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Operator: Rum Jungle Resources Ltd
Tenement Manager: Complete Tenement Management
Tenements: EL 24726
Project Name: Ammaroo Phosphate
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Contents

INTRODUCTION ....................................................................................................................................... 4
LOCATION, ACCESS AND LAND USE ................................................................................................. 4
Location............................................................................................................................................... 4
Access and Logistics ............................................................................................................................ 4
Climate ................................................................................................................................................ 5
Physiography, Land Systems, Flora and Fauna ................................................................................... 7
Land Use.............................................................................................................................................. 7
Aboriginal Sites of Significance ........................................................................................................... 8
Heritage Sites ...................................................................................................................................... 8
Mineral Titles Act Reporting ............................................................................................................... 8
Mining Management Act .................................................................................................................... 8
WorkSafe............................................................................................................................................. 9
HISTORY OF TENURE ............................................................................................................................... 9
EXPLORATION AND PROJECT RATIONALE ............................................................................................... 9
GEOLOGICAL SETTING ............................................................................................................................. 9
Regional Geology ................................................................................................................................ 9
Local Geology and Prospectivity ........................................................................................................... 12
RESOURCES ........................................................................................................................................... 12
SUB-BLOCKS RELINQUISHED ................................................................................................................. 12
WORK ON RELINQUISHED AREA .......................................................................................................... 13
CONCLUSION AND RECOMMENDATIONS............................................................................................. 13
SUMMARY
The Ammaroo Phosphate Project is located 240 km southeast of Tennant Creek. The project area contains the 40 km-long, billion-tonne Ammaroo Phosphate Deposit (partly on EL 24726), which is currently Australia’s largest JORC phosphate resource, the satellite Ammaroo South resource (on EL 25185), the Rockhole prospect, and, as yet untested, greenfields potential in the east. EL 24726 contains an ML application. The overall Ammaroo Phosphate Project prefeasibility has been announced. A voluntary partial relinquishment of 22 sub-blocks from 240 was made from EL 24726, leaving 218 sub-blocks or 696.4 km$^2$. This is part of a rationalisation of tenure between the Ammaroo Resource and the railway and is the second voluntary reduction of EL 24726 during 2014. There has been no on-ground work what-so-ever on this area because drilling on the area retained and on adjacent ELs in the project has demonstrated that the sub-blocks being relinquished have little prospect for phosphate. The areas relinquished also have three large CLC indigenous cultural exclusion zones impinging upon them. These effectively sterilise more than half the sub-blocks being relinquished and render the remaining areas too small to justify retention.
INTRODUCTION
The Ammaroo Phosphate Project tenements are located 280 km northeast of Alice Springs and 240 km southeast of Tennant Creek, on the Barrow Creek SF53-06, Elkedra SF53-07 and Bonney Well SF53-02 1:250,000 mapsheets. Rum Jungle Resources has been exploring for Cambrian rock phosphate in this area since 2009 resulting in the discovery of Barrow Creek 1 deposit (on EL 24726) and the Ammaroo South (on EL 25185). Rum Jungle Resources also acquired the Arganara Phosphate deposit, which is contiguous with Barrow Creek 1, by taking over Central Australian Phosphate. The flagship deposits have been combined into Australia’s largest rock phosphate resource now called Ammaroo Phosphate and the satellite Ammaroo South deposit has been elevated to Inferred Resource status with surrounding defined exploration potential.

LOCATION, ACCESS AND LAND USE

Location
EL 24726 is a flagship title located in the central part of the Ammaroo Phosphate Project (Figure 1). The partial reduction of this EL is part of a greater round of progressive voluntary partial reductions and surrenders across the entire western two-thirds of the project area from the Ammaroo Resource to the railway.

![Figure 1. The Ammaroo project area showing only those partial relinquishments and surrenders (in green tint) in this round that have been actioned by DME to 27/10/2014. EL 24726 is labelled in red. Pink polygons are ML applications. The black polygons are the defined JORC resources.](image)

Access and Logistics
Access to the project area is via the sealed Stuart Highway and the partly sealed Plenty and unsealed Sandover Highways from the south and the Taylors Road / Murray Downs road from the north (Figure 2). Construction of Rum Jungle Resources’ exploration tracks and line clearing are generally done by the local pastoralist or a Tennant Creek based earthmoving contractor. The 20-person Rum Jungle Resources’ Ammaroo base camp and fly-camps are used for exploration. Bores are used for drinking water. A medical clinic is located at the
Ampilatwatja Aboriginal Community. Bulk fuel is carted from Alice Springs on an as-needs basis. The nearest airstrips are at Ampilatwatja and Ali Curung. The Rum Jungle Resources’ Ammaroo base camp has an emergency helipad and JetA1 and AvGas.

