EL 29025

FIRST ANNUAL REPORT

FOR THE PERIOD

1 August 2012 to 31 July 2013

By Company Geologist

Dr Zhiyu Jiang

Jul. 31 2013
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Title Page

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Name of project operator: Darwin Mining & Exploration PTY LTD

Report Title: EL29025

Report Type: First Annual Exploration Report

Reporting Period: 1 Aug 2012 to 31 Jul 2013

Author: Dr Zhiyu Jiang and Dr Jianchun Lu

Date: 31 Jul. 2013

Target: Au, Cu-base metal and Sn

Related NT 1:100 000 Pine Creek, 5270

Related NT 1:250 000 Pine Creek, SD5208

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Abstract

Exploration title EL29025 has been granted to Darwin Mining & Exploration PTY LTD on 1 August 2012. During the last year, a detailed review of the previous exploration work have been conducted. The title area is situated in the Cullen Mineral field which lie in the southern central part of the Pine Creek Geosyncline containing Early Proterozoic metasediments of the Namoona, Mount Partridge, South Alligator and Finniss River Groups comprising shale, siltstone, quartz sandstone, conglomerate, greywacke, dolomite, dolarenite, dololutite and tuff. These metasediments were intruded by pre-orogenic sills of Zamu Dolerite and syn- to post-orogenic granitoids of the Cullen Batholith, including granodiorite, several varieties of granite and leucogranite, bodies of monzonite and younger syenite dykes, then deformed and metamorphosed to Greenschist facies. Mineralisations in the Cullen Mineral field include hydrothermal tin, tungsten, gold, silver, lead, zinc and copper deposits. These mineral deposits are mostly in north to northwest-trending shear zones and are confined to Early Proterozoic contact metamorphosed metasediments or synorogenic to postorogenic granitoids. Generally a ore-forming metal zonation occurs from uranium close to granitoid to tungsten, copper, tin, silver-lead and gold with increasing distance from the contact of granitoid. Most of the granitoids are highly fractionated with later stage leuco-granitic phases with anomalous ore-forming metal values and forming cusps connected to the main body at shallow depths.

Outcrops in the title area include granites and metasedimentary rocks. A mineral occurrence “alluvial gold” had been inspected with less interesting results for a target deposit. The other three occurrences within EL 29025 were not reached in the first year exploration due to access tracks blocked or no access tracks. A review of geophysical images show three magnetic anomalies with outcrops of gossans on ground at contact zone of a granite at northern part of EL29025. Analysis shows that these gossans contain high level of copper, zinc and lead with sulfur. This indicates a significant potential for targeting mineral ore deposit(s). Two areas in the south show three mineral occurrences also of interest, as they are also located on the contact zone of granites. A potential to explore for tin and base metal mineralisation exists.
Introduction

Exploration Licence EL29025 was granted to Darw in Mining & Exploration PTY LTD on 1 August 2012 for a period of six years. This report summarises work carried out on EL29025 during the period 1 August 2012 to 31 July 2013.

Tenure details

EL29025, total of 54 units (Table 1), is located about 12km west of Pine Creek, accessing by Stuart Highway, Spring Hill Road and local 4WD tracks (Fig. 1).

![DME Prospect area 2](image)

**Figure 1** EL29025 Location Diagram

<table>
<thead>
<tr>
<th>BLOCK NO</th>
<th>UNITS</th>
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<tr>
<td>SD52 1509</td>
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<td>Q, R, V, W</td>
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<tr>
<td>SD52 1653</td>
<td>C, D, E, F, G, H, J, M, N, O</td>
</tr>
<tr>
<td>SD52 1654</td>
<td>B, C, G, L</td>
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Geological Setting

Geologically the area of EL29025 is mostly located in Cullen Mineral Field which lies in the southern central part of the Pine Creek Geosyncline (Fig. 2), containing Early Palaeoproterozoic metasediments of the Namoona, Mount Partridge, South Alligator, and Finniss River Groups. This metasediments comprises shale, siltstone, quartz sandstone, conglomerate, greywacke, dolomite, dolarenite, dololutite and tuff and was intruded by pre-orogenic sills of Zamu Dolerite. Felsic volcanics (El Sherana and Edith River Groups) overlying on these basement unconformably. Then syn- to post-orogenic granitoids of the Cullen Batholith emplaced with an extensive metamorphosion to greenschist facies. The Cullen Batholith includes granodiorite, several varieties of granite and leucogranite, bodies of monzonite and younger syenite dykes, which could be the major heat source associated with the ore-forming hydrothermal fluid activities in the Cullen Mineral Field.

![Fig. 2 Location of Cullen Mineral Field and EL29025.](image)

Middle Proterozoic, Palaeozoic and Mesozoic strata unconformably overlying on the Early Proterozoic rocks and form tablelands and plains outskirt the mineral field to the southwest and southeast.

