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Appendix A  Aerosystems Survey Summary and Processing Report. Wollogorang Project
Summary

Northern Cobalt Limited ("Northern Cobalt or the Company") holds eight Exploration Licences (EL) within the Wollogorang area in northeast Northern Territory and was successful in its application funding for geophysics under the Collaborative Geophysics and Drilling Initiative – Resourcing the Territory.

Currently, there is no active mining activity in the Wollogorang area with the last major mining ceased in 2004 with the closing of the Redbank Copper operation. However, Northern Cobalt recently completed resource drilling at the Stanton Cobalt project and the Company is actively looking for additional cobalt resources in the immediate vicinity of Stanton.

Together with this, the Company believes the Wollogorang Area has significant potential to host a major base metal deposit within the Wollogorang Formation.

Northern Cobalt completed a detailed helicopter-bourne magnetic and radiometric survey over much of the eastern part of the Company’s tenement holding to search for further Stanton-style breccia pipes.

A total of 25,000 line kilometres of new data flown at a line spacing of 75m and a survey height of 30m.

It is expected that if this new magnetic data will significantly increase the prospectivity of the region and provide a much greater understanding of the controls on mineralisation within the Wollogorang area.
Introduction

Northern Cobalt is an Adelaide based ASX Listed (ASX:N27) company with two projects located in the Northern Territory. The Wollogorang Cobalt Project is located in the far north-eastern corner of the Northern Territory. The Project area is 180 km to the south-east of the population centre of Borroloola. The capital city of Darwin is 870 km to the north-west and the McArthur River Mine is approximately 150 km to the west-northwest. The Arunta Lithium Project is located in approximately 150km northeast of Alice Springs (Figure 1).

Northern Cobalt has eight granted tenements in Northern Territory and two tenement applications, which together comprise the Wollogorang Project (see Table below and Figure 2). The Company also has two Exploration Permit Minerals (EPM) in Queensland, which are also part of the Wollogorang Project (see Figure 2).

<table>
<thead>
<tr>
<th>EL</th>
<th>Grant Date</th>
<th>Holder</th>
<th>Blocks</th>
<th>Area</th>
</tr>
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<tbody>
<tr>
<td>30496</td>
<td>28/05/2015</td>
<td>Mangrove Resources Pty Ltd</td>
<td>112</td>
<td>368.45 km²</td>
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<tr>
<td>30590</td>
<td>28/05/2015</td>
<td>Mangrove Resources Pty Ltd</td>
<td>107</td>
<td>351.82 km²</td>
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<tr>
<td>31272</td>
<td>9/04/2016</td>
<td>Mangrove Resources Pty Ltd</td>
<td>125</td>
<td>411.17 km²</td>
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<tr>
<td>31548</td>
<td>19/01/2018</td>
<td>Mangrove Resources Pty Ltd</td>
<td>241</td>
<td>772.57 km²</td>
</tr>
<tr>
<td>31549</td>
<td>19/01/2018</td>
<td>Mangrove Resources Pty Ltd</td>
<td>235</td>
<td>738.9 km²</td>
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<tr>
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<td>19/01/2018</td>
<td>Mangrove Resources Pty Ltd</td>
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<tr>
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<td>776.67 km²</td>
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<tr>
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<td>19/01/2018</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1546</td>
<td>4987.17 km²</td>
</tr>
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</table>

Figure 1. Location of Northern Cobalt Projects
Northern Cobalt listed on the ASX in September 2017 and immediately commenced drilling at the Stanton deposit where the Company drilled >11,000m before the commencement of the wet season. Northern Cobalt will commence the 2018 field season with further drilling at Stanton as well as a major detailed helicopter-bourne magnetic survey over the area north and south of Stanton, which will include the Selby area and the area west of the GC2 prospect located on Redbank Copper Limited’s tenement.

Northern Cobalt listed on the strength of the Stanton, Selby and Karns targets (see Figure 3) and with the Stanton drilling program already undertaken and to continue in 2018, the new magnetic data will assist the Company to outline further potential drilling targets.

The 2018 field season will include drilling programs at the Karns target as well as early-stage exploration including field mapping/sampling and surface sampling (soil sampling and/or stream sediment sampling) across the greater tenement package.

The heli-mag/rad survey commenced on 23 June 2018 and was completed on 17 July 2018. The newly acquired magnetic and radiometric data is currently being assessed by the Company and will provide a significant data set for planning future exploration programs aimed at locating further Stanton-type cobalt and Redbank-type copper targets within the Company’s project area.

