AFMECO M INING AND EX P LORATION PTY LTD

Exploration Retention Licences 150, 151 and 152

Arnhem Land, Northern Territory

Second Annual Report

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Alligator River
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Table of Contents

List of Figures .......................................................... ii
List of Tables .......................................................... ii
List of Appendices ..................................................... ii
Summary ................................................................. iii
1. Introduction ......................................................... 1
2. Location and Access ............................................... 1
3. Tenure .................................................................. 1
4. Geology ............................................................... 2
5. Previous Work ....................................................... 3
   6.1 ERL 150 .......................................................... 4
       6.1.1 RIP Survey ............................................... 4
       6.1.2 Pole-Dipole IP Traverse ................................. 5
       6.1.3 Drilling ..................................................... 5
   6.2 ERL 151 .......................................................... 5
       6.2.1 Detailed Gravity Survey ................................. 5
       6.2.2 Drilling ..................................................... 6
7. Conclusions ......................................................... 12
List of Figures

1. Tenement Location Map
2. West Arnhem Land – Solid Geology
3. Correlation chart for Proterozoic rocks of the East Alligator River area
4. ERL 150 – RIP Resistivity Results
5. ERL 150 – RIP Phase Results
6. ERL 150 – Pole-Dipole IP Traverse
7. ERL 151 – Gravity Survey Stations
8. ERL 151 – Bouguer Anomaly Contours
9. ERL 151 – Drillhole Location Map

List of Tables

1. ERL 150 and 151 – 2000 Drillhole Overview
2. 2000 Diamond Drilling Summary
3. Sandstone composite analytical results
4. Sandstone XRD mineralogy
5. Downhole PIMA results

List of Appendices

A. Gravity Survey Logistics Report – Daishsat Pty Ltd
B. 2000 Diamond Drillhole Logs
Summary

The Exploration Retention Licences are located in Arnhem Land about 250 kilometres east of Darwin. Exploration is being 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 report describes the results of the second year of exploration on the tenements.

Seven drillholes were completed during the year comprising 80 metres RC percussion and 1563.9 metres diamond drilling.

Geophysical surveys conducted within ERL 150 identified resistivity and phase anomalies. Drill-testing one of the geophysical anomalies was planned, however could not be conducted due to insufficient water availability.

A gravity survey within ERL 151 highlighted anomalous areas that were tested with a number of drillholes. Drilling confirmed the presence of prospective mineralisation, alteration and lithologies.

No exploration was conducted upon ERL 152 within the reporting period.
1. **INTRODUCTION**

The Exploration Retention Licences (ERL’s) are being explored in joint venture by AFmeco Mining and EXploration Pty Ltd (operator), Cameco Australia Pty Ltd and SAE Australia Pty Ltd.

The tenements are located within the Arnhem Land Aboriginal Reserve and are shown on figure 1.

This report details the work carried out during 2000 and 2001.

2. **LOCATION AND ACCESS**

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

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

Parts of ERL 150 and all of ERL 151 are accessible by 4WD. The sandstone escarpment that covers the majority of ERL’s 150 and 152 is only accessible with helicopter. Access to the tenements is limited during the wet season from November to April, hence all of the fieldwork is conducted between May and October.

3. **TENURE**

ERL’s 150, 151 and 152 were granted on 20\textsuperscript{th} May 1999 for a period of five years. The tenements are currently being explored in joint venture by AFmeco Mining and
EXploration Pty Ltd – operator (25%), Cameco Australia Pty Ltd (50%), and S.A.E Australia Pty Ltd (25%).

The ERL’s replace parts 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. 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 the result of an extensive migmatisation during the Top End Orogeny, which is dated at about 1800my. The relationship between the Cahill Formation and the Nimbuwah Complex is little known. Limited field observations show the contact to be gradational and migmatitic in nature.
Later post-orogenic Proterozoic granites (1780-1750My), 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 formation 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 outcropping in the area.

5. **Previous Work**

Exploration was conducted under the current licences in 1999-2000. Exploration included conventional truck-mounted RC and Diamond drilling, helicopter supported drilling, and ground geophysical surveys. Further details of this work can be found in the First Annual Report, submitted to the Department of Mines and Energy (DME) in May 2000.

