1: Boundaries of EL 18/92. The inner boundary delineates EL 53/88 which was rescinded in Nov., 199?

INTRODUCTION

This report summarises the results of seventeen days of geological mapping in and around EL18/92 in the Balfour District of North Western Tasmania. The field work was carried out in November and December, 1993. It included mapping the more readily accessible parts of EL18/92, mapping along Rebecca Road to the west of EL18/92 and mapping in the ground around Balfour previously held by Soloriens Mining Pty. Ltd. Work in the latter area was carried out with the approval of the Tasmanian Department of Development and Resources.

REGIONAL RELATIONSHIPS

The geology in and around EL18/92 (Maps 1 - 6) comprises mainly sedimentary rocks of Proterozoic age overlain by scattered, thin deposits of Tertiary and younger age. The Proterozoic rocks include an upper group which contains formations equivalent to the latest Proterozoic Smithton Volcanics and Forest Conglomerate and Quartzite. This upper group is unconformably underlain by rocks that are probably partly equivalent to the Cowrie Siltstone (Rocky Cape Group) but which mainly underlay the Cowrie Siltstone with apparent conformity.

The dip direction and facing of the Proterozoic rocks changes fairly progressively from generally NNE on Rebecca Road (Map 2) to ENE and E in EL18/92 (Map 6). This regional variation is consistent with the rocks occupying the eastern limb of a southerly extension of the large anticline that occurs south of Marrawah (Seymour, 1992). Since the anticline plunges north, the Rebecca Road - Balfour rocks are probably structurally deeper than the Marrawah rocks and are probably stratigraphically older. This interpretation is consistent with the presence of a substantial Cowrie siltstone correlate near Marrawah (Seymour, 1994 - pers.com.) but mostly older formations near Balfour (see also Longman and Mathews. 1961). Near Balfour the small Cowrie Siltstone correlate occupies the highest structural position of the older group, occurring immediately below the Forest Conglomerate and Quartzite on Blackwater Road.

INFLUENCE OF FAULTS

There are a number of large faults which subdivide the geology of EL18/92 into blocks between which the stratigraphy and structure differ somewhat (Map 6). An approximately E-W fault separates the block containing Balfour South from the block containing Balfour (Map 5) whilst the NE trending Roger River Fault separates the block containing Balfour from a northerly block containing The Clump (Map 4).

Faults which trend WNW around Mt. Frankland form an eastern boundary to the Balfour and Balfour South blocks with the rocks which underlay the mountain and the country to the south appearing to be a complex of fault slices. There is a considerable change in regional dip direction and facing across the complex (Map 6) from easterly in the Balfour and Balfour South blocks to SSW in the block east of Mt. Frankland. The Mt. Frankland fault complex is clearly a major regional structure.

STRATIGRAPHY OF THE STRATIGRAPHY OF THE OLDER GROUP OF PROTEROZOIC ROCKS

Subdivision of the rocks

The older group of Proterozoic rocks in the Balfour district is subdivided on the basis of lithological associations. Some of the main subdivisions reflect changes in the character of siltstone which is a pervasive rock type. Essentially there are lithological associations in which the siltstone is dark grey (Py, Pyq) and other associations in which much of the siltstone is green or olive (Pn, Pnq, Png). The presence of quartz arenite is also an essential factor in characterising some map subdivisions (Pyq, Pnq). Detailed descriptions of the various lithological associations recognised during the mapping project are given in a later section of this report.

Stratigraphy

Along the Balfour track east of the Heemskirk Road and west of Murrays Reward there is a conformable, east facing, stratigraphic sequence comprising lithological associations ranging from quartz arenite with grey siltstone (Pyq) in the west through grey siltstone (Py) into olive, green and grey siltstone with interbedded quartz arenite (Pnq) then predominantly green siltstone (Png) near Murrays Reward. Units consisting of quartzarenite with grey siltstone and of green siltstone which are respectively north and east of Murrays Reward may be fault repetitions of the rocks to the west.

The Balfour track stratigraphy persists southwards with relatively little change into the Balfour South fault block. It also persists northwards to the Roger River Fault. North of the Roger River Fault there is a generally similar succession though quartz arenite is virtually absent from the green siltstone association. Also, the grey siltstone association extends west onto Rebecca Road without passing down into an association dominated by quartz arenite as is the case on the Balfour track.

Quartz arenite dominates the succession on the western part of Rebecca Road but the relationship of this formation to the lithologically similar rocks on the Balfour track has not been established. They are therefore shown separately in the stratigraphic column in the Geological Legend (See Map 1). This uncertainty also applies to the rocks east of the Mt. Frankland fault complex.

The unit of grey siltstone and fine grained sandstone (Prc) which underlies the Forest Conglomerate on the Blackwater Road (Maps 3,4) is correlated with the Cowrie Siltstone because the constituent lithologies resemble rocks in the Cowrie Siltstone in the lower Rapid River area. Some lithologies in the slaty to phyllitic unit (Pp) which outcrops in the Frankland River north of Balfour town-site are also similar to Cowrie Siltstone lithologies. However, the similarities are insufficient for confident correlation.

Descriptions of the lithological associations

1. Dark grey siltstone (Py) with quartzarenite (Pyq).

In the man-made exposures of Pyq on Rebecca Road, the Heemskirk Road and Balfour track the relative abundances of grey siltstone and quartz arenite are readily apparent. However, this is not the case in areas of natural exposure and thus there is some uncertainty regarding uniformity of presentation on the maps, particularly with respect to areas east of Mt. Frankland. In these areas there is common lag of quartz arenite but little exposure. Since resistent materials like quartz arenite tend to build up in relative volume in lag, the lag is not a guide to the relative volume in the bedrock sequence. Detailed creek traverses might resolve this problem.

The quartz arenite in Pyq (Fig. 2) is pale in colour, medium grained and occurs in beds up to about 200 mm thick. Bedding is commonly defined by plane, parallel lamination and a parting may be developed at 5 - 10 mm spacing. Cross lamination is fairly common with planar to gently curved laminae from 1 mm to 4 mm thick transecting entire beds. One example of cross bedding showing opposing currents in consecutive beds was found (Fig. 2). Other evidence of deposition in oscillating currents, probably above wave-base, is provided by occasional symmetrical, bifurcating ripple marked surfaces (Figs. 3, 4). The presence of probable mud cracks (Fig. 5) in the Pyq successions is further evidence of very shallow conditions, apparently with intermittent exposure to the atmosphere. Shale clasts are abundant in the quartz arenite in many places (e.g. Fig. 6) and may represent debris produced by flaking of dry, shrunken muddy silt. These shale clasts are represented by voids in weathered quartzarenite.

The dark grey siltstone which is interbedded with quartzarenite in Pyq and which is predominant in Py is carbonaceous and can be so rich in carbon that it is black and dirty. In a few places it is rich in bedding - parallel, metamorphic chlorite flakes (eg 328800E5424800N). Pyrite is widespread occurring either as euhedral crystals or as rounded nodules.

Commonly the dark grey siltstone displays planar, darker and lighter grey laminae 1 - 10 mm thick. In some instances the laminae are wavy rather than planar (e.g. Fig 7). In these cases currents have periodically scoured channels in the laminated siltstone and these channels have been filled by later deposits of laminated siltstone. The later laminae drape into the channels thus producing the wavy effect which has probably been further accentuated by compaction.

Much of the grey siltstone contains lenticular, graded interbeds of pale coloured, fine grained, quartzose sandstone and siltstone (Figs. 8, 9, 10) which also rest on scoured surfaces. In a few places these graded beds are predominant over the siltstone and in some places they are absent. The graded beds rarely exceed 50 mm in thickness. They are turbiditic, usually comprising a massive basal subdivision (Bouma A) overlain by a plane laminated subdivision (Bouma B). There may also be a cross laminated interval (Bouma C).

Sandstone dykes commonly extend into the siltstone below the graded beds (Figs. 8, 9). They generally show the effects of compaction either through thickening (Fig. 8) or through the development of tight folds with axial surfaces parallel to bedding (Fig 9). The sandstone dykes are thought to have initially been formed by filling of shrinkage cracks in the grey siltstone (Fig. 11).

2. Associations with green and olive siltstone (Pn, Pnq,Png)

The lithological association designated Pn is more variable than the dark grey siltstone association designated Py. In the Pn association there are interbedded intervals of the dark grey siltstone with thin, turbiditic sandstone beds which characterises Py. However, there are also common green and olive siltstones. These green and olive rocks may also contain thin, turbiditic sandstone beds or they may just display thin (1-10mm), planar parallel banding.

Where quartz arenite is common the green and olive siltstone association is designated Pnq. The quartz arenite is much like the quartzarenite in Pyg being pale in colour, medium grained and fairly thinly bedded, often with a bedding parting at about 10mm spacing. The quartz arenite beds occur in packets of up to several metres in thickness and appear to have limited continuity along strike. Planar parallel bedding is usual though there is occasional cross lamination. Neither chevron cross bedding nor ripple marks were found in Pnq. Sandstone dykes are locally abundant in the siltstone and are similar to those in Figs 8 and 9. Perhaps Py and Pyq were deposited in conditions similar to Py and Pyq, that is, shallow with occasional emergence.

Siltstone in the lithological association designated Png displays plane parallel banding (Fig 12) which is usually less than 25mm thick. It has pale to medium green colours which can be very bright (Fig 13), reflecting high chlorite content. Though intervals of grey siltstone occur within Png, they are of limited extent. No sedimentary structures other than bedding were recognised in the planar banded, green siltstone. The facies was apparently deposited in very stable, quiet conditions, presumably below wave base. The absence of carbonareous matter from the green siltstone in comparison with the dark grey siltstone association is striking.

A useful mapping characteristic of the green to olive siltstones in Pn, Pnq and Png is that they give rise to a distinctive fawn to orange soil profile.

3. Slaty to phyllitic siltstone and mudstone (Pp)

The various silty and muddy rocks that have been designated Pp have been grouped together on both lithological and structural grounds. Dark grey siltstone is the most common lithology. It can be relatively hard and flaggy with thin pyritic horizons and thin, whitish siltstone beds. In this form the dark grey siltstone resembles a common lithology of the Cowrie siltstone. Cream, finely micaceous siltstone which occurs in several places resembles material in the Cowrie Siltstones around the lower Rapid River. Green and maroon siltstone are also present in Pp whilst on the Heemskirk

Road at 327300E5424800N there is a thin interval of well-bedded, pale puggy material which may be after impure carbonate.

In general, the rocks in Pp display more pronounced cleavage development than there is in other map units although strong cleavage development persists westwards into adjacent rocks designated at Png around 325700E5426000N. The cleavage in Pp is thought to be S1. It commonly imparts a lustrous, slaty character to the dark grey siltstone whereas some of the cream, greenish and maroon rocks are phyllitic.

The various exposures of Pp occupy a belt which follows the western boundary fault of the Mt. Frankland fault complex. It is very likely that the relatively greater cleavage development in Pp and the proximity of Pp to a major regional fault are related factors.

4. Cowrie Siltstone Correlate (Prc)

Around the Blackwater Rivulet bridge on the Blackwater Road there is a lithological association designated Prc which is a probable correlate of the Cowrie Siltstone. Prc unconformably underlies a correlate of the Forest Conglomerate and Quartzite and thus has the same relative stratigraphic position as the Cowrie Siltstone. Prc also contains lithologies that are similar to parts of the Cowrie Siltstone.

Hard, dark grey, banded siltstone is present in Prc and there are blocky, pale-coloured rocks which appear to be its leached equivalents. Tough, blocky, pale-coloured, fine grained micaceous sandstone or coarse siltstone occurs west of the Backwater Rivulet whilst a maroon variant of the same rock occurs east of the rivulet, just below the unconformity. Similar maroon, fine grained quartzose rocks occur in the Cowrie Siltstone below the Forest Conglomerate and Quartzite in parts of the lower Rapid River area. In the same area the Cowrie Siltstone also contains hard, dark grey, banded siltstone as a common rock type.

STRATIGRAPHY OF THE LATEST PROTEROZOIC GROUP

Distribution

Formations correlated with the Smithton Volcanics and the Forest Conglomerate and Quartzite are present on Blackwater Road about 1km east of the Blackwater Rivulet, near 325600E5440000N. The formations are laterally offset by some 2.5km along the nearby Roger River Fault such that they reappear in another area to the south west, near 324000E5436000N (Map 6). In both areas the Black River Dolomite, which intervenes between the Smithton Volcanics and the Forest Conglomerate and Quartzite elsewhere in N.W. Tasmania, is either absent or very thin.

Well sorted quartzose sandstone and quartzose conglomerate on Mt. Frankland probably correlate with the Forest Conglomerate and Quartzite though they form a thicker succession than is present in either of the localities near the Roger River Fault. The Mt. Frankland rocks presumably reflect a localised palaeogeographic setting, perhaps a graben. Their correlation with the Forest Conglomerate and Quartzite would be proved if further work shows that the aeromagnetic anomaly which extends along the eastern side of Mt. Frankland is due to a correlate of the Smithton Volcanics.

Forest Conglomerate and Quartzite

On Blackwater Road the correlate of the Forest Conglomerate and Quartzite is marked by siliceous conglomerate (Fig. 14) and well sorted, white quartz arenite. The conglomerate comprises angular clasts of white chert and dark grey, fine grained granular silica, together with a few well rounded pebbles of medium grained quartz arenite. Similar conglomerate occurs in the upper part of the Forest Conglomerate and Quartzite correlate that occurs on the other side of the Roger River Fault. However, in this second locality the largely angular, essentially - chert conglomerate is underlain by deposits in which the clasts comprise well rounded pebbles, cobbles and boulders of very hard, silicified quartz arenite. The upper conglomerate appears to have been derived mainly be the local working of silicified Black River Dolomite whereas the lower beds were derived from an older, more distant Proterozoic terrain.

On Mt. Frankland there is a stratigraphic passage upwards from thickly bedded, white and pale pink, silicified quartz arenite on the western slope to reddish, medium grained, pebbly or cobbly, silicified quartz arenite and minor conglomerate on the eastern slope. In the latter locality the beds can be 100-200mm thick and may be completely cross laminated. The clasts are very well rounded and comprise very hard, medium to coarse grained quartz arenite. There is pink staining on the surfaces of most clasts though their interiors are white. Similar staining affects some clasts in the lower beds of the Forest Conglomerate and Quartzite correlate that is south of the Roger River Fault.

