EL 30494 Surrendered Portion
Bone Creek
Report two years to 8th April 2017
Ripple Resources Pty Ltd

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Summary

Ripple Resources is a fully owned subsidiary of Armour Energy Ltd. Armour has been exploring the gas and oil resources of the McArthur Basin, and has made a significant gas discovery in the Glyde sub basin.

Ripple has selected Exploration Licences within areas inside the Armour Energy permits, and has been cooperating with Armour in order to evaluate these ELs for their base metal potential.

This cooperation has involved modifications and extensions to the Armour program so that it has greater relevance for base metal exploration. Additionally, the techniques and concepts used in hydrocarbon exploration overlap with leading edge base metal exploration.

Base metal exploration within these Licences is challenging because of the rugged topography and cover geology.

Previous exploration by BHP and MIM relied on airborne EM as a target generating technique. This technique continues to have problems due to the extensive conductors in the cover and host sequences. Locally saline water has been an additional problem.

The previous drilling results were compiled against publicly available geophysical data. This revealed that there is widespread shallowly buried copper and lesser zinc lead mineralisation within the EL area. The regional faults appear to play a role in copper distribution, which is interpreted as being hosted by the Wollogorang formation.

A basin wide study was commissioned using Frogtech analysis. This used all known geological and geophysical data to model the basin structure and depth to Wollogorang formation a large area, including all of EL 30494.

The EL contains a prospective fault bound basin adjacent to basic volcanics. This is a classic site for metal deposition. Targets are shallow and more advanced than in any other Ripple McArthur River tenements.

The targets have been retained within 124 of the original 248 blocks and the remainder of EL 30494 surrendered.
1.0 Introduction

Ripple Resources Pty Ltd was set up by DGR Global Ltd for the purpose of exploring for base metals within areas of the McArthur and Mount Isa basins that were being examined by Armour Energy Ltd for gas and oil. After the float of Armour Energy, Ripple Resources was sold to Armour at cost. Since that time, Armour has been providing funding and much of the operating resources for Ripple. Armour Energy began a restructure by bringing in American Energy Partners (AEGP) as a major shareholder, and as the manager and funds provider for the NT petroleum exploration.

AEGP was committed to paying a substantial sum to Armour Energy which will fund Ripple Resources as a separately managed entity. Since that time, AEGP withdrew from the commitment due to the death of the principal and CEO. Efforts to raise money and continue joint hydrocarbons and mineral exploration in the NT have been badly affected by the NT government moratorium on well stimulation.

Modern concepts regarding the formation of sediment hosted basemetal deposits have given new emphasis to the century old model that the metals were introduced along with hydrocarbons, either in conventional trap sites or within basin centred accumulations.

There was an opportunity to modify and extend the Armour program so that Ripple Resources could benefit from aspects of the petroleum evaluation which were relevant to base metals. Ripple and Armour have employed a basin wide approach towards exploration, and has widened its search away from the Batten trough and the Barney Creek formation. This joint evaluation has been stymied by the well stimulation (fracking) ban in the NT.
2.0 Location and Access

Fig. 1 Location and access

The three surrendered portions of the EL extend over 40 km in a peripheral relationship to the central retained portion. Access is best made via tracks from the Borroloola Bing Bong road. Within much of the EL, access is easy using four wheel drives and motorcycles.

3.0 Licence Details

EL 30494 was granted on the 8th April 2015 for 5 years. It covered 248 blocks with an area of 819 sq kms. It is subject to 50% minimum reduction every second year. The surrendered area is half the original size at 124 blocks. Native Title and Heritage clearances have been handled concurrently with overlapping EP 171 and EP 176.

4.0 Geology and Previous Exploration

Most of the area is comprised of the flat lying Tertiary alluvium, and low outcrops of Tawallah Group. These obscure the prospective Proterozoic dolomitic shale sequences, which are faulted and gently folded. The formations of prime interest are the Barney Creek Formation in the far west and the lower Wollogorang Formation in the central and northern areas. Most mineralisation of note lies between the Coxco and the Caranbirini member of the Lynott Formation, but some bitumen – galena- sphalerite infills extend up as far up sequence as the Bessie Springs sandstone in the Roper Group. In the south,
within ELs 29954 and 55, BHP drilling has revealed bitumen chalcopyrite galena sphalerite infills within thick strongly organic dolomitic shales of the McDermott formation. The McDermott formation is interpreted as being too deep to explore within EL 30494. As a rule, formations with hydrocarbon shows as shown in Fig.2 are those with mineralisation. The mineralised rocks in this area are often dangerous to drill due to gas, and fresh rock can be quite inflammable.

