BILLITON AUSTRALIA
THE METALS DIVISION OF
THE SHELL COMPANY OF AUSTRALIA LIMITED

RELINQUISHMENT REPORT FOR EXPLORATION ON E.L. 6895 - EMERALD SPRINGS

for the period ending 1.6.92

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C O N T E N T S

L I S T O F F I G U R E S

SUMMARY

Exploration Licence 6895 (Emerald Springs) comprising 4 blocks was granted to The Shell Company of Australia Limited on 22nd June, 1990 for a period of four (4) years. Two blocks in the western portion of the licence were relinquished on the 1st June, 1992.

This report details all work completed and results gained by Billiton Australia, The Metals Division of The Shell Company of Australia Limited, in the two relinquished blocks.

The licence is located approximately 28 km north northwest of the township of Pine Creek.

The Lower Proterozoic geology of the licence area comprises:-phyllite and chert of the Koolpin Formation; siltstone, phyllite, argillite and tuff of the Gerowie Tuff; shale, siltstone and greywacke of the Mt Bonnie Formation; and Zamu dolerite intrusive bodies.

Little is known about mineralisation within the licence area or old workings.

Work completed within the relinquished blocks in Exploration Licence 6895 has consisted of the purchase and interpretation of aeromagnetic data, and a stream sediment sampling programme.

The results of this work have been negative, not giving any encouragement for the location of a significant near surface gold ore body.

1.0 INTRODUCTION

Exploration Licence 6895 (Emerald Springs) comprising 4 blocks was granted to The Shell Company of Australia Limited on 22nd June, 1990 for a period of four (4) years.

Two blocks in the western portion of the licence area (Burrundie 1:50,000 sheet - blocks 21/47 and 22/47) were relinquished on the 1st June, 1992 (Figure 1).

This report details the work completed and results gained by Billiton Australia, The Metals Division of The Shell Company of Australia Limited, within the relinquished blocks.

2.0 LOCATION AND ACCESS

The licence area is located approximately 28 kms north-northwest of the township of Pine Creek. Access is best taken from the Stuart Highway on the well formed, culverted, gravel Spring Hill Road. The Spring Hill road is followed for 9.5 km and then on the left hand side of the road a track is selected which when followed passes just to the south of the tenement area.

3.0 REGIONAL SETTING

Exploration Licence 6895 lies in the central portion of the Pine Creek Geosyncline. The geosyncline contains Early Proterozoic metasedimentary rocks resting on a gneissic and granitic Archean basement. The metasediments represent a preserved basinal sequence up to 14 kilometres thick (Needham *et al.*, 1980), comprising of a possible original thickness of up to 20 km (Ferguson, 1980), which at 1870-1899 Ma was folded and metamorphosed mostly to greenschist facies, and in places to amphibolite facies. The geosynclinal sequence is intruded by transitional igneous rocks; including pre-tectonic dolerite lopoliths and dykes (Stuart-Smith *et al.*, 1987).

Largely undeformed platform cover of Middle Proterozoic, Late Proterozoic, Cambro-Ordovician and Mesozoic strata (mainly sandstone and minor volcanics and carbonate rocks) rest on these with marked unconformity (Stuart-Smith *et al.*, 1987).

4.0 TENEMENT GEOLOGY

The Lower Proterozoic geology within Exploration Licence 6895 comprises; the Mt Bonnie Formation, Gerowie Tuff, and Koolpin Formation all belonging to South Alligator Group; and the Zamu Dolerite (Figure 2). The Koolpin Formation is the oldest unit exposed in the licence area, covering most of the northwest portion. The unit is comprised dominantly of ferruginous and carbonaceous phyllite with rare chert bands.

Conformably overlying the Koolpin Formation the Gerowie Tuff is found throughout most of the tenement and comprises a sequence of interbedded siltstone, phyllite, argillite, tuff and minor chert.

The Gerowie Tuff is conformably overlain by the Mt Bonnie Formation (the upper-most member of the South Alligator Group). The Mt Bonnie Formation is exposed only in the far northeast and southwest corners of the tenement area. Lithologies within the unit consist mainly of highly interbedded shales, siltstones and greywackes with some minor tuffaceous chert.

Zamu dolerite in the form of long, stratigraphically controlled dykes, is found intruding all other units in the licence area. These dykes and sills are concentrated in the central portion of the area within the Gerowie Tuff.

