ANNUAL REPORT
EL25334 – JABANGARDI HILL
NGALIA PROJECT

FOR THE PERIOD
22 JUNE 2009 TO 21 JUNE 2010

NGALIA BASIN
NORTHERN TERRITORY

THX REPORT NUMBER:

DATE: AUGUST 2010

AUTHOR: MARTIN MOLONEY

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THUNDELARRA EXPLORATION LTD
### BIBLIOGRAPHIC DATA SHEET

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**OPERATOR:** Thundelarra Exploration Ltd  
**TENEMENT:** EL25334  
**REPORT PERIOD:** 22 June 2009 to 21 June 2010  
**1:250,000 SHEET AREA:** MT DOREEN (SF5212) & NAPPERBY (SF5309)  
**1:100,000 SHEET AREAS:** DOREEN (5153), NEWHAVEN (5152), YUENDUMU (5253), SIDDELEY (5252), & MOUNT WEDGE (5352)  
**AUTHOR:** Martin Moloney  
**DATE OF SUBMISSION:** August 2010
ABSTRACT:

**Location:** Exploration License 25334 “Jabangardi Hill” is one eight licenses that currently constitute Thundelarra’s Ngalia Project. EL25334 is located approximately 330km west-northwest of Alice Springs.

**Geology:** The Ngalia Basin is an east west trending intracratonic basin which contains a thick succession of Neoproterozoic to Ordovician shallow marine and fluvio-glacial clastic, carbonate and evaporitic rocks, overlain by Devonian and Carboniferous fluvial to continental sandstone, siltstone & shale. Mesoproterozoic post-tectonic granitoids of the Southwark Granitic Suite and older, high grade metamorphic rocks (together representing the Arunta Inlier), form the basement to the Ngalia Basin. In the central and southern portions of the basin the Proterozoic and Paleozoic rocks are covered by a veneer of discrete Cretaceous to Tertiary basins that locally exceed 220m in thickness.

**Work done:** Exploration work during the reporting period comprised rotary mud & diamond drilling, helicopter-assisted gravity surveying, an airborne magnetic survey and data compilation. Thundelarra is also participating in the CSIRO-managed Joint Surveys Uranium project, which is examining uranium mineral systems in the Ngalia Basin, and which commenced in January 2010.

**Conclusions:** The new potential-field data has proven especially useful in mapping the overall basin structure and exploration drilling should be directed toward the corridors of coarser sediment that flank the basement highs / gravity anomalies.
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1. INTRODUCTION AND TENURE

The Jabangardi Hill Project comprises Exploration License 25334 which covers 16 blocks (approximately 51km²). The License is located approximately 330km west-northwest of Alice Springs, and is accessed via the partly sealed Tanami Road, and then on formed gravel tracks by either the Newhaven or Yuendumu-Nyirrpi roads (Figure 1).

<table>
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<th>Tenement</th>
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<td>22/06/2009</td>
<td>23/06/2010</td>
<td>500</td>
<td>$80,000</td>
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2. GEOLOGICAL AND STRUCTURAL SETTING

The Ngalia Basin is an east west trending intracratonic basin which contains a thick succession of Neoproterozoic to Ordovician shallow marine and fluvioglacial elastic, carbonate and evaporitic rocks, overlain by Devonian and Carboniferous fluvial to continental sandstone, siltstone & shale. Seismic data indicates that the basin is asymmetric and attains a maximum thickness of approximately 4.5km. Sedimentation was terminated by the Alice Springs Orogeny, which was initiated in the Early Carboniferous. This orogenic event produced widespread folding and faulting, with deformation being focussed on the northern margin of the Basin.

Mesoproterozoic post-tectonic granitoids of the Southwark Granite Suite and older, high grade metamorphic rocks (together representing the Arunta Inlier), form the basement to the Ngalia Basin. The granitic rocks are known to be anomalously rich in uranium, and these are likely to be the ultimate source of the widespread uranium mineralisation in the Basin.