Mineralisation

The Pine Creek Orogen is the most productive part of the North Australian Craton, with over 1,000 mineral occurrences. It contains over 20% of the world’s low-cost U resources, has a known resource of about 9 M oz of Au, and produced 3.2 M oz of Au between 1870 and 2007. Considerable resources of Ni-Co-Pb-Cu, Pb-Zn-Ag, Pt-Pd, Sn-Ta-W, Fe ore, magnesite, phosphate and other commodities also exist in this region.
Mineralisations in the Cullen Mineral field include hydrothermal tin, tungsten, gold, silver, lead, zinc and copper deposits. These mineral deposits are mostly in north to northwest-trending shear zones and are confined to Early Proterozoic contact metamorphosed metasediments or synorogenic to postorogenic granitoids. Generally a ore-forming metal zonation occurs from uranium close to granitoid to tungsten, copper, tin, silver-lead and gold with increasing distance from the contact of granitoid. Most of the granitoids are highly fractionated with later stage leuco-granitic phases with anomalous ore-forming metal values and forming cusps connected to the main body at shallow depths.

The term "Cullen Mineral Field", first used by Needham (1981), defines the group of mineral deposits and occurrences located within the Cullen Batholith and its adjacent contact metamorphic aureole. Over 230 mines and prospects occur in the mineral field. It is also a major centre of metal production in the Northern Territory, specially gold, silver, lead, copper, tin, tungsten and iron with minor amounts of zinc, cadmium, bismuth, molybdenum and uranium (Stuart-Smith and other, 1993). Up to June 1989 metal produced in the Cullen Mineral Field is shown in Table 2.

| Table 2. Recorded mine production to June 1989 from Cullen Mineral Field |
|---------------------------------|-----------------|
| Bismuth                         | 46 (ton)        |
| Cadmium                         | 54 (ton)        |
| Copper concentrate              | 26,190 (ton)    |
| Gold                            | 24.8 (ton)      |
| Iron ore                        | 7,979,202 (ton) |
| Manganese ore                   | 250 (ton)       |
| Molybdenum concentrate          | 0.1 (ton)       |
| Silver                          | 61.6 (ton)      |
| Silver/lead concentrate         | 7,476 (ton)     |
| Tin concentrate                 | 4,288 (ton)     |
| Uranium                         | 440 (lb U3O8)  |
| Wolfram concentrate             | 905 (ton)       |
| Zinc concentrate                | 6,077 (ton)     |

From Stuart-Smith and other, 1993

On the basis of the dominant style of mineralisation, metal association, and stratigraphic and structural controls, Stuart-Smith etc. (1993) classified the deposits in the Cullen Mineral Field as follows:

1. hydrothermal veins or stockworks associated with granitoid intrusions (Sn, W, Au, Ag, Pb, Zn, Cd, Cu, Bi, As, U, and Mo);
2. stratabound massive sulphide deposits within the South Alligator Group (Au, Ag, Cu, Pb and Zn);
3. residual massive oxide deposits (Fe and Mn); and
4. alluvial deposits (Au and Sn).

The first style hydrothermal deposits are dominant (over 90%) of mines and prospects, and production within the Cullen Mineral Field. It has been concluded in the following sketch and sub-classified as follows by Stuart-Smith etc. In 1993.

- gold (with or without silver, copper, lead and zinc);
- tin (with or without copper and tungsten);
- silver-lead (with or without zinc, cadmium and gold);
copper (with or without silver, lead, gold and bismuth)  
tungsten (with or without copper, molybdenum, bismuth);  and  
uranium (with or without copper).  

Fig. 3  Schematic sketch showing setting and major characteristics of hydrothermal deposits in the Cullen Mineral Field (Stuart-Smith et al., 1993).
Hydrothermal gold mineralised with quartz veins mostly in a size of 2m wide and 100m long and setting in nearly vertical north to northwest-trend shear zones which are conformable with the regional axial plane S1 cleavage of the Early Proterozoic metasediments or saddle reefs and en echelon veins within shear zones. The gold is present in disseminated sulphides, such as pyrite and arsenopyrite with minor chalcopyrite, galena, pyrrhotite, marcasite, sphalerite, tetrahedrite and native bismuth with typical sericitiesd, silicified, carbonated and chloritised alterations in the wallrocks.

Tin firstly has been discovered at Mount Wells in the Cullen Mineral Field in 1879. Over 4,288 ton tin concentrate had been produced majorly from Mount Wells with minor from other adjacent twenty seven mines. Most production was between 1900 and 1934 with a peak time between 1906 and 1910 at over 200t tin concentrate p.a. following a spate of discoveries including the Horseshoe group of mines and the Umbrawarra alluvial deposits. Following twenty years tin mining in the area is low or nil production until a number of new tin discoveries in the Mount Masson area and resulted in minor tin production between 1956 and 1965. A small increase in tin production in the area is in 1980-1981, mainly from the Horners Creek alluvial deposit.