Smithton Volcanics

In the Blackwater Road locality the Smithton Volcanics correlate is mostly deeply weathered though relatively fresh dolerite occurs near 322>00E5439800N. In the locality south of the Roger River Fault there are scattered blocks of fresh basalt but most exposures are deeply weathered, consisting of reddish orange, claggy materials similar to these on the Blackwater Road. Grey lithicwacke and red-brown mudstone are associated with the basalt.

STRUCTURE

Throughout much of the area of interest the rocks have dip directions and facings which are consistent with the regional structure inferred in an earlier section of this report. Specifically, the rocks occupy the eastern limb of a large, north to north west plunging anticline. Being closer to the hinge of the anticline, the Rebecca Road succession has mostly relatively gentle dips (Map 2) whereas the dips in the Balfour district are steep (Map 6), reflecting a position on the limb of the anticline.

Zones of short wave length folds of variable plunge are developed in several places, for example around 321500E54534500N on the Heemskirk Road, on the Balfour track near its junction with the Heemskirk Road, around Specimen Hill and near 322700E5439400 on Blackwater Road. These short wavelength folds trend N- NW and may be related to the regional anticline. However, detailed work would be necessary to properly demonstrate the relationship. Detailed work would also be necessary to demonstrate the pattern of late kink folding. Kink bands are wide spread though not particularly common. Their widths range approximately 0.1-1 m and there are several sets.

Cleavage is variably developed in the area of interest. In much of the area it was only recognised in scattered localities, generally as a weakly etched surface. This generally weak development of cleavage contrasts with the common presence of a lustrous, slaty bedding parting in silty and muddy rocks. The bedding parting is related to burial metamorphism which was associated with the considerable load compaction that the succession has experienced. The extent of this load compartion is demonstrated by the isoclinally folded sandstone dykes in Fig 9.

Though it is weakly developed in much of the region, cleavage is well developed in a restricted belt of country which included the lithological association Pp and some nearby rocks (Png) in the Balfour South and Balfour fault blocks (Map 6). These rocks have a spacial relationship with respect to the western boundary fault of the Mt Frankland fault complex and with respect to the fault which passes through Murrays Reward. There may be a genetic relationship between the faults and cleavage.

The belt of more intense cleavage development has been fairly well defined on Blackwater Road where it extends from near 321800E54538600N to around 324100E5440100N, a distance of almost 3 km. In this locality there may be a genetic relationship with the inferred extension of the Murrays Reward fault which passes through 323100E5439800N.

METAMORPHISM

There are several different styles of metamorphism evident in the area of interest. They are interpreted as widespread load metamorphism, localised dynamic metamorphism and very restricted thermal metamorphism. Thin section work would tighten up this interpretation which is based on hand specimen examinations.

Burial metamorphism is inferred from the widespread presence of a lustrous bedding parting in pelitic rocks and from the evidence of strong compaction provided by features such as the isoclinally folded sandstone dykes in Fig 9. Recrystallisation associated with the burial metamorphism produced very fine grained mica with a slaty, bedding-parallel alignment. In some rocks abundant flakes of chlorite up to about 1mm across crystalised parallel to bedding (eg. 328900E5424800N).

In various parts of the area of interest both grey and green siltstone may display abundant metamorphic spots about 1mm across In green siltstone the spots comprise mainly chlorite whilst in grey siltstone the spots are grey and of unknown composition. The distribution of spotting has been fairly well defined on Blackwater Road where the zone of spotted rocks corresponds closely with the belt of more intense cleavage development. This close spacial relationship implies a genetic relationship. Therefore, the spotted texture is attributed to dynamic metamorphism.

In a very restricted interval around 320800E5437700N, near the junction of Blackwater Road and the Heemskirk Road, there are probable greisen veinlets (Fig 15) intruding siltstone which is apparently thermally metamorphosed (Fig 16). The greisen comprises fine grained, granular quartz and green mica. Where the veinlets are most numerous, the grey siltstone contains disseminated white porphyroblasts with hexagonal cross section. These porphyroblasts may be chiastolite. There are also abundant tiny, translucent, ragged laths in the siltstone which may be either andalusite or cordierite.

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Seymour, D.B. and Baillie, P.W., 1992. Geological Atlas 1:50000 Series. Sheet 78165 Woolnorth, Tasmania Department of Mines.

Veska, L. 1993. The geology of the Balfour area. Unpublished Honours Thesis, University of Tasmania, Hobart.

Fig 2: Cream to very pale green quartz arenite near 309800E5438300N on Rebecca Road. Cross bedding indicates current R to L in lower bed, L to R in upper bed.

Fig 3: Symmetrical ripple marks on a bedding surface in quartz arenite near 31100E543800N on Rebecca Road.

Fig 4: Symmetrical anastomosing ripple marks on a bedding surface in quartz arenite near 311000E5438000N on Rebecca Road

Fig 5: Cast of a surface with polygonal shrinkage cracks. Quartzarenite near 311000E5438000N on Rebecca Road

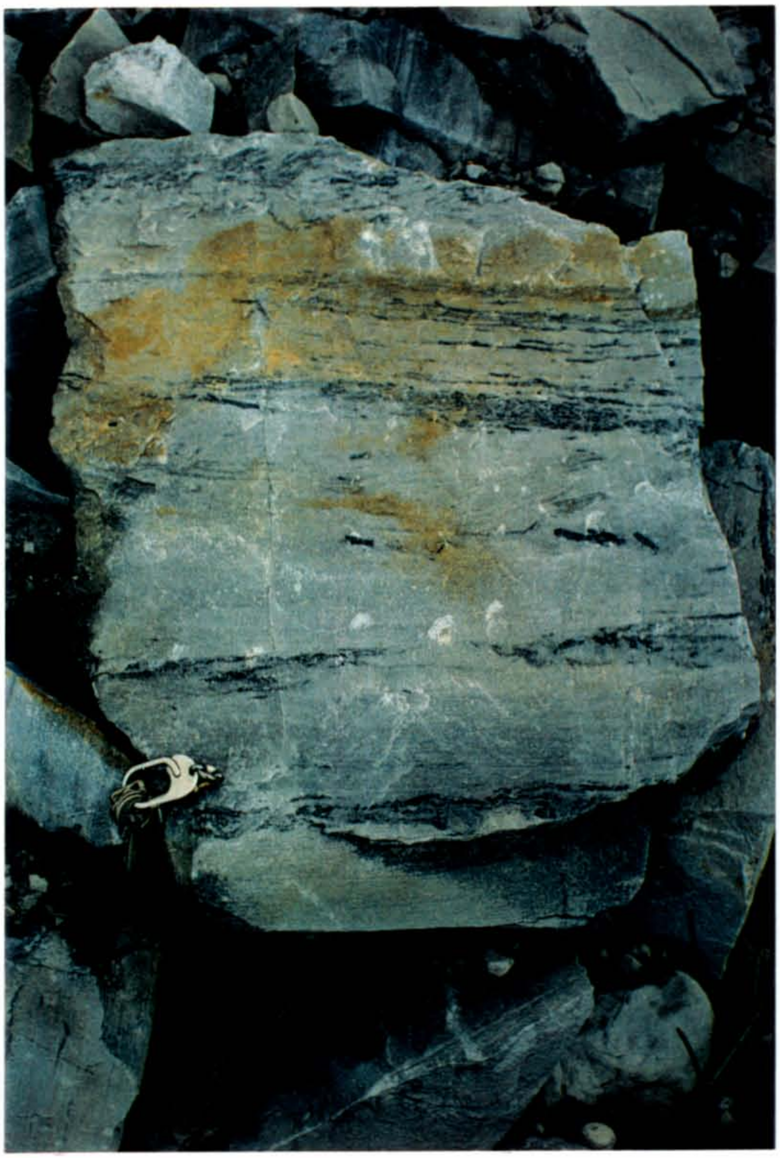


Fig 6: Quartz arenite with intervals rich in shale clasts. Both plane parallel and cross lamination are present. Near 311000E5438000 on Rebecca Road.

Fig 7: Dark grey and paler grey, wavy lamination in siltstone near 306300E5432800N at Temma Harbour.

Fig 8: Dark grey siltstone with abundant graded beds of pale, fine grained sandstone and siltstone. Note thickened sandstone dyke at centre. 306700E5439500N

Fig 9: As for Fig. 8. Note the isoclinally folded sandstone dykes with axial surfaces parallel to bedding. Near 306300E5432800N at Temma Harbour.

Fig 10: As for Fig 8. Note variations in morphology of the upper and lower surfaces of the pale beds. Facing is up page. Near 306300E5432800N.

Fig 11: Bedding parallel section of sandstone dykes another part of the dark grey siltstone of Fig. 8. Near 306700E5439500N on Rebecca Road.

Fig 12: Plane parallel banding in siltstone near 306100E5432950N at Temma Harbour. Similar banding occurs in green and olive siltstones inland.

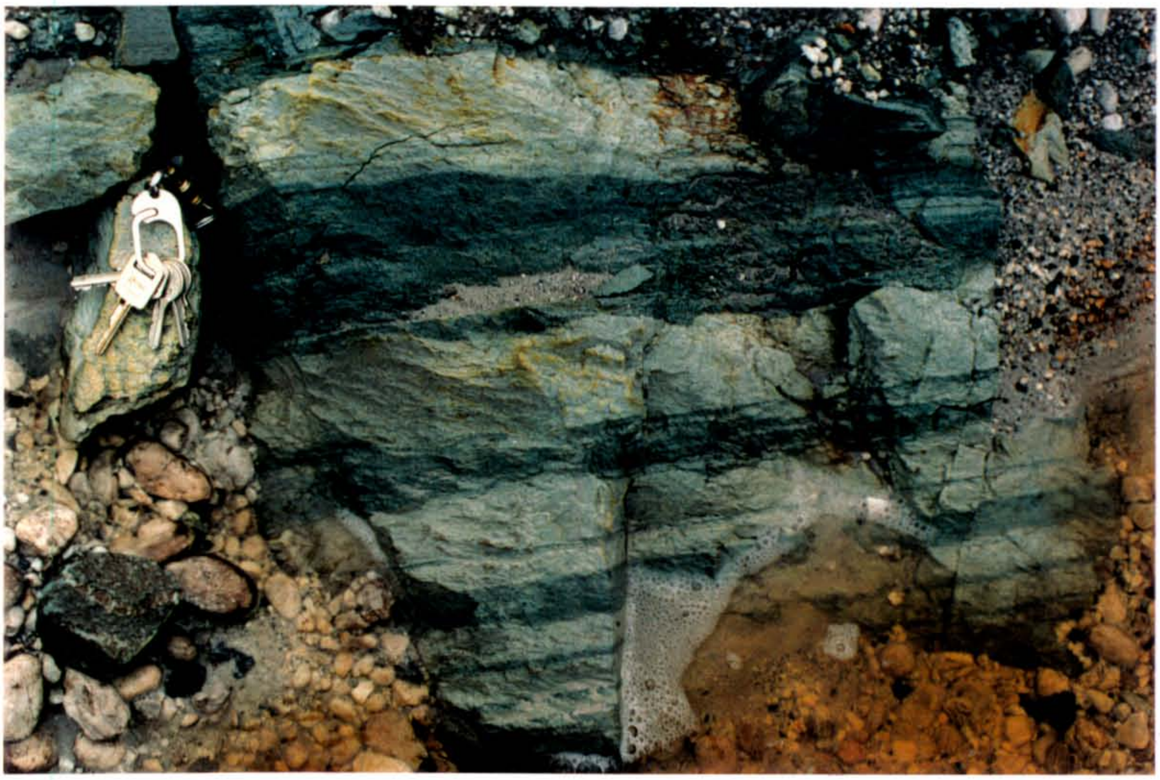


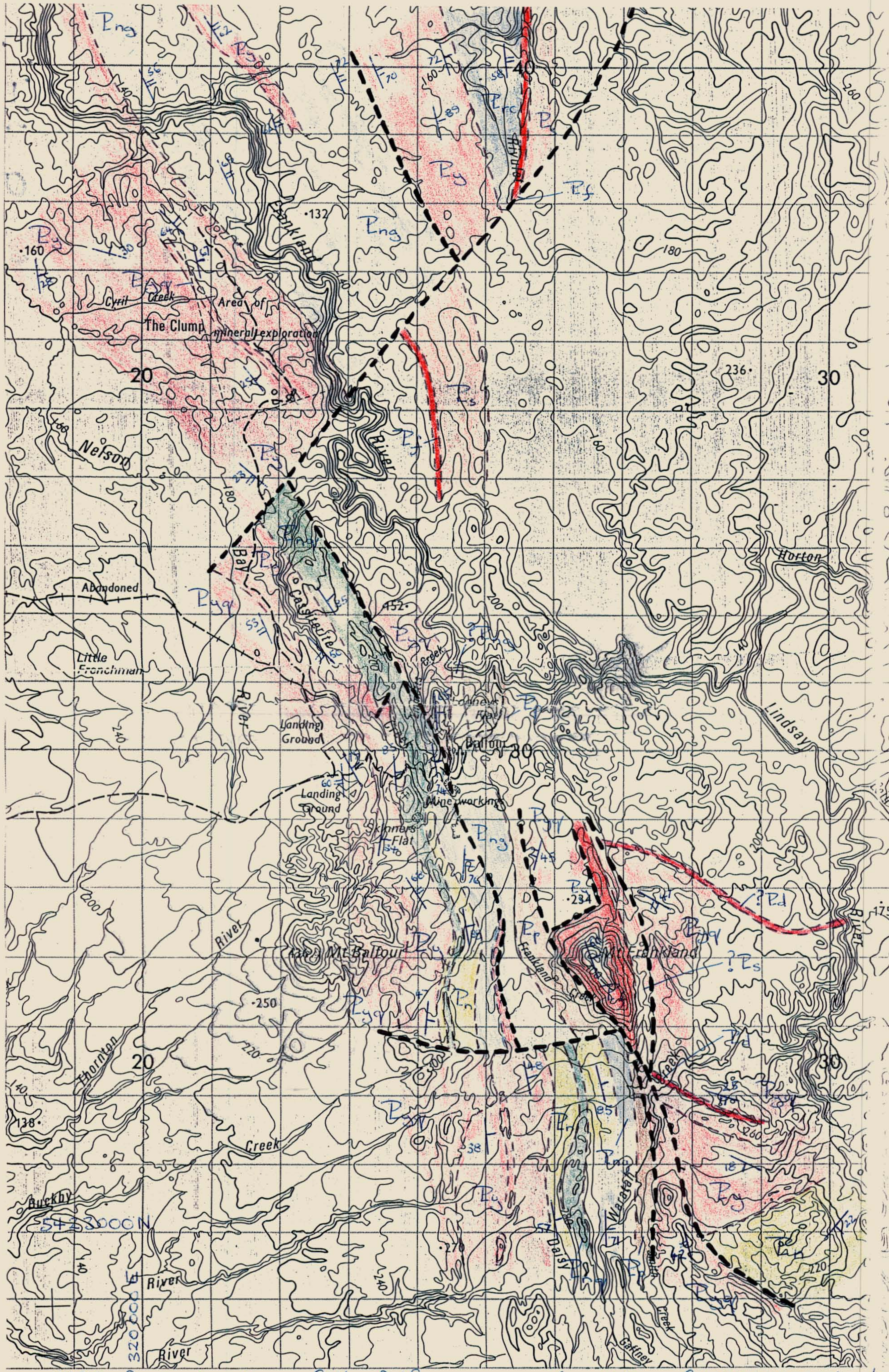
Fig. 13: Plane parallel banding in siltstone in Png near 323000E5439600N on Blackwater Road. Note the bright green chloritic bands.

