

# Exploration Licences ELs 2505, 2506, 2516, 2517, 7029, 9354

## **Tin Camp Creek – Northern Territory**

## **Annual Report**

# CONFIDENTIAL

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## SUMMARY

Exploration Licences (ELs) 2505, 2506, 2507, 2516, 2517, 7029, and 9354 with a total area of 330.6km<sup>2</sup> form the Tin Camp Creek project located in Arnhem Land about 250km east of Darwin. The ELs were granted on 12 September 1995 for six years and are currently in their second two year extension period and are due to expire on 11 September 2005.

The tenements were explored by a joint venture comprising AFmeco Mining and EXploration Pty Ltd (AFMEX –former operator), SAE Australia Pty Ltd and Cameco Australia Pty Ltd (Cameco Australia). Cameco Australia assumed management of this project following the withdrawal of AFMEX from active uranium exploration in the Northern Territory and the dissolution of the joint venture on 1 March 2003.

Work on the Tin Camp Creek tenements has focused on exploration for unconformity–style uranium deposits and in 2003 has consisted of: -

- Data acquisition, compilation and review
- Helicopter supported reconnaissance and rock chip sampling (n=44).
- Relogging of selected core holes.
- Petrography (n=13)
- Geophysical surveys
  - airborne radiometrics and magnetics at 50m line spacing for a total of 1108 line km over the Gorrunghar, Mordijimuk and Gurrigarri prospect areas located in EL2505 and EL2516.
  - airborne TEMPEST (Time Domain Electromagnetics) over the Algodo prospect area (EL2517 and 9354), the northern part of EL2505, the Caramal Prospect (EL2505) and the south of South Horn (EL2506).
  - $\circ$   $\,$  airborne gravity at 2km spacing over the entire tenement
  - reprocessing of regional radiometric data (in progress).

Activity	Timing	Details	Location
Airborne Magnetic + Radiometric Geophysical survey	Late Sept	50m line spacing 1108 line Km.	Mordijimuk-Gorrunghar, Gurrigarri
TEMPEST airborne survey	1-5 Nov	688 line Km.	Algodo (Els2517, 9354), Caramal (EL2505), South Horn (EL2506), Part EL2505.
Gravity	Mid August	2km line spacing	NW Arnhem Land
Airborne magnetic and radiometric survey (reprocessing to remove noise)	Dec 2003	200m line spacing	Entire tenements
Outcrop Sampling	Sept	44 geochemical samples	Known prospects, radiometric anomalies.
Prospecting / Geological reconnaissance	August – Sept	13 Petrography	Old prospects, accessible outcrop, core

There is anomalous uranium (U:Th>2:1) in four of the rock chip samples with a best result of 709ppm  $U_3O_8$  in TC03C10081 from altered amphibolite at Mordijimuk (plus 193ppm Cu, 171ppm Pb and 502ppm Zn). Other anomalous samples are from Gurrigarri from the newly discovered 'hotspot' located ~300m from previous work (51ppm  $U_3O_8$  plus 150ppm Cu), Gibbon (57ppm  $U_3O_8$ ), and 74ppm  $U_3O_8$  from altered Oenpelli Dolerite at Algodo. Geochemistry shows that a hematite-chlorite altered 'hotspot' on the eroded access track to Caramal is thorium dominant. Petrography shows that the high thorium (max 2450ppm) and uranium (max 104ppm) in altered thorium rich samples from Caramal is detrital and is associated with up to 5% monazite in heavy mineral bands. There was no observed reason for the high zinc (up to 1050ppm) in the same samples, and the zinc is interpreted to be in chlorite or iron oxide minerals. Petrography also shows alteration (phengite?) associated with the Bulman Fault in the Algodo prospect area.

The detailed magnetic-radiometric survey has highlighted several subtle anomalies that have not been field checked. Lineaments evident in the magnetic data will assist with lithological-structural interpretation. Bouger corrected gravity data and results for the TEMPEST survey will not be available until early 2004.

Priority target areas identified for follow-up in 2004 are, Mordijimuk-Gorrunghar-Gurrigarri, NE Myra, Gibbon, Algodo, South Horn south (Z25), Z16, TEMPEST anomaly and Robbies West.

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## **INTRODUCTION**

Exploration Licences (ELs) 2505, 2506, 2516,2517, 7029 and 9354, which form the Tin Camp Creek Project have been explored in joint venture by AFmeco Mining and EXploration Pty Ltd (AFMEX operator), Cameco Australia Pty Ltd (Cameco Australia) and SAE Australia Pty Ltd (SAE). Cameco Australia has assumed management of the Tin Camp Creek Project following the dissolution of the joint venture on 1 March 2003 and withdrawal of AFMEX and SAE from active exploration for uranium in the Northern Territory.

The tenements are located within the Arnhem Land Aboriginal Reserve and are subject to a Consent Deed with the Northern Land Council on behalf of the Traditional Owners.

This report summarizes exploration conducted during 2003 on the tenements.

# LOCATION AND ACCESS

The tenements are located in West Arnhem Land about 250km east of Darwin in the Northern Territory of Australia.

### Location Plan

Access is either by air to the Nabarlek airstrip, which is located about 10km north of the tenements or by road via the Arnhem Highway to Jabiru and then via Cahill's Crossing and unsealed roads to the Myra Base Camp located on Tin Camp Creek. The rugged terrain of the Myra Falls Inlier and flanking sandstone escarpment country is mainly only accessible by helicopter or foot. There are some disused tracks in the northeast parts of the tenement, which have not been upgraded since the withdrawal of AFMEX.

## TENURE

ELs 2505, 2506, 2516, 2517, 7029 and 9354 were granted to Queensland Mines Pty Ltd (QML) on 12 September 1995 for a period of six years. The tenements were acquired by Cameco Australia (49%), SAE (24.5%), AFMEX (24.5%) and West Arnhem Land Corporation Pty Ltd (2%) in February 1998 and explored in joint venture with AFMEX as operator. A two-year extension of the exploration licences was approved by the Mines Department in November 2001. A further two-year extension was approved in August 2003. The tenements cover a total area of 330.6 sq km.