The Company is currently drilling targets generated from the 2017 heli-bourne magnetic survey around the Stanton Cobalt Deposit. The newly acquired data will provide further targets for testing in the 2019 field season.
Figure 2. Location of Northern Cobalt’s Wollogorang Project
Figure 3. U²³⁵/Th radiometric image showing initial target areas on the Wollogorang Project (blue polygons) and published prospects (red dots) (note: EL 30458 and 30495 have been amalgamated into EL 31272).
Regional Geology

The project area is located within the Wearyan Shelf tectonic element (Figure 4) of the southeastern Palaeoproterozoic to Mesoproterozoic McArthur Basin, a 5 - 12km thick platform cover sequence of mostly unmetamorphosed sedimentary and lesser volcanic rocks deposited on the North Australian Craton, containing dolostone, sandstone and shale units with minor felsic and mafic volcanics (Goulevitch, 2002; Rawlings, 1999).

Exposures of the basin cover an area of about 180,000km² in a roughly northwest trend from the Queensland – Northern Territory border, along the west coast of the Gulf of Carpentaria, to the north coast of Arnhem Land (Figure 4). The McArthur Basin unconformably overlies the Palaeoproterozoic Pine Creek Orogen to the northwest, Murphy Inlier to the southeast and Arnhem Inlier to the northeast and is host to mineral deposits such as the McArthur River (HYC) zinc-lead-silver mine, the Westmoreland uranium deposit and is spatially associated with the uranium deposits of the Alligator Rivers region, including Ranger and Jabiluka. The basin also hosts numerous other occurrences of base metals, iron ore, manganese and uranium. Bauxite is mined at Gove and manganese is mined on Groote Eylandt from world class Cenozoic deposits (Rawlings, 2013). The most comprehensive study of the southern part of the basin is documented in Jackson et al., (1987).

To the west of the project area, high relief topography is developed on a dissected plateau surface of Proterozoic Masterton Sandstone of the Upper Tawallah Group. A north-northwest trending escarpment at the plateau margin marks the edge of the broad coastal plains of the Gulf of Carpentaria. The Wollogorang Project is situated on the coastal plain where the Gold Creek Volcanics of the Tawallah Group are overlain by 5 – 10m of Cainozoic sand, silt and laterite (Goulevitch, 2002).

The Tawallah Group (Jackson et al., 1987; Haines et al., 1993) is the most extensive and voluminous unit in the southern McArthur Basin, cropping out as resistant sandstone ranges and plateaux between the Murphy and Urapunga Inliers. It is the oldest component of the southern McArthur Basin, lying unconformably on various Orosirian basement units, including the Cliffdale Volcanics (Ahmad and Wygralak, 1989), Scrutton Volcanics (Pietsch et al., 1991) and Urapunga Granite, providing a maximum age of ~1,850 Ma (Rawlings, 1999).
The main geological units of interest in the project area are the Wologorang Formation (carbonaceous shales and dolomite) and Gold Creek Volcanics (interlayered basalt lavas and sediments). In the west, these formations are overlain by the flat-lying 250m-thick Pungalina Member-Echo Sandstone couplet and, in turn, by the Karns Dolomite. The basal Karns sandstone is locally very phosphatic, especially at the Selby prospects (Figure 5), where it is comprised of up to 24% P$_2$O$_5$. Soil and sand cover is widespread but very thin (<20 m). Proximal to the project, there are a number of important prospects and a mine:

- **Stanton-Running Creek Co-Cu-Ni prospects** lie within Northern Cobalt's EL31272. CRAE identified about 10 individual breccia pipes in this "cluster", up to 100m diameter, but not all are substantially mineralised. The resource at Stanton was deemed by CRAE too small to support a development, but other prospects have only been followed up in a limited way. Roughly 300 drill holes, including core, were drilled by CRAE in the 1990s, ~22,000m of drilling. Some of the Cu prospects show signs of artisanal working.

- **Redbank Copper Mine**, 20km to the south of project. A number of separate pits have been mined over the last 30 years, under various ownerships, although there is evidence of artisanal workings for as long as 80 years. The main pit, Sandy Flat, is now in care and maintenance, but the operator (Redbank Copper Ltd) is still exploring.
There are over 20 recorded Cu-mineralised breccia pipes up to 100m diameter that occur in the "cluster"; the main ones shown in Figure 5.

- Selby P-U-REE prospects, on Northern Cobalt’s EL30590. Grades at these prospects reach 34% P₂O₅, 1120 ppm U₃O₈, 0.81% Cu and 1460 ppm Total REE, hosted largely within coarse phosphatic sandstone (Figure 3). Drilling has also identified anomalous Cu, Co, Pb, Zn, Ba, Ag and U in the underlying Tawallah sandstones, below the phosphatic horizon.
- The Karns Dolomite also hosts a number of base metals occurrences in the area, including the 'Mississippi Valley style' Thor prospect (Zn-Pb-Ag).
- Manganese occurs in high-grade pods in the area, usually within the Karns Dolomite, but none have been shown to be of sufficient size to warrant major drill programs.
Figure 5. Regional geology of the Northern Cobalt initial tenement package including the Stanton, Karns and Selby prospect areas.
Previous Exploration

Exploration within the Wollogorang Project area has focussed on several commodities including diamonds, uranium, phosphate, manganese and copper. The most useful datasets for Northern Cobalt has been the exploration undertaken by CRA Exploration (Rio Tinto) who held most of the area Northern Cobalt has under licence in the search for copper. This exploration will not be discussed here.

