ANNUAL REPORT

ALARA JV PROJECT
EL24929

FOR THE PERIOD
21 AUGUST 2009 TO 20 AUGUST 2010

NGALIA BASIN
NORTHERN TERRITORY

REPORT NUMBER:

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PROJECT NAME: Alara JV

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REPORT TYPE: Annual

TARGET COMMODITY: U

KEYWORDS: Data compilation, Seismic data recovery, ASTER Night-time temperature imaging.

PROSPECTS DRILLED: None

HOLDER: Hume Mining NL (25%), Strike Resources Limited (75%)

OPERATOR: Thundelarra Exploration Ltd

TENEMENT: EL24929

REPORT PERIOD: 21 August 2009 to 20 August 2010

1:250,000 SHEET AREA: MT DOREEN (SF5212)

1:100,000 SHEET AREAS: DOREEN (5313) & VAUGHAN (5053)

AUTHOR: Martin Moloney

DATE OF SUBMISSION: September 2010
ABSTRACT:

Location: The Alara JV Project comprises granted Exploration Licenses 24879, 24928 & 24929 and the application EL24927. These licenses are contiguous and located approximately 330km northwest of Alice Springs.

Geology: The tenement is located within the Ngalia Basin, a Neoproterozoic to Palaeozoic intracratonic basin approximately 300km long and 70km wide within the Northern Arunta Province of the Arunta Inlier, in central-south of the Northern Territory.

Work done: Exploration work during the tenure period comprised ongoing data compilation that included the recovery of digital seismic data from Magellan Petroleum, the commencement of a Joint Surveys Uranium project in conjunction with CSIRO and two other ASX listed exploration companies.

ASTER night-time thermal imagery has been acquired and processed for the purposes of indentifying Tertiary paleochannels.

Thundelarra has obtained a grant of $100,000 from the NT government to conduct a regional airborne EM survey (which includes Alara’s Bigrlyi South project area) to map the thickness of the Tertiary sequence, target Tertiary paleochannels, map lithological variation (e.g. shale vs. sandstone) within the Mt Eclipse Sandstone to provide paleo-permeability constraints and detect potential large massive sulphide deposits. This airborne survey is expected to commence in October 2010.

Results: The work to date has resulted in the identification of a target in the form of an interpreted paleochannel.

Conclusions: Uranium mineralisation has been detected in the uppermost Paleozoic unit of the Basin – the Mt Eclipse Sandstone (e.g. Bigrlyi), and this style of mineralisation was the original target of the current exploration within EL24929, however Thundelarra’s ongoing exploration within the Basin (on other licenses) has identified that Tertiary hosted mineralisation exists, and that there is significant potential to find an economic concentration of this style of uranium.

Regional EM and reconnaissance air core drilling will be used in the coming year to define and test for both Tertiary-hosted, and Mt Eclipse-hosted mineralisation.
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APPENDICIES

(NONE)

DVD

DVD1: Report pdf and digital data (attached, back cover)
1. INTRODUCTION AND TENURE

Exploration License (EL) 24929 covers 26 blocks (approximately 67km²) located approximately 330km northwest of Alice Springs on the Mt Doreen pastoral lease, immediately east of the Vaughan Springs homestead (Figure 1). On 14th May, 2009, Thundelarra entered into a formal joint venture with Alara Resources Limited to earn a 70% interested in EL24929.

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2. GEOLOGICAL AND STRUCTURAL SETTING

The Ngalia Basin is a Neoproterozoic to Palaeozoic intracratonic basin approximately 300km long and 70km wide within the Northern Arunta Province of the Arunta Inlier, in central-south of the Northern Territory. The Ngalia Basin is an asymmetric syncline with a steep tectonised northern boundary and a shallow northerly dipping unconformity forming the southern basin boundary. The northern boundary is defined to the east by low angle thrust faults over the Arunta Inlier and to the west by high-angle reverse faults that have thrust the basement rocks several kilometres over the sediments.