AFMEX and SAE withdrew from the joint venture on 1 March 2003 and Cameco Australia is currently finalizing an agreement to acquire the exploration assets of AFMEX, including their interest in the Tin Camp Creek tenements. Cameco Australia has assumed management and will control 98 % of the project. The remaining 2% remains with the West Arnhem Land Corporation Pty Ltd.

# **REGIONAL AND PROJECT GEOLOGY**

The regional geology of West Arnhem Land has been described in detail in previous reports and only a brief overview is given here.

The oldest rocks exposed in the area are gneisses belonging to the Mount Howship Gneiss of the Kakadu Group of lower Palaeoproterozoic age, which is interpreted to overlie Achaean Nanambu Complex. The Mt Howship Gneiss is overlain by the Kudjumarndi Quartzite, which is one of the main marker horizons in the region.

The psammitic rocks of the Kakadu Group are overlain by the Cahill Formation also of lower Palaeoproterozoic age, which is the host of the uranium ore bodies in the area. The Lower Cahill Formation consists of a basal calcareous unit that is overlain by a sequence of pelitic schists, meta-psammite and amphibolite. A well-defined amphibolitic unit at the top of the Lower Cahill Formation hosts the Nabarlek uranium deposit. The Upper Cahill Formation and Nourlangie Schist consist of a monotonous sequence of meta-psammite, schist and amphibolite.

East and south of the area of the Palaeoproterozoic sediments lie the granitoid rocks of the Nimbuwah Complex. These granitoids were extensively migmatized during the Top End Orogeny, which is dated at about 1800my. The relationship between the Cahill Formation and the Nimbuwah Formation is little known. Limited field observations show the contact to be migmatitic and gradational.

Later post-orogenic Proterozoic granites (1780-1750Ma) such as the Nabarlek and Tin Camp Creek Granites have intruded the metasediments in the east and south of the area.

The upper Palaeoproterozoic Kombolgie Formation overlies the older rocks unconformably. This formation consists of sandstones with a prominent basaltic horizon (Nungbalgarri Volcanic Member), which crops out in the northeast of the tenements. The flat-lying sandstones form the Arnhem Land escarpment.

The Oenpelli Dolerite (1710-1720my) intrudes the early Palaeoproterozoic metasediments and the Kombolgie Formation, and forms large lopolithic bodies. It is the youngest Precambrian rock cropping out in the area.

Regional Geology

### **PREVIOUS WORK**

### **Queensland Mines Ltd, Pre-1995**

QML previously explored the area in the early 1970s as apart of exploration around the Nabarlek deposit. During this time the Caramal deposit was discovered and tested with 27 core holes. A sub-economic resource of ~700t of  $U_3O_8$  was outlined at a 0.1% cut-off. Other exploration is poorly documented, but other prospects tested at this time were: -

- Anomaly 12 where trenching and rock chip sampling revealed up to 2000ppm U, 650ppm Cu and 1400ppm Pb. Mineralization is hosted within a hematite-quartz-sericite breccia extending up to 4km north-south along strike and in adjacent schists.
- Gorrunghar, where up to  $3.9 \text{m} @ 0.61\% \text{ U}_3 \text{O}_8$  in quartz-mica schist was obtained from 1.9m depth in a percussion hole. Six holes were drilled in an area of 100 x 150m but it was concluded the mineralization was supergene and no further work was conducted.
- Gurrigarri. Three trenches were excavated in chlorite-muscovite altered amphibolite (results not in available documents).
- Mordijimuk. Five costeans were excavated in weakly altered amphibolite and schist (results not in available documents). Two percussion holes were drilled, but no uranium mineralisation or significant alteration was intersected. Drill logs and analytical results are the only documentation of this prospect available: drill holes locations are only available in local co-ordinates and the local grid is not georeferenced.

### Uranerz 1987-1991

Some work was carried out in the area between covered by present tenement EL7029 in the period 1987 to 1989 by Uranerz as part of the program on former exploration licence EL3418 in the Myra Falls area. Uranerz drilled 53 RAB holes on the south side of a major east-northeast trending fault associated with radon springs. Several holes intersected weakly anomalous uranium to a maximum of 25ppm.

### AFMEX, 1995 - 2002

No exploration was carried out in the remainder of the tenement area from September 1973 until September 1995 when the present tenements were granted to QML.

An airborne geophysical survey was flown over the tenements in 1996. Dighem, radiometric and magnetic data were acquired. A series of radiometric anomalies were delineated in the South Horn area and some shallow conductors were outlined elsewhere in the tenements.

Stream sediment surveys were conducted through much of the tenements in 1996, 1997 and 1998 apart from the sandstone plateau country. These data should be treated with caution as

• there are undocumented reports that samples were sieved at the Myra base Camp where there was potential for contamination from numerous sources including

drilling of mineralization at Caramal and South Horn which took place at the same time

- It was permitted to collect over-bank deposits where there was insufficient sediment in the stream and
- locational errors identified in early follow-up.

Reconnaissance was conducted over an estimated 75% of the identified radiometric anomalies, some of which were investigated as part of follow-up of stream sediment anomalies: about 60 rock chip samples were collected. Prospect areas within the current tenements identified as part of this work (including further follow-up at QML prospects) are: -

