EL 2021 BRIDGE CREEK SOUTH

ANNUAL REPORT

JULY 1980 - JULY 1981

OPEN FILE

G. Hassall.
July, 1981.

OPEN FILE

ABSTRACT.

EL 2021 Bridge Creek South, was granted to AAR Limited on the 12th day of July, 1979 for a period of twelve months. An application for a twelve month renewal was granted on the 12th July 1980. A 50% relinquishment was made on 12th July 1981.

During 1980 the EL was geologically mapped at 1:25,000 scale using colour aerial photographs. Within the area Lower Proterozoic sedimentary rocks belonging to the South Alligator and Finniss River Groups outcrop.

In conjunction with mapping a rock-chip sample and ground radiometric survey were conducted.

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1. INTRODUCTION.

This report describes the results of work carried out on EL 2021, Bridge Creek South, during 1980/81.

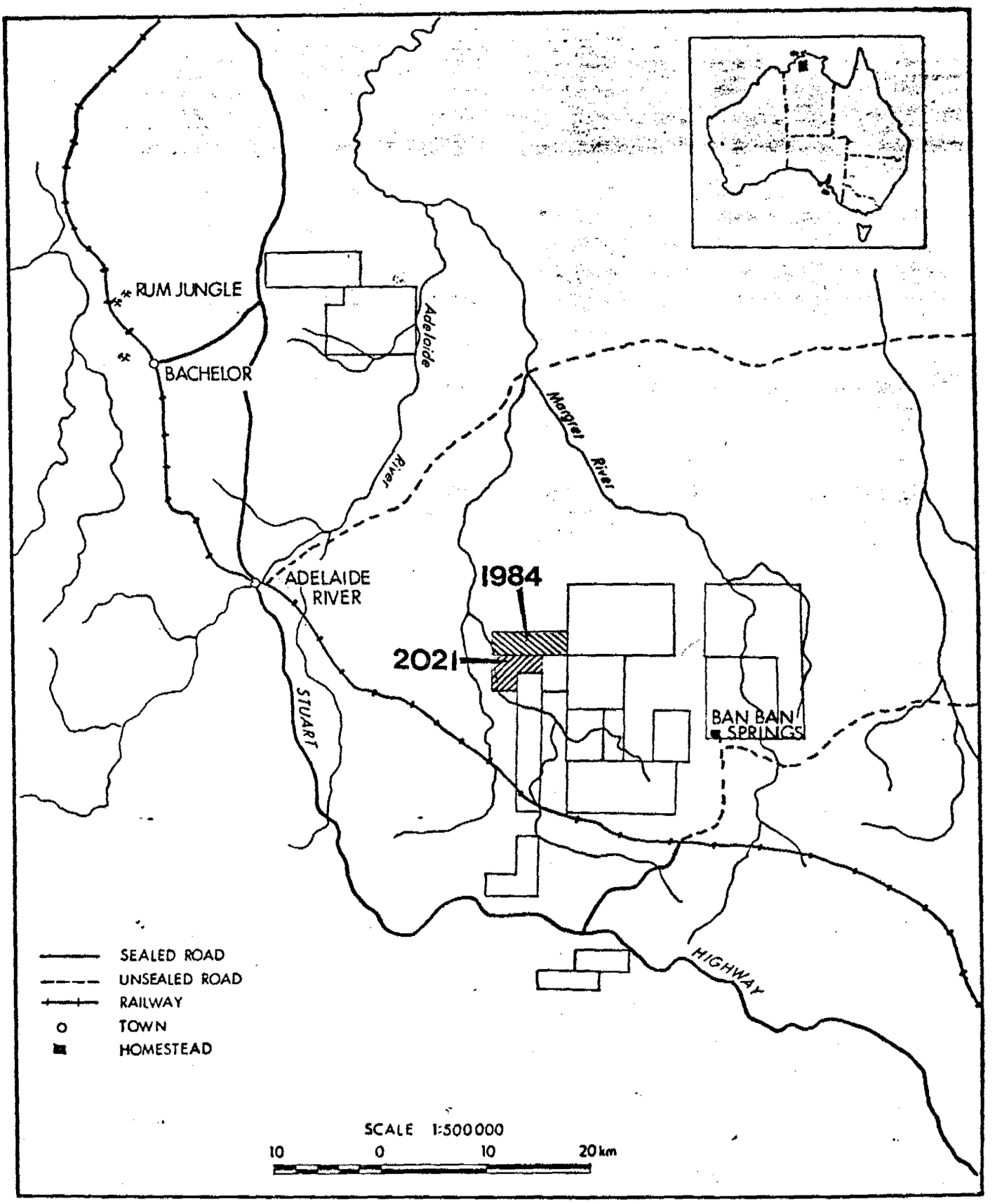
The Exploration Licence was granted for all minerals on the 12th July, 1979. An application for renewal was submitted and granted on the 12th July, 1980. A 50% relinquishment was made on the 12th July, 1981.

1.1 Location and Access

Exploration Licence 2021, Bridge Creek South is located approximately 150 kilometres south-south-east of Darwin (Fig. 1). The area is contained within the Pine Creek 1:250,000 Geological Sheet and the Batchelor 1:100,000 Geological Sheet areas. A detailed description of EL 2021 is as follows:-

All that piece or parcel of land in the Northern Territory of Australia containing an area of 5.14 square miles (13.32 sq km) more or less, the boundary of which is described as follows:-

Commencing at the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 17 minutes thence proceeding to the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 20 minutes thence proceeding to the intersection of latitude 13 degrees 19 minutes with longitude 131 degrees 20 minutes thence proceeding to the intersection of latitude 13 degrees 19 minutes with longitude 131 degrees 18 minutes thence proceeding to the intersection of latitude 13 degrees 20 minutes with longitude 131 degrees 18 minutes thence proceeding to the intersection of latitude 13 degrees 20 minutes with longitude 131 degrees 17 minutes thence proceeding to the intersection of latitude 13 degrees 18 minutes with longitude 131 degrees 17 minutes.



