REPORT ON MINING TENURES HELD IN NORTHERN TERRITORY, AUSTRALIA BY OPTIMAL MINING PTY. LTD.

BY

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1.0 INTRODUCTION

This report describes three mining tenures held by Optimal Mining Pty. Ltd. in the Northern Territory of Australia. Recently Optimal signed a joint venture agreement with A. C. A. Howe Australia Pty. Limited (on behalf of clients) assigning a 50% interest in these mining tenures in return for a guarantee by A. C. A. Howe Pty. Limited to carry out a programme of work for a minimum amount of $117,000 prior to October, 1979.

2.0 PROPERTY

The property consists of the following exploration licences:

Exploration licences No. 1653 (464.25 square miles),
No. 1654 (8.72 square miles) and
No. 1655 (8.00 square miles) are

all adjacent and shown on the mining tenures map, 8/6 Mary River and 14/3 further south to latitude $13^{o}15'$. Additional Exploration Licences No. 1656A (250 square miles) is under application and is pending approval and is located south of Rum Jungle and east of the Stuart Highway. Licence No. 1656B (30 square miles) is under application but conflicts with two local farms. Total area of E.L.s is covered by the Darwin 1:250,000 and Pine Creek 1:250,000 geological maps. Peko-Wallsend have pegged several mining leases over part of E.L. 1653 and these are excluded from the Exploration Licences.

3.0 LOCATION AND ACCESS

Access to the exploration areas in general is good. They may be reached by sealed highway (Stuart and Arnhem Highways) from the nearest major city which is Darwin (65 miles). The trip by motor vehicle takes from 1½ to 2 hours. The nearest all-weather air strip for the Mt. Bundey area is a 3,000 foot strip near Annabaroo homestead. Other small strips service the general area. Mobility within the area is restricted to dirt roads and station tracks and four-wheel-drive vehicles are essential.

Bulk Carrier loading facilities in the port of Darwin are good, - bulk iron ore was shipped from there to Japan in the early to mid-1970's. The Arnhem Highway connects with the main North Australian railway line at a bulk transshipment siding near Satler (16 miles from Darwin). This was used to transport bulk iron ore from Mt. Bundey to Darwin.

Supply of material, equipment and contractors for the exploration area is readily available from Darwin. This would include contract drilling equipment, earth moving equipment, maintenance and spare parts, and trained personnel. Field labour is available locally, although some supervision would have to be carried out in specialized areas by professional consultants (e.g. Environmental Impact Assessment).

Messing and accommodation could be provided by leasing or purchasing portable caravan equipment from B.M.R. or Darwin Cyclone Relief facility. Four-wheel-drive field vehicles could be leased or purchased by the company locally. There is abundant water supply for all phases of the operation.

4.0 HISTORY

Located adjacent to the E.L.1653 is the Mt. Bundey iron mine (a past producer). It is actually situated on the road reserve but could be leased by Optimal if required. The geology of Australian ore deposits indicates that there are indicated reserves of martite ore totalling 843,063 tons of 63.43% Fe with impurities of 0.108% S and 0.057% P_2O_5.

A contract to deliver iron ore to the Japanese was carried out for a number of years but was finally terminated because the sulphur content became too high.

There are three past producers of gold on lease 1653 known as the Great Northern, Great Western, and Star of the North (Ambrooksville). Production from these gold producers consisted of the following:

Producers	Year	Tons	Ounces
Great Northern	1897		47
	1903	1,259	1,052
	1905	100	32
	1906	1,633	223
Great Western	1904	1,770	437
Star of the North	1904	509	230
	1905	1,167	556

The area of the leases was explored by Geopeko Ltd. but was dropped in 1977 as part of the requirement of the Northern Territory Mining Regulation whereby 50% of the companies' holdings must be relinquished each year. Geopeko pegged some mining leases for lead, zinc and gold before relinquishment, and these cover a minor portion of lease 1653. Work carried out by Peko consisted of geological reconnaissance after an airborne radiometric and

magnetic survey by the B.M.R. in 1974 and by Geopeko themselves. Optimal Mining acquired the mining leases in October 1977 and carried out outcrop sampling, and ground radiometric reconnaissance over areas designated as anomalous from the B.M.R. aerial survey.

In October 1978, A. C. A. Howe Australia Pty. Ltd. signed a joint venture agreement with Optimal whereby Howe on behalf of clients committed to spend on exploration in the year to October 1979 a minimum of $117,000. In return for this expenditure, Howe on behalf of clients will earn a 50% interest in the joint venture.