Two major phases of folding can be recognised in the Early Proterozoic sediments of the region, both pre-dating granitoid intrusions.

Of these phases, the older (F_1 folds) are well represented in the tenement area. These folds are tight to isoclinal, and have north to northwest trending axes. The folds seem to plunge at varying degrees to the south (Figure 2).

The second phase and younger (F_2 folds) in the region are widely spaced open types. They are not obvious in outcrop owing to their openness and spacing of several kilometres. They trend east and may be associated with poorly developed mesoscopic similar-trending kink or crenulation cleavages (Stuart-Smith *et al.*, 1987).

5.0 MINERALISATION

Little is known about mineralisation within EL 6895. No old workings are known within the tenement area. The old Spring Hill Mine hosted in a large anticlinal structure lies 2km to the east of the licence area. Two similar large anticlinal structures can be found within the Emerald Springs licence area.

The Pine Creek Shear Zone, a structure which passes some 4 km to the east of the licence area can be traced for a considerable distance to the north-west and south-east, and hosts major gold mineralisation at Pine Creek, Union Reefs, Woolwonga, and Goodall.

6.0 WORK COMPLETED

6.1 Detailed Aeromagnetic Interpretation

Data from a multi-client detailed aeromagnetic survey by Aerodata was purchased by Billiton Australia during late 1989. A total of approximately 6,000 flight line kms were surveyed, the coverage of which includes the Emerald Springs licence area.

Survey details include:-

- Flight line spacing 200m
- Tie line spacing 2000m
- Sensor Height 70m
- Magnetic sample interval 14m
- Radiometric sample interval 70m
- Cesium vapour magnetometer
- Geometrics GR 800B Spectrometer
- 33.5 litre detector

The survey was flown for the purpose of identifying regional structures and more specifically significant magnetic anomalies that may represent bulk tonnage gold mineralisation (e.g. pyrrhotite bearing veining at Mt Todd).

Detailed processing of the aeromagnetic data was conducted by GeoImage of Brisbane.

Interpretation of both the raw and filtered magnetic data over EL 6895 highlighted several magnetic features in the area, including:-

- a major SW - NE fault crossing the top NW corner of the EL.
- a number of small dislocations of magnetic units throughout the tenement area.
- a series of folded magnetic units which are interpreted to be caused by BIF's in the Koolpin Formation.
- no discreet aeromagnetic anomalies that could be interpreted to represent bulk tonnage gold mineralisation as at Mt Todd (Figure 3).

6.2 Stream Sediment Sampling

Active stream sediment samples were collected from 8 locations in the relinquished blocks of EL 6895 in August 1991 (Figure 4). From each site a 5kg sample of material sieved to -10 mesh and a 200g sample sieved to -80 mesh were collected.

Samples were submitted to Australian Assay Laboratories in Pine Creek with the 5kg samples being assayed for gold using the bottle roll bulk cyanide leach (BCL) method and the 200g samples being assayed for Ag, Zn, Pb, Cu, (AAS) and As and Sn (XRF).

Assay results are depicted in Figure 4 with all Cu, Pb, Zn, Ag, As and Sn results being very low or below detection. Gold results were also low and not anomalous. It was felt that no further work in the western two blocks (relinquished blocks) was warranted.

7.0 CONCLUSIONS

The results from exploration within the relinquished blocks of EL 6895 have been negative, not giving any encouragement for the location of a significant near surface gold ore body.