LOCATION MAP.
EL's 1984 & 2021
(BRIDGE CREEK)

Figure 1

Access to Bridge Creek South is gained via the Stuart Highway and then by various bitumen and formed-dirt side roads to Howley Creek Siding on the abandoned North Australian Railway line. From here a track heads north, following a fence line and passes approximately two kilometres to the east of the project area. There are no tracks within the EL. All unsealed tracks are trafficable only during the 'dry' season.

1.2 Topography and Climate.

Broad, flat 'black soil' plains occur in the western half of the EL. These give way to steep sided razor-back ridges in the eastern portion of the area which rise up to 80 metres above the surrounding plains.

Climate is sub-tropical. The monsoonal season occurs from November to April, during which most of the annual rain falls in torrential storms. Rainfall averages more than 1 200 mm Annually. Humidity is constantly high and temperatures range from 30-40^{o}C. During the remainder of the year the humidity is lower with daily changes in temperature ranging from 30^{o}C during the day to 10^{o}C or less at night.

1.3 Tenement Situation.

Exploration Licence 2021 was granted to AAR Limited on the 12th day of July, 1979 for a period of 12 months with a minimum expenditure of $5,000. An application for renewal was granted on the 12th July, 1980. A 50% relinquishment was made on the 12th July 1981.

Implementation of exploration programmes in the licence area is being undertaken by Mines Administration Pty. Ltd, a wholly owned subsidiary of AAR Limited.

1.4 Previous Work.

The earliest geological investigations of the Pine Creek region resulted from the discovery of gold in 1872. A number of the mining fields and mines were mapped with aerial photographs by

the Aerial, Geological and Geophysical survey of Northern Australia between 1935 and 1939.

The BMR has carried out a number of regional mapping programmes which have included the E.L. The area was studied at 1:63,360 scale in the Burnside Geological Series and at 1:250,000 scale in the Pine Creek Geological Sheet (Malone, 1962).

Walpole et.al., (1968) compiled all the existing data pertaining to the Katherine-Darwin Region and proposed a geological evolution of the Pine Creek Geosyncline. More recently mapping of the Batchelor area at 1:100,000 scale (1977) and the entire Pine Creek Geosyncline at 1:500,000 scale (Needham et. al., 1980) has included the EL.

United Uranium and Australian Mining and Smelting tested the uranium potential of the Burnside area in the 1950's and 1960's. More recently Nord Resources (1978) tested an area to the south for uranium and tin. CRAE (1959, 1977-79) and Comalco (1975) also tested the carbonaceous shales for gold and base metal mineralization. The relevant references for this work are presented in the bibliography.

2. REGIONAL GEOLOGY.

Exploration Licence 2021 is located near the centre of the Pine Creek Geosyncline. The regional geology of the Pine Creek Geosyncline has been described in detail by Needham et. al. (1980) and will be discussed only briefly in this report.

By correlating a Tuffaceous sequence Needham et.al., (op cit) have now defined the Pine Creek Geosyncline as a single intracratonic basin containing a thick sequence of mainly pelitic and psammitic Lower Proterozoic sedimentary rocks with interlayered tuff units resting on an Archean granitic basement. Cover rocks, of Carpentarian and younger age, unconformably overlie all of these rocks and conceal the basin margins (Table 1).

2.1 Archean Basement.

The Archean Basement is represented by the domes of the Rum Jungle/Waterhouse and Nanambu Complexes. Possible Archean rocks outcrop in the Woolner area. The complexes consist mainly of gneisses, migmatites and leucocratic granites with minor schists, metasediments and banded iron formations. All of the Archean basement rocks have anomalous uranium concentrations and are possible source rocks for the deposits in the Pine Creek Geosyncline.

2.2 Lower Proterozoic Rocks.

The oldest known Lower Proterozoic rocks are those of the Batchelor and the Kakadu Groups which rest unconformably on Archean basement. The Batchelor Group, which surrounds the Rum Jungle/Waterhouse complex contains arkosic rudites, psammites, conglomerates, and minor shales of the Beetsons and Crater Formations interbedded with massive crystalline carbonates of the Celia and Coomalie Dolomities. The Kakadu Group is best developed adjacent to the Nanambu Complex and is comprised mainly of meta-arkose and paragneiss.