The region has been tectonically active since before 1880Ma with several tectonic events and phases of granitic intrusions up to 1000Ma. Granites and metamorphic rocks have provided the source material for subsequent sedimentation.

The younger post-tectonic granites, particularly the Southwark Granite Suite dated at 1567Ma are believed to be the origin of the uranium for the known uranium mineralisation in the region. Wholerock chemical analysis of 18 samples from these late granites are recorded as having uranium contents varying from 1.5-22.5ppm, thorium ranged from 3-175ppm and vanadium typically from 3-57ppm. In contrast, 8 samples from the older granites ranged in uranium content from 1.5-10ppm and vanadium from 20-90ppm. In general the geochemistry of these late granites is consistent with other high-heat production group (i.e. radiogenic) granites of the Arunta Inlier.

The Neoproterozoic to Carboniferous sedimentary sequences of the Ngalia Basin range in age from 850 - 350Ma. The Basin rests unconformably over the Arunta Inlier. The sediments of the Neoproterozoic are 2-3km in thickness and composed of dominantly fluvial to shallow marine quartz sandstones, shales, mudstones, conglomerates, dolomites and tillites. The transition from the Neoproterozoic to the Cambrian occurs within the 700m thick Yuendumu Formation of sandstone and arkosic sandstone formed in shallow marine conditions. Three further sequences of shallow marine to fluvial sediments, each unconformable upon the underlying sediments, were deposited during the Cambrian, Ordovician and Devonian periods.
The youngest and thickest Palaeozoic sedimentary sequence is the thick Devonian to Carboniferous Mount Eclipse Sandstone, up to 2.4 km thick, which is deposited unconformably on all underlying Ngalia Basin units. In the region around the Biglyi uranium deposits the Mount Eclipse Sandstone overlies the Neoproterozoic age Vaughan Springs Quartzite, the oldest unit in the Ngalia Basin overlying the rocks of the Arunta Inlier.

Uplift and erosion of the Arunta Inlier rocks to the north of the Ngalia Basin between 350-370Ma initiated the deposition of the Mount Eclipse Sandstone. This deposition was terminated at the peak of the Alice Springs Orogeny, possibly about 300-320Ma. At this time the Yuendumu, Waite Creek, Patty Hill, Napperby and Hann Range thrust faults were active, thrusting the Arunta Inlier rocks southward over the Ngalia Basin rocks. This overthrusting is associated with the asymmetric folding of the Mount Eclipse Sandstone sequence with east to west axes and steep north-facing limbs.

The Mount Eclipse Sandstone consists of arkoses, conglomeratic sandstones, greywacke and minor conglomerates deposited in piedmont to subaerial-fluvial environments. The sequence contains a significant carbonaceous component with common plant fossils.

Uranium mineralisation of the Ngalia Basin is hosted in piedmont-style sedimentary channels, composed of carbonaceous arkoses located towards the base of the Mount Eclipse Sandstone. The primary source of the uranium is inferred to be the younger granites of the Arunta Inlier.

Since the end of the Alice Springs Orogen, the Ngalia Basin has been part of the stable Australian Craton with terrestrial sedimentation of sands, silts, aeolian sand, calcrete, silcrete, lateritic ironstones and playa lake sediments; however sedimentation appears restricted to the Tertiary. These unconsolidated sediments obscure parts of the prospective Mount Eclipse Sandstone within the Alara tenement block, however they represent a potential trap site for uranium mineralisation that is sourced from the Mt Eclipse Sandstone. The Tertiary sequence in this area is poorly described; however the Tertiary basins in the Alice Springs area are thought to be the result of two distinct periods of deposition (Senior et al 1994, Wyche 1983). The Lower Tertiary consists of an upward fining sequence, with flowing channel sands at the base locally capped by dark grey & black carbonaceous mudstones and green, white or dark grey swelling clays. A zone of calcrete, silcrete or laterite separates this sequence from pervasively oxidised and locally magnetic Upper Tertiary sands, gravels, clays and massive gypsum beds.

