



**Cameco Australia Pty Ltd**

**ARNHEM LAND WEST**

**GUNBATGARRI PROJECT  
EL 2857 and EL 4012**

**ANNUAL REPORT**

**CONFIDENTIAL**

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## SUMMARY

This report describes exploration work undertaken on the Gunbatgarri project for the first year of tenure. The tenements were formerly part of the Arnhem Land West Joint Venture, a joint venture between Cameco Australia Pty Ltd (Cameco), PNC Exploration Australia Pty Ltd (PNC) and the Ngalangak Aboriginal Corporation. Cameco attained management then ownership of the project when PNC withdrew from exploration activities in Australia.

The commencement of an airborne geophysical survey by Universal Tracking Systems Pty Ltd (UTS) was approved by the Northern Land Council (NLC) in October 2001, prior to the imminent granting of the tenement by DBIRD. Grant of title was then unexpectedly delayed in order to rectify a double-deeming issue. The Minister finally approved the titles on March 19 2002.

Following granting, additional airborne surveys were carried out by both UTS and De Beers Australia Exploration Ltd (De Beers).

Magnetic and radiometric data have been collated and interpreted. The Hyperspectral data is currently being processed by Cameco Corporation, Canada.

## TABLE OF CONTENTS

<b>SUMMARY .....</b>	<b>ii</b>
<b>INTRODUCTION .....</b>	<b>1</b>
Location and Access .....	1
Tenure .....	1
Physiography.....	1
Tenement Geology.....	2
Regional Structure and Geological History .....	2
Exploration Target .....	3
Previous Exploration.....	3
<b>EXPLORATION PROGRAM.....</b>	<b>3</b>
Airborne Magnetics, Radiometrics and DTM .....	3
Hyperspectral – HyMap Mk1 .....	4
<b>WORK PROGRAM .....</b>	<b>4</b>
<b>BIBLIOGRAPHY .....</b>	<b>5</b>

## LIST OF FIGURES

Location Map .....	1
Geophysical Surveys Location Map .....	3
Airborne Magnetics – Total Magnetic Intensity (TMI) with 1st Vertical Derivative (1VD).....	4
Airborne Radiometrics – Total Counts (TC) .....	4
Airborne Radiometrics – Potassium (K).....	4
Airborne Radiometrics – Uranium (U) .....	4
Airborne Radiometrics – Thorium (Th).....	4
Airborne Radiometrics – RGB=U,Th,K .....	4

## LIST OF APPENDICES

Airborne Geophysics Logistics Report by UTS – 2001 .....	4
Airborne Geophysics Logistics Report by UTS – 2002 .....	4
Airborne Hyperspectral Report by De Beers - 2002.....	4

## LIST OF TABLES

Summary of Expenditure EL2857 and EL4012.....	4
Location and Scheduling of Activities.....	5
Listing of On-Site Contractor Requirements .....	5

## INTRODUCTION

This report describes exploration activities carried out from October 2001 to the anniversary date. The work was initially performed on behalf of the Arnhem Land West Joint Venture, (AWJV) a joint venture between Cameco Australia Pty Ltd, PNC Exploration (Australia) Pty Ltd (PNC) and the Ngalangak Aboriginal Corporation. Cameco acquired full ownership of the project in early 2002 when PNC withdrew from uranium exploration in Australia. Since the Exploration Licence is located on Aboriginal Land the exploration program was carried out under the terms of consent documentation agreed with the NLC pursuant to the Aboriginal Land Rights (Northern Territory) Act 1976.

The program as described represents the first year of exploration on the tenements. To date there has been no ground-based activities.

The principal field activity for the period was the flying of two airborne geophysical surveys acquiring magnetic, radiometric and Digital Terrain Model (DTM) data by UTS and a hyperspectral survey by De Beers. The former was originally flown in two parts, the first in October 2001 and the second in July 2002. The second survey covered areas in EL2857 that were previously excluded from exploration.

### Location and Access

Exploration Licences 2857 and 4012 are located in central western Arnhem Land. The project area is centred about 40 km southwest of Maningrida and 140 km east of Jabiru.

The area is traversed by the main Arnhem road and is served by tracks to various Outstations.