Queensland Mines Ltd previously explored the area in the early 1970’s. During this time the Nabarlek prospect was discovered by an airborne survey and over a period of approximately 20 years, defined the resource, mined and processed the ore.

No exploration was carried out in the area from September 1973 until June 1988 when EL 2508 was granted. EL 2508 was extensively explored for ten years until its expiry on June 28th 1998.

Further details of the work completed in the past can be found in previous annual reports submitted to the DME and in the final report on EL 2508 (areas retained under tenure), submitted to the DME in 1998.
6. **WORK COMPLETED DURING 2000/2001**

Work completed during the second year of tenure has included RC/percussion and diamond drilling, and various ground geophysical surveys upon ERL’s 150 and 151. No exploration was conducted upon ERL 152 during the reporting period.

### 6.1 ERL 150

Uranium mineralisation was discovered in the SML boundary (SMLB) area in 1992 following blind drilling of the projected extension of the Nabarlek shear. The mineralised zone is associated with a northwest striking reverse fault zone known as the Boundary Fault. Geophysical surveys in recent years have focused upon discovering significant anomalies beneath the sandstone escarpment to the northwest of the known SMLB mineralisation.

#### 6.1.1 RIP Survey

Reconnaissance Induced Polarisation (RIP) techniques were first utilised in 1999 with the purpose of identifying conductors beneath the substantial sandstone cover covering much of the tenement. Readings using the RIP method were completed during the 2000 field season as a follow up to anomalous data collected during the 1999 field season. High phase and low resistivity anomalies recorded over two separate zones within ERL 150 during 1999 were enigmatic and interpreted as possible large, sub-surface chargeable bodies. However it is now known that much of the 1999 data was potentially influenced by large errors possibly related to poor transmitter current. A recommendation from the geophysical contractors was to improve this noise factor by changing the transmitter array setup. The introduction of a third transmitter bipole in 2000 was successful and resulted in significantly improved data quality.

Station location and resistivity/phase data values are shown in figures 4 and 5, respectively. Phase values do not corroborate the high phase anomalies previously observed, however resistivity values are of similar magnitude.
6.1.2 Pole-Dipole IP Traverse

The eastern most resistivity low was observed again in the RIP data and considered enigmatic when compared with surrounding data points. To provide further information about these resistive lows, a single line of 50m Pole-Dipole Induced Polarisation readings was completed across this resistivity low outlined in the RIP survey (figure 6). Resistive lows were not encountered with this technique, however some phase anomalies were identified.

6.1.3 Drilling

It was anticipated that one helicopter-supported drillhole would target a phase anomaly detected with the pole-dipole IP traverse. A location was selected and a drillpad was prepared, however due to a lack of water, the proposed drilling was not completed.

6.2 ERL 151

Uranium mineralisation was discovered in this area during exploration of EL 2508 in 1988. Two uneconomic zones of primary uranium mineralisation were delineated within the Oenpelli Dolerite. Exploration in 2000 was aimed at delineating possible alteration zones and structures utilising detailed gravity surveys, and testing any anomalies with drilling.

6.2.1 Detailed Gravity Survey

A total of 273 new and repeat gravity observations were made along an established grid on lines 200m apart at approximately 100m intervals. Daishsat Pty Ltd completed gravity readings and GPS surveying. The logistics report for this survey is included as appendix A.

A base station was established on the survey grid using an existing base station at Myra Camp. Other base stations were established around Myra Camp and Nabarlek airstrip. All gravity base stations are tied into the Australian National Gravity Grid.
Station locations for all observations on ERL 151 are presented in figure 7. Distinct gravity lows were observed at three localities within the survey area and infill readings were taken around these anomalous areas. A plan showing the bouguer anomaly contours is presented in figure 8. Two anomalies were recommended for further testing. Furthermore, an anomalous WNW to NW-trending gravity low was detected cross-cutting the centre of the tenement. This is interpreted to be a structure parallel/sub-parallel to the Nabarlek Shear corridor. It was also recommended that drilling be targeted to intersect this structure.