Figure 2. Access to the Ammaroo Project area from Alice Springs in the south and Tennant creek in the north.

Climate
The climate is described as arid tropical by Baker et al 2005. The year is notionally divided into two main seasons, a short, hot summer featuring the bulk of the annual rainfall and a longer mild to cold and dry winter. These two dominant seasonal patterns are separated by short (1-2 months) transitional periods. The summer
Rains are somewhat influenced by the monsoonal rain patterns from the north, particularly cyclones which cross the Western Australian coastline.

Rainfall figures over a 30 year period (1981 – 2010) indicate an annual average rainfall of 383 mm (BOM 2012). However, rainfall is highly variable and unpredictable and annual records range from 86.4 mm to 914 mm. As shown below, much of 2010 and the start of 2011 were atypically wet while the rainfall for 2012 was more typical (Figure 3).

![Figure 3. Average rainfall for the project area.]

The average monthly relative humidity at 9 am (derived from data from 1988 - 2010) fluctuates between 31 to 52 percent with an average of 42 percent (Figure 4). The average monthly relative humidity at 3 pm is about 11-21 percent lower than the 9 am recorded humidity.

![Figure 4. Mean monthly relative humidity (%) at 9am (Green) and 3pm (Orange) at Ali Curung, NT (BOM 2013).]

The mean monthly maximum and minimum temperature over a 30 year period (1981 – 2010) indicate that the summer temperatures can fluctuate between 21 and 38 degrees Celsius and the winter temperatures can flux between 7 and 27 degrees Celsius. Sub-zero temperatures occur occasionally during July and August and there have been instances of surface water freezing at night. Figure 5 shows the mean monthly maximum and minimum temperatures recorded at Ali Curung.
Physiography, Land Systems, Flora and Fauna

Figure 1 (previous) shows the physiography. The project is located in the Tanami Bioregion south of the Davenport Ranges. This bioregion is comprised mainly of red sand plains with underlying rock strata occasionally exposed as hills and ranges. The sand plains are vegetated with mixed shrublands of Acacia, Eucalyptus or Hakea over Triodia hummock grasslands. On the ranges, Acacia shrublands occur over hummock grasses. This bioregion contains many plant taxa that are endemic to the region or the Northern Territory and several flora and fauna species that are of conservation significance.

Using the system devised by Perry, the area contains two major land systems; the Alinga and Singleton. The Alinga Land System can generally be described as a system of undulating plains interspersed by low rounded ridges with shallow stony soils, red earths and red clayey sands. The land system is dominated by *Acacia aneura* (Mulga) or *Acacia georginae* (Gidgee) woodlands over short grasses and forbs. On shallow stony soils, sparse shrublands occur over *Triodia sp* (Spinifex). The Singleton land system includes red sands forming undulating plains and sand rises, separated by moderately wide, flat swales. Alluvial flats and drainage floors may also be present. Vegetation is dominated by sparse shrublands over *Triodia* (Spinifex), with Acacia woodlands also being present.

The project has been the subject of several baseline fauna and flora surveys commissioned by Rum Jungle Resources. These, a Threatened Species Report, and a report on weed species have been provided with MMPs and are not repeated here. These topics are dealt with even more comprehensively in the NOI.

Land Use

The area is sparsely settled. The largest permanent habitations are the indigenous communities at Ampilatwatja (population approx. 500) and Ali Curung (population quoted variously as 960 or 535 of which over 95% are Indigenous persons). The dominant Aboriginal languages spoken are Warlpiri and Alyawarr with English as a second or third language.

The EL 24726 is located on Ammaroo pastoral lease. The area supports an active beef cattle industry and stocking numbers vary seasonally. Cattle are generally not seen near the Ammaroo Phosphate Resource because of a lack of both surface and ground water. In contrast, Ali Curung has irrigated market gardens using the plentiful groundwater there.
Aboriginal Sites of Significance

An AAPA register search was undertaken before Rum Jungle Resources and its subsidiaries began work on ELs in the Ammaroo Project.

