Group Report: GR273/13 covering ELs 28895 and 28897

2nd Annual Report

For the period

20-02-2013 to 20-02-2014

By

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GDA94 - Zone 53
Target Commodities: Heavy Minerals, Manganese and Iron Ore
1:250,000 Hodgson Downs
1:100,000 Chapman, Flying Fox, Throsby

February 2014
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SUMMARY

This Group Technical Report for GR273/13 covers exploration activities on EL 28895 and 28897 which were granted to Australian Manganese Resources Pty Ltd (AMR) on 20/02/2012 for a period of 6 years.

The Project lies within the Bauhinia Shelf of the Proterozoic McArthur Basin. The area has been historically subject to very limited exploration for manganese and other commodities by airborne geophysical methods at wide spacing that provides only basic information for an initial understanding.

The tenements are situated within the McArthur Basin, a major Proterozoic-aged sedimentary basin. In Cretaceous times a major marine transgression laid down a sequence of sandstone, siltstone and conglomerate unconformably over older rocks. Much of this sequence has been eroded with flat top mesas remnant in inland areas and cover (up to 100m thick) on coastal plains.

Those portions of the tenements which are underlain by Cretaceous age sediments are considered to be prospective for manganese similar to that mineralization style found on Groote Eylandt.

No exploration was carried out during the reporting year due to limited exploration funds being available. Refer to letter from G fanning to Titles Division accompanying this report.
INTRODUCTION

Background

Australian Manganese Resources Pty Ltd (AMR) holds eighteen granted exploration licences and one exploration licence application in the Gulf Country of the Northern Territory within the Bauhinia Shelf of the McArthur Basin Area.

The most western group of AMR tenements include: ELs 28895, 28897 (GR273/13) are considered prospective for a significant manganese discovery. The locations of these tenements in relation to Cretaceous hosted manganese occurrences are shown in Fig. 1. Tenements were selected on the basis of geological similarity to that at Groote Eylandt where economic manganese deposits are preserved under Cretaceous cover.

This report covers activities on GR273/13 between 20th February 2013 and 20th February 2014. The tenements were granted to Australian Manganese Resources Pty Limited on 20/02/2012 for a period of 6 years.

Climate

The project area has an average annual rainfall between 600-800 millimeters with most falls between November and April. It represents a humid monsoonal climate, with mild dry winters and hot humid summers often with heavy monsoonal rains associated with tropical cyclones. During the wet season, portions of the area can be inaccessible for exploration activities.

Location and Access

The exploration license is located about 60 km south of Roper Hwy along the Hodgson Downs Road and immediately south of Minyeri town which includes an all-weather airstrip less than 20 km from the Group tenements (Fig.2). Access to these tenements may be possible from a track along the east side of the area. Helicopter access would be required initially for reconnaissance exploration.
Figure 1: AMR Group Tenements location (GR 273/13 in red color).
TENURE

Mining/Mineral Rights

Exploration Licenses within GR 273/13 were granted to AMR Pty Ltd (Australian Manganese Resources Pty Limited) on 20/02/2012 for a period of 6 years. The tenements cover 127 sub blocks (*Table 1; Figure 2*) for 391 sq kms.

Land Tenure

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<th>Title Type No.</th>
<th>Land Tenure</th>
<th>Grant Date</th>
<th>Expiry Date</th>
<th>Area Sq Km</th>
<th>Current Sub Blocks</th>
<th>Annual Report</th>
<th>Existing Covenant</th>
<th>Proposed Covenant</th>
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<td>Pastoral</td>
<td>20/02/2012</td>
<td>19/02/2018</td>
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<td>59</td>
<td>08/04/2014</td>
<td>24,750</td>
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<td>Pastoral</td>
<td>20/02/2012</td>
<td>19/02/2018</td>
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<td>68</td>
<td>08/04/2014</td>
<td>27,000</td>
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</tr>
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</table>