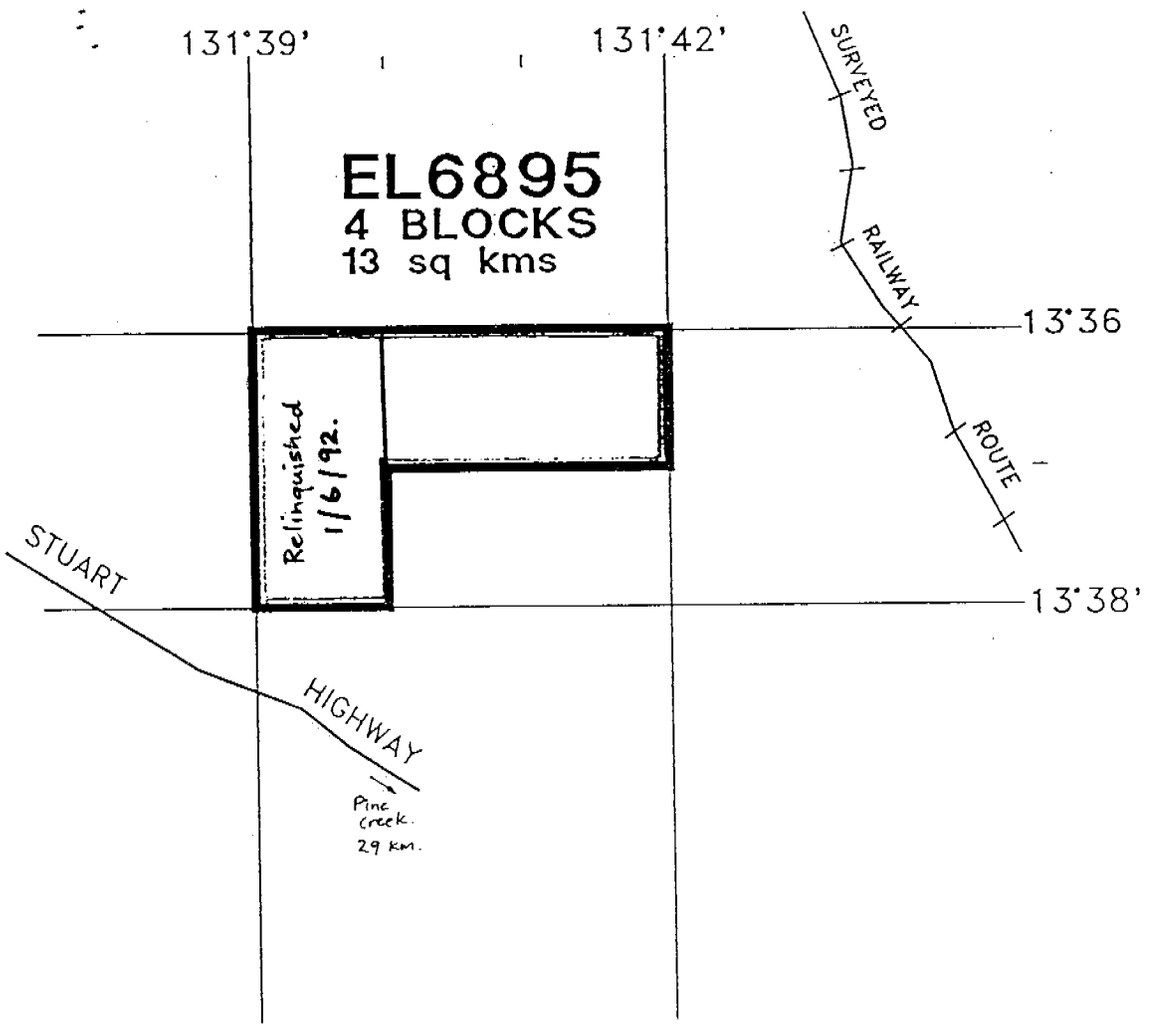
8.0 REFERENCES

FERGUSON, J., 1980 Metamorphism in the Pine Creek Geosyncline and its bearing on stratigraphic correlations. In FERGUSON, J., & GOLEBY, A.B. (Editors) -URANIUM IN THE PINE CREEK GEOSYNCLINE

International Atomic Energy Agency, Vienna, 91-100.

NEEDHAM, R.S., CRICK, I.H., & STUART-SMITH, P.G. 1980 Regional geology of the Pine Creek Geosyncline. In FERGUSON, J., & GOLEBY, A.B. (Editors) - URANIUM IN THE PINE CREEK GEOSYNCLINE
International Atomic Energy Agency, Vienna, 1-22.

STUART-SMITH, P.G., NEEDHAM, R.S., BAGAS, L., & WALLACE, D.A., 1987 - PINE CREEK, NORTHERN TERRITORY (SHEET 5270) 1:100,000 Geological Map Commentary Bureau of Mineral Resources, Canberra.