These two basal groups are overlain by the pelites and psammites of the Namoona Group. The dominant unit in this group is the Masson Formation which extends from west of the Rum Jungle/ Waterhouse Complex almost to the South Alligator River, Further east it is thought to be equivalent to the lower member of the Cahill Formation, a partly calcareous and carbonaceous sequence of micaceous quartz-feldspathic schist, with lenses of massive carbonate. These two units are the hosts to the major uranium deposits in the Rum Jungle and Alligator Rivers areas. In the centre of the geosyncline the Masson Formation is unconformably overlain by the Stage Creek Volcanics. Elsewhere the Masson Formation is overlain by the sandstone-siltstone assemblage of the Mount Partridge Group which contains the Mundogie Sandstone, Mount Hooper Sandstone and Wildman Siltstone and correlates with the Acacia Gap Sandstone in the Rum Jungle area. East of the South Alligator River the Mundogie Sandstone correlates with

TABLE 1 - STRATIGRAPHIC UNITS (AFTER NEEDHAM ET. AL. 1980)

AGE	GROUP	FORMATION	LITHOLOGY
Cretaceous		Bathurst Island F.	Fine to medium grained marine sandstones.
Cambrian	Daly River Gp.	Jinduckin F. Tindall Limestone. Antrim Plateau Volc.	Ferruginous sandstone, siltstone, minor dolomite. Crystalline limestone. Massive vesicular basalt, minor agglomerate.
Lower Proterozoic (Carpentarian)	Tolmer Gp.	Depot Creek Sandstone.	Massive cross-bedded quartz sandstone, pebble bands.
	Katherine River Gp.	Kombolgie Form.	Medium to coarse quartz sandstone, minor andesite basalt and rhyolite.
Lower Proterozoic	Finniss River Gp.	Burrell Creek Form.	Siltstone, shale and greywacke.
	South Alligator Gp.	Kapalga Form.	Ferruginous siltstone, chert bands.
		Gerowie Tuff.	Black-green cherty tuff, green argillite, green tuffaceous greywacke
		Koolpin Form.	Ferruginous siltstone with chert bands, pyritic carbonaceous shale, silicified dolomite minor jasper.
	Mount Partridge Gp.	Nourlangie Schist	Quartz mica schist,mica quartz schist,minor quartzite.
		Wildman Siltstone.	Siltstone, in places carbonaceous at depth, red and cream laminated siltstone, minor quartzite and quartz greywacke.

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AGE	GROUP	FORMATION	LITHOLOGY
	Mount Partridge Gp. (Contd)	Acacia Gap Sandstone Member.	Quartz sandstone and feldspathic sandstone with pyritic carbonaceous siltstone and quartz siltstone interbeds.
		Mount Hooper Sandstone.	Medium quartz sandstone and quartzite with some chert fragments, siltstone, phyllite, feldspathic quartzite, pebbly in places, chert pebble conglomerate cross-bedded.
		Mundogie Sandstone	Coarse medium quartz sandstone and orthoquartzite, commonly pebbly, quartz pebble conglomerate, siltstone cross-bedded scoured and graded beds. Minor schist amphibolitic in places.
	Namoona Group	Stage Creek Volcanics	Mafic volcanic breccia hawaiite, tuff, tuffaceous shale, tuffaceous greywacke.
		Cahill Formation	Mica feldspar quartz schist, quartz mica schist, with garnet, amphibole and kyanite in places, carbonaceous schist, crystalline dolomite-magnesite, and calc-silicate gneiss near base.
		Masson Formation	Ferruginous shale (mostly pyritic and carbonaceous at depth) fine-coarse calcareous and volcanic greywacke, calcarenite, sandstone, limestone.
	Batchelor Gp.	Coomalie Dolomite.	Dolomite, magnesite, dolomite breccia tremolite schist, calcilutite algal structures and evaporite pseudomorphs in places.
		Crater Formation.	Feldspathic sandstone, pebble conglomerate, siltstone, pyritic in part, basal ferruginous conglomerate in places.
		Celia Dolomite	Dolomite, magnesite, silicified or with algal structures in places, tremolite schist, minor sandstone, arkose, carbonaceous sediments.

Table 1 (Contd)

AGE	GROUP	FORMATION	LITHOLOGY
	Batchelor Group. (Contd)	Beestons Formation.	Arkose, feldspathic sandstone, conglomerate, siltstone.
	Kakadu Group.	Munmarlary Quartzite.	Gneissic massive to friable orthoquartzite, minor schist.
		Mount Howship Gneiss	Very coarse white feldspathic leucogneiss, minor schist, rare garnet and amphibole.
		Kudjumarndi Quartzite.	Orthoquartzite, quartz gneiss, minor schist, rare cross-bedding, rare amphibole.
		Mount Basedow Gneiss	White-grey-pink coarse muscovite biotite gneiss, granitoid gneiss minor schist.
Archaean		Rum Jungle Complex Waterhouse Complex Nanambu Complex.	Gneiss, migmatite, leucocratic granite, biotite - chlorite schist, amphibolite and quartzite.
Upper Proterozoic (Carpentarian)	Granite.	Margret Granite. Cullen Granite Fenton Granite. Burnside Granite Mt. Bundy Granite Jim Jim Granite Mt. Shoobridge Granite.	Porphyritic adamellite, fine grained granite, hornblende - biotite granite and aplite dykes.
Lower Proterozoic		Zamu Dolerite.	Differentiated continental tholeiitic basalt sills, olivine dolerite, metamorphosed to amphibolite in places.

feldspathic quartz schist of the upper Cahill Formation and the overlying Wildman Siltstone correlates with the Nourlangie Schist.

Overlying the older rocks is the South Alligator Group which comprises the Koolpin Formation, Gerowie Tuff and Kapalga Formation. Together with the Koolpin Formation, the overlying Gerowie Tuff provides the main evidence for correlating the strata of the western and central parts of the geosyncline. The Kapalga Formation is the youngest unit in the South Alligator Group and represents a transitional sequence between the South Alligator Group and the overlying Finniss River Group.

The Finniss River Group is the youngest Lower Proterozoic Group and consists of a monotonous sequence of siltstone, slate, shale and greywacke. The Finniss River Group is made up of the Burrell Creek Formation, the Fisher Creek Siltstone and the Chilling Sandstone. The Burrell Creek Formation grades laterally and upwards into the Chilling Sandstone. The Fisher Creek Siltstone is present in the South Alligator Valley area and is a correlative of the Burrell Creek Formation.

