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

EXPLORATION LICENCE 4793 SPRING HILL
ANNUAL REPORT FOR THE PERIOD ENDING 7TH NOVEMBER, 1989

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SUMMARY

Exploration Licence 4793, Spring Hill was granted to Territory Resources NL on the 5th October, 1987 for a period of three (3) years. Ross Mining NL purchased Exploration Licence 4793 from Territory Resources in September 1988. A Joint Venture (Spring Hill Joint Venture) over the tenement between Ross Mining NL and The Shell Company of Australia Limited commenced on the 1st of October 1988. Shell is manager and operator of the Joint Venture.

Exploration Licence 4793, Spring Hill is located some 27 kilometres north-northwest of Pine Creek.

The geology of the tenement area consists of moderately folded Early Proterozoic Finniss River Group (Burrell Creek Formation) and South Alligator Group (Gerowie Tuff, Mt Bonnie Formation) sediments and volcanics.

Several megascopic antiforms and synforms with moderate to strong axial planar cleavage occur in the area, the Spring Hill anticline being the dominant structure.

The major Pine Creek Shear Zone passes through the region and several old gold, tin and silver-lead mines occur along this structure. The main mining activity within the licence area occurred at the Spring Hill gold mine where some 22,000 ounces of gold has been extracted in the past.

Work to date has consisted of stream sediment sampling and aeromagnetic coverage.

No economically mineralised targets have been outlined to date, however several highly gold anomalous stream sediment catchment areas have been delineated which drain from MCN's and MLN's held by the Spring Hill Joint Venture partners on the main Spring Hill ridge.

C O N T E N T S

LIST OF FIGURES

1.0 INTRODUCTION

Exploration Licence 4793, Spring Hill was granted to Territory Resources NL on the 5th October, 1987 for a period of three (3) years. Ross Mining NL purchased Exploration Licence 4793 from Territory Resources in September 1988. A Joint Venture (Spring Hill Joint Venture) over the tenement between Ross Mining and The Shell Company of Australia Limited commenced on the 1st of October 1988. Shell is manager and operator of the Joint Venture.

This report details the work completed and results gained by Billiton Australia, The Metals Division of The Shell Company of Australia Limited, on behalf of the Spring Hill Joint Venture, during the year ended 7th of November 1989.

The licence area presently consists of three (3) sub-blocks or approximately 9.8 km^2, one sub-block in the northeast corner recently being relinquished to meet the N.T. Department of Mines & Energy requirements (See Figure 1).

The bulk of work completed in the region has occurred on MCN's and MLN's within Exploration Licence 4793. Work on these tenements is subject to a separate annual report due at the N.T. Department of Mines & Energy on the 31st December, 1989, and therefore no mention of this work is included in this report (See Figure 1).

2.0 LOCATION & ACCESS

Exploration Licence 4793 lies some 27 kilometres north-northwest of Pine Creek (See Figure 1).

Access to the tenement is from the Stuart Highway via Spring Hill Road or via the Mt Wells - Pine Creek Road. The Spring Hill Road accesses south east corner of the tenement whilst the Pine Creek Road and adjacent North Australia Railway and Electrical Power lines provide access to the northeast corner of the tenement. Graded tracks pass from both roads into the licence area providing reasonable access throughout.

3.0 REGIONAL SETTING

The Spring Hill area lies in the southern part 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 *el at.*, 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 sills and syn- to post-tectonic granitoid plutons and dolerite lopoliths and dykes (Stuart-Smith *et al.*, 1987). Largely undeformed platform covers 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 STRATIGRAPHY

The geology within Exploration Licence 4793 comprises three (3) different Early Proterozoic rock units, namely :-

1) Gerowie Tuff
2) Mt Bonnie Formation
3) Burrell Creek Formation (See Figure 2)

The Gerowie Tuff of the South Alligator Group is the oldest exposed unit in the licence area, covering most of the northeast of the licence area. The unit is comprised of a sequence of interbedded siltstone, phyllite, argillite, tuff and minor chert. A silicified mudstone/tuff is the most common lithology found in Exploration Licence 4793. These mudstone/tuff beds sometimes contain chert nodules.

The Gerowie Tuff is conformably overlain by the Mt Bonnie Formation (the upper most member of the South Alligator Group). The Mt Bonnie Formation covers most of the central portions of the licence area. Lithologies within the unit consist of mainly highly interbedded shales, siltstones, and greywackes with some minor tuffaceous chert and banded iron formation.

Unconformably overlying the Mt Bonnie Formation is the Burrell Creek Formation of the Finniss River Group. The Burrell Creek consists of interbedded shale, slate, phyllite, siltstone and greywacke, and is found mainly in the south west and eastern portions of the licence area. In most of these areas the Burrell Creek Formation forms topographic lows and is covered by alluvium and colluvium.