Fig 14: Conglomerate in the Forest Conglomerate and Quartzite correlate near 325600E5440000N on Blackwater Road.

855056

Fig 15: Dark grey and pale grey siltstone with thin grass - green greisen veinlets. Near 320800E5437700N, Blackwater Road.

Fig 16: Dark grey siltstone in the greisen zone shown above. The white grains are hexagonal cross sections of ? andalusite.



MAP 6 Regional geology of the Balfour district. Scale 1:50000. Tertiary omitted.

Compilation of 1:25000 mapping by N.J. Turner Geological Services for CRA Exploration Pty Ltd 7.1.94.

5 cm

855057

APPENDIX 2:

CRAE rockchip lithological codes, sample ledgers and geochemistry

APPENDIX 2: Mount Frankland EL18/92. Rockchip ledgers and geochemistry.

Sampno	DPO	Prospect	AMGE	AMGN	MRTLith	FieldID	Texture	Alt/Mln	Colour	Comments
3753781	77115	THE GAP	323980	5427310	P	SsiSshSss	Ib		DG	Ssh layers carbonaceous.
3753782	77115	THE GAP	324270	5426910	P	SshSsi	Ds	Py	DG	Carbonaceous seds
3753783	77115	THE GAP	324270	5426910	P	Ssi	Ds	PySu?	DG	Sulfidic + qtz vn carbonaceous sed.
3753784	77115	THE GAP	324750	5426540	P					
3753785	77115	THE GAP	325130	5425810	P	Msl	Bs	Py	DGN	Pyritic slate with ssi interbeds.
3753786	77115	THE GAP	325130	5425810	P	SsiSsh	Ib		LV	Chloritic seds with sandy interbeds.
3753787	77115	THE GAP	325260	5425620	P	SssSsiSsh			LG	Cubic (py?) voids in sandy layers.
3753788	77115	THE GAP	325260	5425620	P	Sss	Ds	Py	LG	
3753789	77115	THE GAP	323798	5425800	P	Mq			LGW	Sugary Mq.
3753790	77115	THE GAP	323650	5425800	P	Mq		EpCl	LGW	Sugary Mq. Minor ep/chl patches
3753791	77115	THE GAP	323856	5425895	P	SsiSsh	Gs Vn		DG	py? voids to ~3cm long.
3753792	77115	THE GAP	323710	5425900	P	SsiSsh	VnIb		G	Common py voids
3753793	77115	THE GAP	324210	5425805	P	Ssi	Vn		G	limonite? after py in Sss layers
3753794	77115	THE GAP	323950	5425890	P	Ssi	VnLm		G	qtz veins + py voids
3753795	77115	THE GAP	324250	5425825	P	SsiSsh	Lm		DG	Rare layers of sss.
3753796	77115	THE GAP	324120	5425800	P	Ssi	DsFoFs?	PySu?	DG	Voids after py. Fracts sulph stained
3753797	77115	THE GAP	323855	5425895	P	Ssi			DG	Py casts to 6mm diameter.
3753798	77115	THE GAP	323950	5425900	P	Mq			LGW	Clean sugary Mq.
3753799	77115	THE GAP	323700	5425885	P	Mq			LGW	Clean sugary Mq.
3753800	77115	THE GAP	324100	5425850	P	SsiMq	DsSlVn	Py	V'ish	Pyritic and qtz veined
3753762	77118	MOUNT FRANKLAND	325420	5440070	Pr	Sbs	Lm		N	
3753763	77118	MOUNT FRANKLAND	324400	5440250	Pr	Sbs	LmDsBs	Py	N	Py 5%
3753764	77118	MOUNT FRANKLAND	324000	5440040	Pr	Sss	We		LG	
3753765	77118	MOUNT FRANKLAND	323995	5440040	Pr	Ssi	SlGs		DGN	width 10cm
3753766	77118	MOUNT FRANKLAND	323990	5440040	Pr	Ssi	Lm		ADGW	
3753767	77118	MOUNT FRANKLAND	323985	5440040	Pr	Ccy			WLG	Clay in fold axis
3753768	77118	MOUNT FRANKLAND	323980	5440040	Pr	Ssi	Lm		AVN	
3753769	77118	MOUNT FRANKLAND	323975	5440040	Pr	Ox	We	Mn?	ADBLB	Unknown coaly rock.
3753770	77118	MOUNT FRANKLAND	323250	5439880	Pr	Sbs	LmDsBs	Py	N	
3753771	77118	MOUNT FRANKLAND	322910	5439550	Pr	Ssi	Lm		ALVDV	Chloritic
3753772	77118	MOUNT FRANKLAND	322500	5439280	Pr	Ovq	Gs		YBW	
3753773	77118	MOUNT FRANKLAND	322500	5439280	Pr	Ssi	Lm		ADG	
3753774	77118	MOUNT FRANKLAND	321720	5438340	Pr	Ssi	LmWe		KR	
3753775	77118	MOUNT FRANKLAND	321000	5442000	Pr	Ssi	LmSlDs	Py	N	Py 5%. position uncertain

APPENDIX 2: Mount Frankland EL18/92. Rockchip ledgers and geochemistry.														
Sampno	AMGE	AMGN	Ag ppm	As ppm	Au ppm	Co ppm	Cu ppm	Fe%	Mn ppm	Ni ppm	Pb ppm	Sn ppm	W ppm	Zn ppm
3753781	323980	5427310	-1	1.5	-0.005	-3	13	0.80	153	3	10			6
3753782	324270	5426910	-1	1	-0.005	-3	8	1.71	338	4	11			10
3753783	324270	5426910	-1	23.5	-0.005	4	39	4.48	513	4	11			14
3753784	324750	5426540	-1	1	-0.005	-3	10	3.15	192	9	4			39
3753785	325130	5425810	-1	48.5	-0.005	5	92	5.35	818	5	12			22
3753786	325130	5425810	-1	2	-0.005	4	14	4.65	520	15	-3			21
3753787	325260	5425620	-1	1	-0.005	-3	39	1.71	81	8	-3			21
3753788	325260	5425620	-1	17.5	-0.005	5	24	1.74	59	9	10			14
3753789	323798	5425800	-1	2.5	-0.005	-3	3	0.65	48	5	23			2
3753790	323650	5425800	-1	0.5	-0.005	-3	2	0.55	43	-3	-3			2
3753791	323856	5425895	-1	5	-0.005	-3	8	2.29	185	-3	-3			7
3753792	323710	5425900	-1	-0.5	-0.005	-3	2	0.55	52	-3	-3			6
3753793	324210	5425805	1	9.5	-0.005	-3	122	5.10	522	-3	-3			18
3753794	323950	5425890	-1	1	-0.005	-3	5	0.64	56	-3	-3			5
3753795	324250	5425825	-1	0.3	-0.005	4	47	1.69	83	5	5			10
3753796	324120	5425800	-1	3	-0.005	-3	5	1.02	54	-3	-3			6
3753797	323855	5425895	-1	7.5	0.006	-3	4	1.23	68	-3	4			4
3753798	323950	5425900	-1	1.5	-0.005	-3	2	0.62	52	4	-3			2
3753799	323700	5425885	-1	0.5	-0.005	3	4	0.61	47	4	-3			5
3753800	324100	5425850	-1	18	-0.005	-3	40	4.85	248	4	-3			7
3753762	325420	5440070	-1	14	-0.005	-3	21	1.80	101	5	20			14
3753763	324400	5440250	-1	17.5	-0.005	4	43	2.00	44	9	37			32
3753764	324000	5440040	-1	4.5	-0.005	-3	5	0.17	16	6	7			5
3753765	323995	5440040	-1	5.5	0.007	-3	6	0.64	20	5	5			6
3753766	323990	5440040	-1	2	-0.005	-3	4	0.88	15	7	3			12
3753767	323985	5440040	-1	3	-0.005	-3	5	0.60	13	9	-3			11
3753768	323980	5440040	-1	0.5	-0.005	-3	7	0.51	10	6	-3			13
3753769	323975	5440040	-1	0.5	-0.005	-3	5	0.25	10	-3	3			5
3753770	323250	5439880	-1	8	-0.005	-3	23	1.34	61	90	24			16
3753771	322910	5439550	-1	2	-0.005	10	13	3.26	209	14	-3			123
3753772	322500	5439280	-1	3	0.009	-3	17	0.36	32	3	43			12
3753773	322500	5439280	-1	6	0.005	-3	18	1.08	182	12	63			26
3753774	321720	5438340	-1	1.5	-0.005	-3	22	2.72	63	-3	4			15
3753775	321000	5442000	-1	-100	0.009	16	24	6.56	83	39	-3			28

Appendix 2: Mount Frankland EL18/92. Rockchip ledgers and geochemistry.

Sampno	DPO	Prospect	AMGE	AMGN	MRTLith	FieldID	Texture	Alt/Min	Colour	Comments
3757842	77667	ROGER RIVER FAULT	324200	5436500						Grey pebbly mixture
3757843	77667	ROGER RIVER FAULT	324200	5436500						Grey pebbly mixture
3757844	77667	ROGER RIVER FAULT	324100	5436475						White and dk grey siliceous material
3757845	77667	ROGER RIVER FAULT	324100	5436475						White and dk grey siliceous material
3757846	77667	ROGER RIVER FAULT	323950	5436400						Bright, med. green siltstone
3757847	77667	ROGER RIVER FAULT	324250	5436750						White and dk grey siliceous material
3757803	77662	MT FRANKLAND	328800	5424800						Black siltstone with disseminated chlorite
3757804	77662	MT FRANKLAND	327500	5425100						Quartz vein with associated chlorite and Cu
3757805	77662	MT FRANKLAND	327450	5425150						Medium grained dolerite
3757806	77662	MT FRANKLAND	329200	5423800						Dark grey siltstone with disseminated pyrite
3757807	77662	MT FRANKLAND	330000	5423800						Planar banded greenish grey siltstone
3757808	77662	MT FRANKLAND	329700	5423850						Dark grey siltstone with pale sandstone bands
3757809	77662	MT FRANKLAND	327150	5424850						Planar banded, pale green, spotted slate
3757810	77662	MT FRANKLAND	325800	5425900						Cream to palest green, slaty to phyllitic siltstone
3757811	77662	MT FRANKLAND	326450	5427000						Darker and lighter banded pink quartz arenite
3757812	77662	MT FRANKLAND	326150	5426800						Pink and green, mica phyllite
3757814	77662	MT FRANKLAND	325150	5431000						Dark grey lustrous slate
3757815	77662	MT FRANKLAND	324450	5425900						Quartz arenite with limonite on joints
3757816	77662	MT FRANKLAND	326100	5426050						Pale green mica phyllite with pyrite
3757817	77662	MT FRANKLAND	323350	5439925						Black pyritic siltstone
3757819	77662	MT FRANKLAND	323500	5437750						Grey green siltstone
3757820	77662	MT FRANKLAND	324525	5436400						Fresh basalt
3757828	77662	MT FRANKLAND	319475	5440000						Dark grey, spotted siltstone
3757829	77662	MT FRANKLAND	318725	5442250						Richly pyritic, dark grey to black siltstone
3757830	77662	MT FRANKLAND	318725	5442250						Rounded pyrite in dark grey to black siltstone
3757831	77662	MT FRANKLAND	318725	5442250						Spotted, richly carbonaceous siltstone (black)
3757839	77662	MT FRANKLAND	327050	5426300						Reddish, coarse grained, quartz sandstone
3757871	77676	FRANKLAND ROAD	318830	5442185						Dark grey siltstone with 3mm pyrite band
3757872	77676	FRANKLAND ROAD	318820	5442190						Grey siltstone with 1-3mm pyrite bands
3757873	77676	FRANKLAND ROAD	318810	5442195						Grey siltstone
3757874	77676	FRANKLAND ROAD	318800	5442200						Grey to black siltstone with disseminated pyrite
3757875	77676	FRANKLAND ROAD	318700	5442250						Black siltstone with? fine pyrite
3757876	77676	FRANKLAND ROAD	318690	5442240						Black siltstone rich in disseminated pyrite
3757877	77676	FRANKLAND ROAD	318680	5442245						Black siltstone, no visible pyrite
3757878	77676	FRANKLAND ROAD	318670	5442230						Black siltstone, no visible pyrite

Appendix 2: Mount Frankland EL18/92. Rockchip ledgers and geochemistry.