## Prospect and Anomaly Location

- Robbies: up to 110ppm U and 240ppm Cu in rock chips from hematitic quartzite, located near the eastern edge of the EL2505 sub-blocks outlier (although the rock chip location is not documented in the data).
- Gibbon: up to 32ppm U in north-south trending quartz-hematite breccias, along the interpreted trace of the Kyber Pass Fault about 2km northwest of Caramal. There are several stream-sediment anomalies in this area of up to 9.6ppm U.
- Jacobs: up to 300cps was obtained from a lateritic veneer developed near a quartzite ridge interpreted to be in a similar stratigraphic position to Gorrunghar. However due to proximity to an airstrip belonging to one of the TOs, no further work was conducted.
- Gurrigarri: up to 680ppm U, 170ppb Au, 2000ppm P and 550ppm Cu in reconnaissance rock chips associated with chlorite-white mica altered amphibolite marginal to a quartz-breccia ridge.
- Gorrunghar and Mordijimuk: the only work conducted was minor reconnaissance as they were within a restricted area until 1998 as there was a proposal to build an outstation in the area.
- Anomaly 12: previous anomalies were confirmed, however it was concluded the structure (and mineralization) was pre-sandstone and little further interest. A single hole was drilled (SHW001) to test a geophysical target where the interpreted strike extension of the north-south structure intersects a north-northwest structure. The hole intersected brecciation in the sandstone and basement but no radioactivity.
- EM anomaly 11/12 and Anomaly 6 in EL2516. Ground EM was conducted at EM anomalies identified in DIGHEM data. Soil surveys designed to test EM anomaly 11/12 and to follow-up stream sediment anomalies were conducted in 1999. Minor base-metal anomalies were detected at Anomaly 11/12.
- Razorback gold prospect was identified from follow-up of gold in stream anomalies. Up to 300ppb Au was outlined in soils and up to 1.4g/t Au (plus anomalous copper) was obtained from rock-chips of malachite stained quartz-muscovite-biotite schist.
- South Horn was the main prospect identified from radiometric data. RAB drilling was conducted initially to test South Horn
- Gorrunghar West was identified in a rim flight. Field reconnaissance did not locate any anomalies. RAB drilling was conducted but there was no anomalous uranium. (Examination of available data indicates the drilling was too far south

to test an anomaly located at the unconformity near the northern boundary of EL2516).

RAB drilling was also conducted along the Tin Camp Creek to the south of Gorrunghar and Gurrigarri. The drilling was conducted mainly to map the extent of prospective Lower Cahill Formation lithologies in this area with extensive Quaternary cover. The drilling shows that quartz-muscovite schists and amphibolitic units of interpreted Lower Cahill plus Oenpelli Dolerite dominate in this area. There are no uranium anomalies.

Conventional RC/core drilling and helicopter supported core drilling mainly focused on the South Horn and Caramal prospects with little work elsewhere.

# Field Stations 2003, Drill Holes

- Caramal (27 holes). Drilling traced the mineralization to the northeast under sandstone cover, but no new resources were found. The mineralization is hosted within chlorite-sericite-hematite altered psammopelite and psammite of the Lower Cahill Formation near contacts to Oenpelli Dolerite.
- South Horn (32 holes). Drilling intersected Uranium mineralized intervals of up to 1% uranium over 6m in SHD-04 and narrower intervals of up to 1.4g/t Au. The mineralization occurs as uraninite and brannerite and is hosted within altered dolerite in quartz veins with accessory sulfides (dominantly chalcopyrite and molybdenite). There is a selvedge of uranium minerals on the edge of the quartz and hematite sericite alteration extending up to 3cm from the vein. Chlorite alteration and alteration of titaniferous magnetite to leucoxene extends several metres from the veins. The mineralization lacks continuity and no new uranium deposits were discovered. There is also minor anomalous uranium in garnet and graphite bearing schist in the south of the prospect area. Four holes were also drilled to test geophysical targets to the west of South Horn with negative results.
- Algodo (six holes). Three holes are to the west of the present tenement area and intersected unaltered banded amphibolite. There was no significant uranium in the three holes drilled within the present tenement area, which intersected interpreted Nourlangie Schist. One of these holes (ALG-04) was drilled near the northwest trending Bulman Fault and the other two were drilled near the east-west trending Beatrice Fault. It appears that none of the holes tested the target structures. Minor alteration was intersected in ALG 04 near the unconformity.
- Gurrigarri. A single hole was drilled near the old trenches. Due to rugged terrain the hole was not sited in the optimum position to test the target (not specified). There was a best intercept of 0.05m @ 0.51% U.
- NE Myra. A single hole was drilled to test a subtle radiometric anomaly near the east- northeast tending NE Myra Fault. The hole was collared on sandstone 100m to the north of the fault and drilled at 340° away from the fault. The hole intersected extensive silicification-desilicification and chlorite alteration in the sandstone and moderated to strong hematite-chlorite alteration in mostly psammitic rocks below the unconformity, which is at 264m. There is +200m vertical displacement, (north side down) on the east-northeast structure. The drill hole did not test the major east-northeast structure.

• EM anomaly in the western part of EL2516. A single hole was drilled targeting EM anomaly 11/12 which had been confirmed by a TEMPEST survey conducted in 2001. The drilling intersected sulfidic metasediments, confirmed in petrography to be similar to those at Two Rocks. Analytical results show up to 1330ppm Zn and 536ppm Cu, but no anomalous uranium. The sediments locally contain trace graphite, and unaltered staurolite bearing schist was intersected at the end of the hole.

In 2001 a detailed airborne magnetic and radiometric survey was flown above part of Els 2505 and 7029. This survey targeted the northwest tending structural corridor which hosts the Nabarlek uranium mine to the northwest of the survey area. TEMPEST surveys were also flown over the South Horn area, EM Anomaly 11/12 and the northeastern part of EL2505. This survey successfully delineated the EM conductor and the unconformable horizon in the South Horn area, but was unsuccessful in EL2505 in determining the depth to basement.

Several ground-based geophysical surveys were conducted primarily over the Caramal and South Horn Prospect areas. These included Protem, nanoTEM, Max-min, CSAMT and gravity. Other work at South Horn included regional outcrop sandstone sampling and PIMA studies at South Horn, Caramal and NE Myra.

Previous work is described in detail in Annual Reports submitted to DBIRD by AFMEX as listed in the Bibliography.

## WORK COMPLETED 2003

Work in 2003 comprised: -

- Data acquisition, data entry, compilation, digitizing and evaluation of the extensive work conducted by QML and subsequently AFMEX. There were several problems with locating and acquiring all the old QML data, and final data were only obtained in October 2003. Much of the work is documented in a series of prospect files rather than comprehensive Annual Reports and it has not yet been ascertained how complete the data set is. The only historical data incorporated into the AFMEX database was the drilling at Caramal. Digital surface sample and RAB data sets for work conducted by AFMEX are also incomplete. A lot of data-entry, recoding and other data-base work was required to manipulate available digital data into a format compatible with the Cameco database.
- Reconnaissance of known prospects and selected anomalies and examination of selected core holes. This was conducted to provide familiarization with the style(s) of mineralization and nature of alteration in the project area in order to assist targeting
- Airborne geophysical surveys, over selected areas designed to supplement the 2003 field work and assist with target generation during 2004.
  - UTS Geophysics Pty Ltd (UTS) undertook a detailed airborne magnetic, radiometric and DTM survey over the Mordijimuk area.
  - Fugro Airborne Surveys Pty Ltd (Fugro) undertook an airborne electromagnetic TEMPEST survey over selected parts of the tenements. At the time of writing the final TEMPEST data has not been received from the contractor and consequently will be included in the next annual report.
  - Regional airborne gravity at 2km line spacing.