Billiton Australia
The Minerals Division of the Shell Company of Australia Limited

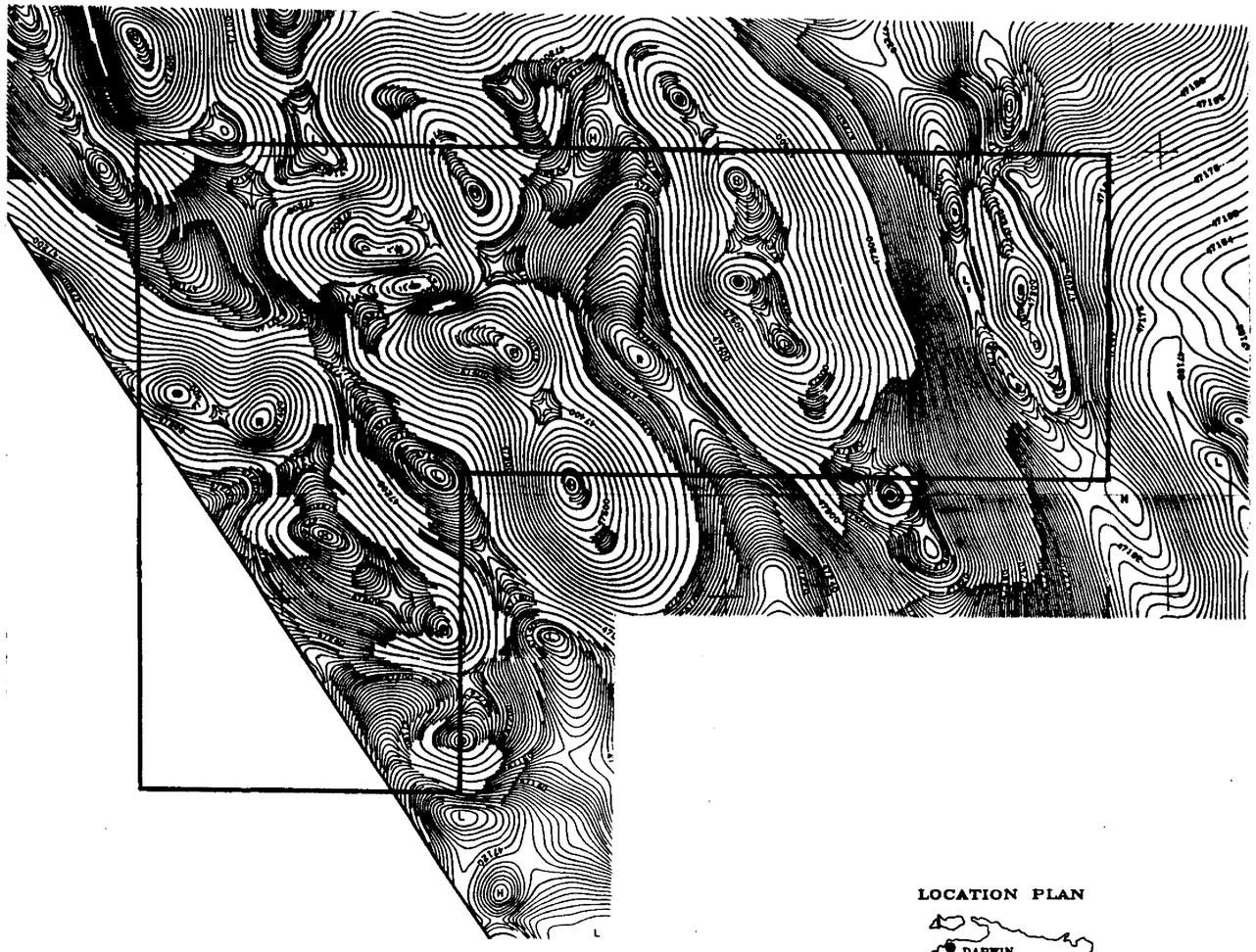
Project: EMERALD SPRINGS - EL 6895

Title: LOCATION.

Author: CRM. Date: Scale: 1:100 000

Drawn: Office: Revised: Date:

Drawing No. Fig. No.