Sampno	AMGE	AMGN	Ag ppm	As ppm	Au ppm	Co ppm	Cu ppm	Fe%	Mn ppm	Ni ppm	Pb ppm	Sn ppm	W ppm	Zn ppm
3757842	324200	5436500	-1	15	0.010	23	39	5.80	281	96	5	9	8	103
3757843	324200	5436500	-1	20	0.008	54	52	10.80	1106	162	10	9	-5	165
3757844	324100	5436475	-1	5	-0.008	85	4	1.55	3242	14	5	6	-5	70
3757845	324100	5436475	-1	0.5	-0.008	5	2	0.17	41	-3	-3	-3	-5	50
3757846	323950	5436400	-1	0.5	-0.008	6	3	1.71	24	8	-3	9	-5	80
3757847	324250	5436750	-1	1	-0.008	7	2	0.61	190	-3	-3	6	-5	53
3757803	328800	5424800	-1	2.5	-0.008	-3	5	1.31	100	4	7	11	-5	32
3757804	327500	5425100	1	1800	0.019	66	7000	9.90	516	20	8	7	-5	43
3757805	327450	5425150	-1	7.5	-0.008	25	133	10.70	987	15	6	5	-5	101
3757806	329200	5423800	-1	8.5	0.008	11	24	3.43	80	12	93	7	-5	41
3757807	330000	5423800	-1	9.5	-0.008	4	8	4.21	322	7	8	11	10	51
3757808	329700	5423850	-1	16	-0.008	3	12	1.81	87	7	14	8	6	23
3757809	327150	5424850	1	1.5	-0.008	9	4	2.48	63	13	5	10	6	67
3757810	325800	5425900	-1	1.5	-0.008	-3	2	1.64	66	-3	-3	7	-5	22
3757811	326450	5427000	-1	2	-0.008	-3	7	0.46	30	-3	4	5	-5	16
3757812	326150	5426800	-1	1.5	-0.008	3	2	1.81	23	3	3	9	-5	11
3757814	325150	5431000	4	4.5	-0.008	5	14	1.95	167	4	5	7	6	26
3757815	324450	5425900	-1	180	-0.008	-3	17	4.44	27	-3	5	8	-5	16
3757816	326100	5426050	-1	2.5	-0.008	-3	3	0.71	44	-3	3	4	-5	17
3757817	323350	5439925	-1	8.5	-0.008	8	70	2.91	101	24	9	9	9	42
3757819	323500	5437750	-1	24	-0.008	-3	8	4.32	111	7	39	10	-5	56
3757820	324525	5436400	-1	13.5	-0.008	28	45	10.40	1064	36	5	10	6	115
3757828	319475	5440000	-1	10.5	-0.008	-3	44	4.03	301	6	7	9	-5	57
3757829	318725	5442250	-1	180	0.024	32	30	12.40	18	42	38	8	-5	33
3757830	318725	5442250	2	1230	0.028	73	782	30.50	57	270	87	6	-5	67
3757831	318725	5442250	-1	3.5	-0.008	-3	32	0.34	23	-3	24	10	6	15
3757839	327050	5426300	-1	1	-0.008	-3	11	0.34	38	-3	4	6	-5	10
3757871	318830	5442185	-1	696	0.012	81	122	3.39	373	85	28	9	9	66
3757872	318820	5442190	-1	25	0.013	15	66	2.51	971	16	4	6	9	78
3757873	318810	5442195	-1	11	0.016	6	86	0.60	69	5	13	7	7	70
3757874	318800	5442200	-1	48	0.022	28	49	2.60	122	42	17	9	12	66
3757875	318700	5442250	-1	38.5	0.022	55	84	3.23	229	53	11	11	-5	66
3757876	318690	5442240	-1	102	0.028	34	73	4.98	35	51	29	12	-5	58
3757877	318680	5442245	-1	3.5	0.018	3	24	0.22	21	-3	17	8	6	50
3757878	318670	5442230	-1	3	0.012	-3	11	0.16	20	-3	14	8	8	76

Appendix 3: EL18/92 Soil Sampling Ledger
The Gap prospect
DPO 77114

Sampno	AMGE	AMGN	Horizon	Depth	MRTLith	FieldID	Colour	Comments	Ag ppm	As ppm	Co ppm	Cu ppm	Fe%	Mn ppm	Ni ppm	Pb ppm	Zn ppm
3753728	323925	5426000	C	0.8	Ps	Ssh	DG		-1	6	-3	30	1.72	196	3	5	23
3753729	323950	5426000	C	1	Ps	Ssh	DG	O/c is laminated ssh with sss interbeds.	-1	1.5	-3	11	1.58	175	4	11	21
3753730	323975	5426000	C	0.8	Ps	Ssh	DG	Side of ridge.	-1	1.5	-3	2	0.44	36	-3	3	13
3753731	324000	5426000	B/C	0.5	Ps	Ssh	DG	Poor C-hor. Qtzite RF's	-1	1	-3	5	0.62	51	5	-3	11
3753732	324025	5426000	C	0.5	Ps	Ssh	DG	Ssh o/c dips steeply to E, youngs to E.	-1	0.5	-3	3	0.65	47	-3	-3	12
3753733	324050	5426000	C	0.3	Ps	Ssh	DG	Ssh o/c dips steeply to E, youngs to E.	-1	1	-3	4	0.3	21	-3	7	4
3753734	324075	5426000	C	0.6	Ps	Ssh	DG		-1	0.5	-3	3	0.38	34	-3	9	5
3753735	324100	5426000	C	0.4	Ps	Ssh	DG		-1	0.5	-3	4	0.59	53	3	9	11
3753736	324125	5426000	C	0.8	Ps	Ssh	DG	From broad gully.	-1	3.5	4	185	4.4	307	38	27	40
3753737	324150	5426000	C	0.7	Ps	Ssh	DG		-1	0.5	-3	4	0.36	42	-3	6	6
3753738	324175	5426000	C	0.6	Ps	Ssh	LG		-1	1	3	12	0.55	38	7	-3	14
3753739	324200	5426000	C	0.8	Ps	Ssh	DG	In gully. Organic contam.	1	2	-3	32	1.42	127	8	10	44
3753740	324225	5426000	C	0.4	Ps	SshSss	DGMG	Sss interbeds in Ssh.	-1	9	-3	7	6.54	175	5	-3	23
3753741	324250	5426000	C	0.8	Ps	Ssh	DG	Laminated. Euhedral py and py nodules.	-1	19	6	22	2.63	89	18	19	78
3753742	323975	5426100	C	0.8	Ps	Ssh	DG	Open gully. No qtzite cover. Ssh RF's.	-1	14	3	5	4.71	264	9	11	53
3753743	323950	5426100	C	0.8	Ps	Ssh	DG	Open gully. No qtzite cover. Ssh RF's.	-1	2	-3	7	0.75	67	-3	8	12
3753744	323925	5426100	C	1.2	Ps	SshSss	BG	Sandy interbeds in shale.	-1	1	-3	9	0.78	56	6	26	23
3753745	323900	5426100	B	0.7	Ps	Mq	GE	Sample from base of qtzite (qtz lag?).	-1	1	3	7	0.57	41	7	-3	6
3753746	323875	5426100	C	0.8	Ps	SshSss	GE	Sandy interbeds in shale.	-1	2.5	3	10	0.7	97	5	48	26
3753747	323850	5426100	C	0.8	Ps	Ssh	DG		-1	1.5	-3	8	0.75	63	3	25	28
3753748	323825	5426100	B/C	0.5	Ps	Ssh	DG	Not good C-hor. Minor organic contam.	-1	1	-3	2	1.65	128	4	-3	19
3753749	323800	5426100	C	0.4	Ps	Ssh	DG		-1	7.5	-3	3	2.25	212	7	4	23
3753750	323775	5426100	B	0.4	Ps	Mq	DG	Poor sample from base? of qtz/qtzite lag.	-1	4	-3	4	0.39	44	4	-3	4
3753751	323750	5426100	B	0.4	Ps	Mq	DG	Poor sample from base? of qtz/qtzite lag.	-1	1	-3	5	0.49	39	9	-3	2
3753752	323725	5426100	B	0.4	Ps	Mq	B	From 'impenetrable' qtz lag.	-1	-0.5	-3	3	0.27	15	6	5	3
3753753	323700	5426100	B	0.4	Ps	Mq	E?	Poor sample. Includes qtzite & shale RF's.	-1	-0.5	-3	2	0.48	37	5	6	4
3753754	323675	5426100	C	0.8	Ps	Ssh	DGE	From creek gully.	-1	3.5	3	3	0.58	31	7	17	6
3753755	323650	5426100	B	0.5	Ps	Mq	DGE	From base of qtz lag; includes Mq RF's.	-1	1	-3	4	0.57	42	8	-3	5
3753756	323625	5426100	B	0.5	Ps	Mq	G	From 'impenetrable' qtz lag.	-1	0.5	-3	2	0.23	21	4	3	4
3753757	323600	5426100	B	0.8	Ps	Mq	DG	From 'impenetrable' qtz lag.	-1	0.5	3	2	0.36	24	7	-3	3
3753758	323575	5426100	B	0.3	Ps	Mq	B	From 'impenetrable' qtz lag.	-1	1	-3	2	0.34	19	7	-3	3
3753759	323550	5426100	B/C	0.7	Ps	Ssh	E	Poor C-hor sample, includes Mq RF's.	-1	3	7	3	0.61	35	10	9	5
3753760	323525	5426100	C	0.7	Ps	Ssh	DE		-1	-0.5	-3	2	0.82	73	5	-3	6
3753761	323500	5426100	C	0.4	Ps	Ssh	DG	SshSss o/c, dips steeply E.	-1	-0.5	3	3	0.66	56	6	-3	6
3753834	323500	5425900	C/Bedrk	0.9	Ps	Sbs	DGN	Clay horizon beneath qtz lag.	-1	-0.5	-3	2	0.52	18	3	3	5
3753835	323525	5425900	C?	0.6	Ps	SssMq	GB	Under qtz lag, into qtzite RF's and vqtz.	-1	-0.5	-3	2	0.33	19	5	-3	-2
3753836	323550	5425900	C	1	Ps	Ssi	DG	Sample felt coarser than a shale.	-1	-0.5	-3	3	0.62	42	7	-3	4
3753837	323575	5425900	C	0.4	Ps	SshMq	G	qtzite & vqtz RF's in clay matrix; no shale RF's.	-1	-0.5	3	3	0.79	72	8	-3	4
3753838	323600	5425900	C	0.7	Ps	SshMq	DG	Shale dominated interbeds. Rel high organics	-1	-0.5	3	-2	0.53	49	3	-3	3
3753839	323625	5425900	C	0.6	Ps	SshSsi	DG	Minor vqtz & plant roots.	-1	-0.5	-3	2	0.54	46	5	26	3
3753840	323650	5425900	C	0.5	Ps	SshSsi	DG	Abundant RF's.	-1	-0.5	-3	-2	0.39	38	4	4	3
3753841	323675	5425900	C	0.6	Ps	Ssh	DG	Minor vqtz & qtzite RF's. Minor roots.	-1	-0.5	-3	5	0.5	44	5	-3	6
3753842	323700	5425900	C	0.3	Ps	Ssh	DG	Abundant RF's. Rel high organic content.	-1	-0.5	-3	-2	0.5	52	8	24	4
3753843	323725	5425900	C	0.4	Ps	SshMq	DG	Interbedded qtzite and shales.	-1	-0.5	-3	2	0.38	25	13	10	4