5.0 STRUCTURE

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

The older (F_1 folds) are tight to isoclinal, and have north to north west trending axes. A major anticlinal fold of this generation (The Spring Hill

Anticline) represents the dominant structure in the licence area. The westerly dipping axis of Spring Hill Anticline passes through the centre of the licence area and can be traced along some 10 kilometres of strike (See Figure 2). The fold plunges at varying degrees to the south. The folding is a composite of parallel and similar folding in competent sandstone/greywacke and pelitic units, respectively; a penetrative slaty to phyllitic cleavage is present in relitic rocks and a less-prominent spaced fracture cleavage in sandstone. Both cleavages are the axial plane surfaces to the F_1 folds and are either near vertical or dip to the south west (Stuart-Smith, *et al.*, 1987).

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).

The north-north westerly trending Pine Creek Shear Zone passes through the north eastern corner of the licence area. Evidence of faulting and shearing throughout the tenement area commonly along axial plane cleavages are thought to be related to this structure.

6.0 MINERALISATION

Exploration Licence 4793 encompasses MCN's and MLN's covering the old Spring Hill Gold Mine. The Spring Hill mine was one of the largest mines in the region in the last century, and has been worked intermittently ever since. Total recorded mine production is estimated at some 22,000 ounces of gold. The gold is associated with pyrite, galena and other sulphides in quartz veins, forming three major lodes between 0.4m and 1.5m wide and up to 180m long (Taube, 1966). The lodes trend 170°, dip steeply to the east (75-90°), and lie in shear zones transgressing the hinge of a south-plunging anticline of Mt Bonnie Formation. Most of the ore has come from the oxidised zone where the gold is free and enriched, and is associated with kaolin, limonite and quartz.

Alluvial gold and tin has been erratically mined from creeks draining Spring Hill since late last century.

The Pine Creek Shear Zone, a structure which passes through the northeast corner of Exploration Licence 4793 can be traced for a considerable distance to the north-west and south-east, and hosts major gold mineralisation at Pine Creek (Enterprise), Union Reefs, Woolwonga, and Goodall.

7.0 WORK COMPLETED

7.1 Stream Sediment Sampling

Some 53 Bulk Cyanide Leach (BCL) gold and 43 -80# silver, lead, zinc, copper and arsenic stream sediment samples were taken throughout the licence area.

At each sample site two samples were obtained for analysis. Sediment was sieved to -8# to obtain 5 kilograms for the BCL Au sample and a 200 gram -80# fraction of sediment was obtained for AAS basemetal analysis.

BCL gold results delineated a number of highly anomalous stream catchment areas, the highest values obtained being 101 ppb, 33.5 ppb, 61.2 ppb and 24.0 ppb Au (See Figure 3). These values highlight the prospectivity of ground held on Spring Hill under MCN's and MLN's. No significantly anomalous areas away from the main Spring Hill ridge were delineated by stream sediment sampling.

Basemetal results were consistently low with only background results being obtained (See Figures 4 and 5).

7.2 Aeromagnetics

Detailed aeromagnetic data has been obtained over Exploration Licence 4793 from Aerodata Holdings. This forms part of a large multi-client survey with the following specifications :-

-	Line Spacing	200m
-	Sensor Height	70m
-	Tie Line Spacing	5,000m

The results from the aeromagnetic data were relatively negative. No discrete aeromagnetic targets were delineated. Magnetic signature clearly traces the contact between rocks of the Burrell Creek Formation and those that belong to units within the South Alligator Group (i.e., Mt Bonnie Formation and Gerowie Tuff) which are marked by distinct flat aeromagnetics (See Figure 6).

8.0 CONCLUSIONS

No economically mineralised targets have been outlined to date in Exploration Licence 4793, however several highly gold anomalous stream sediment catchment areas have been delineated which drain from MCN's and MLN's held by the Spring Hill Joint Venture partners on the main Spring Hill ridge. Considerable follow-up of these areas, including drilling has been conducted, the results of which are subject to a separate annual report due at the NT Department of Mines & Energy on the 31st of December 1989.

9.0 EXPENDITURE STATEMENT

EXPLORATION LICENCE 4793 SPRING HILL

5TH OCTOBER 1988 - 4TH OCTOBER 1989

	$
Staffing - Regional Office (Including Geological Contract Staff)	20,770
Support - Regional Office	14,520
Tenement Costs	820
Geophysical Surveys	1,450
Analyses	5,050
Drilling	-
Aerial Photography	150
Access/Gridding/Surveying	2,340
Other	-
Head Office Management, Administration, Technical Services	5,250
Overheads	5,035
TOTAL EXPENDITURE	**$ 55,385**