Alluvial tin is also played an important role in tin production in the Cullen Mineral Field, such as Barrets 59, Snaddens Creek 122, Jimmy's Knob 111, Mundic 109, Emerald Creek 204, Morris 208 & 212, Shamrock 213, Mary River Camp 176, and the Mount Well5 92 area where more recently the Horners Creek 93 deposits which associated with tin lode. Some of the alluvial tin occurrences are not associated with lode tin deposits, for instance the Umbrawarra 150, Stray Creek 149 and Douglas River 124 mines, and an unnamed prospect 203 on the Wandie Granite. All of these mines are located within the granitoid terranes where the tin source is probably small zones of disseminated cassiterite within greisen zones.

Mineral occurrence in the EL29025 title area are Unnamed 00782 gold, Unnamed 00786 base metal (Cu-Pb-Zn-Ag veins), Unnamed 0842 gold and Stray Creek tin.

**Field Reconnaissance Works**

First field reconnaissance trip was carried out in the October 2012 with chief and senior geologists from China. These geologists have decades of experience in exploration in tin mineralisation associated with granite and copper-gold mineralisations.

The track to Unnamed 00782 ends at a local couples house. The man is over 70- years old and was an inspector in the area for many year. He informed us that he did not know of the mineral occurrence and gold mineralisation at that site. Outcrops of coarse-grain and pinkis granite are present near his house and the hill side. Red conglomerate and coarse-grain sandstone cover on the granite and spread on top of the hill. At Unnamed 00782 site, a litter water creek goes through the site with some small pits. If there is alluvial gold along the creek, it is
uncertain that the gold source is from the exposed conglomerate and sandstone or somewhere off the granite.

Field inspection of Unnamed 01842 had failed due to heavy rain and damage track. For Unnamed 00786 base metal (Cu-Pb-Zn-Ag veins) and Stray Creek tin, no track was found and was left for future reconnaissance.

Three magnetic anomalies have been noted in further geophysical image reviews, (Fig. 4). They are located on a granite contact zone at southeast of the granite. The second reconnaissance will focus on these magnetic anomalies. Outcrops of the granite show a coarse-grain and porphyritic granite with quartz and feldspar phenocrysts in light grey colour. At its east margin (contact zone) scattered small gossans have been discovered (Photo 1).

Figure 4: Three magnetic anomalies in granite contact zone at east of the granite.
Four gossan samples have been analysed and the results are shown below (Table 3).

**Table 3** Analyse results of four gossan samples from eastern margin of the granite in EL29025.

<table>
<thead>
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<th>272</th>
<th>135</th>
<th>390</th>
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<tr>
<td>Cu (ppm)</td>
<td>272</td>
<td>135</td>
<td>390</td>
<td>324</td>
</tr>
<tr>
<td>Zn (ppm)</td>
<td>33</td>
<td>23</td>
<td>54</td>
<td>30</td>
</tr>
<tr>
<td>Pb (ppm)</td>
<td>619</td>
<td>425</td>
<td>930</td>
<td>660</td>
</tr>
<tr>
<td>S (ppm)</td>
<td>7348</td>
<td>4624</td>
<td>8588</td>
<td>7578</td>
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</table>

The results are interesting and encourage us to proceed with more geological work for base metal deposits in the next year.

**Geophysical Images**

Aero-geophysical images have been reviewed in the last exploration year. The aero-magnetic images show three interesting anomalies (Fig. 4). Aero-gravity image also show negative anomalies at north and southeast of the EL29025 for the granites (Fig. 5). They are also present an interesting positive anomaly just adjacent the three magnetic anomalies at southeast. We do not know what causes these and it may related to the magnetic anomalies or mineralisation. It will be significant in next field geological investigation.

In the land satellite images (Fig. 6), the overlaying clastic sedimentary rocks are shown as clear projections (green projections in Landsat741, Landsat742 and pink projections in LandsatPC2_54_17). Some of the granites or rocks, such as quartz vein stocks and greisen, associated with granites underlying the sedimentary rocks are present in red colour in Landsat741, Landsat742, and green colour in LandsatPC2_54_17 images. These images also show that the four mineral occurrences are located on the margins or contact zones between granites and sedimentary rocks. It is certainly significant to have a geological investigation of the
mineral occurrences although only one had been inspected. There areas are also most interesting spots to target ores in next exploration year.

Fig. 5 Images of aero-gravity showing two granites in EL29025.
Fig. 6 Land satellite images of EL29025
Conclusion

Company consulting geologists did not find the mentioned alluvial gold mineralisation in EL29025 and were unsuccessful in reaching the other three mineral occurrences in the field. A review of the aero-geophysical images showed three interesting magnetic anomalies in the north of EL29025 in two areas with the three mineral occurrences associated with granites in the south. More detail geological inspection needs to be carried out in these areas.

Recommendation

Following works have been recommended for the next 12 months:

1. Finishing the remote sensing and retrieve aero-geophysical data in detail;
2. Geological field investigation for the above interesting areas;
3. Detail mapping and rock chip sampling at the identified spots; and
4. Geochemical sampling at the interesting area.

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