Sampno	AMGE	AMGN	Horizon	Depth	MRTLith	FieldID	Colour	Comments	Ag ppm	As ppm	Co ppm	Cu ppm	Fe%	Mn ppm	Ni ppm	Pb ppm	Zn ppm
3753844	323750	5425900	C	0.6	Ps	Ssh	DG	Minor qtz & qtzite contam. Minor organics.	-1	-0.5	-3	2	0.61	37	11	5	4
3753845	323775	5425900	C	0.1	Ps	SshSsi	DG	Laminated siltstones & shales	-1	-0.5	-3	-2	0.44	25	3	-3	4
3753846	323800	5425900	C	0.8	Ps	Ssh	DG	Minor uphole contam from qtzite & vqtz.	-1	-0.5	-3	-2	0.27	15	4	-3	3
3753847	323825	5425900	C	0.3	Ps	SshMsl	DG	Abundant RF's. V minor vqtz.	-1	-0.5	-3	-2	0.43	37	5	-3	3
3753848	323850	5425900	C	0.3	Ps	Ssi	G	Nearby o/c is Ssi with abund cubic voids.	-1	-0.5	-3	-2	0.3	22	5	-3	2
3753849	323875	5425900	C	0.4	Ps	Ssi	GDG	No qtz lag. Minor qtz-veining	-1	-0.5	-3	-2	0.37	21	6	-3	2
3753850	323900	5425900	C	0.4	Ps	Ssh?	DG	Minor ssi/ssh RF's in clay matrix.	-1	-0.5	-3	-2	0.51	24	3	-3	4
3753851	323925	5425900	rock	0.4	Ps	SshSsi	DG	bedrk sample as no C-hor developed.	-1	-0.5	-3	46	0.56	29	5	5	9
3753852	323950	5425900	C	0.4	Ps	Ssi	GDG	O/c 10m S is Ssi	-1	-0.5	-3	-2	0.28	15	4	-3	3
3753853	323975	5425900	C	0.4	Ps	Ssh	DG	Shale is very soft.	-1	-0.5	-3	2	0.66	35	5	3	5
3753854	324250	5425800	C	0.3	Ps	SshSsi	DG	On top of 'spur'/ridge.	-1	77	-3	-2	0.29	22	3	-3	3
3753855	324225	5425800	C	0.2	Ps	SshSsi	VG	chloritic? ssh/ssi . O/c is qtz veined Mq	-1	19	-3	26	2.38	248	8	-3	16
3753856	324200	5425800	C	0.5	Ps	SshSsi	DG	Clay with ssh RF's, v minor sss.	-1	8	-3	44	1.25	21	7	9	3
3753857	324175	5425800	C	0.5	Ps	Ssh	DG		-1	2	-3	3	0.48	25	3	-3	4
3753858	324150	5425800	C	0.4	Ps	Mq	G	Mq RF's in sandy matrix. Minor vqtz and clay.	-1	1	-3	2	0.23	12	3	-3	-2
3753859	324125	5425800	C	0.4	Ps	Mq	G	Mq RF's in sandy matrix. Minor vqtz and clay.	-1	1	-3	3	0.63	36	8	-3	-2
3753860	324100	5425800	C	0.5	Ps	Ssh?	GDG	Clay/ground-up ssh, minor qtz contam.	-1	-0.5	-3	-2	0.39	24	-3	3	2
3753861	324075	5425800	B/C?	0.2	Ps	Mq	LGG	Little C-hor dev. Bottomed on Mq o/c.	-1	1	-3	2	0.37	21	5	-3	-2
3753862	324050	5425800	C	0.3	Ps	Mq	LGG	Minor vqtz & clay.	-1	-0.5	-3	-2	0.28	16	3	-3	2
3753863	324025	5425800	C	0.3	Ps	SshSsi	DG	Mod. vqtz & abund RF's.	-1	-0.5	-3	-2	0.29	13	3	-3	-2
3753864	324000	5425800	C	0.4	Ps	SsiSsh	DG	Dark, damp clay with RF's.	-1	-0.5	-3	-2	0.24	9	-3	-3	-2
3753865	323975	5425800	C	0.8	Ps	SssSsh	DG	Interbedded seds?	-1	-0.5	-3	-2	0.3	13	3	-3	-2
3753866	323950	5425800	B/C	0.5	Ps	Mq	GLG	Qtzite RF's in sandy matrix.	-1	-0.5	-3	-2	0.23	11	3	-3	-2
3753867	323925	5425800	C?	0.4	Ps	Mq	GB	Qtzite RF's in sandy matrix.	-1	-0.5	-3	-2	0.51	20	6	-3	2
3753868	323900	5425800	C	1.6	Ps	Mq	GW	No qtz lag, very thick B horizon.	-1	-0.5	-3	-2	0.16	7	-3	-3	-2
3753869	323875	5425800	B/C	0.9	Ps	Mq	GB	B-hor directly on bedrk.	-1	-0.5	-3	-2	0.29	14	4	-3	-2
3753870	323850	5425800	C	0.5	Ps	Mq	GW		-1	-0.5	-3	-2	0.34	16	4	-3	-2
3753871	323825	5425800	C	0.6	Ps	Mq	GWB		-1	-0.5	-3	-2	0.32	15	4	-3	-2
3753872	323800	5425800	B/C	0.4	Ps	Mq	GB	B-hor directly on bedrk.	-1	-0.5	-3	-2	0.25	12	3	-3	-2
3753873	323775	5425800	C	0.4	Ps	Mq	GW		-1	-0.5	-3	-2	0.25	12	4	-3	-2
3753874	323750	5425800	C	0.3	Ps	Mq	GW	Minor vqtz.	-1	-0.5	-3	-2	0.29	13	5	3	-2
3753875	323725	5425800	B/C	0.3	Ps	Mq	GB	On ridge. Poor soil dev. Abundant qtzite scree.	-1	-0.5	-3	-2	0.37	15	7	-3	-2
3753876	323700	5425800	C	0.4	Ps	Mq	GW		-1	-0.5	-3	-2	0.38	15	5	2	-2
3753877	323675	5425800	B/C	0.4	Ps	Mq	GB	Poor C-hor development.	-1	-0.5	-3	2	0.3	12	4	-3	2
3753878	323650	5425800	C	0.5	Ps	Mq	GWB		-1	-0.5	-3	-2	0.27	13	3	-3	-2
3753879	323625	5425800	C?	0.4	Ps	SshMsl?	GB	V clayey, few RF's, minor vqtz. From ssh	-1	-0.5	-3	-2	0.36	19	5	-3	-2
3753880	323600	5425800	B/C	0.5	Ps	Mq?	GB	Dom. Mq & vqtz RF's, high clay component.	-1	-0.5	-3	-2	0.29	13	5	-3	-2
3753881	323575	5425800	C	0.5	Ps	Mq	GWB		-1	-0.5	-3	-2	0.26	12	5	-3	-2
3753882	323550	5425800	B/C	0.6	Ps	Mq	GB	Bottomed on bedrk? Poor/no C-hor developed.	-1	-0.5	-3	-2	0.25	11	3	-3	-2
3753883	323525	5425800	B/C	0.6	Ps	Mq	GB		-1	-0.5	-3	-2	0.26	12	5	-3	-2
3753884	323500	5426000	B/C	0.6	Ps	Mq	GB	Poor C-hor development.	-1	-0.5	-3	-2	0.23	14	4	-3	-2
3753885	323525	5426000	B/C	0.5	Ps	Mq	GB	Poor C-hor development.	-1	-0.5	-3	-2	0.26	13	3	-3	-2
3753886	323550	5426000	B/C	0.5	Ps	Mq	GB	Poor C-hor development.	-1	-0.5	-3	-2	0.3	17	5	-3	-2
3753887	323575	5426000	B/C	0.4	Ps	Mq	GWB	Poor C-hor development.	-1	-0.5	-3	-2	0.33	17	5	-3	-2
3753888	323600	5426000	B/C?	0.6	Ps	Ssh?	DG	Collected by SM from here.	-1	-0.5	-3	-2	0.37	37	3	5	2
3753889	323625	5426000	B/C	0.5	Ps	Mq	G	Not good C-hor. Didn't get out of qtzite.	-1	1	-3	-2	0.3	32	3	-3	2
3753890	323650	5426000	C	0.4	Ps	Ssh	DG	Ssh/Msl derived soil.	-1	-0.5	-3	-2	0.64	76	4	-3	6

Appendix 3: Soil Sampling ledger and geochemistry

Sampno	AMGE	AMGN	Horizon	Depth	MRTLith	FieldID	Colour	Comments	Ag ppm	As ppm	Co ppm	Cu ppm	Fe%	Mn ppm	Ni ppm	Pb ppm	Zn ppm
3753891	323675	5426000	C	0.7	Ps	Ssh	DG	Ssh RF's. O/c is laminated ssh.	-1	5	-3	9	2.03	144	8	15	18
3753892	323700	5426000	C	0.7	Ps	Ssh	DG	Ssh RF's. O/c is laminated ssh.	-1	9	-3	-2	2.14	135	7	24	32
3753893	323725	5426000	C	0.7	Ps	Ssh	DG	Ssh RF's. O/c is laminated ssh.	-1	1.5	-3	2	0.65	56	6	9	10
3753894	323750	5426000	C	0.4	Ps	Ssh	DG	Ssh RF's.	-1	8	-3	-2	2.42	99	5	17	25
3753895	323775	5426000	C	0.4	Ps	Ssh	DG		-1	2.5	-3	6	1.41	40	-3	16	24
3753896	323800	5426000	C	0.6	Ps	Ssh	DG		-1	5	-3	3	2.16	180	6	8	39
3753897	323825	5426000	B	0.4	Ps	Mq	DG?	Poor C-hor sample. From base? of qtzite?	-1	1	-3	-2	0.46	28	4	4	3
3753898	323850	5426000	B/C	0.8	Ps	Ssh	DG		-1	1	-3	-2	0.59	57	4	9	13
3753899	323875	5426000	C	1.6	Ps	Ssh	DG		-1	3	-3	16	0.63	60	6	6	13
3753900	323900	5426000	C	1.2	Ps	Ssh	DG		-1	1	-3	6	0.99	79	5	11	17

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28th September 1994

MEMO TO: R.G. PARKINSON
FROM: L. VESKA

The Use Of Isotopes as an Exploration Tool; BALFOUR, Northwest Tasmania.

Abstract

Interpretation of chalcopyrite-pyrite-dolomite-quartz veins at Balfour as remobilised stratiform mineralisation may allow the use of sulphur (and lead) isotopic data as an aid to exploration.

Introduction

Copper mineralisation at Balfour is recognised along a regional northwest-trending linear zone of small, historically-mined deposits.

Sulphur Isotopes

Sedimentary pyrite occurring in close spatial relationship to both tin-tungsten mineralisation centred upon Specimen Hill and cupriferous mineralisation at Murray's Reward appears to be characterised by high $^{34}S/^{32}S$ (+15.9 - +18.1), Yaxley (1981).

Assuming the source of the hydrothermal solutions responsible for tin-tungsten sheeted vein systems at Specimen Hill and Tatlow's Shaft to be granite-related ($\delta S=0\pm5$ ‰ , igneous sulphur, Ohmoto., 1986), there is a considerable enrichment of ^{34}S relative to ^{32}S (+9.1 - +14.8) implying a nearby source of 'heavy' sulphur has modified the composition of the fluids. Leaching and/or (chemical?) remobilisation of sedimentary sulphides by granite-related fluids could conceivably produce the observed isotopic values (+9.1 - +14.8).

Murray's Reward vein sulphides are characterised by high (+ve) $^{34}\delta S$ values (+20.0 -+21.5‰, L.Veska; Hons. thesis, 1993), in excess for heavy Balfour sedimentary pyrite. A greater number of sedimentary pyrite samples would need to be analysed to confirm this however, given the variability of $^{34}\delta S$ in sedimentary sulphide (-15 ±40‰, Ohmoto., 1986).

The Murray's Reward sulphur isotopic signature indicates that igneous sulphur was not a major contributor to the fluids responsible for copper mineralisation at this location. The high (+ve) $^{34}\delta S$ signature would support an interpretation of copper mineralisation at Murray's Reward as (physically?) remobilised stratiform mineralisation (inferred to exist at depth). The systematic isotopic analysis of 'copper-only' vein-style mineralisation, known to exist throughout the Balfour field, may act as a pathfinder towards sedimentary-style copper, elevated $^{34}\delta S$ values indicating higher prospectivity at a given site.

Lead Isotope Data

Pyritic veins from Murray's Reward mine, and galena-bearing tin/tungsten ore from Tatlow's Shaft were analysed for their lead isotopic ratios. Interpretation of current data (Carr and Dean; 1991, 1992) suggested the presence of a block of Th-enriched, U-depleted crust in the source rock region to account for the elevated $^{208}Pb/^{204}Pb$ of both sets of data.

Recognising that hydrothermal solutions responsible for tin-tungsten mineralisation at Specimen Hill/Tatlow's Shaft and fluids responsible for cupriferous mineralisation at Murray's Reward were modified isotopically ($^{34}S/^{32}S$) by their interaction with/replacement of? sedimentary sulphides, it is likely that the mineralising fluids had Pb-ratios modified simultaneously. Pb-isotopic analysis of sedimentary pyrite (galena inclusions) and/or pyrrhotite (pyrrhotitic siltstones) occurring at Balfour may confirm this if $^{208}Pb/^{204}Pb$ ratios are elevated to a similar degree as the two sets of existing data.

Conversely, if lead isotope ratios of Balfour sedimentary sulphides are *not* characterised by elevated $^{208}Pb/^{204}Pb$, then the original hypothesis of Carr and Dean (1992), is favoured. Pb-isotopic analysis of vein sulphides selected from the greater Balfour region, including known granite-related mineralisation (e.g. Interview tin veins) would support the existence of a large block of high Th/U crust if results are consistently elevated in $^{208}Pb/^{204}Pb$. In this scenario, a block of crust with quite different characteristics to the Precambrian rocks of the far northwest of Tasmania, would be inferred to exist at depth (=>Leaman thrusting argument; TDR 91-3213).

Lead derived in the Devonian from Precambrian source rocks (hosting sedimentary sulphides) characterised by high Th relative to U would have lower $^{206}Pb/^{204}Pb$ and higher $^{208}Pb/^{204}Pb$ ratios than the Devonian Target. Murray's Reward (and Tatlow's Shaft) sulphides appear to have a $^{206}Pb/^{204}Pb$ ratio consistent with isotopic modification of Devonian hydrothermal fluids by interaction with "Precambrian lead" (refer to Carr and Dean 1991, 1992).

APPENDIX 3:

CRAE soil sample ledgers and geochemistry

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REPORT ON ADDITIONAL GEOLOGICAL MAPPING, PETROLOGY, ROCK SAMPLES AND MAGNETIC SUSCEPTIBILITY IN PARTS OF EL 18/92, BALFOUR DISTRICT, NORTH WESTERN TASMANIA

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30th March, 1994

CONTENTS

LIST OF FIGURES AND MAPS

Introduction

This report supplements a previous report dated 12.1.94 on the stratigraphic and structural setting of rocks in EL 18/92. It outlines the results of an additional eight-day period of mapping and other field work in the exploration licence and provides a listing of all samples submitted to Analabs so far. Petrological descriptions of four samples are included, as well as a brief review of magnetic susceptibility measurements and their relationship to aeromagnetic anomalies.

Geological Mapping

The additional mapping carried out in EL 18/92 was aimed at:

1. More accurately locating the Roger River Fault.
2. Providing better coverage in areas east of Mt Frankland, west of the Heemskirk Road and north of Balfour, across the Frankland River.

Appropriate modifications have been made to the previously prepared 1:25000 map of the exploration licence (Map 1).

Along the Frankland River the Roger River Fault corresponds to a shear zone some 100m wide. Within the zone bedding is of variable orientation and there is a cleavage of NE trend. The intensity of cleavage development varies greatly, ranging from a weakly etched surface in places to a strongly developed, lenticular (scaly) cataclastic surface in narrow zones. Narrow zones of intense shearing are also evident where the Heemskirk Road crosses the Roger River Fault whilst further to the SW the fault is marked by the topographic linear which coincides with the northerly edge of the quartz arenite and grey siltstone (Pyq) which underlies Little Frenchman.

Mapping SE of Mt Frankland showed that the pink sandstone and conglomerate of the Forest Conglomerate and Quartzite correlate (Pf) dip and face westward. Thus, the mountain is formed of a synclinal core in this formation. There is no correlate of the Smithton Volcanics (Ps) along the eastern side of the mountain and the sequence does not appear to be faulted as was previously thought. The basal conglomerate is underlain by poorly outcropping pebbly phyllitic pelite thence by quartz arenite and grey siltstone (Pyq).

No source was recognised for the linear magnetic anomaly which trends NS along the eastern side of Mt Frankland despite traverses crossing the anomaly in several places. Outcrop in the anomaly zone is poor except towards the southern end, where there are sandstone, conglomerate and pebbly pelite of low magnetic susceptibility (0.02 to 0.19). Traverses across the SSE trending aeromagnetic anomaly NE of Mt Frankland showed common lag of quartz arenite typical of Pyq and a small area of brown clay soil probably derived from intrusive Proterozoic dolerite.

North of Balfour, across the Frankland River, there is a wedge of Smithton Volcanics which is bound by the same fault system which controls the rock distribution around Mt Frankland. East of the wedge of volcanics outcrop is poor and the vegetation difficult to penetrate. Consequently investigation of the Balfour Transform structure in this general area would be better if focussed further ESE with access being gained either from east of Mt Frankland or from spur roads off the Sumac Road. Outcrop to the WNW in the bed of the Frankland River should also prove useful in assessing the Balfour Transform. The Balfour Transform is of similar trend to the Rapid River 'corridor' and may prove similarly difficult to define in the field. Best results would be achieved if the structure was specifically targeted.