At or near the end of sedimentation in the Lower Proterozoic the rocks were intruded by a suite of dolerites, mainly sills, known as the Zamu Dolerities. At approximately 1 800 m.y. the sills and sedimentary rocks were deformed and regionally metamorphosed. Both the grade of metamorphism and degree of deformation increases towards the north east of the geosyncline. The metamorphics were then intruded and in places domed by early Carpentarian granite plutons. This was followed by the intrusion of a series of tholeitic lopoliths known as the Oenpelli Dolerites.

2.3 Cover Rocks.

The Lower Proterozoic rocks of the Pine Creek Geosyncline are unconformably overlain by the sandstone and minor volcanics of the Tolmer and Katherine River Groups. The northern and southern margins of the geosyncline are concealed by Palaeozoic rocks of the Daly River Group and Mesozoic strata of the Bathurst Island and Petrell Formations.

3. RESULTS OF FIELD INVESTIGATIONS 1980/81

Geological mapping of EL 2021 at a scale of 1:25,000 using colour aerial photographs was commenced in August, 1980 (Map I). Base and airphoto interpretation maps had been prepared in January 1980 by Hunting Geology and Geophysics (Australia) Pty. Ltd.

In conjunction with the mapping a foot-borne radiometric survey was carried out on east-west grid lines. 16 line kilometres of gridding were completed in July 1980. A rock-chip sampling programme was also undertaken. Sample locations are presented as Map 2.

3.1 Geology.

Rocks of the South Alligator and Finniss River Groups outcrop within EL 2021. The oldest rocks outcropping belong to the Gerowie Tuff which is part of the South Alligator Group. The Gerowie Tuff consists of whitish coloured 'blocky' outcrops which are blue black to grey on fresh surfaces. Lithologically the unit is comprised of interbedded chert and siltstone.

The cherts are blue black in colour on fresh surfaces, extremely indurate and have a conchoidal fracture. The siltstones vary from blue black to grey in colour and are fine grained, well sorted rocks exhibiting various degrees of silicification from moderately to very silicified. (Appendix 2)
Some haematite/goethite after pyrite is present.

Overlying the Gerowie Tuff with conformity is the youngest unit of the South Alligator Group - the Kapalga Formation. This formation consists of interbedded and contorted red-brown siltstones and white to blue black coloured chert nodules and layers. The siltstones are well sorted, fine grained, moderately to very haematitic and have haematite/goethite after pyrite. The chert nodules are up to 12 cm in length and have been stretched. The layers may be up to 15 cm thick.

On the extreme western edge of the EL is an outcrop of Burrell Creek Formation sandstone. The rock is a red-brown poorly sorted,

coarse grained feldspathic litharenite which exhibits good fissility. The outcrop is cut by numerous quartz veins ranging from 1 cm to 1 metre in width.

Structure.

The geosynclinal pile was regionally metamorphosed and deformed by a 1 800 m.y. event (Needham et. al. 1980). As a result of this deformation the sedimentary rocks within the EL are folded about the north-south trending Howley Anticline. The rocks within the project area represent the western limb of this anticline and also a north-south trending syncline (Map 1). Dips are steep in the eastern part of EL 2021 but tend to decrease to the west.

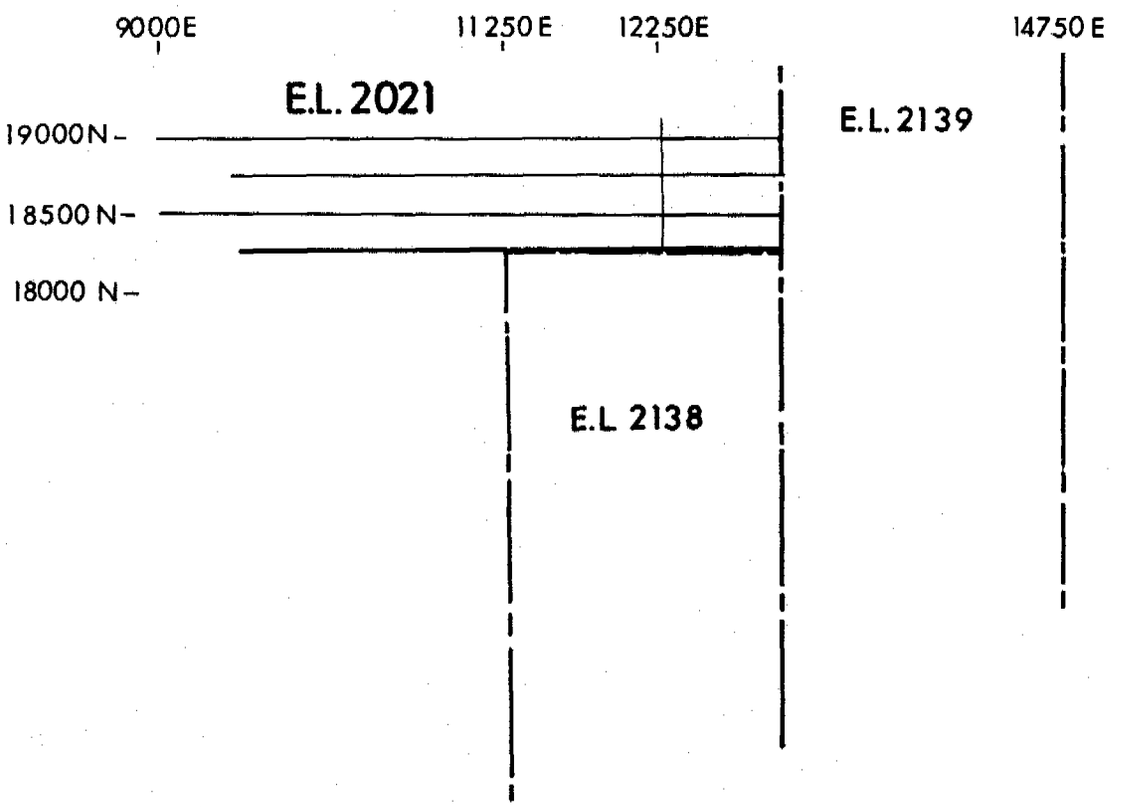
In most cases faulting has been of minor significance however a fault interpreted from aerial photographs and trending north-west to south east may have offset Kapalga Formation rocks by as much as one kilometre.