AIRBORNE SURVEY SPECIFICATIONS

AIRCRAFT	ROCKWELL SHRIKE COMMANDER 500S.
MAGNETOMETER	SCINTREX V201 SPLIT BEAM CESIUM VAPOUR.
	RESOLUTION: 0.04 nanoTesla.
	CYCLE RATE: 0.2 second.
	SAMPLE INTERVAL: 14 metres.
SPECTROMETER	256 CHANNEL GEOMETRICS EXPLORANIUM GR800B.
	Processed channels :
	Total Count 0.40 - 3.01 MeV
	K_{40} 1.37 - 1.58 MeV
	Bi_{214} 1.67 - 1.88 MeV
	Tl_{208} 2.41 - 2.80 MeV
	Cosmic 3.02 - 3.00 MeV
	VOLUME: 33.58 litres.
	CYCLE RATE: 1.0 second.
	SAMPLE INTERVAL: 70 metres.
DATA ACQUISITION	HEWLETT PACKARD 9000 SERIES COMPUTER.
	AERODATA DIGITAL ACQUISITION SYSTEM.
FLIGHT LINE SPACING	Traverse lines: 200 metres.
	Tie lines: 2000 metres.
FLIGHT LINE DIRECTION	Traverse lines: 090-270 degrees.
	Tie lines: 180-360 degrees.
SURVEY HEIGHT	70 metres - mean terrain clearance.
NAVIGATION	SYLEDIS UHF positioning system.

REFERENCE

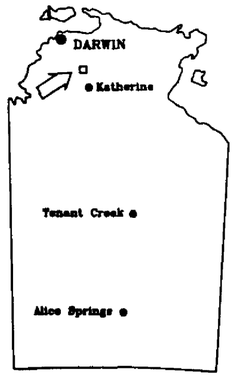
CONTOUR INTERVAL: 100 counts per second

The radiometric data has been stripped, corrected for altitude variation and levelled.

Data has been corrected for system parallax

CLIENT: BILLITON AUSTRALIA

LOCATION PLAN



0 — 3km

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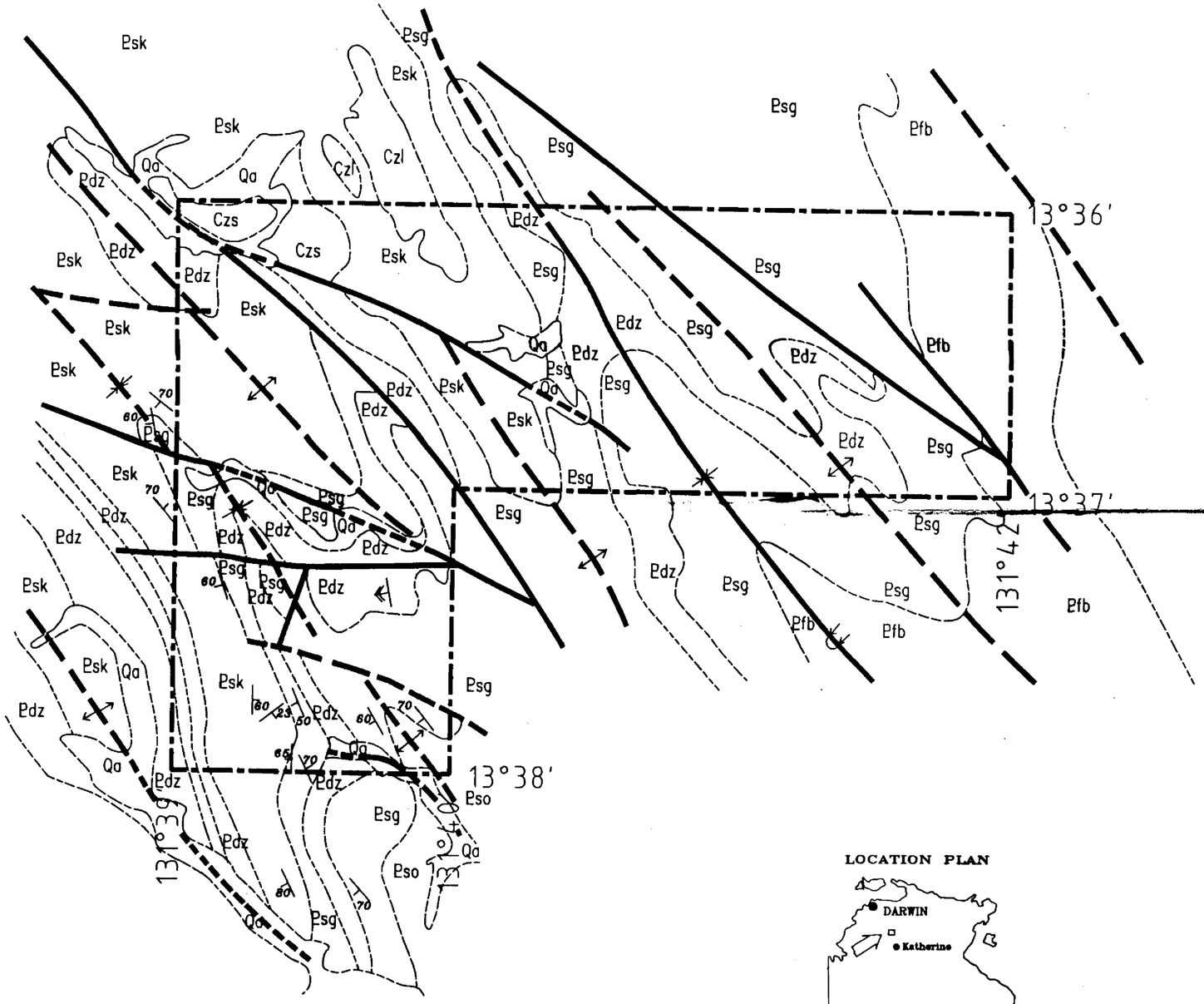
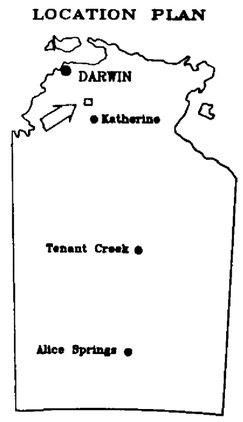
Project NORTHERN TERRITORY
EMERALD SPRINGS EL6895