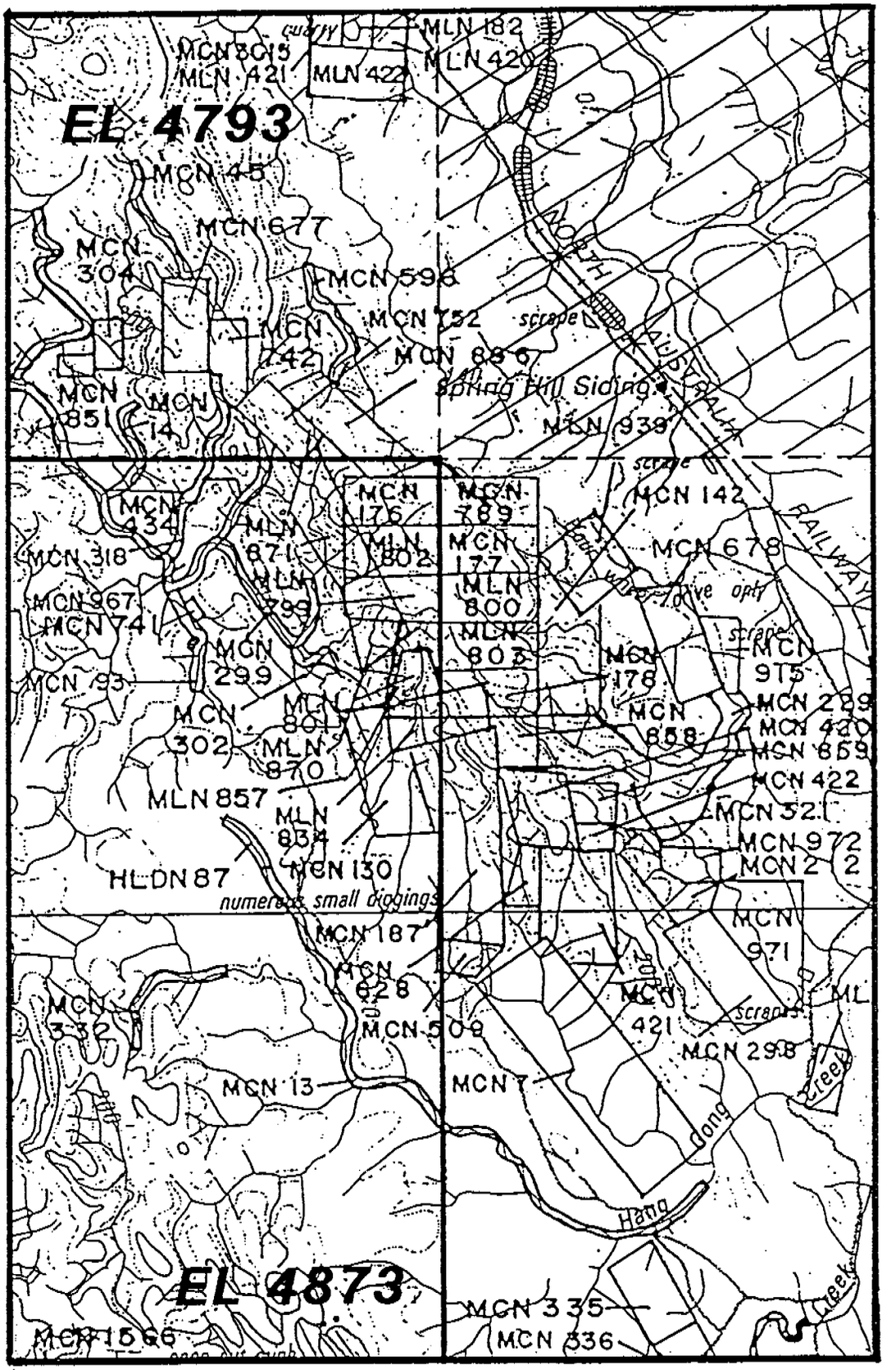
REFERENCES

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.

TAUBE, A., 1966 - Report on a visit to the Spring Hill Gold Mine. Northern Territory Geological Survey Report GS 66/6 (unpublished).



131° 42'

131° 43'