Geochemistry.

Seven rock-chip samples were collected and assayed for Cu, Pb, Zn and U. As well two of the samples were assayed for Au and As and one for W (Table 2).

TABLE 2.

Element - Sample No.	Cu	Pb	Zn	U	Au	As	W
Bridge Ck. S. 1.	5	10	5	4	-	-	<10
" 2.	90	1.84%	10	8	-	-	-
" 3.	5	50	40	4	-	-	-
" 4.	10	240	5	<4	-	-	-
" 5.	15	40	50	4	<0.1	0.4%	-
" 6.	70	50	30	<4	<0.1	90	-
" 7.	15	70	10	<4	-	-	-



E.L. 2021 — BRIDGE CREEK (SOUTH)

GRID PLAN

1km 500m 0 1 2 km

Scale 1:50000

JULY 1981

FIGURE

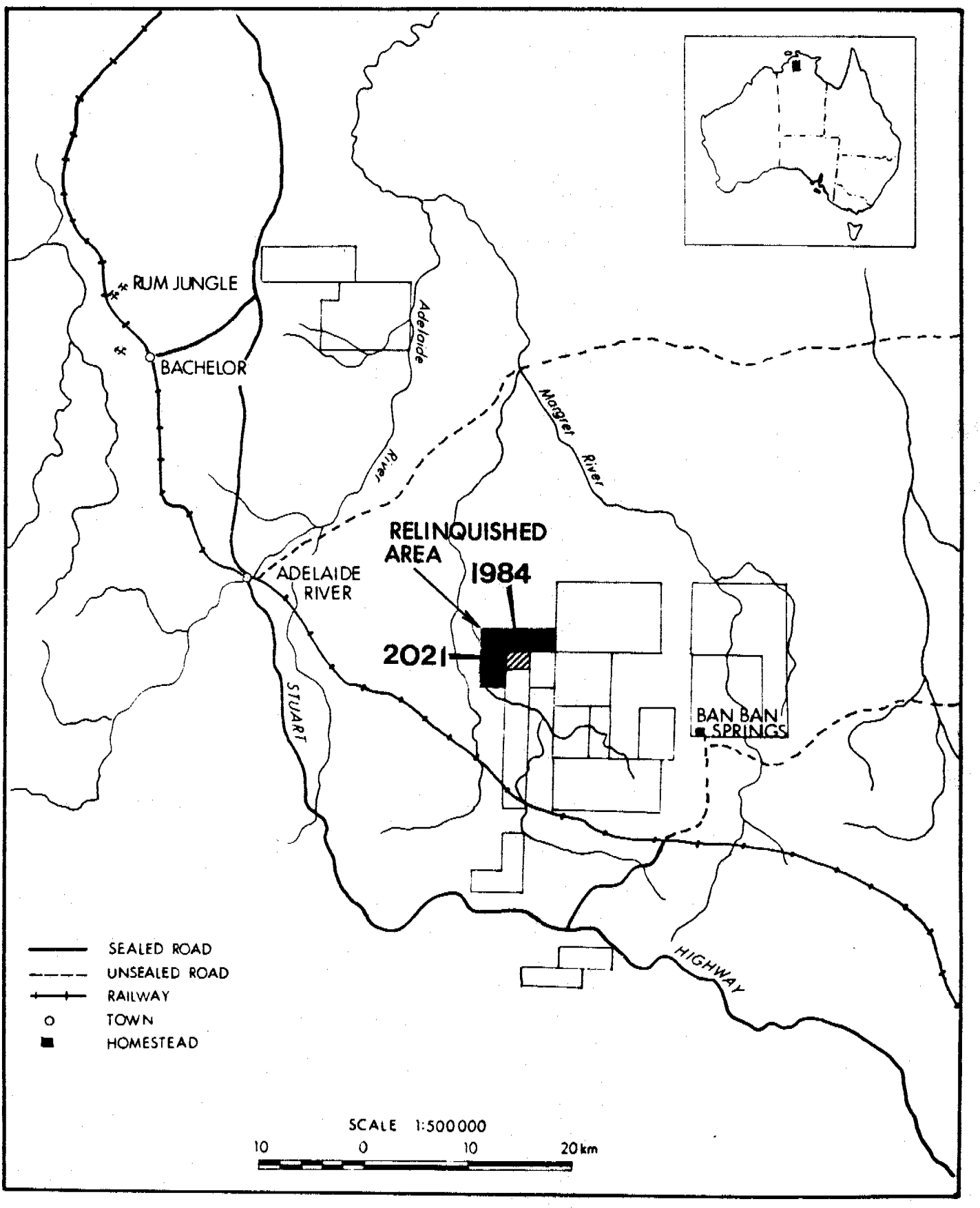
Geophysics

During July, 1980 sixteen line kilometres of gridding were completed over the EL. A ground radiometric survey was then conducted along the east-west lines. Readings were taken every 20 metres using a Scintrex GIS-3 spectrometer (Appendix 3).