In the central and southern portions of the basin the Proterozoic and Paleozoic rocks are covered by a veneer of discrete Cretaceous to Tertiary basins that locally exceed 220m in thickness. The Tertiary sequence in this area is poorly described; however other such basins in the Alice Springs area are thought to be the result of two distinct periods of deposition (Senior et al 1994). The Lower Tertiary consists of an upward fining sequence, with flowing channel sands at the base locally capped by dark grey & black carbonateous mudstones and green swelling clay. A zone of calcrete, silcrete or laterite separates this sequence from pervasively oxidised and locally magnetic Upper Tertiary sands and gravels.
Figure 1. Ngalia Basin Project location map with tenure status.
3. **MINERALISATION AND EXPLORATION MODELS**

The principal target of Thundelarra’s exploration efforts within the Western Ngalia Basin 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 an impervious mudstone.

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, along with the location of channel systems, and this will target further drilling across the Project area.

Carboniferous sandstone-hosted uranium deposits

Bigrlyi-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 Bigrlyi 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 Bigrlyi 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 Bigrlyi 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.

![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.](image)
4. HISTORICAL WORK

Exploration within the Ngalia Basin has been almost exclusively for either oil/gas or uranium targets. No exploration for oil/gas has been conducted since Magellan Petroleum (Aust.) Ltd drilled the Newhaven-1 well in 1998. The first phase of uranium exploration ceased in 1983 due to political reasons. The demonstrated potential of the Basin to host significant uranium resources has recently led exploration companies back into the area.

Whilst shallow & low grade calcrete occurrences have been outlined at Cappers (Energy Metals Ltd) & Currinya (Cauldron Energy Ltd), previous exploration has neither targeted nor encountered sandstone-hosted uranium in the lower Tertiary sequence.

4.1. Oil/Gas

Prior to the start of the uranium exploration programs in the mid 1970’s the only recorded exploration in the area were seismic and gravity surveys directed toward oil/gas discoveries. Over 1400km of seismic lines were shot, and two petroleum wells, Davis-1 and Newhaven-1 have been drilled in the basin, and both have been drilled to the crystalline basement. The Newhaven-1 was drilled within the area now covered by EL25283.

4.2. Uranium – 70’s & 80’s

The Ngalia Basin was the subject of intense exploration for uranium in the 70’s and early 80’s, principally by Agip Australia Pty Ltd, Central Pacific Minerals NL, Urangesellschaft Australia Pty Ltd and AFMECO Pty Ltd. These companies, often in joint venture, held a large number of ELs in the Ngalia Basin in their search for sandstone hosted uranium mineralization in the Mt Eclipse Sandstone. The initial discovery of uranium mineralisation in the lower part of the Mt Eclipse Sandstone occurred in 1971. Exploration was at that time focussed on the northern margin on the Basin to which area the prospective outcrop was restricted.

In 1973, discovery of carnotite mineralisation at Bigrlyi resulted from a basin-wide systematic ground radiometric survey across units of the Mt Eclipse Sandstone. From 1974 to 1983 a comprehensive exploration program was undertaken on the Bigrlyi project including regional and detailed geological mapping, percussion and diamond drilling, mineral resource calculations and preliminary metallurgical extractive testwork.

Agip were actively engaged in exploration during the period 1977 to 1983 and many of their tenements fell wholly or partly on the current project area. Due to the area being totally covered by recent sediments their prime exploration tool was vertical stratigraphic drilling. The main drilling method was rotary drilling with many holes extended with diamond core tails. The drilling programs were restricted to the eastern third of the Project area. The recent cover virtually masked any response from airborne radiometric surveys. Several gravity surveys were completed to assist with structural interpretation of the basin.