5.0 GEOLOGY

The property is underlain by rocks of the Lower Proterozoic series of the Precambrian era. The major area of the leases are covered by Burrell Creek formation consisting of siltstones, shales and graywacke. In the northeast corner of lease E.L.1653 are exposed formations in descending order: Kopalga Formation, Gerowie Tuff, and Koolpin Formation. These formations lie below the Burrell Creek Formation and are known as the South Alligator Group.

The Kopalga consists of ferruginous siltstones, chert bands and nodules whereas the Gerowie Tuff consists of black-green cherty tuff and green argillite. The Koolpin Formation consists of ferruginous siltstone with chert bands and nodules, also pyritic carbonaceous shale and silicified dolomite. Also some banded iron formation.

The above formations are intruded by Precambrian granite known as the Mt. Bundey Granite. A section of Kopalga Formation intruded by Margaret granite is exposed in the southeast corner of E.L.1653.

The South Alligator Group are important as the host rock for uranium, and are highly folded around the margins of the Mt. Bundey granite. The Koolpin Formation in particular is the host rock in the South Alligator and Rum Jungle areas. Adjacent to the southwest corner of E.L.1656A is the Adelaide River Uranium Mine (past producer) which is located in the Burrell Creek formation.

6.0 RESULTS OF 1978 WORK PROGRAM

These results are summaries in a report by Dr. T. K. Wignall in a report dated March 9, 1978. His report states:

"The Northern parts of E.L.1653, 1654 and 1655 areas are in the Mounts Goyder and Bundey complexes, and since these were the areas in which the main B.M.R. radiometric survey anomalies occurred, our reconnaissance ground radiometric survey was concentrated there. The outcropping rock formations are chiefly Lower Proterozoic sedimentary types, many of which have been folded and cleaved and intruded by the granite and syenite of Mount Bundey and the syenite of Mount Goyder.

Previous work by the Department of Mines, the Bureau of Mineral Resources and Geopeko Ltd., has high-lighted the prospects of economic mineralization in the areas as follows:

(i) Several very high radiometric anomalies in the B.M.R. survey in the vicinities of Mounts Goyder and Bundey, and their aureoles.

(ii) Very high magnetometer anomalies over the area, especially in the vicinity of Mount Bundey Iron mine.

(iii) The golden Dykes formation is the host rock for uranium in the Rum Jungle area some 70 kilometres to the WSW, and the Craig Creek Formation Member correlates with the Koolpin and Cahill host rocks in the East Alligator River Uranium province some 120 kilometres to the east. These formations both make contacts with the intrusive granite and syenite in the areas.

(iv) Geopeko Ltd. has pegged several leases over similar contact zones within the licence areas.

The main objectives of our survey parties were achieved in our ground survey. The B.M.R. anomalies checked out very well on the ground, all occurring over the granites and syenites and their aureoles."

7.0 CONCLUSIONS AND RECOMMENDATIONS

The Optimal leases are strategically located close to the Rum Jungle uranium province. It is interesting to note that if one projects the East Alligator uranium province to the south-west towards Rum Jungle the axis of mineralization appears to pass through the Optimal leases. In addition, the South Alligator uranium province axis projected to the northwest also passes through the Optimal leases (refer to the location map at rear).

The Northern section of E.L.1653 (40 square miles) is overlain by Koolpin formation (formerly designated Golden Dyke) which is the favourable formation for uranium mineralization in the South Alligator and Rum Jungle areas.

The basic requirements for uranium deposits are present, namely,

1. Koolpin formation
2. Folding of the formation causing structural traps
3. Granite intrusive providing the metamorphic changes required in the formations.

The lease also contains three known gold occurrences and an iron deposit. Production from these has been recorded in the past. Further investigation of their feasibility is warranted. The following programme of work is therefore recommended:

(a) Radiometric surveys over designated areas of geological interest such as the Golden Dyke formation and the metamorphic aureole around the Mount Bundey granite. The surveys will be carried out on grid lines 100 metres apart with readings at 25 metre intervals on each line.

(b) Geological surveys over the same grid as in (a) above.

(c) Detailed radiometric surveys at a closer interval in areas where anomalous readings are obtained in (a).

(d) Reconnaissance geological surveying and prospecting over the remainder of the leases in search of uranium, gold, base metals and iron mineralizations.