• Acquisition of digital radiometric data from the 1996 survey for reprocessing.

### Airborne Geophysics Location Map

All digital data have been submitted on CD with this report. In some cases data over culturally sensitive "NoGo" zones have been excised from figures and data in accordance with requests by Traditional Owners.

### Geophysics

### Detailed magnetic-radiometric survey

A detailed airborne magnetic, radiometric and DTM survey was undertaken by UTS Geophysics Pty Ltd (UTS). The survey was flown at 50 m line spacing and 30 m flying height, totalled 1108 line kilometres. The survey was designed to further delineate the geophysical response at the Mordijimuk / Gorrunghar / Gurrigarri prospects and to identify further radiometric anomalies for follow-up.

## Airborne Geophysics Logistics Report by UTS

2003 UTS Radiometrics with Historical Anomalies and Geology 2003 UTS Geophysics Data

## TEMPEST Survey

The TEMPEST survey was conducted in October after the planned HOISTEM survey was abandoned after a series of technical problems with the test lines flown. Lines are a nominal 200m apart and oriented either east-west or north-south depending on orientation of the major target structures in the areas flown. The areas covered by TEMPEST are: -

- EL2505. This is the northern part of the project area and the survey was designed to extend coverage to the north of the conductivity anomaly identified on the north most line of a TEMPEST survey flown in 2001 over the Myra tenement (EL23461) located to the immediate south.
- Caramal. This is effectively an orientation survey to determine the electromagnetic response associated with this sub-economic unconformity style uranium prospect.
- Algodo. These survey lines cover portions of both the Bulman and Beatrice Faults and may assist with delineation of targets under extensive Mamadawerre Sandstone cover
- South Horn. These lines extend coverage to the south of the survey flown by AFMEX in 2001, and cover structures of potential interest to the south of the South Horn prospect.

### Reprocessing of Radiometric data

The project scale Tin Camp Creek airborne radiometric data from the survey flown in 1996 have been acquired and Pitt Research Pty Ltd has commenced reprocessing.

Processing techniques have improved in the time since the survey was flown and it is considered that noise reduction will better resolve subtle anomalies. Reprocessed data will not be available until early 2004 and will be included in the next Annual Report.

### Gravity

During 2003, Fugro Airborne Surveys Pty Ltd flew 4516 line kilometres of regional airborne gravity over northwest Arnhem Land, including the Tin Camp Creek project area. The survey was flown at 2 km line spacing using a Russian-developed GT-1A airborne gravimeter operated by Canadian Micro Gravity Pty Ltd. The survey was jointly funded by Cameco Australia, Geoscience Australia (GA), the Northern Territory Geological Survey (NTGS) and Rio Tinto Exploration Pty Ltd. Final Bouger corrected data will not be available until early 2004. Data for this survey has not been submitted with this report, as it is publicly available through the NTGS.

### **Prospect and Anomaly Reconnaissance**

Prospects and anomalies field checked as part of reconnaissance of the project area are described in the following section. Selected intervals of core from several prospects were also examined to assist in recognition of alteration and possible controls on uranium mineralization. Part of this work was conducted with the assistance of Geological Consultant J Fabray (and former AFMEX employee) who provided an independent assessment of previous work conducted on the tenements and remaining prospectivity.

An Assessment of the Tin Camp Creek Tenements, Arnhem Land, NT

## Prospect and Anomaly Location Map

Selected core holes from Caramal were summarily relogged to determine the nature and possible controls on the mineralization at Caramal.

## Caramal Core

A total of 102 field outcrop stations were visited and data recordings made: photos were taken at selected field stations and are included in a photographic record in this report.

Field Station Descriptions Outcrop Descriptions Field Station Photographic Record Field Station Location Map

A total of 44 rock chips (prefix TC03) were collected from selected stations for geochemical analysis.

### Sample Descriptions

#### **Geochemical** Processing

All samples were sent to NTEL in Darwin and Pine Creek, Northern Territory, for multi-element analysis. In total, four separate methods were used to analyse up to 65 elements and four isotopes as follows.

Rock chip samples are separated into two portions. A ~500g sample is pulverised to a nominal 75 $\mu$ , split and digested using a mixed acid digest (G400, nitric, hydrochloric, perchloric and hydrofluoric with a double dehydration with perchloric acid). The digest is then read for a suite of elements listed in the appendix including total uranium, thorium, lead isotopes chalcophile and rare-earth elements using either ICPMS (G400M) or ICPOES (G400I) depending on the element. A portion of this sample is analysed for Au Pt, Pd using a Fire Assay and an ICPMS or ICPOES finish (either method is suitable). LOI is measured at 1000°C. Boron is measured following peroxide fusion digest. A smaller portion of this rock sample (<~100g) is coarsely crushed on site and put in a vial. At NTEL the sample is crushed to a nominal 1mm and subject to a weak acid digest (Method G950), which is a dilute nitric acid digest. The sample is then read using ICPMS for labile uranium and lead isotopes.

### Outcrop Sample Geochemistry Results

Fracture samples (WAL or weak acid leach samples) are analysed to test for weakly bonded labile uranium, lead isotopes derived from the decay of radioactive elements and other elements listed in the attached appendix. Samples consist of a vial of <~100g rock coarsely crushed on site as described above. The sample is crushed to a nominal 1mm at NTEL and then subject to a weak acid leach which is a dilute nitric acid solution. Elements are read either using ICPMS (G950M) or ICPOES (G950I) depending on the element.