4.3. AGIP EL 1199

E.L. 1199 “Yungarra” was granted to Agip on February 9th, 1977, with the primary aim of exploration for sandstone-hosted uranium mineralization. Due to a total lack of outcrop of prospective rocks, drilling was the primary exploration tool. Agip completed 36 vertical rotary holes totalling 5,478m within the project area with 11 of the holes completed by diamond tails totalling 616m of core. Hole spacing varies considerable from less than 100m to over 10km. Their drilling confirmed that the eastern part of the area is underlain by Mt Eclipse Sandstone with thicknesses varying up to > 130m. Many of the holes were not drilled to basement. The sandstone is in turn overlain by Tertiary sediments varying from 34m to 130m thick. In places the Mt Eclipse Sandstone is absent either due to palaeo basement highs or was stripped off during the Tertiary. Eighteen of the holes intersected reduced or transitional facies Mt Eclipse
Sandstone varying in thickness from 7m to > 82m. Narrow zones of uranium mineralization were intersected in a few holes with the best as follows (also, see Figure 1).

Table 2. Summary U intercepts – AGIP EL 1199 “Yungarra”.

<table>
<thead>
<tr>
<th>Hole</th>
<th>From (m)</th>
<th>To (m)</th>
<th>Interval (m)</th>
<th>U₃O₈ (ppm)</th>
<th>eU₃O₈ (ppm)</th>
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<td>163</td>
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<td>YRD112</td>
<td>177</td>
<td>178.5</td>
<td>1.5</td>
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<tr>
<td>YRD206</td>
<td>197</td>
<td>201</td>
<td>4</td>
<td>1240</td>
<td></td>
</tr>
<tr>
<td>YRD207</td>
<td>116.6</td>
<td>118.8</td>
<td>2.2</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the drilling programs, gravity, Sir otem, and ground resistivity surveys; water bore sampling and petrological and palynological studies were also carried out.

4.4. AGIP EL 1302

EL 1302 “Cassidy Bore” was granted to Agip Australia Pty Ltd on February 9th, 1977. The main exploration activities carried out were drilling, down-hole logging and gravity surveys. The gravity survey was part of a trial survey conducted by AGIP in conjunction with the NTGS. AGIP reported the results over EL 1302 as being inconclusive.

Stratigraphic vertical drilling was the main exploration tool with 37 holes for 3,772m completed. Three of the holes were extended by diamond drilling with a total of 167m of coring completed. The holes intersected from 0 to >150m of Mt Eclipse Sandstone though it was mostly oxidised facies sediments. Only four holes intersected reduced facies rocks with the maximum thickness being 32m however three of the holes stopped in the reduced facies. Downhole radiometric logging did not identify and significantly anomalous zones with the best being 4x background. No samples from any of the holes were assayed.

4.5. AGIP EL 1310

AGIP explored EL1310 “Siddley Range” which included the southern part of the current project area between 1978 and 1982. Exploration completed included stratigraphic drilling and a gravity survey. A total of 10 vertical rotary holes were completed for 1,739m which included 6 diamond core tails for 505m. The holes were drilled at extremely broad spacings with up to 17km between holes. All holes intersected Mt Eclipse Sandstone with thicknesses up to >220m. Two holes intersected the Devonian Kerridy Formation (near Djabangardi Hill) with the remainder stopping in Mt Eclipse Formation. Three of the holes intersected reduced or transitional facies sediments in multiple zones varying from a few metres up to 58m wide. Weakly anomalous radioactivity up to 66ppm eU₃O₈ was recorded in three holes.

4.6. AGIP EL 2081

AGIP was granted EL2081 “Yarragan” in late 1979. AGIP had previously held the same ground as part of EL 1199. The tenement covered the eastern portion of the current project. As with other tenements their main exploration tool was stratigraphic drilling. They also completed a regional gravity survey to further assist in the interpretation of a probable sub basin structure previously identified. A trial VLF electromagnetic survey was carried but results were inconclusive due to the thickness of conductive overburden.

AGIP completed 22 holes for 4,409m included in this total is 1,819.5m of diamond core tails in 15 of the drill holes. Five holes intersected reduced facies Mt Eclipse Sandstone up to a maximum thickness of 104m. Low level radiometric anomalies were reported from four holes. No samples were submitted for assay.
5. EXPLORATION PROGRAM

The work conducted by Thundelarra Exploration in relation to the Jabangardi Hill Project is detailed below.