relinquished block

Billiton Australia

The Minerals Division of the Broken Hill Proprietary Company Limited

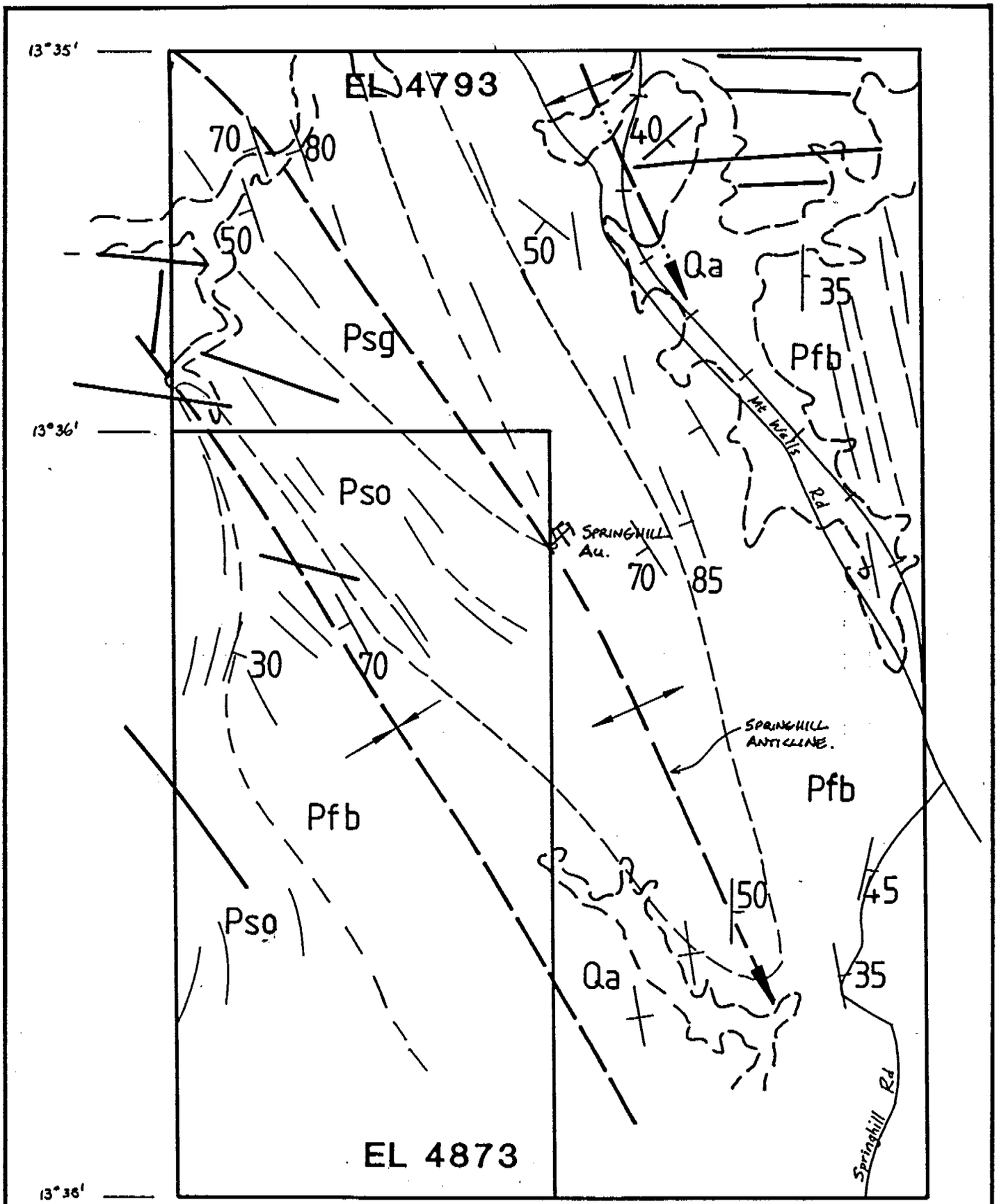
Project: SPRINGHILL J.V.

Title: LOCATION AND TENEMENT STATUS.

Author: CRM | Date: 11/89 | Scale: 1:25000

Drawn | Office | Revised | Date

Drawing No | Fig. No. 1.



LEGEND

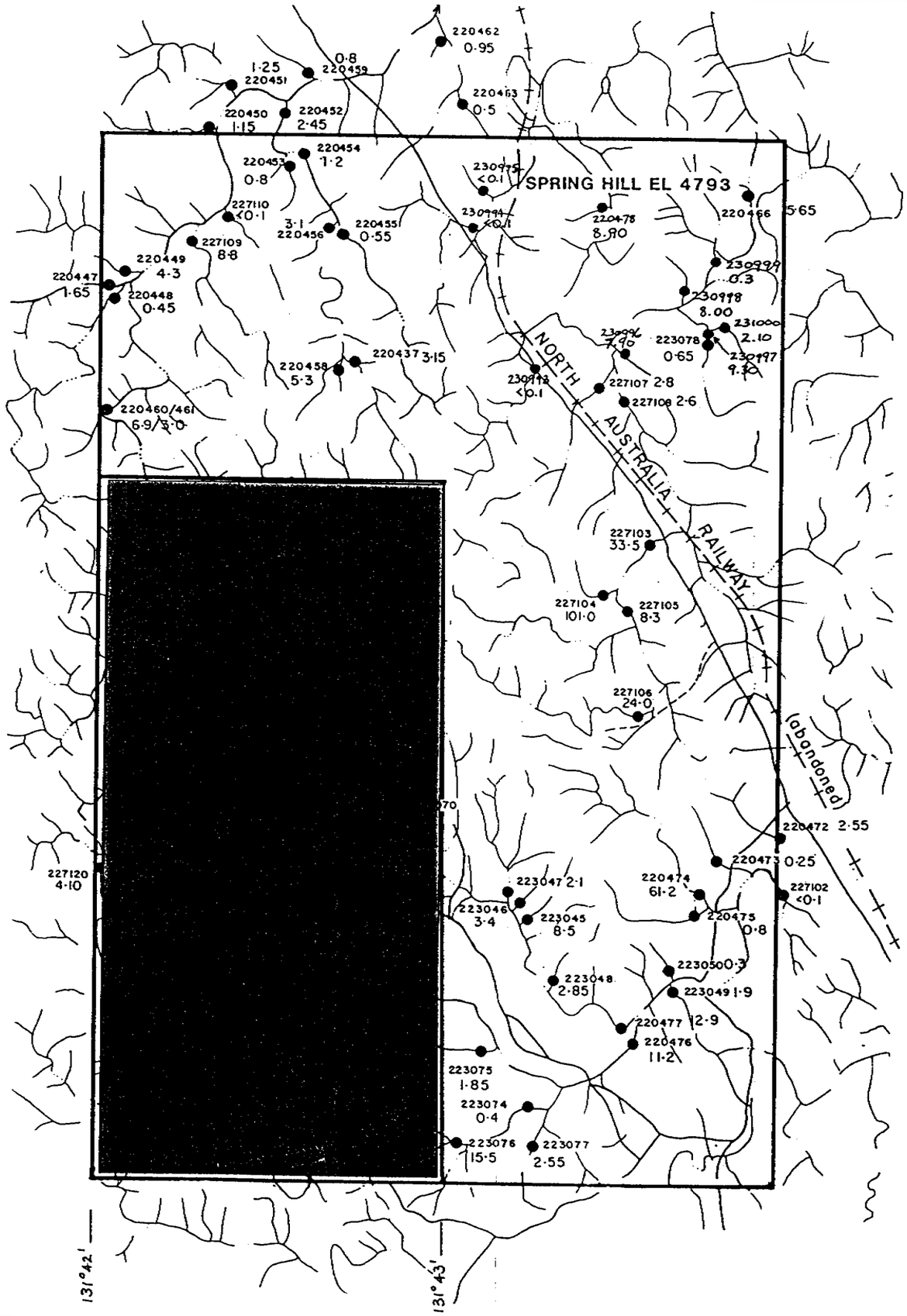
Pfb	BURRELL CREEK F'n
Pso	MOUNT BONNIE F'n
Psg	GEROWIE TUFF
	ANTICLINE
	SYNCLINE