### Location Map

### Tenure

ELs 2857 and 4012 were granted on the 19 March 2002 for an initial period of six years. On granting, the total area covered by the licences is 1253 km<sup>2</sup> (23.4 km<sup>2</sup> for 4012). Much of the area is designated as 'no-go' and is therefore excluded from exploration.

### Physiography

The tenement consists of heavily incised sandstone plateau merging northwards into coastal plains interspersed with tidal river estuaries. Vegetation varies with geology and topography but generally consists of eucalyptus woodland and scrubland with remnants of monsoonal forest confined to deep gorges and mangroves along watercourses.

The plateau is dissected by numerous, mostly north flowing drainages including the Liverpool and Mann Rivers. Gorges and waterfalls have developed in places.

## **Tenement Geology**

Based on the NTGS mapping of the Milingimbi 1:250000 geological series (Carson and others 1999), outcropping rocks within the tenement are dominated by the Kombolgie Subgroup of the Paleoproterozoic Katherine River Group. These overlie basement rocks assigned to the Nimbuwah Complex. The latter is present as a small 'window' and was once thought to be intrusive into the overlying sandstone ('Gunbatgarri Complex'). The Kombolgie is represented by the fluviatile Gumarrirnbang and Marlgowa Sandstones.

Stratigraphically, these sandstone formations are located at the top of the Kombolgie Subgroup. Depth to the unconformity from the top of the Marlgowa Sandstone on the Milingimbi sheet area is estimated to be at least 700 metres as calculated from the measurement of sections through the various sandstone units by the NTGS.

Extrusive volcanic rocks of the Nungbalgarri Volcanics and the Gilruth Volcanic Member are present. The former conformably separates the Mamadawerre (basal member of the Kombolgie) from the Gummarrirnbang while the Gilruth forms a thin lateritised or saprolitic surface separating the latter from the overlying Marlgowa sandstone.

Oenpelli dolerite intrudes both the Nimbuwah Complex and the Kombolgie. Exposures are restricted to linear incised fault traces within the sandstone.

Much of the coastal plains country to the north of the sandstone escarpment is underlain by the Cambrian Wessel Group Buckingham Bay sandstone. Recent cover comprising sands and clay, gravel and cemented ferruginous deposits mostly obscure any outcrop.

## **Regional Structure and Geological History**

The early Proterozoic rocks of the region have been affected by the Top End orogeny (1880 to 1780 Ma), which includes the initial Nimbuwah Event or Barramundi Orogeny at about 1870 Ma. This produced a prograde metamorphic effect with associated tight folding and faulting.

Major regional faults, which affect the early Proterozoic, have northwest (Bulman), north-north-west and northerly (Goomadeer) strikes. Another significant set trends to the east and includes both the Ranger and Beatrice faults.

Dating by AGSO (now Geoscience Australia) has constrained the time of deposition of the mid-Proterozoic Kombolgie Subgroup to between 1822 and 1730 Ma. A significant hiatus existed between the Nungbalgarri volcanic event and deposition of the Gumarrirnbang.

A more intense concentration of structures traverse the mid Proterozoic and younger rocks and include northwest, east, northeast and north trends. Both faulting and jointing with displacements ranging from a few metres up to 100 metres, locally heavily dissect the Kombolgie.

In a regional context, the Gunbatgarri project is located at the northern extent of the McArthur Basin. The tectonic environments that existed during deposition of the Katherine River Group varied, ranging from extension and local basin formation with probable fault-controlled sedimentation, to a basin-wide extensional setting. As noted above the exposed sandstone units illustrate spectacular eroded joint and fault patterns, however the near horizontal to shallow-dipping bedding would imply a tectonically inactive post depositional environment.

The widespread Oenpelli Dolerite intrusive event took place at about 1715 Ma.

### **Exploration Target**

The focus of the exploration strategy is the discovery of unconformity-related uranium deposits. The nearby economic deposits at Ranger, Jabiluka, Koongarra and the now depleted Nabarlek Mine serve as models for this strategy. The presence of gold, palladium and platinum in these deposits plus the economic gold-platinum resource at Coronation Hill in the South Alligator Valley, indicates an additional potential for this deposit style.

### **Previous Exploration**

Historically, the region was explored for uranium during the late 1960s and early 1970s by McIntyre Mines. Records are sketchy but it appears that airborne surveys with some limited ground follow-up was carried out. There is no indication that any mineralisation was discovered within the tenement boundaries.

