REPORT TO THE DEPARTMENT OF MINES AND ENERGY ON THE RELINQUISHED PORTIONS OF EXPLORATION LICENCES 5605, 5606, 5649, 5650, 5787 AND RELINQUISHED EL 5878. MCArTHUR RIVER PROJECT AREA, N.T.

EXPLORATION LICENCES

5605, 5606, 5649, 5650 and 5787

5878

HELD BY

Quilpie Pty Ltd
GPO Box T1725
PERTH WA 6000

Top End Resources N.L.
C/- Michael Atkins
Level 4, 50 Colin Street
WEST PERTH WA 6005
(Project Operators)

Date of Submission

November 1990

1:250,000 Scale Map Sheets

SD 53 19 : Mount Young
SE 53 03 : Bauhinia Downs

S.F. Thornett
Perilya Mines NL
278 Stirling Highway
CLAREMON T WA 6010

CR90/682
<table>
<thead>
<tr>
<th></th>
<th>LIST OF CONTENTS</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>LOCATION, ACCESS AND LAND TENURE</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>REGIONAL GEOLOGY AND GEOPHYSICS</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>PREVIOUS EXPLORATION</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>EXPLORATION PROGRAMME</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>RESULTS</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>REFERENCES</td>
<td>10</td>
</tr>
<tr>
<td>Figure No.</td>
<td>Title</td>
<td>Scale</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>1.</td>
<td>Location Map Showing Exploration Licences - 1988</td>
<td>1:125 000</td>
</tr>
<tr>
<td>2.</td>
<td>Location Map Showing Current Exploration Licences and Ground Surrendered on 12.7.1990</td>
<td>1:125 000</td>
</tr>
<tr>
<td>3.</td>
<td>Dingo Creek Prospect - Geology</td>
<td>1: 25 000</td>
</tr>
<tr>
<td>4.</td>
<td>Dingo Creek Prospect - Geochemistry</td>
<td>1: 25 000</td>
</tr>
<tr>
<td>5.</td>
<td>Tooganginie South Project - Geology</td>
<td>1: 25 000</td>
</tr>
<tr>
<td>6.</td>
<td>Tooganginie South Project - Geochemistry</td>
<td>1: 25 000</td>
</tr>
<tr>
<td>7.</td>
<td>Solid Geological Interpretation - Sheet 1</td>
<td>1:100 000</td>
</tr>
<tr>
<td>8.</td>
<td>Solid Geological Interpretation - Sheet 2</td>
<td>1:100 000</td>
</tr>
<tr>
<td>9.</td>
<td>Solid Geological Interpretation - Sheet 3</td>
<td>1:100 000</td>
</tr>
<tr>
<td>10.</td>
<td>Solid Geological Interpretation - Sheet 4</td>
<td>1:100 000</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

Exploration for base metals and gold was commenced during 1988 on a block of 14 Exploration Licences covering approximately 10,900 sq km in the McArthru River area.

These ELs are subject to a joint venture agreement between Noranda Pty Limited, Top End Resources N.L. and Perilya Mines N L and are classified as a single entity project area (McArthru River Project Area) by the NT Department of Mines and Energy. They cover sedimentary and volcanic rocks of the Proterozoic McArthur Basin, which host the HYC Pb-Zn deposit at McArthru River and numerous small Cu, Pb and Zn occurrences throughout the region.

The original 14 Exploration Licences are shown on Figure 1.

During 1989 Exploration Licences 5653, 5655, 5743 and 6237 were totally surrendered and 4939 was partially surrendered. In July 1990 a compulsory 50% reduction of graticular blocks was carried out on the remaining licences. The areas surrendered and the portions of the licences remaining are shown on Figure 2. This report covers those portions of the titles which were surrendered on 12.07.90, i.e. the shaded areas on Figure 2.
2. LOCATION, ACCESS AND LAND TENURE

Figures 1 and 2 show the locations of the Exploration Licences and their relationships to significant geographical features of the area. Access is provided by the bitumen-sealed Carpentaria and Tablelands Highways and well-formed gravel roads to Billingarra, Nathan River, Bauhinia and Mallapunyah stations. Elsewhere access is by station tracks which are often poorly maintained. Much of the area is extremely rugged and can only be reached on foot or by helicopter.