EL 24726 was part of an agreement between the CLC on behalf of the TOs and NuPower (later Central Australian Phosphate). Rum Jungle Resources has continued to honour this agreement.

EL 24726 contains numerous sites of cultural significance, the exact details of which cannot be disclosed under the terms of the agreements. Three areas of cultural significance impinge upon the sub-blocks being relinquished.

The CLC agreements also provide for monetary compensation to the CLC and Traditional Owners in proportion to the exploration expenditure. The most recent CLC on-country meeting, dealing with broader Ammaroo Project, was held with Traditional Owners on 03/10/2014.

A search of the NT Heritage Register held by NRETAS shows no Declared Heritage Sites in the area covered by this report.

Mineral Titles Act Reporting

EL 24726 was part of reporting group GR104 under the Mineral Titles Act, but this is a standalone partial relinquishment report.

Mining Management Act

The NT Mining Management Act (MMA) allows for different reporting groups to the Mineral Titles Act (MTA). Under the MMA, EL 24726 is part of the amended Ammaroo Authorisation 609-04. The most recent version of the MMP, for regional phosphate reconnaissance drilling, was approved by DME in Alice Springs during June 2014. This work has now been completed and the results influenced the decision to partially relinquish these sub-blocks.
WorkSafe

As part of an NT-wide move by Worksafe to improve its monitoring and inspections of exploration and mining projects, Worksafe required Rum Jungle Resources to redo its Safety Management System and update its Risk Management Plans for each project including Ammaroo. Consultants Switched on to Safety were engaged to completely update Rum Jungle Resources WHS&E. The most recent Worksafe inspection of the Ammaroo project was undertaken in March 2014.

HISTORY OF TENURE

Exploration license EL 24726, formerly called “Arganara”, was applied for by Arafura Resources Limited on 12th May 2005 and granted on 1st April 2008 as 1,374 km². It was part of their Ni-PGE-Au exploration portfolio around the Kurinelli Goldfield. EL 24726 was transferred to NuPower Resources Limited on 3rd April 2008 as a result of the demerger of certain uranium assets from Arafura and the formation of the new company. NuPower was targeting uranium, but had done little on the ground until late 2010 after Rum Jungle announced the discovery of phosphate on the adjacent title. NuPower then swapped to phosphate exploration. EL 24726 was reduced in 2010 and again in 2011, to 294 sub-blocks or 939.6 km². It was then in three parts. An ML application covers part of EL 24726 over the current JORC Resource.

NuPower became Central Australian Phosphate (CEN). During 2013, Rum Jungle Resources took over Central Australian Phosphate which became a wholly owned subsidiary and gave RUM control of the contiguous CEN titles in the Ammaroo Project.

As part of the 2014 renewal of EL 24726, it had to be reduced to less than or equal to 250 sub-blocks and/or split into two or more. The larger part of the previous three, which contains the JORC resource, was retained as EL 24726 with the voluntary partial relinquishment of 11 sub-blocks. The two remaining portions became EL 30520.

The current voluntary partial reduction further reduces EL 24726 to 218 sub-blocks or 696.4 km². This reduction was applied for on 21/10/2014, actioned in TIS on 27/10/2014 and back dated by DME to 23/20/2014.

EXPLORATION AND PROJECT RATIONALE

The Ammaroo Project is being explored for rock phosphate, principally within the Arthur Creek Formation which hosts the Ammaroo Phosphate Resource and the Ammaroo South deposit. Exploration is directed at locating phosphate where it is shallow (low strip ratios), not entirely weathered (predictable rock properties amenable to mining), and highest grade and thickest (palaeo-coast and potentially draped over palaeo-highs). Rum Jungle Resources’ approach, which has worked successfully to date, is to initially undertake reconnaissance RC or air core drilling on existing tracks and fences. Samples are analysed in the field with a handheld XRF and potential phosphate is sent for laboratory analysis. Depending on success, follow-up drilling usually involves cleared drill lines and/or grid RC drilling.

Since the discovery of economic grades of phosphate in 2010, Rum Jungle Resources has moved to rapidly prove them up to JORC 2012 standard including a significant component in the Measured category. The company has also completed Scoping and Prefeasibility Studies.