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

Project: SPRINGHILL J.V.

Title: REGIONAL GEOLOGY

Author S.M.	Date 11-89	Scale 1:25000	
Drawn	Office	Revised	Date
Drawing No.		Fig. No. 2.	



223047 Stream Sediment Sample
● 2.1 Location.
Location Number and Gold Result (ppb).

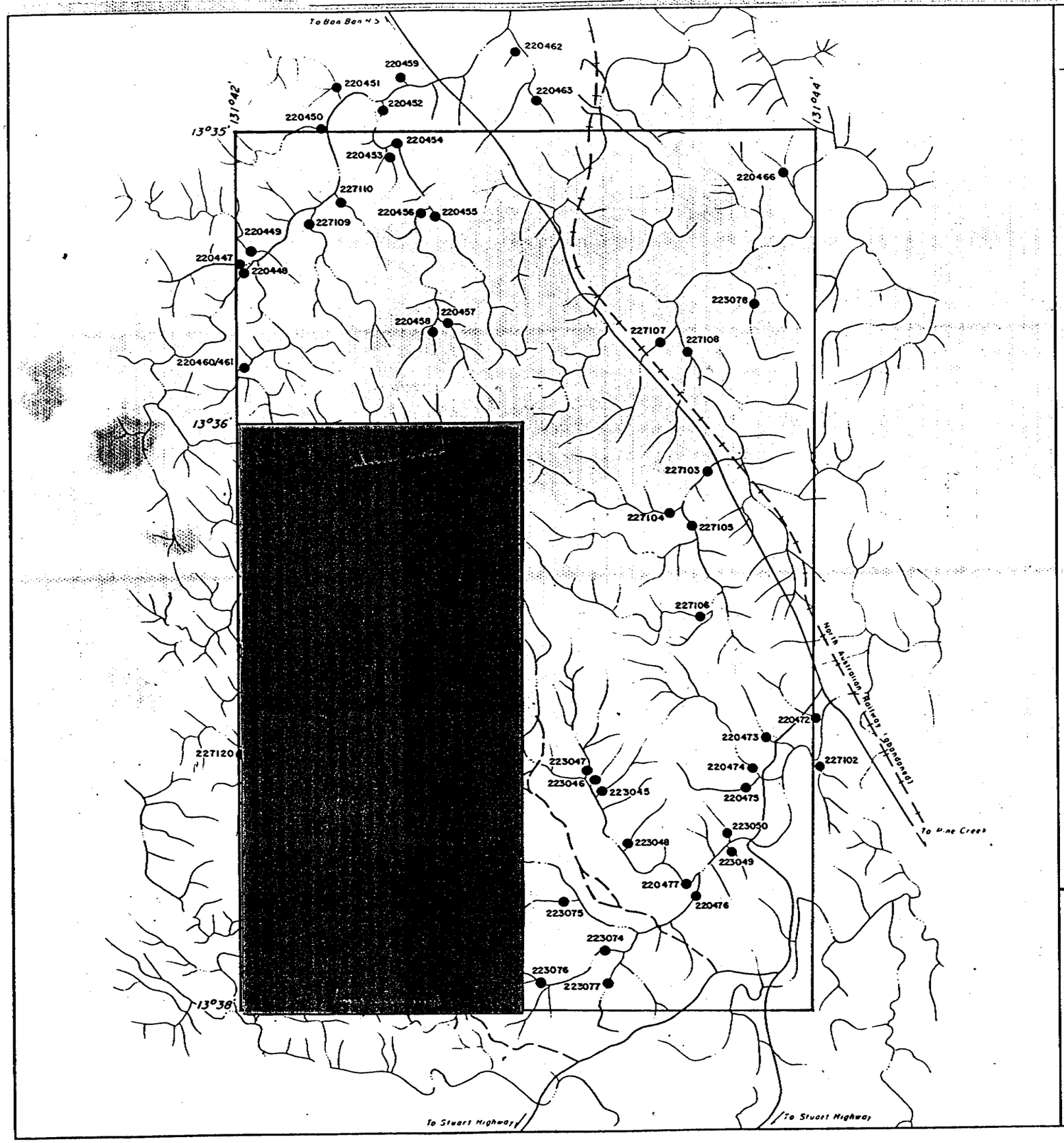
Billiton Australia
The Metals Division of the Shell Company of Australia Limited