Title
TOTAL MAGNETIC CONTOUR MAP

Author C.R.M. Office CNS	Scale 1 25 000
Drawn K.S.J. Date 9/90	Revised Date
	Report No.
Drawing No.	Fig. No. 3



LOCATION PLAN



LEGEND

	Qa	Silt, sand
	Czs	Unconsolidated sand
	Czl	Nodular laterite
	Pdz	Zamu Dloerite
FINNISS RIVER GROUP	Pfb	Burrell Creek Formation
SOUTH ALLIGATOR GROUP	Pso	Mount Bonnie Formation
	Psg	Gerowie Tuff
	Psk	Koolpin Formation

Geological boundary

Fault

Anticline

Syncline

Overturned anticline

60 Strike and dip

0 3km

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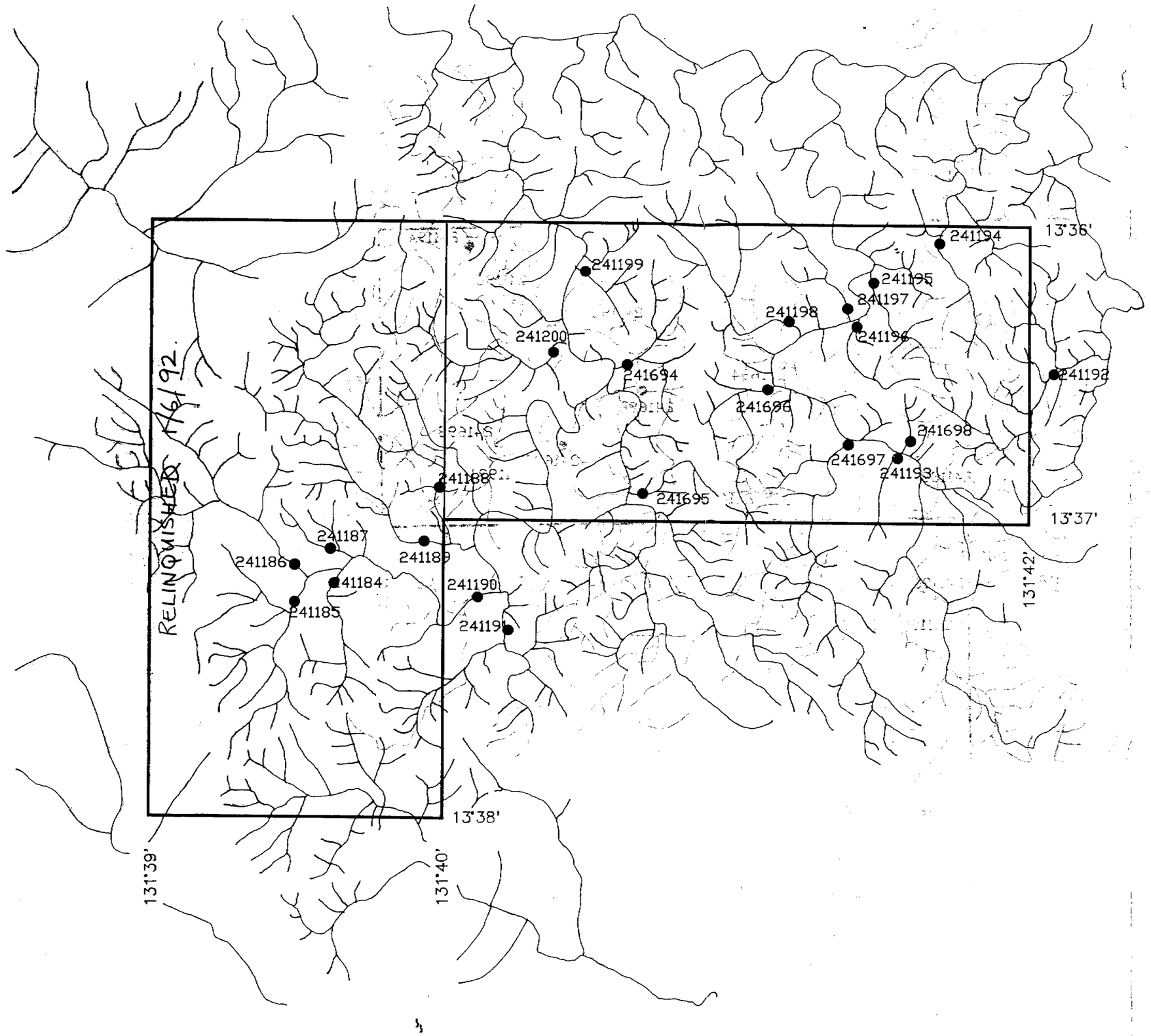
The Base Metals of the Broken Hill Company of Australia Limited

Project NORTHERN TERRITORY
EMERALD SPRINGS EL6895

Title
GEOLOGY

Author C.R.M. Office CNS	Scale 1 25 000
Drawn K.S.J. Date 9/90	Revised Date
	Report No.
Drawing No.	Fig. No. 2



LOCATION PLAN

Sample	Au	Cu	Pb	Zn	Ag	As	Sn
241183	1.60	25	42	51	<1	28	<5
241184	2.40	44	67	59	<1	39	<5
241185	0.9	39	35	44	<1	22	<5
241186	1.20	56	41	71	<1	24	<5