## Outcrop Fracture (WAL) Sample Geochemistry Results

## <u>PIMA (Reflectance Spectroscopy)</u>

Reflectance spectroscopy (PIMA) analysis was completed using the PIMA II shortwave infrared spectrometer on all samples collected. This instrument measures the reflected energy from a sample in the short wave infrared (SWIR) region of the energy spectrum. The sampling area on the rock specimen that is measured is permanently marked. Multiple measurements are taken on occasions, particularly if variations in spectral features are noted. The spectra are converted to an ASCII format and processed using "The Spectral Geologist" (TSG) developed by AusSpec International, and a Cameco in-house software program called Minspec. TSG is routinely used to process all spectral data. The SWIR spectra, once processed, provide a mineral identification utilising internal software pattern matching algorithms called "The Spectral Assistant" (TSA).

The spectra for samples collected in 2003 have not yet been processed using TSG due to inconsistencies noted recently in mineral identification between the PIMA

and petrography. The samples will be processed once the reason for the discrepancies is resolved. Unprocessed spectra are included as .fos files in the Data Folder.

#### Petrography

Forty of the geochemical samples were submitted for thin sectioning and petrographic descriptions were supplied for two of these samples. A further 11 core samples were submitted for petrography.

#### Petrographic Report

#### **DISCUSSION OF RESULTS**

#### Geophysics

#### Detailed magnetic-radiometric survey Mordijimuk-Gorrunghar-Gurrigarri

Pre-existing subtle anomalies are enhanced in the new data and several subtle radiometric anomalies have been identified that do not appear to have been previously field checked. Although most of these anomalies are within the basement, at least one is within the sandstone east of Mordijimuk and is regarded as a high priority. The Oenpelli Dolerite dominates the magnetic response in the northwest of the survey. Elsewhere, subtle magnetic features (<2 nT) are likely to relate to the Zamu Dolerite. Several magnetic lineaments are present in the new data and may assist with litho-structural interpretation and understanding the controls on some of the known prospects and uranium anomalies.

The 2003 detailed magnetic and radiometric survey will be used to determine new radiometric anomalies for follow up, refinement of known geology and target definition during 2004.

#### **Prospect and Anomaly Evaluation**

#### South Horn

The South Horn radiometric anomalies identified in 1996 have been comprehensively tested by 32 RC/core holes and extensive RAB drilling. There appears little remaining potential in the area drill tested for an economic uranium resource. Mineralization discovered to date is hosted within discontinuous quartz veins in dolerite. However, there are some uranium anomalies in basement, which is locally garnetiferous and graphitic and interpreted to be part of the Lower Cahill Formation. A weakly mineralized interval from SHD-32 is described in the petrographic report. These anomalies are in the south of the prospect area. Some of the better uranium anomalies from the 1996-1997 stream-sediment sampling are also in this area and upstream of the main South Horn prospect. Due to the focus on drill testing strong radiometric anomalies, which are almost entirely associated with dolerite subcrop, potential remains in the area for concealed deposits; again most potential is considered to be to the south in the vicinity of the Beatrice and Kyber Pass Faults or sub-parallel structures. Two areas investigated as part of the 2003 program are described in the following sections.

### <u>Z24</u>

This target was identified by Zaluski and Matthews (1998) as part of an assessment of the Tin Camp Creek project for Cameco. It lies on the strike extension to the south of the Kyber Pass Fault. The target is mostly outside the current tenement boundary. Reconnaissance on the northern end of the target area and along the interpreted trace of the fault to the south revealed little of interest. Subtle radiometric anomalies appear to be associated with windows of unaltered Nimbuwah Complex (and possible Mt Howship Gneiss) in thin cover.

### <u>Z25</u>

This target was identified by Zaluski and Matthews (1998) at the intersection of the Beatrice Fault, a major northwest structure and a north-northwest structure subparallel to the Kyber Pass Fault. The Plateau Prospect occurs on the Kyber Pass structure about 2km south of the fault intersection. There are several subtle radiometric anomalies along the Beatrice Fault in this area the strongest ones being near the tenement boundary on the southwest. Reconnaissance conducted by AFMEX in the area of the strongest anomaly identified up to 65ppm  $eU_3O_8$  in sandstone with a lateritic film. Further reconnaissance in 2003 identified up to 980cps (Urtec) in sandstone that is strongly tilted to the east (up to 35°) on the immediate west and south of the intersection of the Kyber Pass and Beatrice Faults respectively. However, there were no uranium anomalies in the limited sampling undertaken with a best result of 34ppm U<sub>3</sub>O<sub>8</sub> and 17ppm Th in TC03C10080 from a ferruginous flat lying breccia on the western edge of the Beatrice Fault. However, there are several Au, Pt and Pd anomalies in samples TC030076, 77, 78, and 80 from this area to maxima of 23ppb, 17.5ppb and 5ppb each. These are the highest values of these elements in the 2003 sampling program. TEMPEST conducted over this area in late 2003 may assist target definition.

The origin of an area of bleached silicified volcanic rock scree on sandstone outcrop about 300m north of the Beatrice Fault in this target area is problematic. Petrography indicates the rock is probably basaltic, however the nearest Nungbalgarri Volcanics are ~10km distant. Inferred Edith River Volcanics have been mapped about 2km to the southwest near the Beatrice Fault.

### <u>Caramal</u>

Limited potential remains at the main Caramal prospect for additional mineralization in an orientation other than that tested by drilling (which all targeted a dominantly 070° trending ore-body.) There are several north-northwest structures (Kyber Pass orientation) mapped in the area and it is possible mineralization also has this orientation. However there is potential for only modest additional resources within the existing drill pattern, and these do not currently constitute a viable target.

Other radiometric anomalies in the vicinity of the Caramal deposit, mainly to the west are associated with strongly chlorite –hematite altered psammitic to psammopelitic rocks, interlayered with quartzite. Geochemistry shows these anomalies are strongly thorium dominant. There is a correlation between anomalous zinc and thorium in some of these samples. There was conjecture that the thorium-zinc may form a halo around the uranium mineralization. Petrography of an intensely chlorite-hematite altered interval in CA-54 at 286.3m with 2360ppm Th, 101ppm U and 854ppm Zn shows that relic detrital heavy minerals including monazite are abundant in this sample and can account for all the thorium and uranium. There is no obvious explanation for the high zinc and it is inferred it occurs in chlorite or opaque oxides. A single sample collected from an isolated anomalous area to the east of Caramal (TC030011) shows Th>>U with up to 3300cps (Urtec) measured from the sample locality in clay altered psammopelitic gneiss-schist with sub-horizontal foliation sub-conformable with the overlying sandstone.