6.2.2 Drilling

Drilling during the 2000 field season was designed to follow up anomalies highlighted by the detailed gravity survey. Seven drillholes utilising a conventional truck-mounted dual-purpose (RC/DDH) rig were drilled in the tenement, totalling 80m RC and 1563.9m diamond. The drilling locations are included in figure 9.

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

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. When the original U value was >2ppm the sample was reanalysed using an aqua-regia digest to obtain a value for labile uranium (U-AR). The results are shown in table 3.

XRD and PIMA mineralogical analyses were conducted on sandstone and basement (PIMA only) core at regular intervals, and results are shown in tables 4 and 5, respectively. A description of the PIMA method has been detailed in previous reports submitted to the Department of Mines and Energy.
N147-8 targeted a shallow gravity low in the northeastern portion of the tenement. It was collared in dolerite and drilled to the southeast, approximately perpendicular to the dolerite-sandstone contact. Approximately 30m of strongly hematized clay with remnant dolerite clasts were encountered from the surface. Moderately to strongly chlorite altered dolerite occurred from beneath the clay to 92.0m, where the dolerite-sandstone contact was intersected. The dolerite is strongly brecciated in places and contains common quartz-carbonate veinlets and rare disseminated pyrite.

The sandstone is fine to coarse-grained, silicified and ‘spotted’, and apart from thin moderately chlorite altered intervals, chlorite is restricted to fracture planes. A brecciated zone occurs immediately above the unconformity comprising angular to sub-angular sandstone and rare basement clasts within a chlorite-hematite matrix. The unconformity occurs at 110.8m.

The basement comprises lithologies interpreted to be part of the upper arkosic unit of the Lower Cahill Formation. These include quartz mica schist, uncommon meta-arkose and rare, thin amphibolite bands towards the end of hole. The meta-sediments are moderately to strongly hematite altered immediately beneath the unconformity, and continue for approximately 20m. Mild to moderate chlorite alteration continues to the end of hole.

No anomalous radioactivity was recorded in this drillhole.

N147-9 was collared within the Lower Kombolgie Formation and drilled towards the southwest. The sandstone down to approximately 130m is fine to coarse-grained and moderately silicified. Narrow, strongly silicified and proto-brecciated zones occur sporadically within this sandstone package. From 130m to the first unconformity (168.3m) the sandstone is coarse-grained to pebbly, strongly fractured and brecciated in places, and moderately to pervasively chlorite altered throughout.

Moderately to strongly fractured and altered metasediments occur between 168.3m and 178.0m, where a faulted contact with a narrow sandstone ‘wedge’ was intersected. This 10m interval of metamorphic basement comprises lithologies interpreted as part of the
upper arkosic unit of the Lower Cahill Formation, and includes micaceous meta-arkose and garnet-mica schist. The metasediments are moderately to strongly hematite and chlorite altered.

A narrow, moderately chlorite altered pebbly sandstone package occurs between 178.0m and the second unconformable contact with the basement at 180.6m. The sandstone contains small to large basement rip-up clasts, and pyrite is present, both disseminated within the sandstone and in narrow veinlets.

The remainder of the basement is comprised of garnet-(graphite)-mica schist, micaceous meta-arkose and amphibolite. Narrow quartz breccias and mobilisates were also present. A narrow, aphanitic dolerite sub-parallel to the foliation was intersected at 182.8m. Fracturing is concentrated within narrow zones, and can be associated with strong illite alteration. Hematite alteration beneath the lower unconformity is confined to a relatively narrow zone of approximately 10m, and is accompanied by chlorite and illite alteration. The remainder of the basement is mildly to moderately chlorite and illite altered.

A narrow zone of primary pitchblende mineralisation was intersected at 250.5m. The mineralisation appears to be associated with quartz removal and hosted by microfold hinges. The mica schist is moderately chlorite altered. Wider, anomalous zones of radioactivity are scattered through the remainder of the basement, between approximately 200m and 260m. Minor anomalous radioactivity was detected in the sandstone between approximately 28 and 65m, correlating with elevated Th values detected in the geochemical analysis. Elevated Th and U values are also present in the chlorite-altered sandstone immediately above the unconformity.