West of the Heemskirk Road along the old Balfour-Temma track there are scattered outcrops of quartz arenite with interbedded intervals of dark grey siltstone (Pyq). This association extends north beneath the elevated land which includes Little Frenchman and terminates against the Roger River Fault. Throughout the area the beds dip shallowly in comparison with the moderate and steep dips of beds further east. Cross folding on ENE and NNW trends is evident in the shallowly dipping rocks. These trends are similar to the measured trends of outcropping faults in the Balfour district and to the trends of major regional faults.

Rock Samples

A range of rock types were sampled during the main and supplementary phases of mapping in EL 18/92 (Appendix 1). The samples were submitted to Analabs to be analysed for Cu, Pb, Zn, Ag, Fe, Mn, Co, Ni, Au, As, W and Sn. Results were not to hand at the time this report was written.

Thin sections were cut from four of the rock samples by Mineral Resources Tasmania. The sections are described in Appendix 2.

Petrology

Grey siltstone and green siltstone

The subdivisions in the older group of Proterozoic rocks in EL 18/92 are built around two distinctive rock types, namely dark grey siltstone (Py, Pyq) and medium green siltstone (Pn, Pnq, Png). In each case the rock types owe much of their silty character to metamorphic rather than detrital grains. The protolith in the case of the grey rocks was carbonaceous silty mudstone, whereas the protolith of the green rocks was silty mudstone with apparently little or no carbonaceous matter.

Metamorphic silicates in both the grey and the green rocks are similar though the proportions vary. The minerals include abundant muscovite, quartz, plentiful green chlorite and brown to green tourmaline. Tourmaline is much more abundant in the grey rock. Chlorite and muscovite grains show preferred orientation parallel to bedding in both rock types and this fabric is taken to reflect burial metamorphism.

Granitoid veins and thermal metamorphics

Thin sections were cut to confirm the granitic character of veinlets in a locality on Blackwater Road just east of the Balfour turn-off. A section was also cut of the country rocks intruded by the veins in order to confirm the presence of metamorphic minerals.

Both the granitoid and the country rock have been altered by late fluids (greisenised). The granitoid consists of quartz and abundant green chlorite with subordinate muscovite and a little unaltered biotite. In the country rock cordierite and probably anthophyllite are altered to sericite.

Magnetic Susceptibility

Magnetic susceptibility measurements were made during the course of mapping with a view to determining the probable sources of some of the aeromagnetic features in the exploration licence.

Very high magnetic susceptibility readings of up to 40 were obtained from basaltic rocks in the Smithton Volcanics. These readings are consistent with the strong positive aeromagnetic response of the formation. In comparison, intrusive dolerite at 327200E5425150N, south of Mt Frankland, gave maximum readings of 10.

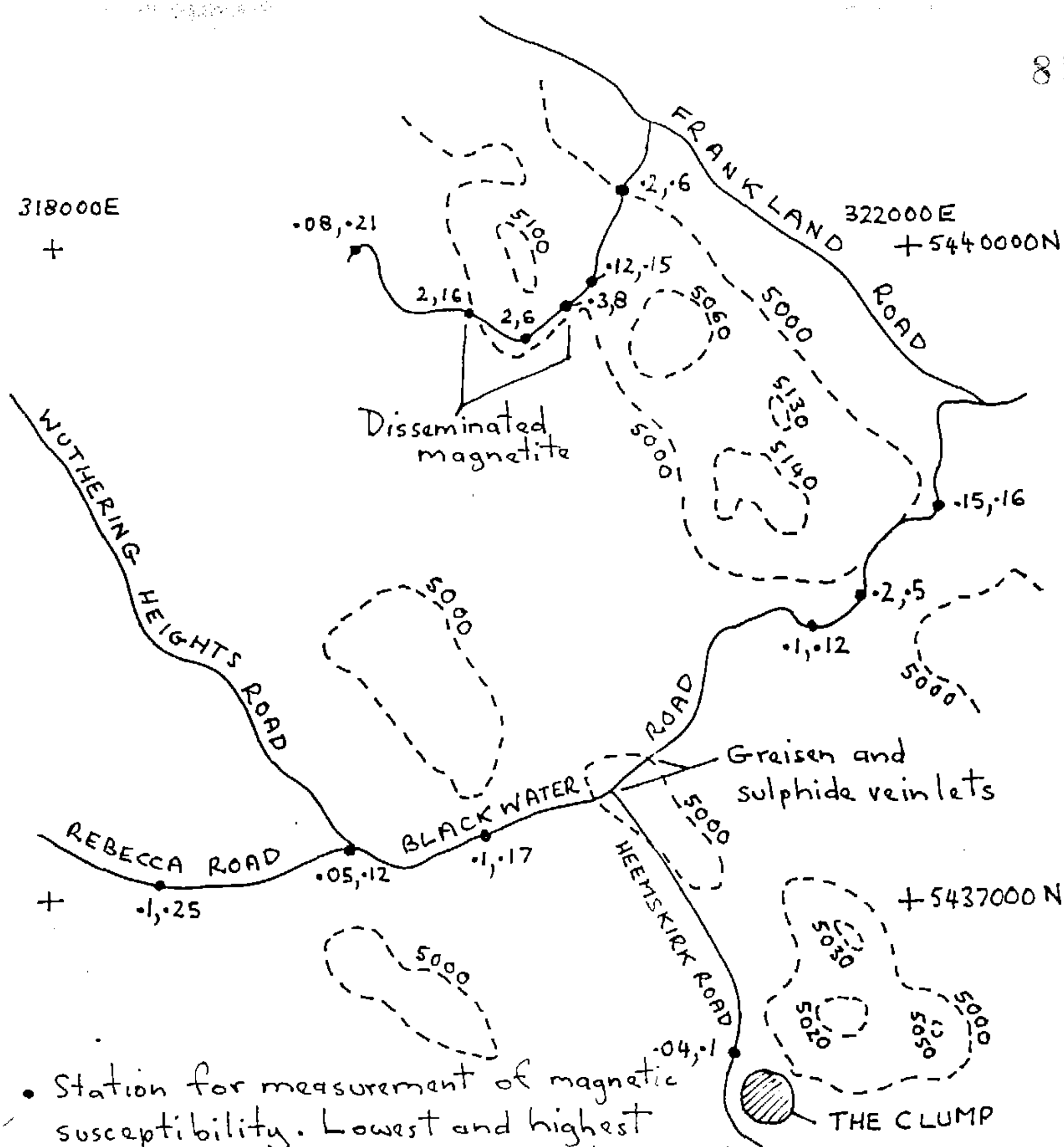
Relatively high susceptibility values of up to 16 were obtained from magnetite-bearing outcrops in the green siltstone succession west of Frankland Road (Fig. 1). These magnetite-bearing rocks are present in substantial volume and are fairly clearly the source of the positive aeromagnetic anomalies over the green siltstone association.

Much of the dark grey siltstone association also gives positive magnetic anomalies. However, the magnetic susceptibility measurements recorded inside and outside the magnetically anomalous areas are all low values in the range 0.03 to 0.17. Thus variation in the bulk surface mineralogy of the grey siltstone does not apparently reflect the cause of the aeromagnetic anomalies. Examination of drill core may resolve this problem.

Greisenised granitoid veinlets intrude the dark grey siltstone association in an aeromagnetically anomalous part of the Balfour track (Fig. 2). These veinlets have a close spatial association with lag of cassiterite-bearing quartz veins. Though the granitoid veins display markedly higher magnetic susceptibility (0.16 to 0.44) than the country rock, their susceptibility is still low and they are much too low in volumetric terms to account for the extensive aeromagnetic anomaly. Again it is necessary to appeal to something at depth, perhaps associated alteration, to account for the aeromagnetic anomaly. A much less extensive aeromagnetic anomaly coincides with similar granitoid veinlets on Blackwater Road (Fig. 1). In this area the granitoid veinlets have a close spatial association with sulphide veins.

Figure 1: Magnetic susceptibility survey - Rebecca and Blackwater Roads, spur west of Frankland Road. Scale 1:25000. EL 18/92.

Figure 2: Magnetic susceptibility survey - Balfour track and Heemskirk Road. Scale 1:25000. EL 18/92.



• Station for measurement of magnetic susceptibility. Lowest and highest values shown. All measurements are of country rock values.

5000 Selected aeromagnetic contours.

Fig 1.

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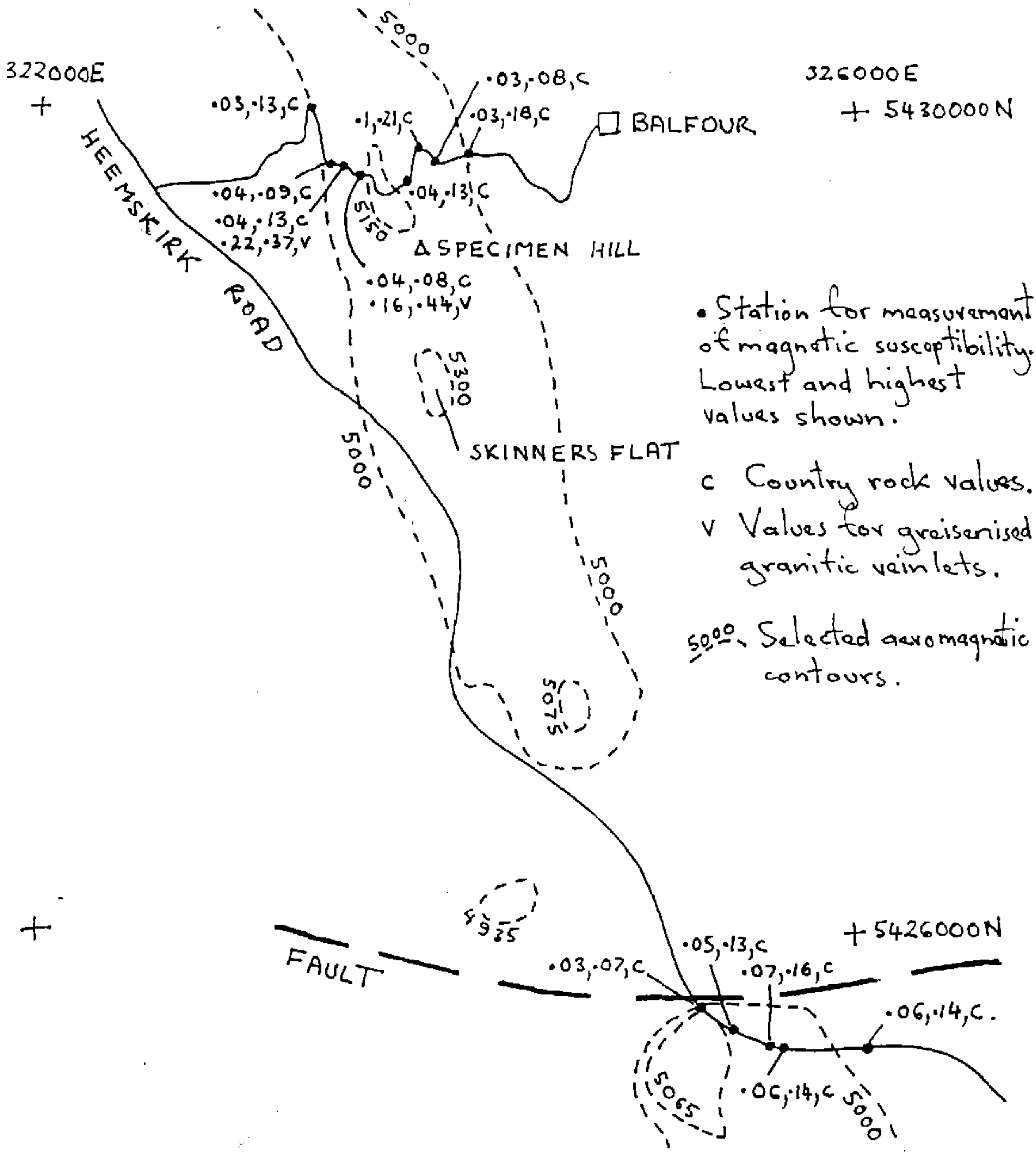
322000E
326000E
+ 5430000N
+ 5426000N
BALFOUR
HEEMSKIRK ROAD
SPECIMEN HILL
SKINNERS FLAT
FAULT
5000
5150
5300
5075
4935
5065
•03,•13,c
•1,•21,c
•03,•08,c
•03,•18,c
•04,•09,c
•04,•13,c
•22,•37,v
•04,•13,c
•04,•08,c
•16,•44,v
•03,•07,c
•05,•13,c
•07,•16,c
•06,•14,c.
•06,•14,c
• Station for measurement of magnetic susceptibility. Lowest and highest values shown.
c Country rock values.
v Values for greisenised granitic veinlets.
5000 Selected aeromagnetic contours.

Fig 2.