### <u>Algodo</u>

Reconnaissance of the Algodo tenements confirms that the northwest trending Bulman fault is not coincident with the East Alligator River valley and is located about 1.5km to the southwest. The fault is evident in the Mamadawerre Sandstone outcrop as a quartz breccia up to 10m wide. There is no anomalous radioactivity and no uranium in the single sample collected (TC03C10070). Only about 1km of this structure is available for exploration due to 'NoGo' zones in the area. A single hole (ALG-004) drilled by AFMEX to the northwest intersected minor alteration at the unconformity. Another hole (ERR-01) drilled by AFMEX to the northwest outside EL2517 also targeted the Bulman Fault. This hole intersected intense white mica development and some chlorite below the unconformity and strongly hematitic possible epiclastic rocks of the Edith River Volcanics. Petrography show that although much of the white-mica is metamorphic in origin some is hydrothermal (possibly phengitic) and shows evidence for strong hydrothermal fluid flow. There is no anomalous uranium in the drill hole.

The east-west trending Beatrice Fault extends through the project area almost coincident with the tenement boundary between EL2517 and EL9354. There is no evidence for a fault as shown in regional mapping in the northwest fracture located about 1km north of this. A sample (TC03C10074) of dolerite subcrop collected from within the fault zone has 74ppm  $U_3O_8$ . The dolerite appears to be associated with a northeast structure. Two holes (ALG002 and 003) drilled to test the Beatrice Fault a short distance west of this locality failed to intersect any uranium or any alteration. The location and azimuth of these drill holes need to be reconciled with all other available data to determine if targets in the area have been adequately tested.

## Gorrunghar - Gurrigarri - Mordijimuk

Collectively these prospects define a series of outcropping radiometric anomalies in basement with geological and structural elements in common, associated with highly anomalous uranium of up to  $3.66m @ 0.61\% U_3O_8$  which may be indicative of concealed uranium mineralization in the vicinity. All prospects are in lower Cahill Formation lithologies mostly comprising quartz-mica schists and amphibolite of inferred Zamu Dolerite. There is a strong northeast fabric evident in remote imagery throughout the area and which extends to Nabarlek to the northeast. The dolerite unit, which outcrops to the north of Mordijimuk and Gorrunghar, can also be traced to the northeast to Nabarlek. There are several major north-northwest (Kyber Pass orientation) lineaments (faults?) in the sandstone in this area. This orientation is the D3 orientation interpreted to be co-eval with uranium mineralization in Arnhem Land. There are some subtle radiometric anomalies in sandstone associated with one of these structures to the north-northeast of Gurrigarri near the northern boundary of EL2505.

Highest uranium anomalies in the 2003 sampling reconnaissance program are from the Mordijimuk and Gurrigarri Prospects. There is 709ppm  $U_3O_8$  from chloritehematite-white mica altered amphibolite (TC03C10081) at Mordijimuk and 51ppm  $U_3O_8$  (TC03C10086) in a veneer of lateritic material from a newly discovered 'hotspot' ~300m northeast of the main Gurrigarri prospect. There is also anomalous copper to 193ppm in both these samples and anomalous zinc (502ppm) from Mordijimuk. A series of subtle radiometric anomalies along the unconformity for about 4km to the southeast of Gurrigarri were checked as part of the 2003 program. Little of interest was noted and the anomalies appeared to be associated with basement windows in the extensive sandstone scree, although one extensive area of basement outcrop was not associated with an anomaly.

No samples were collected in the brief visit to Gorrunghar. At Gorrunghar there is a north-south trending quartz breccia with polymict basement fragments. A trench adjacent to the breccia shows moderate chlorite-white mica alteration in quartz schist. Generally little alteration was noted in the quartz-mica-(chlorite) schists that dominate this prospect area. Foliation in the schists mostly dips gently to moderately to the north, however microfolding and crenulation cleavage was noted in some areas of subcrop. Graphite was also noted in the schist in two localities to the immediate south and east of the trench. The radiometric response was generally background apart from isolated hotspots in small pits in a veneer of lateritic material developed locally. The  $3.66m @ 0.61\% U_3O_8$  intersected in previous drilling (to the south of the trench) although attributed to supergene enrichment is nevertheless significant and the possibility of blind mineralization at depth has never been tested.

### <u>NE Myra</u>

Field reconnaissance confirmed alteration and deformation in the sandstone in this area as noted previously by AFMEX. This prospect area has a similar structural setting to Caramal (i.e. the intersection of east-west faults and the Kyber Pass Fault), but has never been effectively drill tested. The single hole drilled by AFMEX was

located to the north of the east-northeast trending structure and drilled to the north. This hole intersected hematite chlorite alteration but no uranium. There is up to 25ppm uranium in RAB holes drilled by Uranerz in weathered basement to the south of the fault, which is evident as radiometrically anomalous black soils with radon springs. There is conjecture about the style of the east-northeast fault, which has +200m vertical displacement. AFMEX interpreted it as a reverse fault dipping to the south.

#### Anomaly 12

There are no anomalies in rock chips collected in 2003, however the northern part of this prospect, which is outside the current tenements, was not investigated as part of the 2003 work. There is no evidence for alteration or deformation in the sandstone in the south part of the prospect area.

#### Gibbon

The original Gibbon prospect located by AFMEX is located near the interpreted trace of the Kyber Pass fault about 2km to the northwest of Caramal. A larger area of semi-coincident radiometric and stream sediment anomalies broadly associated with the intersection of a major east-west structure and the Kyber Pass Fault was investigated as part of the 2003 program. AFMEX attributed many of the anomalies to Tin Camp Granite shown along the east-west structure in regional mapping. Rock types observed in this area are dominantly gneissic (Mt Howship Gneiss?) and include fleck migmatite. Psammitic rocks similar to those at Caramal and minor quartzite (Kudjumarndi Quartzite) were also observed. Only minor outcrop of Tin Camp Granite was observed, and it is not as extensive as shown on regional maps. Clay weathered basement rocks with a subhorizontal foliation are immediately below the unconformity in all localities observed. There is anomalous uranium in one of the samples collected (TC03C10014), of 57ppm U<sub>3</sub>O<sub>8</sub>. The sample consists of a subvertical ferruginous quartz vein up to 2cm thick trending 025°, from within sub-horizontal clay altered psammite interlayered with quartzite.