(e) Evaluation of known gold, iron and blue metal deposits to determine whether further development work and feasibility studies should be carried out.

The estimate of the cost of this programme in Australian dollars is as follows:-

PRE-FIELD ACTIVITIES

a.	3 sets of 1:88,000 aerial photography	$ 315	
b.	Stereo examinations of photography to pinpoint old mine workings	500	
c.	Preparation of controlled photomosaic at 1:100,000 and production of 3 turapaper prints	500	
d.	Preparation of 35 base sheets at 1:5,000	1,400	$ 2,715

FIELD ACTIVITIES

MOBILIZATION

a.	Travel to Darwin by air (one way)	$ 1,250	
b.	Establish Base Camp	540	1,790

SURVEY

a.	Location and co-ordinate, on the Australian Map Grid, 6 control points for Base Line Origins	$ 1,260	
b.	Hire of Wild D135 Distance Meter	600	
*c.	Cut and Survey 39.2 kms. of Base Line	7,200	
d.	Establish 22.1 kms of base line with compass and chain	820	9,880

GEOLOGY & RADIOMETRICS

a.	Observe Basic Outcrop and Radiometric along 1,827 kms of grid as per survey diagram. Say 92 man days each for 2 teams at $165 per team per day	$37,680	
b.	Locate and sample old mines throughout the property using controlled photomosaic. Say 40 old mines and workings - sample and sketch 1 per day	6,600	
c.	Cost of analysis for U, Au, Ag, Bi, Pb, Zn in say 100 samples	2,000	
d.	Observe and sample outcrop geology throughout the Burrell Creek Formation	6,600	
e.	Cost of analysis for U, Au, Ag, Bi, Pb, Zn for samples collected above in say 50 samples	1,000	
f.	Petrographic Analysis by Wally Fander - say 50 samples at $30 each	1,500	55,380

* Estimations to "SURVEY" c. calculated at $180 per day per team.

Estimations following this item are calculated at $165 per day per team.