N147-10 was positioned to target the western limits of the subtle gravity low in the southeastern portion of the tenement. The hole was drilled to the southwest and was collared within the Lower Kombolgie Formation. Fine-grained sandstone occurs down to a depth of 73.2m. Much of this zone is moderately to strongly broken, and clay coatings are common along the fracture/joint planes. Mild to moderate chlorite alteration occurs from 91.9m to the unconformity at 134.9m. Chlorite chemical breccias
of varying maturity are also common within this zone. Stylolites are common in this zone, and can contain drusy quartz, clay or chlorite. The pebbly sandstone basal unit occurs from approximately 115m. Mild to moderate hematite alteration accompanies the chlorite immediately above the unconformity.

The basement lithologies are representative of the upper arkosic unit of the Lower Cahill Formation and include (garnet)-mica schist, meta-arkose and uncommon amphibolite. Narrow quartz mobilisates and segregates are common. Moderate hematite alteration occurs for approximately 8m immediately beneath the unconformity, and mild to moderate chlorite and illite alteration is present throughout the remainder of the basement. A minor radiometric anomaly occurs at 152.7m, and is associated with moderately chlorite altered mica schist.

N147-11 was positioned to target the same gravity anomaly and, like N147-10, was drilled towards the southwest. The sandstone down to approximately 80m is fine to medium-grained and moderately to strongly silicified. The sandstone is moderately fractured/jointed in places, and proto-brecciation occurs within some strongly silicified zones. From 80m to approximately 104m the sandstone is medium to coarse-grained, fractured and moderately hematite altered. Following this zone, the sandstone becomes fine to medium grained and silicified for approximately 8m, from which coarse-grained to pebbly sandstone is present to the unconformity at approximately 157.7m. This basal pebbly sandstone unit is moderately chlorite altered and, closer to the unconformity, contains common chlorite altered chemical breccias of varying maturity. Quartz dissolution is common throughout this basal zone and in narrow intervals of intense chloritisation the sandstone is almost completely replaced. Immediately above the unconformity, small hematite altered basement rip-up clasts are present, along with rare pyrite disseminated along fracture planes.

Lithologies representative of the upper arkosic unit of the Lower Cahill Formation are present beneath the unconformity, and include (garnet)-mica schist, micaceous meta-arkose and uncommon amphibolites. Mobilisates and pegmatites are common, especially between 180 and 190m. Mild to moderate hematite alteration occurs sporadically throughout the basement and is not confined to the paleoweathering zone
beneath the unconformity. Moderate to strong quartz dissolution is present within the metamorphic basement from the unconformity to approximately 175m. Chlorite and illite alteration occurs throughout the basement, and is strongest from the unconformity down to approximately 185m. An interpreted 20cm-wide very low angle ductile shear zone was intersected immediately below the unconformity.

No anomalous radioactivity was detected in this drillhole.

N147-12 was positioned to the southeast of N147-9, and targeted the west-northwest trending gravity low. The hole was drilled to the southwest and collared within the Lower Kombolgie Formation. The initial 104m of the drillhole comprises fine to medium-grained, moderately to strongly silicified sandstone. Narrow intervals of strong silicification and jointing, accompanied by quartz flooding and tectonic brecciation occurs between approximately 75m and 100m. Coarse-grained pebbly sandstone occurs from 104m to the unconformity, at 176.5m. This large zone of pebbly sandstone is hematite altered for approximately 10m, then becomes moderately to strongly chlorite altered and brecciated throughout the remainder of the interval. Four separate narrow aphanitic dolerite intrusions crosscut the sandstone. The dolerite dykes are strongly chlorite altered and brecciated. Some breccias proximal to and within the dolerite are polymict, containing both dolerite and sandstone clasts. From 168m to the unconformity, the sandstone is both chlorite and hematite altered, containing common hematite altered basement rip-up clasts.