## TEMPEST Anomaly

A conductivity anomaly immediately below the unconformity was recognized at ~316,000E in EL2505 just to the north of the Myra tenement (EL23461) boundary from a TEMPEST survey flown over Myra in 2002. The anomaly is evident in the three north most lines of the survey. The anomaly is coincident with a major north-northwest lineament in the sandstone and to the immediate south of a major east-northeast fault in sandstone evident as subtle radiometric anomalies associated with black soils. Field reconnaissance revealed little of interest in the area. The trace of the TEMPEST feature is along a soil covered valley in sandstone. There is no evidence of any alteration or deformation in the adjacent sandstone. There are no uranium anomalies in the two sandstone samples collected. Preliminary TEMPEST data from the 2003 survey indicate the conductivity feature dips moderately to the east and may have a stratigraphic basement control.

This target area was recognized by Zaluski and Matthews (1998). It consists of a northeast trending radiometric anomaly extending through the single EL2505 subblock into EL2516. Quartzite ridges in the area are interpreted to be thrust controlled (NW vergence). AFMEX conducted ground EM over a conductor (Anomaly 6) located near the boundary between Els 2505 and 2516 in this target area. Details of this survey cannot be located, however there is reportedly a coincident conductor-magnetic feature. No further follow-up was conducted. Field reconnaissance shows that there is no evidence for Oenpelli Dolerite as shown in 1:100,00 mapping of the area. AFMEX interpreted the radiometric anomalies to be due to radon springs and black soils but there is no evidence for this either. The area is dominated by subcropping to outcropping quartzite (quartz-muscovite +/- biotite +/- garnet schist), which is locally cobbly. The quartzite has a consistent dip of 15-25° to the southeast. The source of the uranium radiometric anomalies was not identified with highest scintillometer (Urtec) readings of ~200-300cps. The single sample (TC03C10044) collected (460cps) is of hematitic quartzite with a ferruginous irregular fracture and contains no anomalous uranium, but has 20ppm Cu which is weakly anomalous.

### EM

A single hole drilled by AFMEX to test a conductor in the western part of EL2516 intersected significant sulfides (percentage not documented) with up to 536ppm Cu and 1330ppm Zn plus arsenopyrite, pyrite and pyrrhotite but no uranium. The hole was collared to the north of and topographically below a ridge of south dipping quartzite, in the core of an interpreted anticline. The stratigraphy intersected was thus interpreted to be part of the Mt Howship Gneiss. The rock types intersected are dominantly schistose locally garnetiferous psammite, psammopelite and minor amphibolite, with unaltered staurolite bearing schist at the end of the hole. Minor graphite is also present in one interval. Petrography shows the rock types are similar to those at Two Rocks, which is interpreted to be part of the EM target there are also several radiometric anomalies in this area that have not been followed up.

### Robbies West

No field reconnaissance was conducted in this area in 2003 as the location of the original Robbies rock chip uranium anomaly (110ppm) is not documented, but is probably to the east of the present tenement boundary. The locality is of interest as despite the absence of radiometric or stream sediment anomalies it is in a structurally favourable location. The major east-west Caramal fault extends through the area coincident with the unconformity contact between sandstone to the south and basement to the north. There is also a major north-northwest lineament (fault?) in the area.

<u>Z16</u>

Razorback (Au)

Up to 1.4g/t Au has been obtained in rock chips and 300ppb Au in soils in this prospect area. The gold is associated with anomalous copper but there is no uranium. The anomalies are associated with quartz-muscovite-biotite schist located topographically below a ridge of quartzite. There is also a north-northwest trending quartz breccia and the gold occurs in basement rocks adjacent to this; the breccia itself has a maximum of 0.18g/t Au. Exposure is reasonably good in this prospect area with thin colluvial soils developed on a relatively steep scree slope with common subcrop. Potential for a significant gold ore body given the low-order of results to date appears low in the known prospect area.

The host stratigraphy here appears to be lithologically part of the Lower Cahill, but due to the topographic relationship with the quartzite it has been considered to be Mt Howship Gneiss. This apparent stratigraphic relationship is also seen at EM and at Two Rocks. The favoured interpretation is that the rigid, brittle quartzite has been thrust over the more ductile Cahill Formation rocks, in these parts of the Myra Falls Inlier. Alternatively the regional mapping in this part of the Myra Falls Inlier requires revision and the quartzite that forms an obvious outcrop pattern but is generally less than about 3m thick is a minor unit within the Cahill Formation.

# **EXPENDITURE**

Eligible expenditure on the Tin Camp Creek project in 2003 was AUD\$310, 053.

**Expenditure Statement** 

# CONCLUSIONS AND RECOMMENDATIONS

Work completed during 2003 has shown that due to the focus on exploration at South Horn and Caramal since 1995 there are several pre-existing and newly recognized target areas within the Tin Camp Creek tenements that have not been systematically tested and potential remains for significant uranium mineralization. Main areas identified for follow-up in approximate order of priority are: -

# Mordijimuk-Gorrunghar-Gurrigarri.

These former QML prospects located in outcropping basement with known uranium and several untested radiometric anomalies are located within a 2km radius have several features in common and are better considered collectively rather than as isolated anomalies. There is potential for blind mineralisation associated with the known uranium at surface. However, these anomalies may also be an indicator of concealed uranium below sandstone in the area. Further interpretation of new data and anomaly reconnaissance and sampling is required. However, the present preferred target area is located to the east of Mordijimuk and north of Gurrigarri and is evident as subtle radiometric anomalies in sandstone associated with a major north-northwest lineament. The radiometric anomalies to the southeast of Gurrigarri need to be ground checked using the new radiometric data to better locate the anomalies. The radiometric anomaly located by AFMEX on the edge of the escarpment in a rim flight west of Gorrunghar needs to be field checked. Initial follow-up by AFMEX failed to locate the source of the anomaly, however given renewed interest in this area further work is justified. (The rim flight data cannot be located, however the approximate position of this anomaly is known).