## **EXPLORATION PROGRAM**

During the period October 2001 to mid August 2002 several airborne surveys were flown by Cameco to collect radiometric, magnetic, DTM and hyperspectral data. Interpretation of the magnetics and radiometrics has generated several areas of interest, which have been prioritised according to their geological setting, for follow-up during 2003.

All digital airborne geophysical data has been submitted on a separate CD with this report. In some cases data over culturally sensitive “nogo” zones has been excised from figures in accordance with requests by Traditional Owners. Data from the hyperspectral HyMap MkI survey is currently being processed and interpreted by Cameco Corporation Geoscientists in Canada. Consequently, this data will be submitted to the NTGS with the next annual report.

### **Geophysical Surveys Location Map**

#### **Airborne Magnetics, Radiometrics and DTM**

UTS Geophysics of Perth conducted two separate airborne magnetic/radiometric/DTM surveys over the project area. The initial survey, flown between 14 and 28 October 2001, covered 1623 line kilometres. The second, in late July 2002, covered an additional 683 line kilometres over ground that was previously excluded from exploration. Survey specifications employed for both surveys were 200 metre spaced flight lines at a flying height of 60m.

Radiometric anomalies appear to have two main associations, as ‘trails’ of anomalous points coincident with mapped outcrops of Gilruth volcanics, and less commonly within the Kombolgie Subgroup (Marlgowa) corresponding to photo lineaments. In two cases there is a spatial relationship with Oenpelli dolerite although there are no apparent anomalies within the dolerite itself. Field checking of these radiometric anomalies will commence in 2003.

The airborne magnetic intensity diminishes to the north-east due to increased Wessel Group sandstone and cover. Elsewhere, the Nungbalgarri Volcanic Member and Oenpelli Dolerite dominate the magnetic response. However, there is no clear magnetic response from the basement Nimbuwah Complex, which outcrops in the south. Several major faults and folds can be interpreted from the magnetic data.

[Airborne Geophysics Logistics Report by UTS – 2001](#)

[Airborne Geophysics Logistics Report by UTS – 2002](#)

[Airborne Magnetism – Total Magnetic Intensity \(TMI\) with 1st Vertical Derivative \(IVD\)](#)

[Airborne Radiometrics – Total Counts \(TC\)](#)

[Airborne Radiometrics – Potassium \(K\)](#)

[Airborne Radiometrics – Uranium \(U\)](#)

[Airborne Radiometrics – Thorium \(Th\)](#)

[Airborne Radiometrics – RGB=U,Th,K](#)

[Airborne DTM – Height with NE Sun Angle](#)

### **Hyperspectral – HyMap Mk1**

On the 7 and 8 of August 2002, a hyperspectral survey was flown over the outcropping Kombolgie Sandstone within the tenement. The survey was conducted by De Beers utilising their HyMap MkI system, an airborne multi-spectral scanning instrument designed to map minerals and identify alteration. Cameco is utilising the instrument as an aid in locating alteration patterns associated with unconformity-style uranium deposits. It is hoped that the system will identify and map variations in clay types in the sandstone such as kaolinite, illite, dickite, halloysite and iron and magnesium chlorites as well as silicification.

Since the HyMap MkI data is still currently being processed and interpreted it will be submitted to the NTGS with the next annual report.

[Airborne Hyperspectral Report by De Beers - 2002](#)

[Summary of Expenditure EL2857 and EL4012](#)

### **WORK PROGRAM**

A summary of the proposed exploration activities, timing and contractors under consideration for Year 2 of the project is tabulated below. Budgeted exploration expenditure for EL2857 is \$44,000 and for EL4012 \$5,000 totalling \$49,000. A further \$26,000 will be expended on DBIRD and NLC costs.

### Location and Scheduling of Activities

<b>Activity</b>	<b>Duration of Activity</b>	<b>Timing</b>	<b>Amount</b>	<b>Approximate Location</b>
Sandstone sampling	7 days	Late May	Maximum 149 samples	Regional coverage
Anomaly Investigation	3 days	Late May	Dependent upon result of investigation	Closer spaced sample collection.

### Listing of On-Site Contractor Requirements

<b>Activity</b>	<b>Equipment</b>	<b>Personnel</b>	<b>Potential Contractor</b>
Sampling and Anomaly Investigation	Helicopter	1	Jayrow Darwin

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