The basement lithologies are representative of the upper arkosic unit of the Lower Cahill Formation, and include garnet-(graphite)-mica schist, meta-arkose and (garnet)-amphibolite. A narrow, partially brecciated dolerite intrudes the meta-sediments between 209.3 and 210m. The meta-sediments immediately beneath the unconformity are moderately to strongly hematite altered and also contain narrow brecciated intervals. Moderate to strong illite alteration accompanies the hematite alteration. The remainder of the basement lithologies are mildly to moderately chlorite and illite altered.

Anomalous radioactivity was not detected within this drillhole.
N147-13 was positioned to the east of N147-12. The hole was drilled to the southwest and was collared in Lower Kombolgie Formation. For the first 117m, the sandstone is fine to medium-grained and moderately silicified. Much of this large zone is strongly fractured and jointed, and there are some narrow sandy and clay-filled intervals. Coarse-grained to pebbly sandstone occurs from 117m to the unconformity, at approximately 146.9m. The pebbly basal sequence is moderately to strongly chlorite altered and brecciated throughout, with accompanying hematite and limonite alteration in places. Narrow dolerite intrusions occur immediately above the unconformity. The dolerite is aphanitic and brecciated, with most breccias in this narrow interval containing dolerite and sandstone clasts.

The basement lithologies are representative of the upper arkosic unit of the Lower Cahill Formation, and include garnet-(graphite)-mica schist, micaceous meta-arkose and (garnet)-amphibolite. Quartz mobilisates and segregates are common. A narrow, aphanitic dolerite intrudes the meta-sediments at 216.3m. The paleoweathering zone extends to a depth of approximately 25m beneath the unconformity, and apart from one metre of moderate chlorite alteration immediately beneath the unconformity, comprises moderate to strong hematite alteration. The meta-sediments in this zone are commonly brecciated, the breccias comprising varying morphology, clast size and shape, and cement. Narrow intervals of strongly fractured meta-sediments are also common throughout the basement.

Minor radioactivity was detected in the sandstone between approximately 52 and 60m, corresponding to elevated Th values over a similar interval. Anomalous radioactivity was not detected in the basement.

N147-14 was positioned to target possible west-northwest trending structures to the west of N147-7, drilled in 1999. The hole was drilled towards the east-northeast and was collared within the Lower Kombolgie Formation. Fine to medium-grained sandstone was intersected down to a depth of approximately 106m. Moderate to strong fracturing occurs over narrow intervals, especially at the base of the fine-grained sandstone package. A ten metre wide zone of coarse-grained pebbly sandstone occurs from 106m, and is moderately hematite and kaolinite altered. From approximately
117m to 139m the sandstone is fine to medium-grained, and moderate to strong quartz dissolution was observed. Coarse-grained pebbly sandstone occurs from 139m to the unconformity at 164.3m. The coarse basal sequence is chlorite and hematite altered throughout the interval, and hydraulic and tectonic brecciation is common. Narrow zones of strongly chlorite altered and brecciated dolerite were intersected closer to the unconformity. Hematised basement rip-up clasts occur immediately above the unconformity.

The basement lithologies include garnet-mica schist, micaceous meta-arkose and (garnet)-amphibolite. Quartz segregates and mobilisates are common. These lithologies are representative of the upper arkosic unit of the Lower Cahill Formation. The foliation, when compared to other N147 drillholes, is relatively stable, and only minor folding and a few crenulation bands were observed.

Anomalous radioactivity was not detected in this drillhole.

7. CONCLUSIONS

The additional RIP measurements conducted in 2000 with the extra transmitter array successfully improved the signal-to-noise ratio of the previous survey. The 2000 survey failed to confirm the phase anomalies detected in the 1999 survey, however the presence of large resistive anomalies was confirmed.

The detailed pole-dipole IP traverse failed to confirm the targeted resistivity low, however indicated the presence of apparent structurally controlled phase anomalies. These geophysical anomalies remain to be tested.

A detailed gravity survey over the majority of ERL 151 highlighted a number of anomalies that were tested with drilling. The presence of WNW- and NW-trending structures parallel to the Nabarlek Structure was further confirmed by both the gravity survey and through drilling. The WNW-trending gravity low demands further testing,
and is considered prospective due to the confirmation of reverse structures, unconformity offset, and basement primary mineralisation.