4. CONCLUSIONS AND RECOMMENDATIONS.

Geological mapping at 1:25,000 scale delineated outcropping rocks belonging to the Gerowie Tuff, Kapalga and Burrell Creek Formations in EL 2021. A geochemical rock-chip sampling programme and a ground radiometric survey were conducted in conjunction with the mapping.

It is recommended that all of EL 2021, Bridge Creek South, west of $131^{o}18'E$ be relinquished.



RELINQUISHED AREA

LOCATION MAP.

EL's 1984 & 2021

(BRIDGE CREEK)

JULY 1981

Figure 1

5. REFERENCES.

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APPENDIX I.

BRISBANE.

7th August, 1981.

MINES ADMINISTRATION PTY LIMITED

STATEMENT OF EXPENDITURE

BRIDGE CRK STH EL 2021

YEAR ENDED 12.7.81

REF: AC/MDE

	$
Salaries and Wages	5,484
Travel & Accommodation	144
Drafting, Air Photography, Printing, etc.	201
Laboratory	179
Geophysics Contractor - Other	1,856
Surveying Contractor	1,456
	9,320

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pro G.T. Hall,
Accountant.

APPENDIX 2.

THIN SECTION DESCRIPTION

SAMPLE NO.	ROCK TYPE - COMPOSITION.	FABRIC	MINOR MINERALS	COMMENTS.
Br.Ck.S. 6.	Brecciated Quartz-Graphite Schist. Bands/ laminae of graphite-sericite schist alternating with bands of granular, stre-sed quartz with oxidised pyrite.	Deformation, brecci- ation confined mainly to schist bands. Some recrystallization.	Deformed veins of coarse quartz, stressed and granulated.	Originally a laminated chert/carbonaceous siltstone, mildly metamorphosed, then stressed.

APPENDIX 3.

	68	9250	9260	9280	9300	9320	9340	9360	9380	9400	9420	9440	946
19000		38	37	37	39	40	42	40	38	34	36	35	37	38	
18500		36	29	26	30	36	40	39	38	40	41	47	42	42	
	69	9500	9520	9540	9560	9580	9600	9620	9640	9660	9680	9700	972
19000		34	36	29	36	40	36	38	32	32	42	37	34	33	
18750		46	46	45	40	42	40	38	40	38	36	27	29	36	
18500		41	40	38	39	27	28	39	38	38	39	41	44	46	
18250		36	33	28	26	28	28	31	29	32	35	31	29	26	
	70	9750	9760	9780	9800	9820	9840	9860	9880	9900	9920	9940	996