APPENDIX 1: ROCK SAMPLES

EL 18/92

SAMPLES TO ANALABS, COOEE

NUMBER	AMG	ROCK TYPE	
3757803	328800E5424800N	Black siltstone with disseminated chlorite	
3757804	327500E5425100N	Quartz vein with associated chlorite and Cu	0.7% Cu
3757805	327450E5425150N	Medium grained dolerite	
3757806	329200E5423800N	Dark grey siltstone with disseminated pyrite	
3757807	330000E5423800N	Planar banded greenish grey siltstone	
3757808	329700E5423850N	Dark grey siltstone with pale sandstone bands	
3757809	327150E5424850N	Planar banded, pale green, spotted slate	
3757810	325800E5425900N	Cream to palest green, slaty to phyllitic siltstone	
3757811	326450E5427000N	Darker and lighter banded pink quartz arenite	
3757812	326150E5426800N	Pink and green, mica phyllite	
3757813	323300E5429900N	Dark grey banded siltstone with limonitic seams	
3757814	325150E5431000N	Dark grey lustrous slate	
3757815	324450E5425900N	Quartz arenite with limonite on joints	
3757816	326100E5426050N	Pale green mica phyllite with pyrite	
3757817	323350E5439025N	Black pyritic siltstone	
3757818	324450E5440325N	Black pyritic siltstone	
3757819	323500E5437750N	Grey green siltstone	
3757820	324525E5436400N	Fresh basalt	
3757821	320875E5437825N	Richly pyritic, chloritic siltstone	
3757822	320800E5437675N	Granitoid veinlet - altered to greisen	
3757823	320800E5437675N	Oxidized (limonitic) sulphide veinlet	
3757824	320800E5437675N	Porphyroblastic slate - thermal, sericitised	
3757825	320775E5437675N	Altered (? greisenised) siltstone	
3757826	320550E5437500N	Chalcopyrite, covellite, sulfates, limonite	5.2% Cu 0.25 ppm Au
3757827	320550E5437500N	Quartz, chlorite, pyrite assemblage	
3757828	319475E5440000N	Dark grey, spotted siltstone	
3757829	318725E5442250N	Richly pyritic, dark grey to black siltstone	
3757830	318725E5442250N	Rounded pyrite in dark grey to black siltstone	

3757831	318725E5442250N	Spotted, richly carbonaceous siltstone (black)	
3757832	322700E5433950N	Quartz/carbonate vein with chalcopyrite, etc	65% Cu
3757833	322700E5433950N	Schist - ? talcose	
3757834	322700E5433950N	Strongly altered chloritic siltstone	
3757835	321475E5435775N	Quartz sandstone with pyrite and sphalerite	
3757836	315050E5428850N	Open space quartz vein	
3757837	322600E5435875N	Medium green sandstone with pyrite nodules	
3757838	322750E5435600N	Limonitic gossan and pyrite	
3757839	327050E5426300N	Reddish, coarse grained, quartz sandstone	
3757840	323500E5429700N	Altered (? greisenised) fine grained sandstone	
3757841	323500E5429700N	Granitoid veinlet - altered to greisen	

APPENDIX 2: PETROLOGICAL DESCRIPTIONS

Rock type: Dark grey siltstone with fine grained sandstone (Py)

AMG: 329700E5423850N

Assay number: 3757808

Outcrop and hand specimen

The rock consists partly of dark grey siltstone showing fine (1-5mm) banding due to variations in the depth of grey colour. Fine grained quartz sandstone makes up the remainder of the rock. It occurs as pale coloured interbands up to 60mm thick, which display grading, occasional cross bedding and commonly rest on scoured bases.

Thin section

The grey siltstone consists mainly of fine grained metamorphic muscovite. Rather than being a true siltstone it is a metasediment derived from a very muddy protolith. It contains common anhedral, lepidoblastic grains of green chlorite and common, disseminated, subhedral to euhedral grains of green to brown tourmaline. Scattered, relatively large grains (0.25-0.50mm) of leucoxene comprise 2-5% by volume of the siltstone and black dusty carbonaceous material is plentiful.

Sandy layers interbanded with the siltstone comprise mainly even grained, equidimentional quartz grains with minor muscovite. Chlorite is common in the sandstone and pyrite may be present as rounded nodules.

Muscovite, chlorite and leucoxene grains display preferred orientation parallel to bedding but tourmaline grains are more randomly oriented. Since there is no evidence in the Balfour district of regional isoclinal folding, this mechanism of generating bedding - parallel metamorphic fabric is discounted and the observed strong fabric is attributed to burial metamorphism.

Cleavage occurs at a high angle to bedding and is defined by short seams of dusty opaque material (carbonaceous) and by rotated mineral grains. The cleavage post-dates all the main mineral phases, including pyrite.

855085

Rock type: Greyish-green and cream siltstone (Png)

AMG: 319950E5438700N

Assay number: None. Similar 3757819, 3757809

Outcrop and hand specimen

The rock is characterised by its colours and by its planar banding. The bands range in thickness from less than 1mm to about 20mm. Occasionally, thicker pale bands rest on gently scoured bases. Both green and cream bands contain common disseminated magnetite and magnetic susceptibility measurements of 2 to 16 units were made on the outcrop sampled for this thin section.

Thin section

Alternating quartz-rich and muscovite-rich bands comprise the rock. Bright green lepidoblastic and porphyroblastic chlorite grains are common throughout. Muscovite is often intergrown with the porphyroblastic chlorite. Compared with the dark grey siltstone described previously, tourmaline is sparse in the green and cream siltstone and carbonaceous material is negligible. Anhedral to euhedral magnetite makes up some 2-5% by volume of the specimen described here.

Chlorite grains display preferred orientation parallel to bedding but muscovite grains are less clearly aligned. No cleavage was recognised in this specimen.

Rock type: Thermally metamorphosed, richly carbonaceous pelite

AMG: 320800E5437675N

Assay number: 3757824

Outcrop and hand specimen

The sample is from cuttings on the Blackwater Road in which there are thin altered granitoid veins and thin sulphide and quartz/sulphide veins.

In hand specimen the rock is a hard, black, fine grained pelite with several per cent by volume of pale porphyroblasts 1-3mm across. The porphyroblasts are commonly hexagonal in cross section but some display crystal faces with interangles of 90°. This variation in crystal form is consistent with the pseudohexagonal habit of cordierite. Another mineral of apparently thermal metamorphic origin occurs as common ragged laths 2-4mm long.

Thin section

Ultra fine grained, black carbonaceous matter makes up 60-70% by volume of the rock. It contains intermixed fine grains of quartz and muscovite.

Both the cordierite and the other thermal metamorphic mineral are pseudomorphed by sericite thus indicating late hydrothermal alteration. A bladed form for the second mineral is evident in thin section, suggesting that it was anthophyllite.

Rock type: Altered granitoid

AMG: 320800E5437675N

Assay number: 3757822

Outcrop and hand specimen

The rock occurs in thin (1-30mm) veins in thermally metamorphosed pelite. These veins occupy fractures that strike subparallel to bedding. Some fractures contain a phase of quartz veining as well as the granitoid.

The granitoid is fine to medium grained (0.5-1.5mm) and consists of granular quartz and abundant green mica.

Thin section

In thin section the granitic texture is marked though feldspar is absent, presumably due to replacement. Quartz is the predominant mineral and there is abundant green chlorite. In (? large) part the chlorite is after biotite and there are uncommon grains of pristine biotite. A small proportion of the chlorite grains are distinctively vermicular with finely fibrous, transverse crystal structure. Muscovite is scattered throughout the rock, occurring in relatively large patches which may have originally been single grains but which are now composites of fine grains. A little carbonate occurs as inclusions in some quartz grains.

APPENDIX 4:

<u>Memo from L. Veska. Isotopes at Balfour.</u>

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CRA EXPLORATION PTY LTD

1/23 BELL ST, PRESTON, 3072

REPORT ON ROCK CHIP ANALYSES FROM PARTS OF EL18/92, MT FRANKLAND, WESTERN TASMANIA

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Telephone (002) 34 2652

2nd May, 1994

CONTENTS

SUMMARY AND CONCLUSIONS

1.In the dark grey pelitic unit (Py) which extends NNW from the vicinity east of The Clump there is an uppermost, richly carbonaceous zone. This stratabound (?stratiform) zone contains pyritic rocks that are anomalous in copper,lead,silver,cobalt,nickel,arsenic and gold.

2.Quartz/sulphide veins on Blackwater Road near the Balfour turn-off contain a similar suite of anomalous metals to the suite in the stratabound zone and may represent material remobilized from the zone.

3. Tin is anomalous in a quartz/carbonate/sulphide vein southeast of The Clump and there are quartz/cassiterite veins around Specimen Hill. Further work is necessary to determine the relationship between the tin and sulphide mineralization.

4.Altered granitoid veinlets are present in the mineralized intervals on Blackwater Road and on the Balfour track north of Specimen Hill. On the Balfour track the the granitoid is anomalous in tin whereas on Blackwater Road it is not. Further work is necessary to determine whether these sparse, very thin veinlets of fine to medium grained altered rock are related to Devonian granite or were produced by other processes.

INTRODUCTION

This report is supplementary to previous reports on EL 18 / 92 which are dated 12/ 1/94 and 30/3/94. The first of the previous reports dealt with stratigraphy and structure whilst the second dealt with additional mapping, petrology, samples collected and magnetic susceptibility. This report deals with the assay results for rock chip samples listed in Appendix 2 of the report of 30/3/94.That sample listing is reproduced here as Appendix 1. Analabs' analytical data sheets are included as Appendix 2 of this report.

GRANITOID VEINLETS AND ASSOCIATED ROCKS

Sparse, thin veinlets containing fine to medium grained granitoid intrude dark grey to black carbonaceous pelite (Py) on Blackwater Road around the Balfour turn-off where there is a close spatial association with quartz/sulphide veins. The granitoid consists of quartz and chlorite together with minor muscovite, biotite and carbonate. No feldspar is present. Much of the chlorite appears to be due to alteration of biotite.The pelite intruded by the veinlets appears to be thermally metamorphosed, containing sericitised porphyroblasts of probable cordierite and probable anthophyllite. Neither the granitoid (Table 1-3757822) nor the intruded pelite (Table 1-3757824) display notable metal values apart from elevated copper in the granitoid.

Similar granitoid veinlets intrude Py on the Balfour track north of Specimen Hill where they are spatially related to quartz veins containing cassiterite. No thermal metamorphic features were recognised in this locality but there is a little,patchy alteration of the country rocks .Both the granitoid (Table 1-3757841) and the altered country rock (Table 1-3757840) are anomalous in tin but not in other metals.

QUARTZ,SULPHIDE,CARBONATE VEINS

Thin veins were sampled on Blackwater Road around the Balfour turn-off (Table 1-3757823,26,27); southeast of The Clump near the Frankland River where alteration assemblages were also sampled (Table 1-3757832,33,34); in Waratah Creek southeast of Mt Frankland (Table 1-3757804); and on the old Temma track (Table 1-3757836).With the exception of the barren quartz vein on the old Temma track, the veins and altered rocks all show elevated to anomalous values of copper (96ppm to 6.53%).The samples show sporadically elevated to anomalous values of silver (1-69ppm), cobalt (16-66ppm), nickel (20-270ppm),arsenic(9-1800ppm)and gold (0.019-0.249ppm).Lead and zinc do not exceed 44ppm and 60ppm respectively.Tin is only anomalous (65ppm) in the vein southeast of The Clump (Table 1-3757832).

DARK GREY TO BLACK CARBONACEOUS PELITIC ROCKS

1. Py against Png north of the Roger River Fault

A stratabound, probably stratiform zone of anomalous metal enrichment has been identified in the uppermost part of the dark grey pelitic unit (Py) which extends

NNW from the vicinity of The Clump. The grey pelitic unit dips and faces ENE, apparently conformably underlying the pale and medium green pelitic unit (Png) to the east though in places there is clear evidence of movement on the intervening boundary. In its uppermost part the grey pelite is so rich in carbonaceous matter it is black in colour and dirty to handle. In contrast, the overlying pale to medium green beds contain little or no carbonaceous matter. Pyrite is abundant in parts of the richly carbonaceous zone in the grey pelite and anomalous values of a range of metals are associated with the pyrite.

Samples were collected in four localities along the zone of interest (Table 1; Appendix 1). Sample 3757838 from a very small stratabound gossan close to the zone in the vicinity of the Roger River Fault gave 758ppm copper, 102ppm lead,2ppm silver,23ppm arsenic and 0.019ppm gold. Pyritic lag (3757821) on Blackwater Road gave 1108ppm copper,1ppm silver,39ppm arsenic and 0.034 gold. On Frankland Spur Road no pyritic rocks were located but on Frankland Road there are very pyritic rocks present in the zone. Sample3757830 of nodular pyrite from Frankland Road gave 782ppm copper, 87ppm lead, 2ppm silver,73ppm cobalt, 270ppm nickel, 1230ppm arsenic and 0.028ppm gold. Overall, the suite of metals in the zone resembles the suite of anomalous metals that is present in the quartz/sulphide/carbonate veins discussed in the previous section with the 65ppm tin in vein sample 3757832 being the only exception. This chemical similarity suggests that the veins represent in (?large) part material remobilized from the stratabound zone or similar zones. Such an origin for the Murrays Reward mineralization could account for the 'pre-Devonian' isotope results of Veska(1993) and others.

2.Other Carbonaceous Pelites (Py,Pyq,Pp)

Other rock chips of dark grey to black pelite were collected on a fairly random basis through the area covered by the geological mapping programme. Several pyritic samples gave elevated to anomalous values of some metals. For example,3757806(Table 1) contains 93ppm lead, 8.5ppm arsenic and 0.008 gold whilst 3757818 contains 56ppm lead,19ppm cobalt, 17ppm nickel and 17.5ppm arsenic. Based on this limited sampling it seems that the dark grey to black pelite in Py against Png north of the Roger River Fault contains markedly higher and more diverse metal values than similar pelite elsewhere.

GREENISH SILTSTONE,SLATE AND PHYLLITE (Pn,Png,Pp)

Samples of greenish,essentially non-carbonaceous rocks were also collected on a fairly random basis. Generally low metal values were found though 3757807(Table 1) contains elevated arsenic (9.5ppm) and 3757819 contains 39ppm lead and 24ppm arsenic.

DOLERITE (Pd) AND BASALT (Ps)

Metal values in these rocks are of an expected order (Table 1-3757805,20).

OTHER ROCKS (Pnq, Py, Pf)

A sample of quartz arenite (Pnq) with limonitic coatings on fracture surfaces was found to contain 180ppm arsenic (Table 1-3757815). A piece of quartz sandstone lag (Table 1-3757835) with scattered patches of pyrite and sphalerite gave 799ppm lead , 755ppm zinc,1ppm silver and 11ppm arsenic. The lead and zinc values in this sample are exceptional for the Balfour area in general. The sample came from Py beside the Heemskirk Road near The Clump. Sample 3757839 is of sandstone from the Forest Conglomerate and Quartzite (Pf) correlate on Mt Frankland. It contains low metal values.

REFERENCES

Turner, N.J.1994.Report on the stratigraphic and structural setting of rocks in EL 18/92,Balfour District,North Western Tasmania. CRA Exploration Pty Ltd 12/1/94.

Turner,N.J. 1994. Report on additional geological mapping, petrology, rock samples and magnetic susceptibility in parts of EL 18/92, Balfour District, North western Tasmania. CRA Exploration Pty Ltd 30/3/94.

Veska,L.1993. Geology and mineralization of the Balfour area. Hons. Thesis, Univ. Tasm., Unpubl.