5.1. Data Compilation

Data compilation continued with the acquisition of digital data from historic seismic surveys, along with a re-processing report by Gell et al. (1991) and an interpretation report by Davidson (1991).

Seismic data was retrieved from Magellan’s storage facility in a number of digital tape formats & these were sent to SpectrumData in Perth for transcription onto modern media (USB hard drive). This data was then submitted to the Department of Resources directly, and, due to the large size, will not be included here.

5.2. ASTER Thermal Image Processing

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 following ASTER images were acquired.

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<th>THX ASTER ID</th>
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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 4).

The raw & processed data is provided as Appendix 1.

5.3. Gravity survey

Thundelarra conducted a helicopter-assisted ground gravity survey using Atlas Geophysics of Morley, WA. This 1400 station survey covered the full extent of EL25334 at 1km spacing, and included full coverage of the contiguous ELs 25334 & 25283 at either 1km, or 2km spacing (Figure 4 & 5). The contractor’s logistical report and data is provided as Appendix 2.

5.4. Airborne Magnetic/Radiometric survey

Thundelarra conducted an airborne magnetic & radiometric survey. The contractor was Thompson Aviation of Griffith, NSW. This 100m spaced survey covered the full extent of EL25334, and included partial coverage of the contiguous EL 25334 (Figure 6). The contractor’s logistical report and data is provided as Appendix 3.
Figure 4. Map showing the ground gravity stations and extents of the airborne magnetic survey (black outline), with the ASTER night time temperature image. Blue areas on the image represent cooler temperatures, which are thought to represent areas of shallow groundwater accumulation. Hot colours almost invariably correlate with mapped outcrop of pre-Tertiary units.

Figure 5. False colour image of gravity data - Spherical Cap Bouguer reduction, after subtraction of a 10m upward continued grid (to remove the significant regional associated with the Central Australian Suture zone).

Figure 6. False colour image of the airborne magnetic data - reduced to pole data after subtraction of a 250m upward continued grid to enhance high-frequency anomalies.

5.5. Drilling
Thundelarra established a field camp within the license area in January, and commenced drilling activities in February. A total of 12 holes were drilled, for a total of 1621.98m, including on water bore (at the camp site), 8 combination mud rotary/diamond holes, two diamond-only holes and one mud rotary hole (see Table 1 & Appendix 5).

5.6. Drilling conditions

The drilling conditions proved difficult, especially in the east, where the Tertiary sequence was thicker. A very hard silcrete layer at about 60m in holes 4, 5, 8 & 9 proved difficult to penetrate with the rotary bit, and the drillers switched to coring. Several holes did not penetrate the Tertiary due to excessive overburden pressure and running sands encountered below swelling clays. These formations were generally encountered in the lower part of the Tertiary sequence, below 120m. A hole inclined at 60 degrees (TNG008MR) collapsed higher within the Tertiary and subsequent holes were drilled either vertically or at 85 degrees, if oriented core was required in the Mt Eclipse section.

The swelling clays, although relatively thin, are under excessive pressure and cause heavy water inflows in every instance despite a heavy mix of barite loaded mud. Heaving of the sand in the aquifers was costly and time consuming.

5.7. Results

Significant radioactivity was encountered in the diamond core sections of holes 2 & 6, and the drillers reported a “spike” on their dosimeter toward the end of hole 7. As a consequence these holes were sampled and sent to ALS in Alice Springs for laboratory assay. A total of 106 samples were sent. These assay results confirm that Drillhole TNG006MD has intersected three distinct zones of elevated uranium, including an anomalous interval of 12m averaging 106ppm U3O8 (10ppm cut-off) within the poorly consolidated Tertiary sedimentary rocks. Detailed scanning electron-microscope studies of core (Appendix 5) from these intervals have confirmed
that uranium is in the form of a suite of minerals including uraninite. Within this Tertiary zone, the following two intersections have been calculated (100ppm U$_3$O$_8$ cut-off):