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19000		36	36	36	33	36	32	33	38	38	41	40	42	47	
18750		39	40	37	39	40	44	43	42	44	45	40	32	33	
18500		42	43	42	40	40	40	38	34	39	42	41	42	42	
18250		31	30	33	28	32	30	34	33	30	32	29	28	29	
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19000		44	44	37	41	40	41	44	44	40	38	42	41	40	
18750		39	39	40	40	38	37	44	43	42	43	42	42	42	
18500		34	36	36	29	29	30	30	32	34	36	36	37	42	
18250		24	26	25	26	28	23	25	28	33	33	32	34	32	
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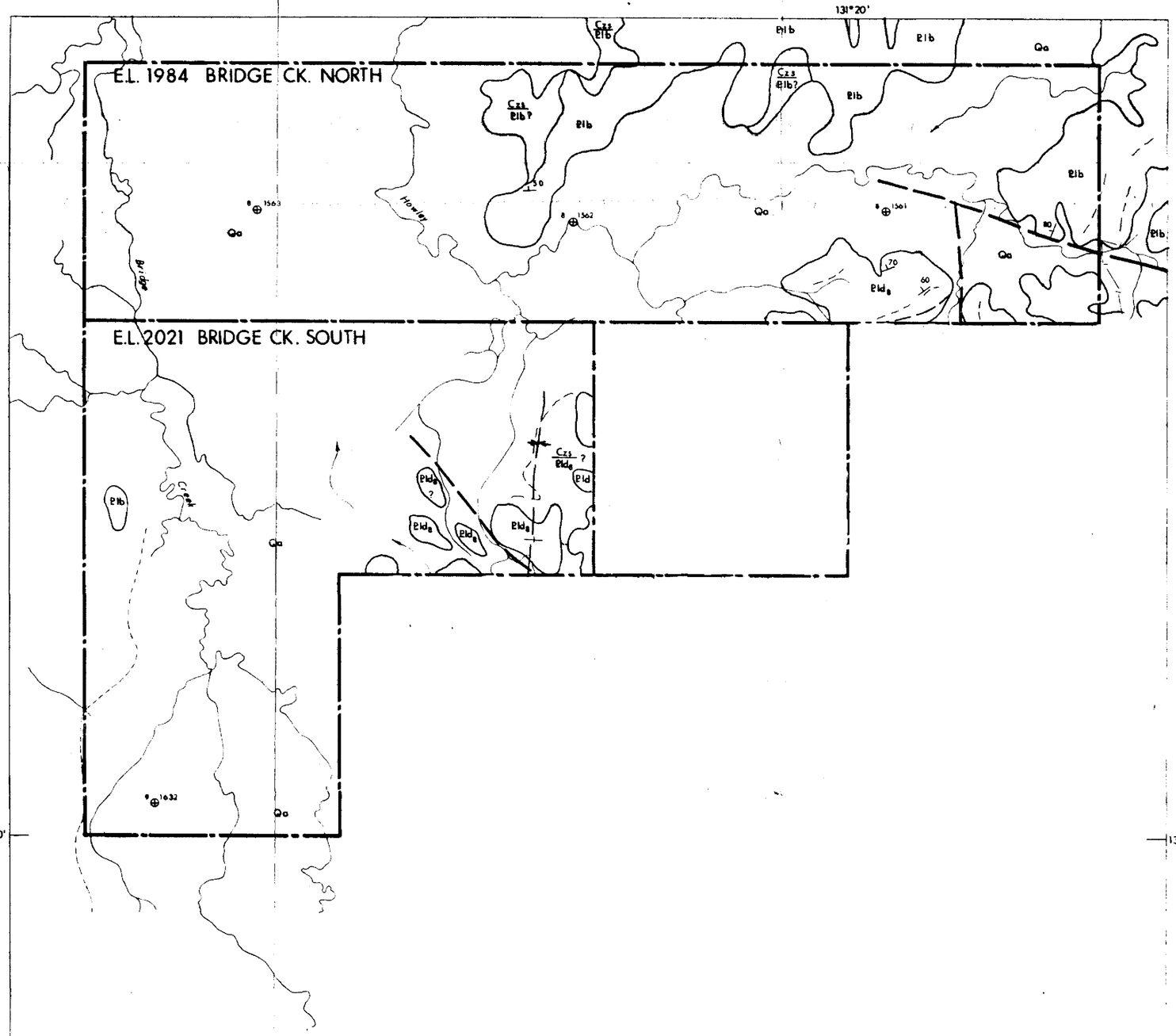
19000		41	43	33	42	41	40	41	32	27	26	27	29	28	
18750		41	42	44	42	42	39	43	42	42	41	40	40	38	
18500		45	40	42	40	39	36	36	39	40	37	45	44	44	
18250		34	34	37	33	39	36	36	36	31	34	36	43	41	
	73	10500	10520	10540	10560	10580	10600	10620	10640	10660	10680	10700	1072
19000		28	29	29	30	32	35	37	39	40	38	31	23	23	
18750		37	37	38	38	34	32	31	30	32	32	31	30	30	
18500		41	37	35	36	31	29	28	28	30	30	30	30	33	
18250		38	33	32	46	45	46	45	45	45	44	42	46	47	
	74	10750	10760	10780	10800	10820	10840	10860	10880	10900	10920	10940	1096
19000		24	25	34	34	36	37	32	33	32	35	34	37	37	
18750		33	34	34	32	26	26	28	30	31	28	34	32	33	
18500		33	32	26	28	34	34	37	28	29	31	29	38	27	
18250		44	41	42	42	38	41	38	40	39	33	33	33	32	
	75	11000	11020	11040	11060	11080	11100	11120	11140	11160	11180	11200	1122
19000		36	35	34	36	37	36	38	37	37	41	39	43	34	
18750		30	26	30	28	31	28	30	28	29	27	30	32	29	
18500		29	29	34	34	36	34	30	30	37	41	30	31	31	
18250		35	34	37	40	38	32	29	31	30	30	32	32	29	



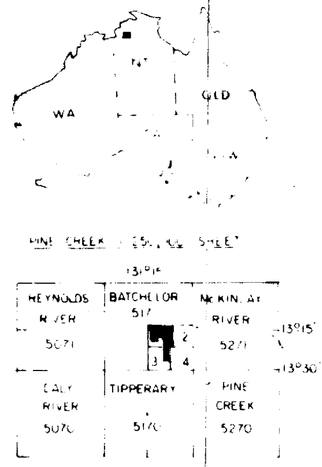
GEOLOGICAL EXPLANATION

CAINOZOIC	QUATERNARY	Qa	Silt, clay, sand, black soil and alluvium.
	TERTIARY	Czs	Undivided, unconsolidated soil, sand and scree deposits.
LOWER PROTEROZOIC	PINNISS RIVER GROUP - BURRELL CREEK FM.	Plb	Red, tan, grey siltstones, interbedded sandstone.
	SOUTH ALLIGATOR GROUP — KAPALGA FM	Pld8	Red-tan siltstones, contorted quartz haematite beds and minor silicified sandstone
	SOUTH ALLIGATOR GROUP — GEROWIE TUFF	Pld7	Grey-green, red siltstones, feldspathic sandstones and chert.
	SOUTH ALLIGATOR GROUP — KOOLPIN FM	Pld6	Massive ironstones, red siltstones, carbonaceous shale
	ZAMU DOLERITE	Pdo	Dolerite sills

- GEOLOGICAL BOUNDARY
- TRACE OF BEDDING
- 50 STRIKE AND DIP OF STRATA
- VERTICAL DIP AND STRIKE
- FAULT
- INFERRED FAULT
- SYNCLINE
- ANTICLINE

LEGEND

- ⊕2048 Photocentre showing run and photo number
- Railway
- Track
- Fence
- Drainage
- Exploration Licence Boundary
- Old Workings



Note This map was compiled from 4 photogeological worksheets by Hunting Geology and Geophysics (Australia) Pty. Limited Canberra, September 1979, GA88/79.