There have been several geophysical surveys undertaken within the area. Below is a summary of the company exploration within the area.

Geophysics

Table 1. Summary of geophysical surveys – Wollogorang area

<table>
<thead>
<tr>
<th>EL</th>
<th>Company</th>
<th>Target</th>
<th>Type of Survey</th>
<th>Results of Survey (Company surveys)</th>
</tr>
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<tbody>
<tr>
<td>22251</td>
<td>Legend International Holdings</td>
<td>Diamonds, phosphate and base metals</td>
<td>Airborne EM survey and ground gravity survey completed</td>
<td>The EM survey generated 9 EM targets – located north of drilling</td>
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<tr>
<td></td>
<td>NT Geological Survey</td>
<td>TMI and 256 channel radiometrics</td>
<td>Regional magnetic and radiometric data – line spacing 500m with 100m terrain clearance</td>
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<tr>
<td>8343,</td>
<td>Carnegie Minerals</td>
<td>Diamonds</td>
<td>TMI and 256 channel radiometrics</td>
<td>Regional magnetic and radiometric data – line spacing 400m with 60m terrain clearance</td>
</tr>
<tr>
<td>8533,</td>
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<td></td>
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</tr>
<tr>
<td>8532 &amp;</td>
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<td>8769</td>
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<tr>
<td>8856</td>
<td>Rio Tinto Exploration</td>
<td>Copper</td>
<td>TMI and 256 channel radiometrics</td>
<td>Regional magnetic and radiometric data – line spacing 300 &amp; 400m with 60m terrain clearance</td>
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<td>9205 &amp;</td>
<td>BHP Minerals</td>
<td>Copper</td>
<td>Magnetics and radiometrics</td>
<td>Regional magnetic and radiometric data – line spacing 400m with 70m terrain clearance</td>
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<td>9266</td>
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<td></td>
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<td>Diamonds</td>
<td>Regional magnetic and radiometric data – line spacing variable with 105m terrain clearance</td>
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<tr>
<td>8098 &amp;</td>
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<td>8115</td>
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</tr>
</tbody>
</table>

Exploration Concept

Northern Cobalt recognise that the Wollogorang area has several potential styles of mineralisation including:

Redbank/Stanton-style Breccia Hosted Copper Deposits

The Redbank Copper Mine is located approximately 150km from Borroloola in the Northern Territory (see Figure 5). The Redbank copper field was originally discovered in 1916 with small scale mining undertaken up to the 1960’s. Company exploration from the 1960’s until the 1990’s discovered numerous pipes and modern mining commenced in the 1990’s with the Sandy Flat open cut developed. Currently, the site is not operating.

The Redbank copper deposits are located within the Gold Creek Volcanics with between 30-50 breccia pipes discovered by company exploration. Northern Cobalt is currently focussed on the Stanton Cobalt Deposit and in late 2017 completed a major drilling program to upgrade the historical cobalt resource previously defined by CRA in the 1990’s.
Figure 6 shows a diagrammatic representation of a possible exploration model for the Stanton and Redbank breccia pipes. Northern Cobalt completed ~11,000m of drilling on the Stanton Cobalt Deposit and several of the surrounding prospects in late 2017 and will recommence aircore drilling based on the interpretation of the recently completed heli-mag survey the Company also completed in late 2017.

Figure 7 shows a comparison of the available regional aeromagnetic data over the Stanton area and the newly acquired heli-mag data collected by Northern Cobalt. The 2017 heli-mag survey comprised a total of 3,685 line km of high quality magnetic and radiometric data acquired by helicopter flown at 25m line spacing with a terrain clearance of 30m.

![Exploration model for Redbank-style breccia pipes in the Wollogorang Project area (modified from Ahmad et al., 2013).](image-url)
Northern Cobalt engaged a geophysical contractor to reprocess the 25m data to see if increasing the line spacing downgraded the data. Based on the review it was found that a line spacing up to 100m would provide high-quality data. The upcoming heli-mag survey will be flown at 75m line spacing.