Project: SPRINGHILL J.V.

Title: Stream Sediment
BCL Gold Results (ppb).

Author CRM	Date 17/11/89	Scale	
Drawn CRM	Office	Revised	Date
Drawing No.		Fig. No. 3.	

1:25,000

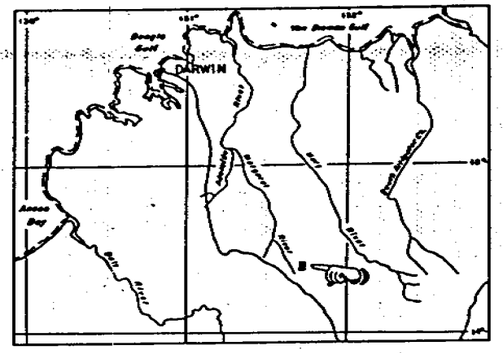


SAMPLE RESULTS (ppm)

Sample Number	Cu	Pb	Zn
220447	37	32	47
220448	24	19	35
220449	17	10	20
220450	25	15	22
220451	28	21	32
220452	23	28	30
220453	19	14	25
220454	23	21	39
220455	17	29	38
220456	24	20	29
220457	35	32	57
220458	35	17	57
220459	21	8	26
220460	38	11	39
220461	50	12	23
220462	18	27	34
220463	9	27	35
220466	8	24	27
220472	8	38	23
220473	9	17	29
220474	9	17	29
220475	24	10	46
220476	21	31	60
220477	14	24	38
223045	21	28	27
223046	24	39	61
223047	20	36	60
223048	19	38	47
223049	20	25	30
223050	21	28	41
223066	32	22	38
223067	26	38	114
223068	24	33	33

Sample Number	Cu	Pb	Zn
223069	23	37	34
223070	15	37	30
223071	23	28	29
223072	15	30	32
223073	19	29	28
223074	18	20	41
223075	22	31	47
223076	21	29	24
223077	18	21	31
223078	16	24	52
227102	15	41	46
227103	17	30	33
227104	22	17	36
227105	12	14	26
227106	39	24	35
227107	17	41	40
227108	15	25	34
227109	21	22	22
227110	24	21	27
227111	16	29	36
227112	18	25	32
227113	28	26	40
227114	27	22	37
227115	14	20	37
227116	32	27	40
227117	28	21	53
227118	41	22	52
227119	23	23	37
227120	24	26	28
227121	25	25	20
227122	40	29	52
227123	17	16	28
227124	21	23	70

LOCATION DIAGRAM



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KILOMETRES

NOTES:

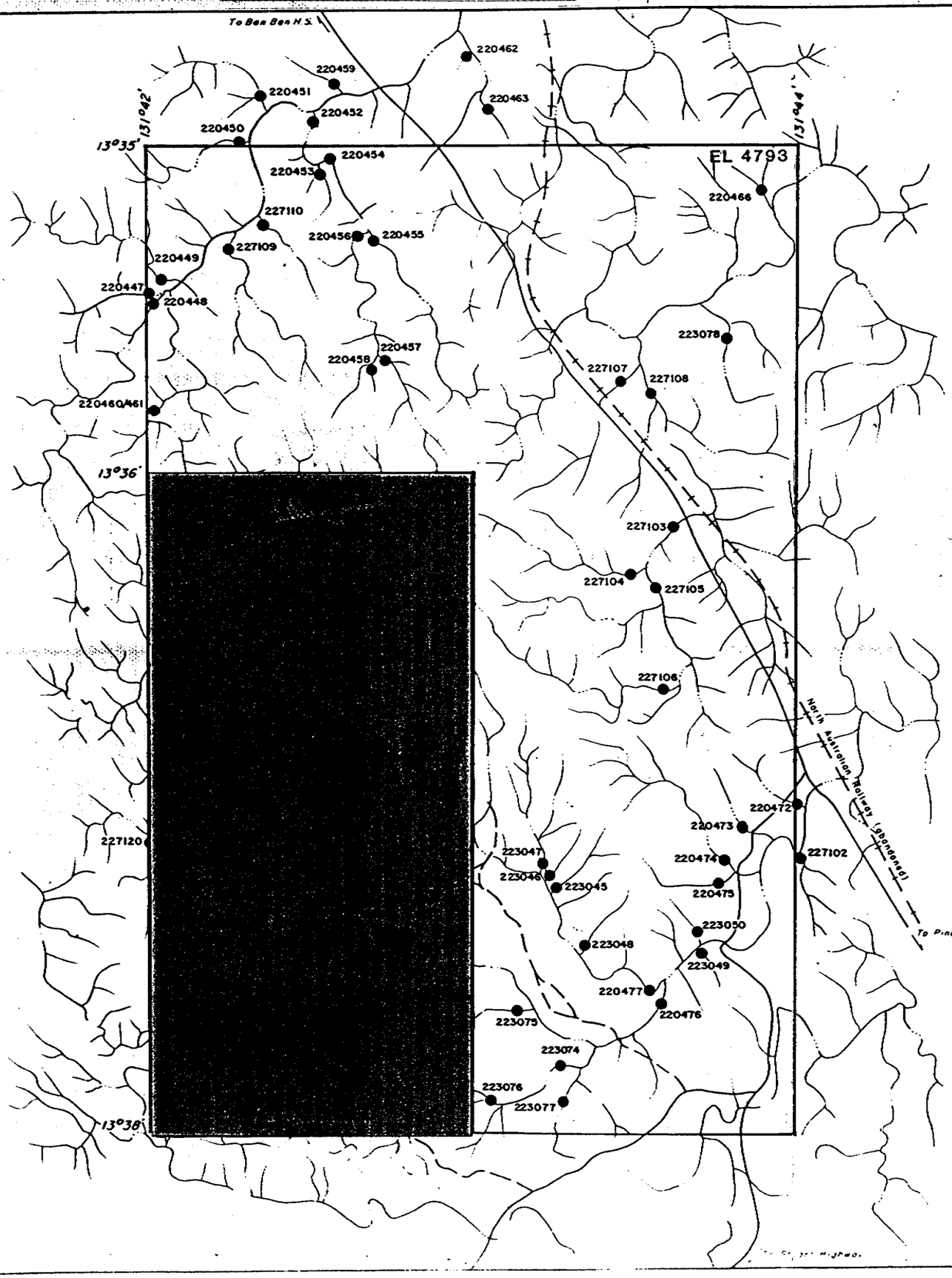
1. Topographic data obtained from Pine Creek 1:100000 map (5270) and Billiton field surveys.
2. BCL Au results - Billiton plan no. C/HJ50/7
   Ag/As results - Billiton plan no. C/HJ50/8

Billiton Australia

Project SPRING HILL J.V. EL4793 & EL4873
NORTHERN TERRITORY

Title
SAMPLE LOCATIONS & RESULTS (ppm)
Cu/Pb/Zn

Author C.R.M.	Date 3/89	Scale 1:25000	
Drawn K.S.J.	Office CNS	Revised K.S.J.	Date 5/89
Drawing No C/HJ50/9		Fig No 4.	

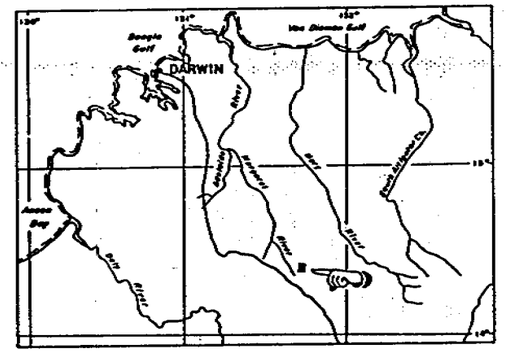


SAMPLE RESULTS (ppm)

Sample Number	Ag	As
220447	–	24
220448	–	14
220449	–	–
220450	–	8
220451	–	9
220452	–	25
220453	–	7
220454	–	23
220455	–	7
220456	–	24
220457	–	11
220458	–	33
220459	–	4
220460	–	6
220461	–	5
220462	–	6
220463	–	3
220466	–	6
220472	–	33
220473	–	–
220474	–	8
220475	–	3
220476	–	13
220477	–	12
223045	–	29
223046	–	27
223047	–	28
223048	–	11
223049	–	12
223050	–	27
223066	–	16
223067	–	9
223068	–	36

Sample Number	Ag	As
223069	–	35
223070	–	18
223071	–	39
223072	–	26
223073	–	27
223074	–	16
223075	–	30
223076	–	26
223077	–	6
223078	–	9
227102	–	15
227103	–	56
227104	–	150
227105	–	21
227106	–	70
227107	–	17
227108	–	16
227109	–	160
227110	–	18
227111	–	–
227112	–	35
227113	–	10
227114	–	6
227115	–	5
227116	–	70
227117	–	85
227118	–	8
227119	–	31
227120	–	34
227121	–	15
227122	–	20
227123	–	18
227124	–	15

