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Summary

Exploration Retention Licence 152 is located in Arnhem Land about 250 kilometres east of Darwin. Exploration was conducted by a joint venture that consists of AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and SAE Australia Pty Ltd.

This final report describes the results of exploration on the tenement.

Two helicopter-assisted drillholes were completed totalling 566m of diamond drilling. Ground EM traverses were completed over four areas within the tenement.

Despite the favourable geology and the presence of minor amounts of primary mineralisation, no significant uranium resource was found within ERL 152. The JV partners have agreed to relinquish the tenement.
1. INTRODUCTION

Exploration Retention Licence (ERL) 152 was explored in joint venture by AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and SAE Australia Pty Ltd.

The tenement is located within the Arnhem Land Aboriginal Reserve and is shown on figure 1.

This final report details the work carried out during the tenure of the ERL.

2. LOCATION AND ACCESS

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

Access is either by air to the Nabarlek airstrip, which is located close to the tenement, or by road via the Arnhem Highway to Jabiru and then via Cahills Crossing and unsealed roads to Nabarlek.

The ERL is partially accessible by 4WD access tracks (opened in 1992 by Queensland Mines Limited), however much of the tenement can be accessed only by helicopter. Exploration is conducted between May and October each year.

3. TENURE

ERL 152 was granted on 20th May 1999 for a period of five years. The tenement was explored in joint venture by AFmeco Mining and EXploration Pty Ltd – operator (25%), Cameco Australia Pty Ltd (50%), and SAE Australia Pty Ltd (25%).
The ERL replaced part of exploration licence (EL) 2508 which expired on 28th June 1998.

4. GEOLOGY

The regional geology of West Arnhem Land has been described in detail in many previous reports and only a brief overview will be given here. The regional geology is shown on figure 2 and a stratigraphic chart is shown on figure 3.

The oldest rocks exposed in the area are gneisses belonging to the Mount Howship Gneiss of the Kakadu Group of lower Palaeoproterozoic age. Further to the west in the Alligator Rivers uranium field, similar rocks overlie the Archaean Nanambu complex. The Kudjumarndi Quartzite, one of the main marker horizons in the region, overlies the Mount Howship Gneiss.

The psammitic rocks of the Kakadu Group are overlain by the Cahill Formation also of lower Palaeoproterozoic age, which is the host of the main uranium ore bodies in the area. The Lower Cahill Formation consists of a basal calcareous unit, which is overlain by a sequence of pelitic schists, meta-arkose 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-arkose, schist and amphibolite.

East and south of the area of the Palaeoproterozoic sediments lie the granitoid rocks of the Nimbuwah Complex. These granitoids are believed to be the result of a major migmatitic event associated with the Top End Orogeny, which is dated at about 1800my. The relationship between the Cahill Formation and the Nimbuwah granitoids is complex. Limited field and core observations show the contact to be gradational and migmatitic in nature.

Later post-orogenic Proterozoic granites (1780-1750 My), such as the Nabarlek and Tin Camp Granites have intruded the meta-sediments in the east of the area.
The upper Palaeoproterozoic Kombolgie Subgroup overlies the older rocks unconformably. This Subgroup consists of sandstones with a prominent basaltic horizon (Nungbalgarri Volcanic Member). These flat-lying sandstones form the Arnhem Land escarpment.

The Oenpelli Dolerite (1700my) intrudes the early Palaeoproterozoic metasediments and the Kombolgie Subgroup, and forms large lopolithic bodies. It is the youngest Precambrian rock known to outcrop in the area.

5. **PREVIOUS WORK**

The ERL covers rugged sandstone escarpment country and contains radiometric anomaly U65. Queensland Mines Ltd discovered this anomaly during an airborne survey conducted in 1988 over EL 2508. Surface exploration was carried out in the area from 1989 until 1997. A track-etch survey in the sandstone outlined radon concentrations close to the airborne anomaly, along N110 faults. The radiometric anomaly is caused by minor primary uranium mineralisation within altered Oenpelli Dolerite and to a lesser extent by uraniferous, gossanous sandstone. The area was initially considered prospective because it was considered to be geologically similar to the Nabarlek deposit. Ten conventional drillholes and three helicopter-assisted drillholes were completed, along with ground geophysical techniques and petrological studies.

Details of the work completed during the tenure of EL 2508 can be found in previous annual reports submitted to the Department of Mines and Energy and in the final report on EL 2508 – areas retained under tenure (Ewington, 1998).

6. **WORK COMPLETED AND RESULTS**

Work completed during the tenure of the ERL included helicopter-assisted diamond drilling and ground geophysics.
6.1 Drilling

Two helicopter-assisted drillholes were completed totalling 566.0 metres (figure 4).

Details of the drillholes can be found in tables 1 and 2. Diamond drillhole logs are presented in appendix A.

All of the holes were probed with a downhole natural gamma tool, manufactured by Auslog Pty Ltd.