2.1. STRUCTURE

Shallow, south-dipping, small scattered outcrops of Mt Eclipse Sandstone cover approximately 5-10% of the Biglyi South Project area. The remainder is covered by a thin cover of Recent to Quaternary sands, silts, calcrite, silcrete, lateritic ironstones and playa lake sediments.

A curvilinear low angle thrust, known as the Yuendumu Thrust, has been interpreted to straddle the entire length of EL24929 (Figure 1). The Yuendumu Thrust has a total length of 100 km and joins up with another major northeast thrust fault west of EL24929. Another small thrust fault locally known as the Cusacks Bore Thrust has been mapped for about 5 km and is located 3 km to the north of the Yuendumu Thrust and 5 km east of
EL24929. Significant uranium mineralisation occurs in the Mt Eclipse Sandstone close to the Yuendumu Thrust at the Camel Flat prospect.
Figure 1. Ngalia Basin Project location map with tenure status.
3. MINERALISATION AND EXPLORATION MODELS

The principal target of Thundelarra’s exploration efforts is uranium mineralisation that is amenable to ISR and which is hosted by the Tertiary sediments that cover large portions of the basin. A secondary target is Bigrlyi-type uranium mineralisation hosted by the Carboniferous Mt Eclipse Sandstone (Figure 2).

![Figure 2. Schematic cross section through the Ngalia Basin looking west (modified after Young et al 1995) showing target uranium mineralisation styles.](image)

**Tertiary-hosted uranium deposits**

Thundelarra has discovered significant and widespread uranium at depth within the basal Tertiary channelling sands where they come into contact with carbonaceous mudstones and sandy clays (more below).

Tertiary sediments cover large portions of the central and southern Ngalia Basin, and indeed around 99% of the Thundelarra tenure. The Tertiary sequence has been found to exceed 220m in drilling conducted by AGIP close to the southern margin of the Basin (hole SR9R).

The Tertiary sediments have two excellent uranium source rocks – the Mt Eclipse Sandstone, and the older Southwark Suite granites. The Mt Eclipse is a particularly good source rock because:

- It hosts widespread uranium anomalism (see Figure 1),
- It was exposed throughout the Tertiary to erosion (i.e. reworking into Tertiary sediments) and oxidation
- The uranium is physically accessible to oxidising groundwaters as it is found within the Mt Eclipse coating sand grains
- The uranium is in the form of uraninite, which can be easily leached by oxidised waters.
- The Mt Eclipse is exposed in the north, and groundwater flow is to the south, and into the Thundelarra licenses.

Thundelarra will actively search for suitable hydrogeological & chemical traps within this Tertiary sequence. To this end, Thundelarra has:

- Mapped a substantial & structurally controlled Tertiary sub-basin in the southeastern part of the Ngalia Basin,
- Processed satellite (ASTER night-time) temperature mapping data,
- Conducted a airborne magnetic/radiometric surveys,
- Conducted 1km-spaced gravity survey,
- Commenced follow-up mud rotary & diamond drilling.

Across the Project, a number of paleochannel targets have been interpreted from the ASTER and airborne magnetic data. Visual porosity estimates from core samples indicates that excellent hydro-geological conditions exist for in-situ recovery (ISR) mining techniques, with mineralised sands being capped by a low-porosity claystone & mudstone sequence.

Good potential therefore exists for ISR-amenable paleochannel-style deposits within the Tertiary sediments of the Ngalia Basin. Similar deposits are found in the Frome Embayment of South Australia (Beverley, Four Mile, Honeymoon etc), and these mines tend to have low operating costs and very low environmental impact.