241187	0.8	42	35	34	<1	53	<5
241188	1.20	35	30	23	<1	40	6
241189	1.00	21	15	19	<1	27	<5
241190	1.00	41	64	72	<1	34	<5
241191	1.00	20	46	53	<1	33	<5
241192	2.50	20	28	34	<1	19	<5
241193	4.60	19	30	20	<1	62	<5
241194	0.5	19	20	34	<1	18	<5
241195	0.6	20	26	28	<1	26	<5
241196	0.9	19	26	22	<1	24	<5
241197	0.6	19	27	21	<1	30	<5
241198	2.10	20	36	36	<1	63	<5
241199	1.70	20	19	26	<1	49	<5
241200	1.30	56	42	120	<1	66	7
241694	2.80	20	24	32	<1	50	7
241695	0.4	14	14	17	<1	19	<5
241696	6.30	19	19	35	<1	65	6
241697	7.60	19	33	27	<1	198	14
241698	0.8	19	24	26	<1	25	<5

Note:
Data in ppm unless otherwise stated
Gold values ppb

● 241192 STREAM SEDIMENT SAMPLE LOCATION & NUMBER

N

0 0.5 1.0 1.5km

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Project EMERALD SPRINGS EL6895
NORTHERN TERRITORY

Title -80# & -10#
STREAM SEDIMENT SAMPLE
LOCATIONS & RESULTS

Author C.R.M. Office CNS	Scale 1:25000
Drawn K,S,J, Date 9/90	Revised B.J.F. Date 9/91
Plotted date 5/9/91	Report No.
Drawing No. C/HE13/3	Fig. No. 4

CR92/443.