Partial relinquishment report for EL 28872, Karinga Lakes Potash Brine Project

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Datum/Zone: GDA94/ Zone 53
250K map sheet: Kulgera SG5305
100K map sheet: Ebenezer 5447
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SUMMARY

EL 28872 is one of several substantially contiguous granted ELs in Rum Jungle Resources’ Karinga Lakes Potash Brine Project. Exploration targeted potassium- and magnesium- sulfate-salts in subsurface salt lake brine to produce potassium sulfate (SOP) and/or potassium magnesium sulfate (schoenite) fertiliser probably using solar evaporation ponds and flotation. The project has a JORC resource of potash brine and has advanced beyond exploration. A scoping study of the Karinga Lakes Project has been undertaken by CICCC and GHD. EL 28872 is in the northeast of the project area. As part of a rationalisation of adjacent ELs in the Karinga Lakes Project, ten blocks are being voluntarily relinquished from EL 28872. No on-ground work was conducted on the area being relinquished and there is no expectation of potash brine being present in the area relinquished.
PHYSIOGRAPHY, ACCESS AND LOGISTICS

Location
EL 28872 is located in semi-desert country 150 km southwest of Alice Springs on the Kulgera 1:250 000 map sheet (Figure 1).

Figure 1. Location map of EL 28872 in the northeastern part of the project area along with other contiguous potash tenements to the south. The JORC brine resource is outlined in pink.

Habitation and Land Use
EL 28872 is on Lyndavale pastoral station which runs cattle. This is the only land use of the EL. Stocking rates vary seasonally but are generally low due to the arid environment. Apart from the pastoral station, the nearest points of habitation are Aboriginal communities, the largest of which is Imanpa (population between 180 and 250), 7 km north of the Lasseters Highway and about 17 km from Mt Ebenezer Roadhouse. Imanpa has a clinic which was built in 1986 and a visiting nurse with an ambulance.

Access and Logistics
Access to EL 28872 is from the Lasseter Highway which runs east-west through the project area north of the EL (Figure 1). The EL is serviced by several station tracks.

Curtin Springs Station and roadhouse have been used as a logistic base. During 2012, rental camper vans were also used as site accommodation. A transportable “donga” camp was established in 2013 and removed again in 2014.

Access on the salt lakes themselves requires specialist equipment. Quad bikes were not successful and it was necessary to purchase tracked AWD amphibious vehicles and a trailer with a ground footprint of less than one psi. Drilling contractors used hovercraft to move personnel. Helicopter support and equipment lift have also been used extensively throughout the duration of the project.

Climate
The climate is classified as semi-arid with long hot summers and relatively mild winters. A feature of the winter months is the marked diurnal fluctuations in temperature, which can range from sub-zero overnight to mid twenties (°C) or higher during the day. Daytime summer temperatures rarely fall below 30°C and there are often long periods with days in excess of 40°C. On the salt lakes themselves, temperatures can be even higher because of reflected heat. The average rainfall is about 250-300 mm, most of which falls in the mid to late summer, and the average annual evaporation is 3,000-4,000 mm.
HISTORY OF TENURE
EL 28872 was applied for on 04/07/2011 and was granted on 06/03/2012 for a period of six years. It covered 79 blocks or 245.41 km². Earlier in 2015, 58 blocks were relinquished leaving 21 blocks or 65.21 km². All the titles in the Karinga Lakes project were transferred into a single company name. This transfer of titles was held up by the Territory Revenue Office and Stamp Duty.

Another voluntary partial relinquishment of a further 10 blocks being reported here reduces EL 28872 to 11 blocks.

In practical terms, Rum Jungle Resources works the Karinga Lakes as sole operator of a single project. Clearly, individual lakes and the brine resource extend over many ELs and the company’s work straddles EL boundaries.

EXPLORATION AND PROJECT RATIONALE
EL 28872’s salt lakes and sub-surface aquifers were explored for potassium- and magnesium-rich sulfate brines as part of Rum Jungle Resources’ Karinga Lakes Potash project. The project has advanced beyond exploration with an established resource. It is hoped to produce potash and/or schoenite fertiliser by simple solar evaporation and/or other onsite treatments such as flotation. Australia has no producing potash mines. Around 350,000 tonnes of potash is imported into Australia annually from Canada and is worth around $200 million. Potash of sulfate and schoenite are utilised as high-end fertiliser products globally, as they have a lower salt index than muriate of potash and are often preferred in crops sensitive to chloride or susceptible to fertiliser burn. Sulfate of potash and schoenite attract premium pricing in comparison to the more common muriate of potash. The Karinga Lakes Potash Project is strategically well located adjacent to the Lasseter Highway and within close proximity of the Central Australian Railway line, providing access north to the port of Darwin and proximity to Asian markets and south to domestic markets.