*Table 1: Exploration Licence Details GR 273/13 (127 Blocks).*

Aboriginal Sacred Sites

No archaeological surveys have been carried out during the current tenure. If ground disturbing exploration becomes warranted by initial encouraging rock chip results or observations then AAPA Clearances Certificates will be sought.
Figure 2: West Group Tenements location plan of GR 273/13 (127 sub blocks)

GEOLOGY

Regional Geology

The tenements are situated within the McArthur Basin, a major Proterozoic-aged sedimentary basin. The Project lies on the border between Bauhinia Shelf and Daly Basin of the Proterozoic McArthur Basin (Figure 3). The Daly Basin consist of Neoproterozoic to Palaeozoic sedimentary basins of the Central Australian Platform Cover which are characterized by shallow marine epicontinental successions of carbonate and marine
clastic rocks, evaporite, and fluvial and lacustrine continental sandstone, glaciogenic sediments, shale and siltstone. Extensive sub-aerial flood basalt of Early Cambrian age (540 Ma) covered large areas in the northern part of the Territory. The McArthur Basin, within which Bauhinia Shelf belongs, is part of the Palaeo- to Mesoproterozoic sedimentary basins of the North Australian Platform which are characterized by accumulations of alternating shallow marine, intertidal, supratidal and fluvial facies, and contain abundant evaporites and carbonates. Mesoproterozoic sediments include shallow marine and fluvial quartz-rich arenite and subordinate siltstone and carbonate.

**Figure 3:** Location of project along the margin between McArthur's and Daly's Basin.
Local Geology

The tenement GR 273/13 lies on the border between Bauhinia Shelf and Daly Basin. Bauhinia Shelf includes Roper Group Stratigraphy which contains oolitic ironstones of the Sherwin Formation. The older rocks are covered in part by flat-lying Cambrian age sandstone, volcanic and limestone of the Georgina Basin. In Cretaceous times a major marine transgression laid down a sequence of sandstone, siltstone and conglomerate unconformably over older rocks. Much of this sequence has been subsequently eroded leaving flat-topped mesas away from the coast and a thin cover (up to 100m) on the coastal plains.

The Group Tenements is located on the border between Bauhinia Shelf and Daly Basin. The geology in this area consists of Mesoproterozoic rocks related to the Roper Group and Cambrian rocks related to the Georgina Basin, often both covered by Cretaceous and Cainozoic sediments (Geology map in Figure 4). Cretaceous sediments are considered prospective for manganese mineralization and hence such mapped areas need to be checked.
PREVIOUS EXPLORATION

Mining History
No historic mining has been conducted on this Group Tenement (GR 273/13).

Exploration by Previous Companies
Sporadic exploration over the western and southern margins of the Carpentaria Basin on the mainland has been conducted by various companies since 1964 (eg BHP 1964a, Chesnut et al 1967, Still 1971, Lockhardt 1977, Paterson 1997). A number of significant prospects (eg South Rosie Creek and Batten Creek) have been discovered in this region.
using the Groote Eylandt manganese model. Total production of manganese ore from the Northern Territory is about 50 Mt and is dominated by the Groote Eylandt operation. BHP Minerals undertook exploration for manganese in the area covered by the AMR tenements during the early 1990’s. The main techniques used were airborne and ground electromagnetic surveys (TEM) plus some drilling done. Many spurious TEM anomalies were generated by saline water incursions in the coastal sediments. Minor intersections of manganese were found at the Brumby, Rosie Creek South and Yiyintyi prospects. Rosie Creek South is located close to a prominent hill of Yiyintyi Sandstone. The manganese mineralization is hosted by Cretaceous claystone at the unconformity with the underlying Yiyintyi sandstone (Ferenczi 2001). The mineralization is represented as a stratiform pisolitic manganese horizon within a glauconitic clay-stone which overlies a basal quartz sandstone. The Cretaceous sequence is up to 100m thick. The ore zone forms a sheet-like body up to 3m thick which occurs within a mineralized zone some 22km long and up to 6km wide. Current reserves are about 120Mt at 48% Mn.