A proposed AEM survey has been designed to detect the paleochannel systems that host the Tertiary mineralisation. This survey will provide direct targets for stratigraphic drilling in areas of thick cover where the conductivity data suggests the presence of channels (dendritic patterns) and carbonaceous mudstone units (high conductivity layers). A regional map of the thickness of the Tertiary sediments will be interpreted from these data, along with the location of channel systems, and this will target further drilling across the Project area.

Carboniferous sandstone-hosted uranium deposits

Biglyi-type uranium mineralisation, hosted by coarse feldspathic sandstones in the Mt Eclipse Sandstone is another target. Significant uranium is also known at the Minerva (2.43 Mlbs U₃O₈ - AGIP 1983), and Walbiri occurrences (1.49 Mlbs U₃O₈ – NTGS Orestruck Uranium Factsheet, Nov 2009).

The principal host to uranium mineralisation in the Ngalia Basin is the Mt Eclipse Sandstone - a thick, synorogenic sequence of non-marine sandstone and shale, deposited in piedmont and sub-aerial deltaic environments (Questa, 1989). The uranium mineralisation at Biglyi is known to be related to those parts of the Mt Eclipse Sandstone that contain abundant carbonaceous material. However other parameters, related to fluid flow during the mineralising event (e.g. alteration, paleo-porosity & structural setting) are also important facets of the Thundelarra exploration program.

The Biglyi deposit has been described as a tabular deposit formed by the interaction of uranium-bearing, oxidising fluids with reducing carbonaceous matter in a permeable sandstone formation. Fidler et al. (1990) have suggested that Biglyi was formed in the Mt Eclipse Sandstone prior to the completion of diagenesis. Uranium-bearing fluids are proposed to have originated from weathering profiles of granites in the exposed Arunta complex and to have migrated into the Ngalia Basin. Within this model, diagenesis of the Mt Eclipse Sandstone would have ‘fixed’ the uranium deposits. Subsequent faulting and fracturing have modified the distribution of mineralisation to a limited extent.

Significantly, the final stages of deposition of the Mt Eclipse Sandstone occurred synchronously with the culmination of major structural movements in the Ngalia Basin, during the Alice Springs Orogeny (ASO); a tectonic event with widespread & profound...
structural / metallogenic significance. It appears that the ASO-related thrusting within the Ngalia basin might have played a critical role in the formation of these deposits in a variety of ways such as:

- Acting as the driving force for the movement of fluids responsible for alteration and mineralisation,
- Creating favourable conduits for the movement of fluids,
- Producing repetitions of the favoured traps (e.g. carbonaceous horizons) within the Mt Eclipse Sandstone,
- Acting as a tectonic “fixing” agent, creating a fossilised redox system by the dewatering action of structural tilting.

The uranium mineralisation within the Mt Eclipse is likely the result of a variety of processes acting in concert, and consequently a variety of deposit styles can be expected as these processes compete for relative dominance. This is certainly the case in other sandstone-hosted uranium provinces such as the Colorado Plateau in the USA or the Frome Embayment in South Australia. One fundamental parameter, however, is the porosity of the host rocks. In clastic sediments the porosity is initially a function of grain size. A classic demonstration of the control that grain-size may have on mineralisation is found in South Texas (Figure 3), where uranium deposits are spatially associated with the coarser sediment, the distribution of which is controlled by the overall structure of the basin.

This primary porosity can be markedly reduced during diagenesis and compaction as groundwaters fill the pore space with carbonate cement. This diagenetic event is likely to have coincided with both the Alice Spring Orogeny and the main uranium mineralising event.
Figure 3. Sandstone-percentage map of the Oakville (Miocene) bedload fluvial system, South Texas Coastal Plain, illustrating coincident distribution of uranium mineralisation and coarse grain size (Modified from Galloway and Hobday 1999). The gravity ridge that runs through Project area is thought to have been a basement high that resulted in an analogous grain size distribution in the Mt Eclipse.