LOCATION DIAGRAM



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KILOMETRES

NOTES:

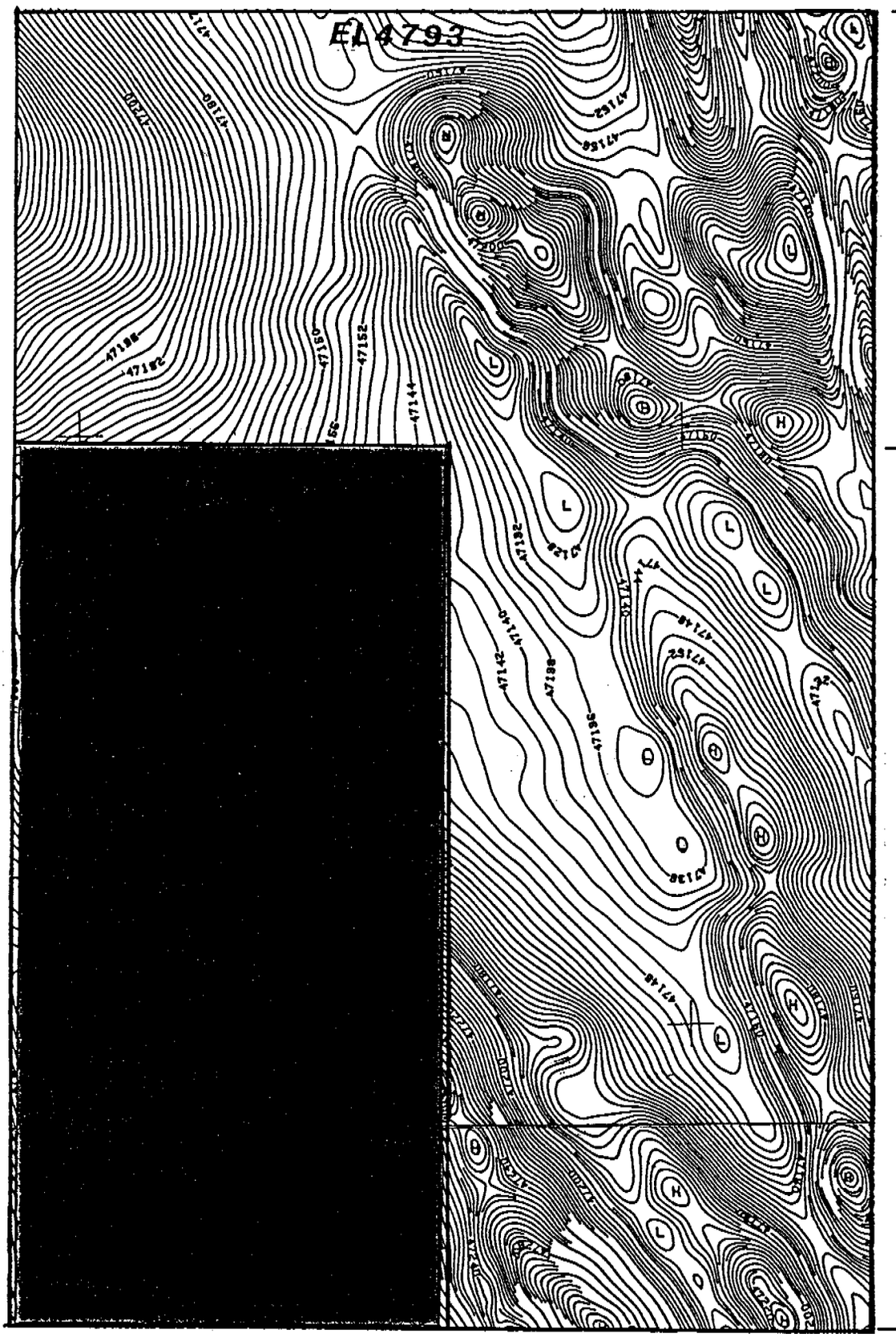
1. Topographic data obtained from Pine Creek 1:100000 map (5270) and Billiton field surveys.
2. BCL Au results - Billiton plan no. C/HJ50/7
   Cu/Pb/Zn results - Billiton plan no. C/HJ50/9.
3. Results below detection level are shown by '–'.

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

Project SPRING HILL J.V. EL4793 & EL4873
NORTHERN TERRITORY

Title
SAMPLE LOCATIONS & RESULTS (ppm)
Ag/As

Author C.R.M.	Date 3/89	Scale 1:25000	
Drawn K.S.J.	Office CNS	Revised K.S.J.	Date 5/89
Drawing No. C/HJ50/8		Fig No. 5.	



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

Project: SPRINGHILL J.V.

Title: Aeromagnetic Contours.

Author CRM | Date 16/6/95 | Scale 1:25000
Drawn | Office | Revised | Date
Drawing No. | Fig. No. 6.