**EXPLORATION COMPLETED BY AMR**

No field exploration was carried out on this area by AMR Pty Ltd, during the 2013 year. Enquiries were made with Fugro Geophysical on the possibility of flying aeromagnetics to locate manganese under shallow cover in a similar way to the discovery of Groote Eylandt.

In addition the intention to conduct helicopter based reconnaissance rock chip sampling and mapping was hampered by the lack of exploration funding. This was to be made available through the parent company Australian Ilmenite Resources. However that company was focused on trying to maintain its ilmenite Production from Sill 80 on the Roper Heavy Minerals Project. In that case there were no funds available to conduct the proposed programme on this AMR Group of tenements.

Consequently geological activities and prospecting such as reconnaissance mapping and sampling need to be planned in the 2014 exploration program.

In this western part of the Project area potential for Sherwin Formation to exist and host oolitic ironstone mineralization should be checked also.
GEOLOGICAL MODEL

Remote sensing methods such as satellite imagery, airborne geophysics and hyperspectral mapping can be used at a regional level for manganese exploration. Subsequently geological activities and prospecting such as reconnaissance, mapping and sampling needs to be planned with a specific program.

**Satellite imagery**

Satellite imagery covers large areas and can be used to map outcropping or subcropping manganiferous zones and related vegetation types.

**Airborne geophysics**

Airborne geophysics is cost effective in locating flat-lying Mn oxide sheets at shallow depths in relatively resistant host rocks (Irvine and Berents 2001). Airborne electromagnetic (AEM) methods are able to detect manganese oxides when present in moderate amounts due to their conductive properties. Results from a Geotem AEM survey flown at 600-1000 m line spacing over the Groote Eylandt deposits outlined conductive areas that correlated well with defined manganese ore zones (*Figure 5*). This Geotem AEM method has also been successfully used to locate subsurface manganese mineralisation on the mainland south of Groote Eylandt (Berents et al 1994) and in the Bootu Creek area to the north of Tennant Creek (Nunn 1997).
Hyperspectral ground reflectance data can be collected from a conventional airborne geophysical platform (Hausknecht et al 2000) or satellite (e.g. JERS and ASTER). Commercial airborne sensors include OARS (Operational Airborne Research Spectrometer), HYMAP, GEOSCAN and AMS (Airborne Multispectral Scanner). Hyperspectral mapping allows the identification of most species of phyllosilicates, clays, carbonates and metal oxides that occur in regolith and parent rocks. Manganese oxides have a distinctive low reflectance signature (Figure 6) relative to clay and iron oxide minerals. Ground-based electromagnetic (Nunn 1997) and gravity (Dentith et al 1994, p 70, Consolidated Minerals 2000) geophysical surveys can be used to gain a better understanding of the shape, size, depth and orientation of subsurface deposits.
Fig. 6 Spectra of some manganese ore minerals, from USGS digital spectral library (after Clarke et al 1993)
CONCLUSIONS AND RECOMMENDATIONS

The group tenements GR 273/13 is considered potentially prospective for manganese based on geological comparison with the Groote Eylandt manganese model. The following exploration work plan is recommended:

As a result of the 2013 exploration programme largely unable to be conducted for financial reasons it is proposed that this programme be implemented in Year 2 of the GR273-13 Group Reporting, with funding now apparently becoming available

The following exploration work plan is recommended:

• A detailed review of historic exploration data including exploration and discovery of deposits and Groote Eylandt Manganese and acquisition of all geological, geophysical and thematic maps.

• Geological reconnaissance and rock chip sampling which may include helicopter support considering the terrain and possibly limited track access.

• In combination with the rest of the tenements consider an airborne EM or equivalent survey to assess potential for manganese and potentially base metals under shallow cover. Fugro fly quarterly for Groote Eylandt.

• Any exploration work that involves helicopter reconnaissance or aerial surveys should be done in collaboration with the other AMR tenements especially when similar geological association is evident.

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