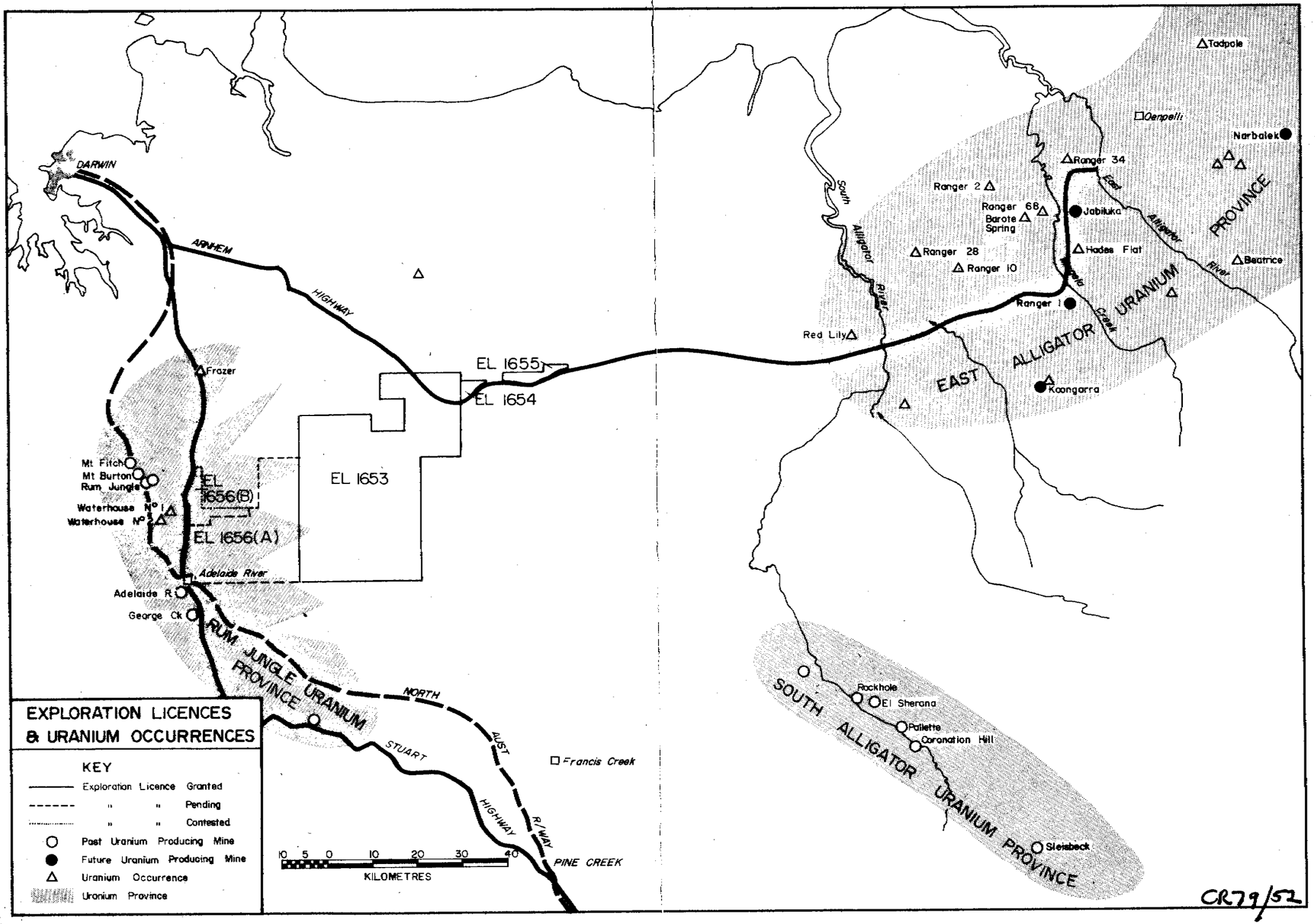
DETAILED RADIOMETRIC SURVEYS		
1. Assume 3 anomalies are located in those areas gridded. Cost for detail gridding (50 m grid interval and 12½ m down line readings would be	$ 3,300	
2. Assume 1 area of interest located in the Burrell Creek Formation. Cost for establishing control throughout the area and mapping geology and, if necessary radiometrics	2,200	$ 5,500
OTHER FIELD EXPENSES		
1. Vehicle hire for say 7 months 2 vehicles at $250 per vehicle per month	14,000	
2. Vehicle maintenance - say $125 per month per vehicle	1,750	
3. Petrol	2,200	
4. Road haulage of petrol to camp	400	
5. Air freight samples to Amdel	500	
6. Road freight from Sydney	400	
7. Purchase two Mt. Sapris scintillometres	3,600	22,850
DEMOBILIZATION		
1. Break camp	540	
2. Return Sydney by air	1,250	1,790
DRAFTING		
Fair drawing of geology sheets	7,000	
Cost of computer drafting for radiometric contour overlays	5,000	
Preparation of 1:20,000 compilations		
i) Geology	500	
ii) Radiometrics	500	
Drafting of say 40 sketch maps	1,000	14,000
SUPERVISION		
Supervision of programme and reports and statistical analysis of field activities during the season, plus final report	21,100	21,100
TOTAL		$135,005

Expenditure is distributed over the three Exploration Licences as follows:-

E.L. 1653	$112,000
1654	10,255
1655	12,750
	$135,005

Respectfully submitted,

A. C. A. Howe, P.Eng. B.Sc. A.R.S.M.


DARWIN
ARNHEM HIGHWAY
Frazer
Mt Fitch
Mt Burton
Rum Jungle
Waterhouse No 1
Waterhouse No 2
EL 1656(B)
EL 1656(A)
EL 1653
EL 1655
EL 1654
Adelaide River
Adelaide R
George Ck
RUM JUNGLE URANIUM PROVINCE
NORTH AUST R/WAY
STUART HIGHWAY
PINE CREEK
Francis Creek
Red Lily
South Alligator River
East Alligator River
Tadpole
Oenpelli
Nabalek
Ranger 34
Ranger 2
Ranger 68
Barote Spring
Jabiluka
Ranger 28
Ranger 10
Hades Flat
Beatrice
Ranger 1
Koongarra
EAST ALLIGATOR URANIUM PROVINCE
Rockhole
El Sherana
Pallette
Coronation Hill
Sleisbeck
SOUTH ALLIGATOR URANIUM PROVINCE
10 5 0 10 20 30 40
KILOMETRES
EXPLORATION LICENCES & URANIUM OCCURRENCES
KEY
Exploration Licence Granted
" " Pending
" " Contested
Past Uranium Producing Mine
Future Uranium Producing Mine
Uranium Occurrence
Uranium Province