4. HISTORICAL WORK

A number of historic exploration licenses coincide with the present area of EL24929. Most of the work on these historic licenses did not involve exploration within EL24929. The eastern-most portion of EL24929 is approximately 300m south of drilling conducted by AGIP at the Camel Flat North prospect, which is centered some 3.65km to the northeast of the license boundary. More recently, Energy Metals Ltd has drilled at Camel Flat, and diamond hole CFD1001 returned an intercept of 27.0m @ 4058 ppm eU₃O₈ from 93.5m downhole, including 8.80m @ 10,567 ppm (1.06%) eU₃O₈ (Energy Metals, 2010)

Within EL24929, a number of seismic lines were surveyed by the BMR between 1967 & 1969 (2 lines) and by Magellan in 1971 on OP165 (5 lines).

5. EXPLORATION PROGRAM

The work conducted on EL24929 for this reporting year is detailed below.

5.1. Data Compilation & Processing

Work during the quarter included the recovery of digital seismic data from Magellan Petroleum’s vaults in Brisbane. This has been transcribed onto modern media with data recovery specialists in Perth. The tapes were then handed over to the NTGS, along with a copy of the recovered data. 7 seismic lines have been surveyed over the license area (Figure 4).

Figure 4. Location of seismic lines in relation to the granted Bigrlyi South Joint Venture licenses.
5.2. JSU Project

Thundelarra entered into an agreement for the Joint Surveys Uranium (JSU) Project with CSIRO, the Northern Territory Geological Survey (NTGS) and 2 other ASX listed resource companies. This collaborative project will involve detailed investigations by CSIRO scientists (which include the application of several CSIRO technologies) at the Bigrlyi uranium project site, and the Ngalia Basin as a whole, with the aim of developing a set of exploration guidelines.

5.3. Night-Time ASTER Thermal Imagery

A selection of night-time ASTER images was made from searches of the USGS Glovis website. The corresponding images were ordered from the NASA Land Processes Distributed Active Archive Centre. The ASTER Level 2 AST08 product provides land surface temperatures from data collected during the night time. The temperatures are determined from Planck's Law, using the emissivities calculated after correction of the measured radiances for atmospheric effects (all conducted by the GDC using their standardised processing procedures). The ASTER images acquired are detailed in Table 2.

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A false-colour temperature mosaic was then prepared using ERMapper software, and output as a raster image for use in MapInfo (Figure 5).

![Figure 5](image_url)

**Figure 5.** Night time ASTER surface temperature image mosaic. Cooler (blue) areas are interpreted to represent the location of a paleochannel system (in conjunction with magnetic and seismic data). Hot (red/magenta) colours clearly identify the extents of pre-
Tertiary units. Areas of subcrop or very small exposures of where these older rocks crop out can be readily mapped from this image.

6. DISCUSSION AND RECOMMENDATIONS

Thundelarra’s ongoing exploration within the Basin (on other licenses) has identified significant potential for Tertiary hosted mineralisation. Regional EM and reconnaissance air core drilling will be used in the coming year to define targets based on this model.

To this end, Thundelarra has;

1. Obtained a grant of $100,000 from the NT government to conduct a regional airborne EM survey (which includes Alara’s Bigrlyi South project area) to map the thickness of the Tertiary sequence, target Tertiary paleochannels, map lithological variation (e.g. shale vs. sandstone) within the Mt Eclipse Sandstone to provide paleo-permeability constraints and detect potential large massive sulphide deposits. This airborne survey is expected to commence in October 2010.

2. Planned a 53-hole reconnaissance air-core drilling programme (which includes Alara’s Bigrlyi South project area) to test Tertiary targets and thickness and provide interface sampling on the Mt Eclipse Sandstone. At the time of writing, Thundelarra is in the process of obtaining heritage and regulatory approvals for this work.
3. REFERENCES


ENERGY METALS LTD. 2010.  High Grade Intercept at Camel Flat.  ASX Release 14th July 2010.