GEOLOGICAL AND HYDROLOGICAL SETTING
EL 28872 overlies the southwestern sector of the Amadeus Basin in the Northern Territory. The Amadeus Basin covers approximately 150,000 km² and extends into Western Australia. It is comprised of a Neoproterozoic to mid-Palaeozoic succession of predominantly shallow marine sedimentary rocks and attains a thickness of up to 14,000 m. The siltstones of the central Amadeus Basin have weathered into a modern topographic low. This depression contains a chain of Cenozoic playa salt lakes. Quaternary sand dunes, up to 30 m high, encroach onto the depression. The dunes are mostly vegetated and stable. The playas presently occupy only the lowermost topographic depressions in swales between dunes. Quaternary calcrete and silcrete duricrusts (of vadose origin) are characteristically superimposed on Amadeus Basin outcrops, forming escarpments, several metres high along the margins of some of the playa lakes. Low-relief gypsum-sand “islands” are also present in some of the playas.

The sediments in the modern playa lakes and their palaeo-drainages contain brines formed by the evaporation of surface and near-surface water from infrequent and largely unpredictable rain and flooding events.

Most importantly, the lakes are also fed from groundwater discharge in the Central Australian Groundwater Discharge Zone as described below.
Figure 2. Regional view of the Central Australian Groundwater Discharge Zone (outlined in light blue) running from Lake Hopkins in WA through to Karinga Lakes, nearest the railway. The blue arrows indicate sub-surface flow.

Figure 3. Schematic diagram of how the Central Australian Groundwater Discharge Zone works.

The Devonian Horseshoe Bend Shale forms low mesas around many of the lakes and constitutes the lake “floor”. Where it is fractured and/or deeply weathered, the Horseshoe Bend Shale is a brine aquifer in its own right; being the local discharge point for the Central Australian Groundwater Discharge Zone. It is hydraulically connected to the brine in the modern lake sediments, to collectively form a single brine aquifer. The Horseshoe Bend Shale was/is evaporitic, containing sulfate and chloride evaporites. It also contains locally abundant detrital biotite. The evaporites have been leached out over geological time and have almost certainly contributed to the brine, both within the shale and within the lake sediments. These migrating brines have also liberated additional potassium from the weathering biotite.
WORK BY PREVIOUS OPERATORS
Local pastoralists have exploited surface salt on a few of the Karinga Lakes (eg Swansons Lake) as a source of NaCl for cattle licks since the 1940s and there was some local exploitation of gypsum for domestic and commercial use. Small-scale commercial salt-crust scraping operations have operated sporadically over the decades, notably at Lake Suzi. There has been no exploitation of the subsurface lake brines except for road crews who dug pits and pumped brine for use in road works. The possibility of commercial exploitation was examined in 1960s and again by NT Evaporites during the late 1980’s and early 1990’s. In 1988, NT Evaporites and the Northern Territory Department of Industry and Development created a geological data base to assess the industrial mineral resources in the license areas. The investigation involved field mapping, sediment sampling and water sample collection. This work identified a variety of industrial minerals and brine resources including industrial clays, zeolites and evaporites. In 1992, Geo-Processors Pty Ltd conducted an assessment of resources and feasibility study of the Karinga Lakes area and concluded that the site was suitable for a commercial operation and technically feasible. These studies, and the reasons for their lack of success, have been summarised in previous reports and are not reproduced here.

WORK BY RUM JUNGLE RESOURCES ON RELINQUISHED PORTION
Only desk-top studies and remote-sensing based on publically available data have been undertaken on the blocks being relinquished. The blocks being relinquished have not been sampled or tested by drilling. However, there is no expectation that potash brine would be present in the areas being relinquished.

BLOCKS BEING RELINQUISHED
A major rationalisation of the titles in the Karinga Lakes Project was undertaken in early 2015. This is a second round of partial relinquishments that includes titles adjacent to EL 28872. The ten blocks being relinquished are shown below on a block ID map.

Figure 4. Sub-blocks being relinquished from EL 28872 outlined in pink.
CONCLUSION AND RECOMMENDATIONS
Remote sensing studies and desk-top studies failed to identify any potential for potash brine in the area of EL 28872 being relinquished.