1. **Tertiary Zone**
   - TNG006MD: 112.5 - 112.82 : 32cm @ 1547ppm U$_3$O$_8$
   - TNG006MD: 119.5 - 120.22 : 72cm @ 296ppm U$_3$O$_8$

   Below this, and within dominantly grey (reduced) medium-coarse sandstones of the Devonian-Carboniferous Mt Eclipse Sandstone, an oxidation front was intersected within and around a highly altered conglomerate. This conglomerate is interpreted to represent a paleochannel, which, along with the alteration and host rock, make this mineralisation style similar in many respects to the Biggly deposit; however no anomalous vanadium is present in TNG006MD. The following intersection has been calculated (100ppm U3O8 cut-off):

2. **Mt Eclipse Channel Zone**
   - TNG006MD: 199.88 - 200.38 : 50cm @ 2316ppm U$_3$O$_8$
   - TNG006MD: 199.78 - 200.58 : 80cm @ 1771ppm U$_3$O$_8$

   A further 20m below the mineralised conglomerate, TNG006MD intersected a steeply dipping fault zone represented by a 2-cm fault gouge. This structure appears to have acted as a conduit for uranium bearing fluids, which have mineralised a 1.5m selvedge around this fault. It’s highly likely that this fault zone intersects the conglomerate-hosted uranium mineralisation above, and that these two zones are thus connected and genetically related.

3. **Mt Eclipse Structurally Controlled Zone** (100ppm U$_3$O$_8$ cut-off):
   - TNG006MD: 221.79 - 222.3 : 51cm @ 484ppm U$_3$O$_8$
   - TNG006MD: 221 - 222.5 : 150cm @ 318ppm U$_3$O$_8$

   Of the three intersections, this discovery of Tertiary-hosted uranium is perhaps most significant for a number of reasons:
   - It is the first time mineralisation at these grades has been reported from the Ngalia Basin.
   - This confirms the potential of the Tertiary cover sequences within the Ngalia Basin to host an ISR-amenable paleochannel-style uranium deposit.
   - Thundelarra is well positioned to explore for Tertiary paleochannels with an extensive landholding (>3000km$^2$) in the south of the Basin where the Tertiary cover is thickest, and where historical drilling has confirmed the presence of deep (> 100m) paleovalleys.
   - Furthermore, as evidenced by the deeper intersections in TNG006MD, the underlying Mt Eclipse Sandstone is clearly an excellent source rock for Tertiary reworking as it is host to uranium in a highly leachable form (uraninite in porous rocks).
   - Thundelarra’s licenses are located down the hydrological gradient from these source rocks which crop-out extensively on the northern margin of the basin and which host the Biggly deposit, and which are interpreted to underlie almost 100% of the Thundelarra license areas.
<table>
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5.8. Vegetation Survey (Ian Fordyce, August 2010)

The central part of the Ngalia Basin, where Thundelarra’s current drilling is focused, varies from sandplain in the east to low dunefield in the west. Apart from some small areas of outcrop and saline claypans, the substrate is massive (structureless) reddish brown sand, 1-3 m deep (obviously deeper in some of the sand-dune country). A thin (5-50 mm) topsoil is sometimes present. A 1-2 m thick, clayey subsoil underlies the sand. The soil is skeletal over outcrop areas. In some of the denser mulga thickets, and along drainage lines, it tends towards a brown sandy earth, with weakly developed horizons.

The vegetation over the red-sand plain is an open woodland or very open woodland, 6-12 m tall (occasionally up to 17 m). Canopy cover is generally less than 5%. Near the camp itself, the canopy consists of Allocasuarina decaisnina and Acacia coriacea (both known locally as desert oak), and beefwood (Grevillea striata). Elsewhere, the canopy includes bloodwood (Corymbia opaca), black gidyea (Acacia pruinocarpa) and ironwood (Acacia estrophiulata).