MINES ADMINISTRATION PTY. LIMITED

E.L. 1984 BRIDGE CREEK (NORTH)
E.L. 2021 BRIDGE CREEK (SOUTH)

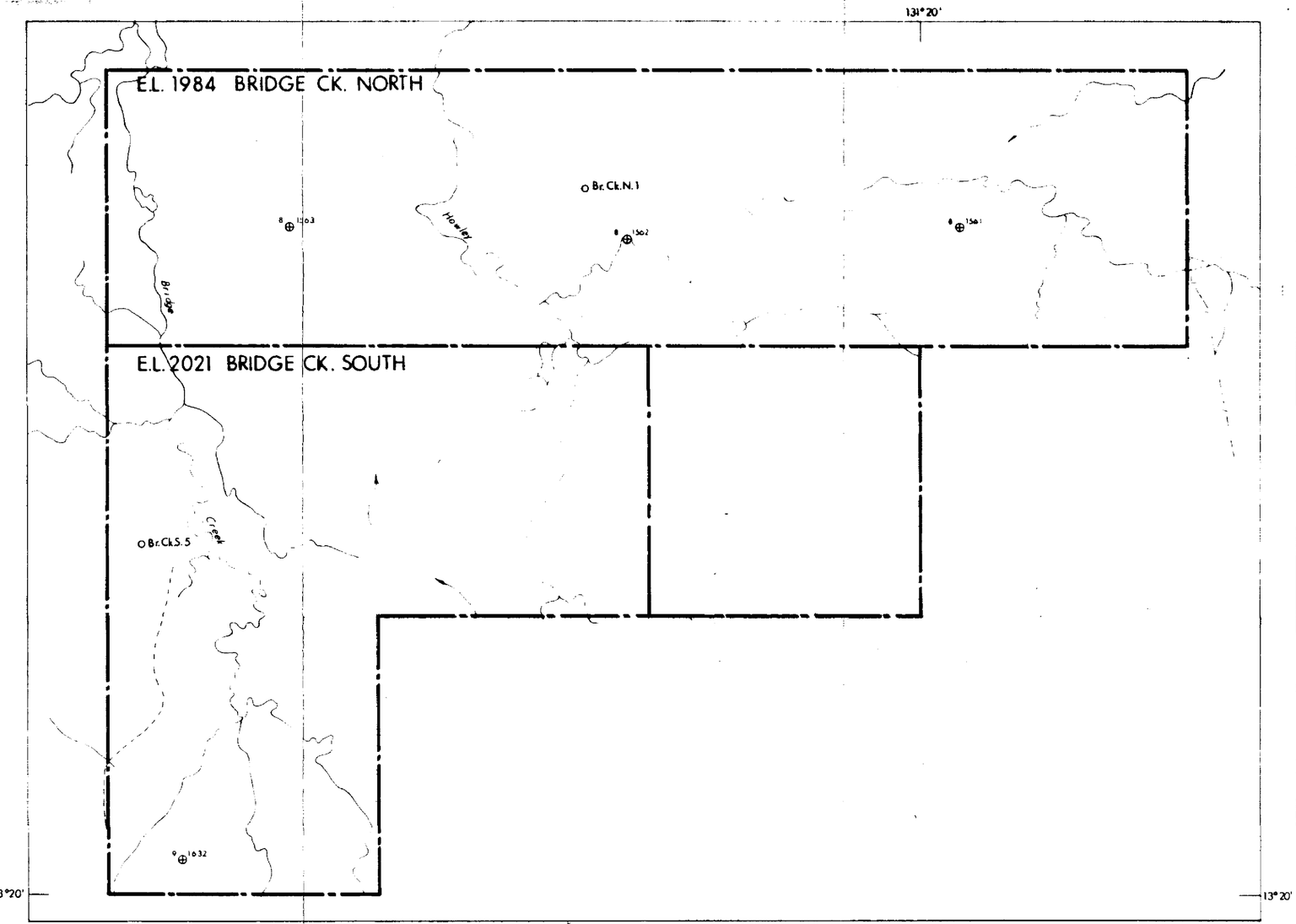
NORTHERN TERRITORY

RELINQUISHED AREA GEOLOGICAL MAP

SCALE
500 0 1000 2000m
1:25,000

AUTHOR G. HASSALL
DWG No FILE No DATE JULY 1981

CR81/229



LEGEND

Br.Ck.N.1 — Rock Chip Sample Location Point

Photocentre showing run and photo number

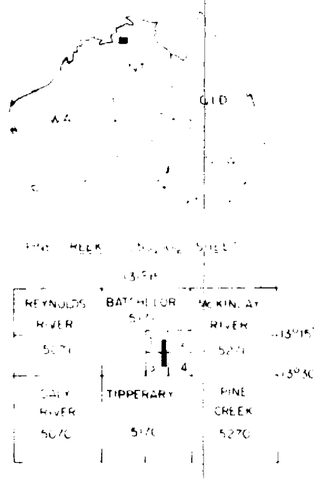
Railway

Track

Fence

Drainage

Exploration Licence Boundary



Note This map was compiled from 4 photogeological worksheets by Hunting Geology and Geophysics (Australia) Pty. Limited Canberra, September 1979, GA88/79.

MINES ADMINISTRATION PTY. LIMITED

E.L. 1984 BRIDGE CREEK (NORTH)
E.L. 2021 BRIDGE CREEK (SOUTH)

NORTHERN TERRITORY

RELINQUISHED AREA
SAMPLE LOCATION MAP

SCALE 1:25,000

AUTHOR G. HASSEL

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