## NE Myra.

A major east-northeast structure with +200m vertical displacement associated with radon springs and up to 25ppm uranium in previous RAB drilling has never been drill tested, although one core hole near by did intersect chlorite-hematite alteration. There is  $\sim$ 7km strike extent of this structure in the tenements. This structure should be tested with at least two holes drilled to the north from the south side of the fault. This target area can be accessed from old tracks using conventional drill rigs.

## Z25

Previous work at South Horn focused on drill testing of outcropping radiometric anomalies, which are almost exclusively associated with dolerite. There is some scope to reinterpret existing drill data and define a small resource in the areas drill tested however potential for a large deposit here appears limited. There is some remaining potential primarily to the south for mineralization concealed by sandstone and possibly hosted within basement (garnet and graphite bearing schist) rather than dolerite. Despite disappointing results in a limited amount of surface sampling in 2003 a location about two kilometres south of the main South Horn prospect near the intersection of the Beatrice Fault, a major north-northwest structure (Kyber Pass Fault?) and a northwest lineament is a favoured target area. This locality is also 2km north on strike of the Plateau prospect located on the north-northwest structure. TEMPEST data may assist with more precise targeting in this area. Helicopter supported drilling will be required to test this locality.

## Algodo

There are two main target areas in this prospect area, which has extensive Mamadawerre Sandstone cover. New TEMPEST data may assist with target definition. The priority target is the northwest trending Bulman Fault. A 1km long portion of this structure is available to exploration (next to 'NoGo' zones). There is evidence for hydrothermal alteration (phengitic mica? hematite and chlorite) near the unconformity in two holes drilled to test this structure up to 4km to the northwest. There is no evidence for radioactivity associated with the surface trace of the fault, which is evident as a quartz breccia in sandstone. The east-west trending Beatrice Fault has a ~1km portion available for exploration. Two previous holes drilled in this area did not intersect any uranium anomalies or any alteration: they also did not test the major fault structure. A single rock chip collected in 2003 from dolerite subcrop at the intersection of the Beatrice fault with an interpreted northeast structure has 74ppm U<sub>3</sub>O<sub>8</sub>. The two previous drill holes and their positioning relative to the target structures needs to be reevaluated. A complete absence of alteration in proximity to a uranium-mineralized structure would downgrade this target area. Any drilling in the Algodo area would need to be helicopter assisted.

## Z16.

The source of the strong uranium anomalies evident in radiometric data remains unexplained. A coincident conductor-magnetic feature on the northern end of the target area is also of interest. The possibility of a structural setting comparable to Two Rocks with prospective lower Cahill rocks concealed under a thrust wedge of Kudjumarndi Quartzite is a possibility and requires further field reconnaissance.

## TEMPEST

This conductivity feature under an interpreted 150m of Mamadawerre Sandstone cover, warrants a single drill hole to determine the possibility of a Two Rocks style target. The drilling will also provide valuable information to assist ongoing interpretation of TEMPEST data. A heli-supported drill hole will need to be collared on the deeply incised Kombolgie Sandstone (locating a suitable drill pad could be difficult) and drilled to the west.

### EM

A single hole designed to test a conductivity target in this locality intersected disseminated sulfides and strongly anomalous copper and zinc in a stratigraphic sequence confirmed by petrography to be similar to that at Two Rocks. There was no uranium in this hole however there are several subtle uranium anomalies evident in radiometric data nearby that were not tested by this single hole. The possibility of uranium mineralization similar to that at Two Rocks remains. Field reconnaissance is required.

## **Robbies West**

The intersection of the east-west Caramal structure and a major north-northwest lineament on this south edge of the Myra Falls Inlier maintain interest in this area. There is also 110ppm U plus 240ppm Cu at Robbies to the immediate east. There are no radiometric anomalies, only weak stream sediment anomalies (2.8ppm U) and no specific targets. Field reconnaissance and sampling should be conducted in the vicinity of intersection of the two major structures and along the east-west escarpment where the unconformity may be exposed, to determine any prospectivity in this area. An old track into the area could be upgraded if initial results warrant further follow-up

## Gibbon

No clear targets have been defined but the area remains of interest as the source of many of the anomalies has not been identified. The orientation TEMPEST survey over

Caramal covers part of the major east-west structure central to this large prospect area and may assist target definition.

## Caramal

Surface sampling in 2003 has shown that radiometric anomalies near the main Caramal prospect area are thorium dominant and petrography has confirmed they are detrital in origin. There is limited remaining potential within the present drill pattern, for additional small resources possibly in a north-south orientation. These small targets do not currently warrant follow-up. TEMPEST data may reveal untested targets.

## Anomaly 12

Any further work at this target is better conducted once the tenement to the north (ELA22826), which covers the main part of the target is granted. The precise location and azimuth of SHW-01 should be reconciled with other data to ensure it has tested the interpreted southwest strike extent of this structure and that there are no other targets to the south in the sandstone.

### 2004 WORK PROGRAMME AND PROPOSED BUDGET

Tenement	Expenditure (AUD\$)
EL2505	103,000
EL2506	105,000
EL2516	103,000
EL2517	50,000
EL7029	60,000
EL9354	50,000
TOTAL	471,000

The expenditure covenant for the Tin Camp Creek Project for 2004 is AUD\$471,000.

The proposed budget includes provision for 800m of RAB drilling, 720m of RC 800m of land based core drilling and 1300m of helicopter supported core drilling, as well as geochemistry for reconnaissance outcrop samples.

Extensive drilling is proposed for Mordijimuk-Gorrunghar-Gurrigarri. Most of this area can be accessed from existing tracks but there may be a requirement for helicopter-supported holes if targets are defined in the sandstone. Reconnaissance and sampling is required prior to drilling.

At least two conventional RC/core holes are proposed to test the east-northeast structure at Myra NE.

A single helicopter supported hole is proposed to test the TEMPEST target north of Myra.

Two helicopter-supported holes have been budgeted for Z24 located to the south of South Horn.

Two helicopter supported drill holes are proposed for Algodo, one each for the Bulman and Beatrice Faults, provided that evaluation of previous drilling confirms that the faults have not been adequately tested and if targets can be defined in TEMPEST data.

Reconnaissance, mapping and sampling will be conducted at Z16, EM, Robbies West and Gibbon and any new anomalies identified in interpretation of reprocessed radiometric data.

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