Sandstone drillcore was composite sampled over 10 metre lengths and the samples were sent to Ultratrace Pty Ltd to be analysed for Al₂O₃, CaO, Fe₂O₃, K₂O, MgO, Na₂O, TiO₂, P₂O₅, U, Th, As, B, Ni, Pb, V and Zn by ICP-MS/OES. Where the original U value was >2ppm the sample was reanalysed using an aqua-regia digest to get a value for labile uranium (U-AR). The results are shown in table 3.

XRD and PIMA clay mineralogical analyses were conducted on sandstone core at regular intervals and the results are shown in tables 4 and 5, respectively. The PIMA tool and sampling technique has been described in previous reports submitted to the Department of Mines and Energy.

Some samples of drillcore were sent for petrographic study and the descriptions are presented in appendix B.

6.1.1 Drillhole U65-4

Drillhole U65-4 was designed to test a major north-south structure and resistivity target, and was drilled towards the west. The Lower Kombolgie Formation in this hole is 178.6m thick. Fine to coarse-grained sandstone occurs from surface to 91.6m, and is followed by pebbly sandstone from 91.6 to 101.6m. Fine to very coarse-grained sandstone is present between 101.6 and 129.2m. Silicified to hematitic pebbly sandstone occurs from 129.2 to the unconformity at 178.6m. There is no chlorite alteration or brecciation in the sandstone.
The basement lithologies are believed to be representative of the upper arkose and amphibolite units of the Lower Cahill Formation. The upper part of the basement consists of hematitic meta-arkose with minor mica schist bands from 178.6 to 204.9m. A major fault structure was intersected from 204.9 to 251.0m and has been intruded by a massive quartz breccia dyke. Below the fault zone from 251.0 to 299.6m altered meta-arkose, mica schist and amphibolite (amphibolitic unit) were intersected. The hole was terminated at 299.6m and no anomalous radioactivity was logged.

6.1.2 Drillhole U65-5

Drillhole U65-5 targeted an interpreted WNW-ESE reverse fault, and was drilled towards the south-southwest. The Lower Kombolgie Formation in this hole is 171.0m thick. Fine to coarse-grained silicified sandstone occurs from the surface to 104.6m, and is followed by altered pebbly sandstone from 104.6 to 115.5m with minor chlorite alteration. Fine to coarse-grained silicified sandstone was intersected between 115.5 and 146.6m and is brecciated in part. Brecciated hematitic pebbly sandstone occurs from 146.6 to 150.4m. A zone of hematite rock was intersected from 150.4 to 151.8m. Brecciated altered pebbly sandstone with some zones of hematite/chlorite rock occurs between 151.8 and 160.0m. Altered pebbly sandstone with chlorite-coated fractures was intersected from 160.0 to 166.8m. Altered pebbly sandstone occurs from 166.8m to the unconformity at 171.0m, the sandstone is very coarse-grained immediately above the unconformity and the contact is possibly faulted.

The basement in this hole comprises mica schist and meta-arkose of the upper arkose unit of the Lower Cahill Formation. A minor dolerite sill was intersected between 214.4 and 215.4m. Some zones of alteration were intersected but there is no anomalous radioactivity.

6.2 Geophysics

During 1999, Zonge Engineering and Research Organisation conducted ground electromagnetic (EM), specifically NanoTEM, surveys within the ERL.
The NanoTEM method has been used previously in other areas of west Arnhem Land to map sandstone thickness and to detect fault-controlled vertical offsets of the unconformity. The equipment is portable by helicopter and the method had given satisfactory results in 1998. The survey method was the same for each area. The transmitter loop was $50 \times 50$ m with a receiver loop of $10 \times 10$ m. The station spacing was 50 m and the configuration was ‘In-loop’. All of the surveys were conducted on grid lines pegged using compass and tape.

6.2.1 NanoTEM Results

The locations of the geophysical surveys completed within ERL 152 are shown on figure 5.

Four NanoTEM lines were surveyed in the ERL. The aim of the survey was to test for structures and determine the thickness of the Lower Kombolgie Formation. The NanoTEM data is presented in appendix C. The data from lines 2 and 3 show a strongly resistive zone associated with a major north-south fault. This zone was tested with drillhole U65-4 (see section 6.1.1). The other two NanoTEM lines did not show any anomalous features. One line was anticipated to cross the reverse structure targeted with drillhole U65-5, however due to topographical constraints the line was stopped before crossing the structure.

7. CONCLUSIONS

During the tenure, exploration included four NanoTEM traverses and two helicopter-assisted diamond drillholes.

When applying for the ERL it was interpreted that unconformity-related uranium mineralisation may exist within the tenement area. Unfortunately, mineralisation appears to be restricted to minor occurrences within the Oenpelli Dolerite beneath the Spencer Massif. Drilling and geophysical surveys failed to delineate prospective targets.
It is for these reasons that the JV partners are relinquishing the tenement.

8. **REFERENCES**