The economically significant lead zinc copper deposits are part of the Mt. Isa – McArthur metallic province, which is the most productive zinc district in the world. Locally, the HYC mine is the only producer, with a global resource of over 200 million tonnes of lead zinc with minor copper. New exploration by Rox Resources (Teck) has enhanced the nearby Myrtle and Teena deposits by means of deeper drilling and larger richer intercepts. They are typical of the basin hosted deposits which are normally richest in the structurally lowest sites, within the most organic dolomitic shales.

Other zinc-lead copper deposit types are known, and are mainly of the porosity infill type, where hydrocarbons and metals have migrated into trap sites usually in solution breccias or decarbonated dolomitic shales. Locally, these include the Coxco, Cooleys and Ridge deposits. Century in Queensland is the largest known deposit of this type, and until recently was the world’s largest source of zinc. At Century, the stratiform sulphide mineralisation occurs in a matrix of live oil occupying secondary porosity sites, and adjacent smaller mines have produced pitch as well as silver lead. Renewed exploration at Walford Creek (in Queensland, close to the NT border) has discovered significant Mt. Isa style copper cobalt phases that overprint the silver lead zinc. This style is also present in breccias at Cooleys, but is not economically significant.

Locally, the major previous work in the Bone Creek area was done by MIM (ELs 6808 and 7891) BHP (ELs 3061, 3578, and 7797) Conarco (EL 2396), and Shell (EL 1728).
Fig. 2 Stratigraphic column - note that the >200m thick McDermott formation black dolomitic shales and evaporites have been removed from this official version, despite its widespread distribution about 150m above the Siegal volcanics. It is considered too relevant to ignore.
5.0 Work Conducted During the Reporting Period

5.1 Compilation of Previous Exploration

Publicly available data and reports on the results of previous exploration in the general area were compiled with the view of understanding the mineralisation controls and to develop exploration targets within the EL area.

The compilation is demonstrated in Figure 3. As can be seen, there is a persistent trend of copper mineralisation along a regional scale WNW fault system. Some of this mineralisation has IOCG affinities, being clearly epigenetic and concentrated within magnetite rich siderite bodies, but most is disseminated within fractured dolomitic shales.

The dolomitic shales are interpreted to belong to the Wollogorang formation, mainly on the basis of their proximity to the magnetic volcanics and sandstones at the top of the Tawallah group. They could also belong to the McDermott formation. Both formations have been recognised as potential hosts to SEDEX mineralisation in a CSIRO study funded by Ripple.

The Barney Creek formation is confined to the western margin of the EPM. It is not fully developed and does exhibit strong conductivity and unusually high geochemistry. The principal EM conductors are the Mainoru formation pyritic kerosene smelling pyritic shales, which are not a known mineral host. Weaker conductors are probably sourced in the Wollogorang and McDermott formations.

The Mule Creek EM conductor remains untested by MIM drilling. The target lay at 200m depth under a 48m sub economic copper intersection. Plans to deepen the hole were thwarted by the XSTRATA takeover.

Fig. 3 Previous drilling, geochemistry and magnetics
A moderate EM conductor in the far south east may be the source of unusual copper in a water bore nearby.

Figure 7 illustrates the structural and stratigraphic target represented by the faulted juxtaposition of basement volcanics and dolomitic shales. This buried target is quite shallow, within reach of cheap percussion drilling.

Fig. 4 Interpreted Structural Stratigraphic Target

5.2 Frogtech Basin Study

The purpose of the survey was to provide information that would allow structural interpretation of the areas obscured by cover, at the same time as identifying fault bounded sub basins that may host sulphide accumulations. Figure 8 shows a 3D image with some targets illustrated.

Frogtech uses geophysical geological and downhole information to generate an image of the basin structure. The pale colours are areas of shallow McArthur group, darker areas are deeper. The Emu fault system is clearly illustrated as are the other growth faults controlling sub basinal development.

The hydrothermal system along the Emu fault sets (it is more than one fault) is regionally extensive, but is only known from outcrops and drill cores that are comprised of rocks below the Lynott formation. The other fault systems have mineralised hydrothermal breccias but these have been poorly documented. A more subtle ENE set is of prime importance in the McArthur Basin and in the adjacent part of the Mt. Isa superbasin. These have been strongly highlighted in the HYC – Teena area.
Fig. 5 Tilted Frogtech image with regional targets

Fig. 6 Targets selected in EL 30494
6.0 Results and Conclusions

EL 30494 contains widespread copper mineralisation at a shallow depth under cover. It also contains Barney Creek formation of variable thickness.

The eastern Emu Fault and adjacent basins provide an excellent setting for major mineralisation.

The non-prospective portions should be surrendered and a more aggressive program should continue within the retained portion.