GEOLOGICAL SETTING

Regional Geology

The Ammaroo Project is located in the Georgina Basin which contains the largest sedimentary rock phosphate deposits in Australia. The Georgina Basin includes rocks of Neoproterozoic to Devonian age, with Cambrian
platform carbonate rocks dominating basin fill. The southern Georgina Basin is contiguous with the Wiso Basin to the west (Figure 7).

The southern Georgina Basin includes a thick sequence of Cambrian-Ordovician sediments, deposited within the Dulcie Trough and on the adjoining Elkedra Shelf. Work by previous explorers and NTGS identified an extensive area of shelf-facies marine carbonate and clastic sediments of the Middle Cambrian Arthur Creek Formation within the southern Georgina Basin (Figure 8, 9). This area is prospective for sedimentary phosphate mineralisation.
Cambrian sediment outcrop is generally restricted to the north of the project area, along the flanks of the Davenport Range. Several formations contain very similar carbonate and recessive shale units that can be very difficult to tell apart without palaeontology and some published maps show incorrect formation assignation. Indeed, the outdated Elkedra published 250K map shows the Arthur Creek Formation as being partially laterally equivalent to the Chabalowe Formation and partially underlying it, whereas the actual Chabalowe Formation is laterally equivalent to the younger Arrinrunga Formation not the Arthur Creek Formation. The Chabalowe Formation can directly and conformably overlie the Arthur Creek Formation, but they are distinctly different ages, and this should be the relationship on the Elkedra mapsheet. The former Errarra Formation shown on published maps is now recognised as Red Heart Dolostone. In addition, it has recently been recognised that the so-called Thorntonia Limestone mapped over large areas of the Northern Territory is...
actually the older Hay River Formation and the former name should be restricted to its type area in Queensland. This change is yet to be reflected on any NT maps or publications.

Alluvial, aeolian and residual sediments of Cenozoic age blanket most of the remaining project area

**Local Geology and Prospectivity**

Within the overall project area, the Cambrian lithostratigraphy of the southern Georgina Basin includes units of the Shadow and Narpa Groups, of which two units are known to be phosphatic:

- mid-Cambrian Thorntonia Limestone (now Hay River Formation) – a limestone and dolostone unit (rarely containing a localised black shale) with phosphorite beds
- mid-Cambrian Arthur Creek Formation – deep-water anoxic organic-rich shales overlain by shallow-water aerobic calc- and dolo-siltstones with phosphorite beds

To date, the Thorntonia Limestone (Hay River Formation) phosphorite in the study area is thought to be inferior to that in the Arthur Creek Formation in Rum Jungle Resources’ project area. In the opinion of Rum Jungle Resources, reports of phosphate in the Chabalowe Formation are erroneous and reflect the mismapping on published maps (see discussion above).

Drilling within the project area indicates that the Arthur Creek Formation target stratigraphy generally contains two distinct facies:

- an upper aerobic facies consisting of grey to brown siltstones, with minor brown chert bands or lenses; and
- a lower anaerobic facies consisting of dark green to black siltstones, with minor black chert bands or lenses.

The upper facies is the phosphate target and, where it is present, the lower facies serves as economic basement.

**RESOURCES**

*Main Ammaroo Resource*

The current JORC 2012 resource for the main Ammaroo Project is over a billion tonnes at 14% P₂O₅ using a 10% cut-off. The pre-feasibility study for the project has been released.

*Ammaroo South Resource*

Ammaroo South is a satellite resource on EL 25185 approximately 70 km southeast of the main Ammaroo deposit. It is a JORC 2012 Inferred phosphate resource estimated at 70 Mt at 13% P₂O₅ using a 10% cut-off.

**SUB-BLOCKS RELINQUISHED**

The areas being relinquished from EL 24726 are shown below.
The areas dropped from EL 24726 are considered to have been tested by drilling on contiguous retained areas. Furthermore, CLC culturally significant areas that impinge upon the areas relinquished, sterilise much of the area. The remainder is rendered too small to retain.

**WORK ON RELINQUISHED AREA**

No on-ground work what-so-ever was possible on the sub-blocks being relinquished because of cultural sites.

**CONCLUSION AND RECOMMENDATIONS**

All the sub-blocks being relinquished from EL 24726 are various combinations of:

- sites of cultural significance
- tested by drilling on the area retained which failed to intersect phosphate to the maximum depths drilled there.