The observations from the recently acquired magnetic survey shows that the Stanton Deposit appears to have a characteristic magnetic signature with the following characteristics:

- The deposit overlies an anomalous magnetic low (blue-purple colour)
- The magnetic low appears to be controlled by a NE-SW trending regional structure
- The deposit looks like it occurs within a structural zone that has been pulled apart (dilatant), and
- The magnetic low appears to cross cut a pre-existing magnetic fabric (Figure 8).
These observations have significant implications for predicting the location of additional cobalt mineralising systems in the region. Initial analysis of the magnetic data has identified several magnetic anomalies with similar characteristics to those at Stanton (Figure 9). In interpreting regions of low magnetic intensity, it is important to distinguish between areas that have low magnetite content because of the underlying rock types and areas that have undergone magnetite destruction. Areas of magnetite destruction can be identified by observing magnetic lows which cross cut the background magnetic fabric/structures. These areas are more prospective for cobalt mineralisation as they are likely to be caused by mineralising fluids interacting with the host rock and converting magnetite (highly magnetic) into iron oxides (less magnetic).
Figure 9. Location of potential drill targets initially identified from the 2017 TMI RTP image.

A further review of the newly acquired magnetic data has shown that a combination of geophysical attributes which characterise the Stanton cobalt deposit include:

- TMI_RTP lows
- TMI_RTP_1VD lows, and
- VRMI high

Based on a review of the new data and using GIS to query where all three geophysical attributes outlined above coincide, a total of 32 Priority A targets have been outlined (see Figure 10). Where only two characteristics coincide, these are Priority B targets and then Priority C targets are just for the TMI-RTP demagnetised zones.

Northern Cobalt will commence testing these targets in early June 2018 after the receipt of necessary approvals (MMP).

The new data collected by the larger helimag/rad survey outlined within this proposal will provide Northern Cobalt with a high-quality data set to undertake exploration for potential Stanton and Redbank style breccia pipes into areas where the highly prospective Gold Creek Volcanics is undercover.
Survey Details
Details of the Heli-mag/rad survey are provided below:

Line Orientation   0/180
Line spacing    75m
Tie spacing    750m
Terrain clearance   30m
Survey distance   25,000km
Aircraft type    Robinson R44 (VH-APM)
Datum           GDA94

Further details of the survey are contained with Survey Report presented in Appendix A.

Results
Data received from the geophysical contractors included all digital data. The located data conformed to ASEG-GDF format and the gridded data was received in ERMapper format. A description of the located data is summarised below:

<table>
<thead>
<tr>
<th>File name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>*_magdtm</td>
<td>Raw magnetics &amp; elevation data</td>
</tr>
<tr>
<td>*_rad256</td>
<td>Raw 256 channel data</td>
</tr>
<tr>
<td>*_rads</td>
<td>Final Radiometric Window Data</td>
</tr>
</tbody>
</table>

Located data supplied in ASEG GDF

<table>
<thead>
<tr>
<th>File name</th>
<th>Definition</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>*_TMI</td>
<td>Final magnetic gridded data</td>
<td>nT</td>
</tr>
<tr>
<td>*_ELEV</td>
<td>Final elevation gridded data</td>
<td>m</td>
</tr>
<tr>
<td>*_TOT</td>
<td>Final radiometric dose rate gridded data</td>
<td>CPS</td>
</tr>
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<td>*_POT</td>
<td>Final radiometric potassium gridded data</td>
<td>CPS</td>
</tr>
<tr>
<td>*_TH</td>
<td>Final radiometric uranium gridded data</td>
<td>CPS</td>
</tr>
<tr>
<td>*_URA</td>
<td>Final radiometric thorium gridded data</td>
<td>CPS</td>
</tr>
</tbody>
</table>

Gridded data supplied in ER Mapper format
* Denotes the area name as described above

Figure 10 shows the digital terrain model from the newly acquired data. Figure 11 shows the newly acquired TMI image for the survey and Figure 12 shows a radiometric ternary image from the new survey data.
Figure 10. Digital terrain model from newly acquired survey showing survey area
Figure 11. Total magnetic intensity (TMI) image from newly acquired survey data
Figure 12. Radiometric ternary image from newly acquired survey data
Figure 13. Reduced to Pole image from new aeromagnetic survey outlining area of prospective geology
The newly acquired aeromagnetic data has been very successful in outlining areas of prospective Gold Creek Volcanics in the project area and will be further assessed to outline potential drilling targets (Figure 13).

**Conclusion**

The Wollogorang heli-mag/rad survey over Northern Cobalt’s Wollogorang Project has provided a significantly upgraded data set which will assist the Company in outlining prospective areas for cobalt and copper targets based on historical company exploration and Northern Cobalt’s current exploration program.

The Company is currently testing targets generated from the 2017 heli-mag survey and will incorporate the findings from this exploration together with regional mapping data to interpret the newly acquired 2018 magnetic and radiometric data for the 2019 field season.

**References**


Appendix A

Aerosystems Survey Summary and Processing Report

Wollogorang Project