A distinct midstorey is almost always present. It is generally denser (5-20%) and more diverse than the canopy. In most places near Thundelarra’s campsite, the midstorey is overwhelmingly dominated by the untidy, low malleee Eucalyptus gamophylla. Other plants near the campsite include two fuschia or poverty bush species (Eremophila oldfieldii var. angustifolia and E. longifolia), plum bush (Santalum lanceolatum), desert grevillea (Grevillea juncifolia), the broad-leaved shrub (Psydrax latifolia), corkwood (Hakea subarva and H. cynaena), desert poplar (Codonocarpus cotinifolius), currant bush (Scaevola spinescens), and broom ballart (Exocarpos sparteus), together with several species of Senna and Acacia.

The groundstorey everywhere is a hummock grassland, dominated by spinifex grasses (mostly Triodia basedowii) and a variety of perennial herbs and low shrubs. Cover varies greatly, but is seldom less than 30%.

Overall, the sandplain vegetation is distinguished by its structural and floristic simplicity, and its apparent sameness over an extensive area. There are few spaces that are totally open, and the cover of trees and shrubs is almost always high enough to so that this open woodland with spinifex groundstorey is not classified as a hummock grassland with sparse trees.

At irregular intervals throughout the woodland, there are linear patches where mulga and other dark-coloured acacias grow in even-height (even-age?) thickets. As stated earlier, the brown, earthy substrate contrasts with the reddish sands of the surrounding sandplain. There is almost no understorey in these thickets. Non-spinifex grasses grow in clearings and along the edges.

Similar ‘tiger stripe’ patterns have been reported from North Africa, the Middle East, China and many arid or semi-arid parts of Australia. Some observers have claimed to recognise some order in this seemingly random distribution; however, there is no consensus about either the origin of the pattern or its maintenance, and no single explanation that I find satisfactory.

The Ngalia dunefield, like other sand-dune areas in central Australia, is almost entirely vegetated, although the cover is generally less dense and the canopy lower than over the sandplain to the east. Amongst the elongated seif dunes, the vegetation is hummock grassland with a sparse cover of trees and shrubs. Several kinds of low scrub predominate on the necklace or ‘choppy’ dunes. There is a clear distinction in plant cover between the swales, slopes and crests. Many of the species represented on the dunefield, especially in the swales and lower dune-slopes, are the same as those on the sandplain. However, the dunes themselves support an entirely new suite of plants. The dunefield vegetation will be described in more detail when exploration activities move westwards later in the year.
6. DISCUSSION AND RECOMMENDATIONS

A large amount of historical and open-file data has been recovered, assembled & processed, and new gravity and magnetic surveys have been undertaken. The new potential-field data has proven especially useful in mapping the overall basin structure. The linear east-west features are interpreted to represent a horst & graben or half-graben structural configuration whereby the Proterozoic Vaughan Springs & Mt Doreen Formations are now juxtaposed against Mt Eclipse and Tertiary sediments. This interpretation is supported by the historical drilling data, along with Thundelarra’s drilling data collected on the adjoining EL25334 (see especially hole TNG006MD, Figure 1).

Furthermore, the data suggests that the faults that lie along the edges of these structural blocks have been active during the deposition of both Mt Eclipse and Tertiary sediments, and caused localised variations in sediment facies.

Therefore the spatial distribution of porosity, uranium reductants (e.g. carbonaceous material or pyrite) within these sediments is ultimately structurally controlled, and exploration drilling should be directed toward the corridors of coarse sediment “pinch-outs” and paleochannels that flank these basement highs / gravity anomalies / fundamental structures where epigenetic uranium mineralisation is anticipated to occur.

In order to overcome the drilling difficulties, Thundelarra will trial Air Core techniques, as well as modifying the approach to mud rotary / diamond drilling such that the drillers persist with the rotary mud technique in the hard silcrete layers (as opposed to pulling out and converting to diamond), and in other formations the penetration speed is prioritised over sample quality. A Wireline logging device will remain onsite, and gamma logs will be run inside the rods.
7. REFERENCES