TABLE 1 : ASSAYS OF SELECTED METALS SHOWN ACCORDING TO ROCK GROUPING

SAMPLE	copper	lead	zinc	silver	cobalt	nickel	arsenic	gold	tin	wolfram
GRANITOID VEINLETS AND ASSOCIATED ROCKS										
3757822	159	4	62	<1	5	3	21	0.008	8	<5
3757824	21	5	15	<1	<3	<3	4	<0.008	8	5
3757840	16	8	65	<1	4	16	<0.5	<0.008	321	7
3757841	11	3	76	<1	<3	4	7	<0.008	50	10
QUARTZ,CARBONATE,SULPHIDE VEINS AND ASSOCIATED ALTERATION										
3757823	98	10	42	<1	3	<3	240	0.028	11	17
3757826	5.21%	12	22	69	4	9	1.5	0.249	9	7
3757827	3571	44	26	10	16	23	28.5	0.059	7	5
3757832	6.53%	20	20	3	17	14	10	0.048	65	13
3757833	123	<3	44	<1	3	8	9	<0.008	5	7
3757834	96	<3	60	<1	25	10	3	<0.008	5	<5
3757804	0.70%	8	43	1	66	20	1800	0.019	7	<5
3757836	13	4	12	<1	<3	4	1.5	<0.008	4	<5
DARK GREY TO BLACK CABONACEOUS PELITIC ROCKS										
1.Py against Png north of the Roger River Fault										
3757829	30	38	33	<1	32	42	180	0.024	8	<5
3757830	782	87	67	2	73	270	1230	0.028	6	<5
3757831	32	24	15	<1	<3	<3	3.5	<0.008	10	6
3757828	44	7	57	<1	<3	6	10.5	<0.008	9	<5
3757821	1108	24	71	1	8	5	39	0.034	8	<5
3757838	758	102	22	2	5	3	23	0.019	13	8
3757837	31	19	99	<1	15	20	43.5	<0.008	8	5
2.Other carbonaceous pelites (Py,Pyq,Pp)										
3757803	5	7	32	,1	<3	4	2.5	<0.008	11	<5
3757806	24	93	41	<1	11	12	8.5	0.008	7	<5

3757808	12	14	23	<1	3	7	16	<0.008	8	6
3757813	20	5	31	<1	<3	<3	3	<0.008	10	10
3757814	14	5	26	4	5	4	4.5	<0.008	7	6
3757817	70	9	42	<1	8	24	8.5	<0.008	9	9
3757818	54	56	44	<1	19	17	17.5	<0.008	8	5
3757825	12	<3	30	<1	3	<3	2	<0.008	10	5
GREENISH SILTSTONE, SLATE AND PHYLLITE (Pn, Png, Pp)										
3757807	8	8	51	<1	4	7	9.5	<0.008	11	10
3757809	4	5	67	1	9	13	1.5	<0.008	10	6
3757810	2	<3	22	<1	<3	<3	1.5	<0.008	7	<5
3757812	7	4	16	<1	3	3	1.5	<0.008	9	<5
3757816	3	3	17	<1	<3	<3	2.5	<0.008	4	<5
3757819	8	39	56	<1	<3	7	24	<0.008	10	<5
DOLERITE (Pd) AND BASALT (Ps)										
3757805	133	6	101	<1	25	15	7.5	<0.008	5	<5
3757820	45	5	115	<1	28	36	13.5	<0.008	10	6
OTHER ROCKS (Pnq, Py, Pf)										
3757815	17	5	16	<1	<3	<3	180	<0.008	8	<5
3757835	70	799	755	1	9	8	11	<0.008	5	<5
3757839	11	4	10	<1	<3	<3	1	<0.008	6	<5

APPENDIX 1 : ROCK SAMPLES

SAMPLES TO ANALABS, COOEE

NUMBER	AMG	ROCK TYPE
3757803	328800E5424800N	Black siltstone with disseminated chlorite
3757804	327500E5425100N	Quartz vein with associated chlorite and Cu
3757805	327450E5425150N	Medium grained dolerite
3757806	329200E5423800N	Dark grey siltstone with disseminated pyrite
3757807	330000E5423800N	Planar banded greenish grey siltstone
3757808	329700E5423850N	Dark grey siltstone with pale sandstone bands
3757809	327150E5424850N	Planar banded, pale green, spotted slate
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3757818	324450E5440325N	Black pyritic siltstone
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3757823	320800E5437675N	Oxidized (limonitic) sulphide veinlet
3757824	320800E5437675N	Porphyroblastic slate - thermal, sericitised
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3757826	320550E5437500N	Chalcopyrite, covellite, sulfates, limonite
3757827	320550E5437500N	Quartz, chlorite, pyrite assemblage
3757828	319475E5440000N	Dark grey, spotted siltstone
3757829	318725E5442250N	Richly pyritic, dark grey to black siltstone
3757830	318725E5442250N	Rounded pyrite in dark grey to black siltstone

3757831	318725E5442250N	Spotted, richly carbonaceous siltstone (black)
3757832	322700E5433950N	Quartz/carbonate vein with chalcopyrite, etc
3757833	322700E5433950N	Schist - ? talcose
3757834	322700E5433950N	Strongly altered chloritic siltstone
3757835	321475E5435775N	Quartz sandstone with pyrite and sphalerite
3757836	315050E5428850N	Open space quartz vein
3757837	322600E5435875N	Medium green sandstone with pyrite nodules
3757838	322750E5435600N	Limonitic gossan and pyrite
3757839	327050E5426300N	Reddish, coarse grained, quartz sandstone
3757840	323500E5429700N	Altered (? greisenised) fine grained sandstone
3757841	323500E5429700N	Granitoid veinlet - altered to greisen

APPENDIX 2 : ASSAYS

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
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855102

Phone (004) 716837	14 Thirkell St. CODEE TAS 7320	Fax (004) 718899

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77662	NICK TURNER

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6	22/04/94	1	39

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
3737803/7841	RO Prep : SP033	Cu,Pb,Zn,Ag,Fe,Mn,Co,As,Ni/GA140 Cu,Fe,Ag,Mn/GA104 As/HA140 Sn/W/SX401 Au,Au(R),Au(S)/GG307

✓ RESULTS TO
Mr N Turner
CRA Exploration Pty Limited
65 Lochner Street
WEST HOBART TAS 7000

RESULTS TO
Mr R Parkinson/Mr C Hayward
CRA Exploration Pty Limited
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NORTHLAND CENTRE VIC 3072

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855103

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	1 OF 6

	SAMPLE No.	Cu	Cu	Pb	Zn	Fe	Fe	Ag	Ag	Mn
METHOD		GA140	GA104	GA140	GA140	GA140	GA104	GA140	GA104	GA140
1	3757803	5	-	7	32	1.31	-	<1	-	100
2	3757804	-	0.70	8	43	-	9.90	1	-	516
3	3757805	133	-	6	101	-	10.70	<1	-	987
4	3757806	24	-	93	41	3.43	-	<1	-	80
5	3757807	8	-	8	51	4.21	-	<1	-	322
6	3757808	12	-	14	23	1.81	-	<1	-	87
7	3757809	4	-	5	67	2.48	-	1	-	63
8	3757810	2	-	<3	22	1.64	-	<1	-	66
9	3757811	7	-	4	16	0.46	-	<1	-	30
10	3757812	2	-	3	11	1.81	-	<1	-	23
11	3757813	20	-	5	31	-	6.12	<1	-	621
12	3757814	14	-	5	26	1.95	-	4	-	167
13	3757815	17	-	5	16	4.44	-	<1	-	27
14	3757816	3	-	3	17	0.71	-	<1	-	44
15	3757817	70	-	9	42	2.91	-	<1	-	101
16	3757818	54	-	56	44	1.08	-	<1	-	29
17	3757819	8	-	39	56	4.32	-	<1	-	111
18	3757820	45	-	5	115	-	10.40	<1	-	1064
19	3757821	1108	-	24	71	-	18.60	1	-	603
20	3757822	159	-	4	62	-	9.86	<1	-	765
21	3757823	98	-	10	42	-	15.20	<1	-	534
22	3757824	21	-	5	15	1.28	-	<1	-	250
23	3757825	12	-	<3	30	3.99	-	<1	-	796
24	3757826	-	5.21	12	22	-	22.90	-	69	147
25	3757827	3571	-	44	26	-	26.30	10	-	601

Results in ppm unless otherwise specified
- = element not determined

IS = insufficient sample
SNR = sample not received

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A.C.N. 004 591 664

855104

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	2 OF 6

	SAMPLE No.	Cu	Cu	Pb	Zn	Fe	Fe	Ag	Ag	Mn
METHOD		GA140	GA104	GA140	GA140	GA140	GA104	GA140	GA104	GA140
1	3757828	44	–	7	57	4.03	–	<1	–	301
2	3757829	30	–	38	33	–	12.40	<1	–	18
3	3757830	782	–	87	67	–	30.50	2	–	57
4	3757831	32	–	24	15	0.34	–	<1	–	23
5	3757832	–	6.53	20	20	–	14.80	3	–	462
6	3757833	123	–	<3	44	–	9.14	<1	–	–
7	3757834	96	–	<3	60	4.54	–	<1	–	1023
8	3757835	70	–	799	755	1.56	–	1	–	142
9	3757836	13	–	4	12	0.29	–	<1	–	21
10	3757837	31	–	19	99	–	9.90	<1	–	498
11	3757838	758	–	102	22	–	27.80	2	–	116
12	3757839	11	–	4	10	0.34	–	<1	–	38
13	3757840	16	–	8	65	–	6.44	<1	–	1160
14	3757841	11	–	3	76	–	5.52	<1	–	1409
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	DETECTION	2	0.01	3	2	0.01	0.01	1	10	3
25	UNITS	ppm	%	ppm	ppm	%	%	ppm	ppm	ppm

Results in ppm unless otherwise specified
– = element not determined

IS = insufficient sample
SNR = sample not received

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855105

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	3 OF 6

	SAMPLE No.	Mn	Co	Ni	As	As	Au	Au(R)	Au(S)	Sn
METHOD		GA104	GA140	GA140	HA140	GA140	GG309	GG309	GG309	GX401
1	3757803	-	<3	4	2.5	-	<0.008	-	-	11
2	3757804	-	66	20	-	1800	0.019	-	-	7
3	3757805	-	25	15	7.5	-	<0.008	-	<0.002	5
4	3757806	-	11	12	8.5	-	0.008	-	-	7
5	3757807	-	4	7	9.5	-	<0.008	-	-	11
6	3757808	-	3	7	16.0	-	<0.008	-	-	8
7	3757809	-	9	13	1.5	-	<0.008	-	-	10
8	3757810	-	<3	<3	1.5	-	<0.008	-	-	7
9	3757811	-	<3	<3	2.0	-	<0.008	-	-	5
10	3757812	-	3	3	1.5	-	<0.008	-	-	9
11	3757813	-	<3	<3	3.0	-	<0.008	-	-	10
12	3757814	-	5	4	4.5	-	<0.008	<0.008	-	7
13	3757815	-	<3	<3	-	180	<0.008	-	-	8
14	3757816	-	<3	<3	2.5	-	<0.008	-	-	4
15	3757817	-	8	24	8.5	-	<0.008	-	-	9
16	3757818	-	19	17	17.5	-	<0.008	-	-	8
17	3757819	-	<3	7	24.0	-	<0.008	-	-	10
18	3757820	-	28	36	13.5	-	<0.008	-	-	10
19	3757821	-	8	5	39.0	-	0.034	-	-	8
20	3757822	-	5	3	21.0	-	0.008	-	-	8
21	3757823	-	3	<3	-	240	0.028	-	-	11
22	3757824	-	<3	<3	4.0	-	<0.008	<0.008	-	8
23	3757825	-	3	<3	2.0	-	<0.008	-	-	10
24	3757826	-	4	9	1.5	-	0.249	-	-	9
25	3757827	-	16	23	28.5	-	0.059	-	-	7

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855106

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	4 OF 6

	SAMPLE No.	Mn	Co	Ni	As	As	Au	Au(R)	Au(S)	Sn
METHOD		GA104	GA140	GA140	HA140	GA140	GG309	GG309	GG309	GX401
1	3757828	-	<3	6	10.5	-	<0.008	-	-	9
2	3757829	-	32	42	-	180	0.024	-	-	8
3	3757830	-	73	270	-	1230	0.028	-	-	6
4	3757831	-	<3	<3	3.5	-	<0.008	-	-	10
5	3757832	-	17	14	10.0	-	0.046	-	-	65
6	3757833	0.67	3	8	9.0	-	<0.008	-	-	5
7	3757834	-	25	10	3.0	-	<0.008	-	-	5
8	3757835	-	9	8	11.0	-	<0.008	-	-	5
9	3757836	-	<3	4	1.5	-	<0.008	-	-	4
10	3757837	-	15	20	43.5	-	<0.008	-	-	8
11	3757638	-	5	<3	23.0	-	0.019	-	-	13
12	3757839	-	<3	<3	1.0	-	<0.008	<0.008	-	6
13	3757840	-	4	16	<0.5	-	<0.008	-	<0.008	321
14	3757841	-	<3	4	7.0	-	<0.008	-	-	50
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	DETECTION	0.01	3	3	0.5	50	0.008	0.008	0.008	3
25	UNITS	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm

Results in ppm unless otherwise specified
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855107

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	5 OF 6

	SAMPLE No.	W
METHOD		GX401
1	3757803	<5
2	3757804	<5
3	3757805	<5
4	3757806	<5
5	3757807	10
6	3757808	6
7	3757809	6
8	3757810	<5
9	3757811	<5
10	3757812	<5
11	3757813	10
12	3757814	6
13	3757815	<5
14	3757816	<5
15	3757817	9
16	3757818	5
17	3757819	<5
18	3757820	6
19	3757821	<5
20	3757822	6
21	3757823	17
22	3757824	5
23	3757825	<5
24	3757826	7
25	3757827	5

Results in ppm unless otherwise specified
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SNR = sample not received

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855108

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	104165.60.10080	22/04/94	77662	6 OF 6

	SAMPLE No.	W								
METHOD		GX401								
1	3757828	<5								
2	3757829	<5								
3	3757830	<5								
4	3757831	6								
5	3757832	13								
6	3757833	7								
7	3757834	<5								
8	3757835	<5								
9	3757836	<5								
10	3757837	5								
11	3757838	8								
12	3757839	<5								
13	3757840	7								
14	3757841	10								
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	DETECTION	5								
25	UNITS	ppm								

Results in ppm unless otherwise specified
– = element not determined

IS = insufficient sample
SNR = sample not received

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