CR79/52

LEGEND

Era	Period	Group	Formation	Symbol	Description
MESOZOIC	Cretaceous		Bathurst Island Formation	Kb	Fine-medium sandstone, siltstone, mostly marine.
			Mullaman Beds	Km	Medium-course sandstone, siltstone, conglomerate, mainly terrestrial.
PRECAMBRIAN	Carpentarian ?	TOLMER GROUP	Depot Creek Sandstone Member	Ptd	Massive cross-bedded sandstone, pebble bands.
	Carpentarian	KATHERINE RIVER GROUP		Phk	Medium-very coarse quartz sandstone, cross-bedded and ripple-marked; quartz pebble conglomerate, minor siltstone.
			Mount Goyder Syenite	Pgd	Dark pinkish-grey porphyritic syenite and quartz syenite.
			Margaret Granite	Pgg	Pink and green coarse porphyritic adamellite.
			Mount Bundey Granite	Pgu	Pink medium to course hornblende biotite granite and adamellite, porphyritic in places.
	Lower Proterozoic		Zamu Dolerite	Pdz	Differentiated continental tholeiitic basalt sills, olivene dolerite, quartz dolerite, diorite and granophane.
		FINNISS RIVER GROUP	Burrell Creek Formation	Pu	Siltstone, shale, graywacke and graywacke siltstone. Graywacke increases to west.
		SOUTH ALLIGATOR GROUP	Kapalga Formation	Psp	Ferruginous siltstone, chert bands and nodules in places, commonly carbonaceous at depth.
			Gerowie Tuff	Pvg	Black-green cherty tuff, green argillite, pale green tuffaceous greywacke.
PRECAMBRIAN	Lower Proterozoic	SOUTH ALLIGATOR GROUP	Koolpin Formation	Psk	Ferruginous siltstone with chert bands and nodules; pyritic carbonaceous shale, silicified dolomite, minor phyllite, jasper and banded iron formation.
		BARRAMUNDIE GROUP	Wildman Siltstone	Pbw	Siltone, in places carbonaceous at depth, red and cream laminated siltstone, minor quartzite and quartz greywacke.
			Acacia Gap Sandstone Member	Pba	Quartz sandstone and feldspathic sandstone with pyritic carbonaceous siltstone and quartz siltstone interbeds.
			Mount Hooper Sandstone	Pbh	Medium quartz sandstone and quartzite with some chert fragments, siltstone, phyllite, feldspathic quartzite, pebbly in places, chert pebble conglomerate, cross-bedded.
			Mundogie Sandstone	Pbm	Coarse to medium quartz sandstone & orthoquartzite, commonly pebbly; quartz pebble conglomerate, siltstone; cross-bedded, scoured & graded beds. Minor schists, amphibolitic in places.
		NAMOONA GROUP	Masson Formation	Pnm	Ferruginous shale (mostly carbonaceous at depth), fine to coarse calcerous and volcanic greywacke, calcarenite, sandstone, limestone.
		BATCHELOR GROUP	Coomalie Dolomite	Pac	Dolomite, magnesite, dolomite breccia, tremolite schist, calcilutite, algal structures and evaporite pseudomorphs in places.
			Crater Formation	Par	Feldspathic sandstone, pebble conglomerate, siltstone, pyritic in part, basal ferruginous conglomerate in places.
			Celia Dolomite	Pal	Dolomite, magnesite, silicified or with algal structures in places, tremolite schist, minor sandstone, arkose, carbonaceous sediments.
			Beeston's Formation	Pab	Arkose, feldspathic sandstone, conglomerate, siltstone.
	Archean-Lower Proterozoic		Rum Jungle Complex	APr	Aplitic leucocratic granite, adamellite, fine to coarse granite garnetiferrous to porphyritic in places, dolerite, amphibolite, granodiorite, schist, gneiss, migmatite, metasediments, banded iron formation.

SCALE 1:100,000

Kilometres 2 1 0 2 4 6 8 10 12 Kilometres

DATUM: AUSTRALIAN MAP GRID
ZONE 52

CR79/152

SCALE: 1:100,000		DATUM: A.M.G.
FIELDWORK		FILE No.
DRAFTED	R. COURT	
TRACED	"	
CHECKED	C. PARKINSON	

ACA HOWE AUSTRALIA PTY. LTD.
OPTIMAL MINING PTY. LTD.

REGIONAL GEOLOGY
AND
MINERAL OCCURRENCES

PROPERTY:
E.L. 1653
" 1654
" 1655
" 1656(A)
" 1656(B)