Details of the Exploration Licences covered in this report are as follows:-

<table>
<thead>
<tr>
<th>E.L. NUMBER</th>
<th>OWNER*</th>
<th>DATE GRANTED</th>
<th>ORIGINAL NUMBER OF BLOCKS</th>
<th>BLOCKS DROPPED</th>
<th>BLOCKS RETAINED</th>
</tr>
</thead>
<tbody>
<tr>
<td>5605</td>
<td>Q</td>
<td>13.07.88</td>
<td>440</td>
<td>116</td>
<td>324</td>
</tr>
<tr>
<td>5606</td>
<td>Q</td>
<td>13.07.88</td>
<td>495</td>
<td>465</td>
<td>30</td>
</tr>
<tr>
<td>5649</td>
<td>Q</td>
<td>13.07.88</td>
<td>500</td>
<td>234</td>
<td>266</td>
</tr>
<tr>
<td>5650</td>
<td>Q</td>
<td>13.07.88</td>
<td>410</td>
<td>204</td>
<td>206</td>
</tr>
<tr>
<td>5787</td>
<td>Q</td>
<td>13.07.88</td>
<td>175</td>
<td>111</td>
<td>64</td>
</tr>
<tr>
<td>5878</td>
<td>TE</td>
<td>13.07.88</td>
<td>36</td>
<td>36</td>
<td>0</td>
</tr>
</tbody>
</table>

* Q = Quilpie Pty Ltd  
   TE = Top End Resources N.L.
PERILYA MINES N.L.
McARTHUR RIVER JOINT VENTURE
LOCATION MAP
SHOWING
EXPLORATION LICENCES

FIGURE 1
PERILYA MINES N.L.
McARTHUR RIVER JOINT VENTURE
LOCATION MAP
SHOWING
CURRENT EXPLORATION LICENCES
AND GROUND SURRENDERED ON 12.7.1990

FIG 2
3. **REGIONAL GEOLOGY AND GEOPHYSICS**

On a regional scale, the geology of the McArthur River Project area is depicted on the 1:1,000,000 scale map, 'Geology of the McArthur Basin' (Plumb, 1988).

The Southern McArthur Basin has been the subject of extensive geological mapping and research by the Bureau of Mineral Resources during the period 1977 to 1982. This work is published as BMR Bulletin 220 (Jackson et al., 1987) and the accompanying 1:100,000 geological map (Geology of the Abner Range Region) has been used as a geological framework for all exploration in the licences which lie to the south of 16°30'S.

The northern ELs are covered by the 1:250,000 scale geological maps for Bauhinia Downs (Smith, 1964) and Mount Young (Plumb and Paine, 1964), Geologists of the Northern Territory Geological Survey have spent the 1987 and 1988 field seasons remapping the Bauhinia Downs 1:250,000 sheet and 1989 season working on the Mount Young 1:250,000 sheet and the enclosed Tawallah Range 1:100,000 scale geological map. Much of this recent mapping has been made available in the form of 1:100,000 scale geological maps (De Ross et al., 1988 'a,b,c,d'), and other new maps are currently being compiled.

The stratigraphic subdivisions defined in BMR Bulletin 220 (Jackson et al., 1987) have been used for all local mapping in the ELs, however silicification and lateritisation increase markedly towards the north and precise stratigraphic definition is very difficult in parts of the northern titles. All correlations between the stratigraphy defined in BMR Bulletin 220 and that in the older 1:250,000 maps to the north are based on Figure 4 of Bulletin 220, which places the Vizard Formation in an equivalent stratigraphic position to the Batten Subgroup and upper half of the Umbolooga Subgroup.

Bureau of Mineral Resources geophysical coverage of the whole project area is available as 1:250,000 maps of aeromagnetic (pre-1970 survey), gravity (pre-1981) and radiometric data. In addition, gamma-ray spectrometer and magnetic data are available in digital format.
4. PREVIOUS EXPLORATION

The McArthur River area has been extensively explored since the discovery of the HYC deposit in 1955. The most active explorers have been Carpentaria Exploration Co. Pty Ltd, BHP Proprietary Co. Ltd, CRA Exploration Pty Ltd, Amoco Minerals Australia, Shell (Minerals) Australia, Western Mining Corp. and A.O. Australia Pty Ltd. The work carried out during the period up to the mid 1970s is reviewed by Plumb (1977). Summaries of all exploration data for the EL block have been made by NTGS geologists as part of the "Exploration Series" maps. These have been provided in preliminary form for the Mallapunyah, Batten and Tawallah Range 1:100,000 sheets and Bauhinia Downs and Mt. Young 1:250,000 sheets. All subdivisions of the Exploration Series data (i.e. Geology, Geophysics, Geochemistry, Drilling and Mineral Occurrences) have been examined and used in the selection of target areas for exploration.
5. **EXPLORATION PROGRAMME**

Work commenced in July 1988 following the granting of the Exploration Licences on 13.07.88. The initial activity was as follows:

- Liaison with pastoralists in the area.
- Contact with the NT Aboriginal Sacred Sites Authority to determine locations of registered and recorded sites and obtain site clearance.
- Research of open-file exploration reports held at the NT Department of Mines and Energy Library in Darwin.
- Generating of remote sensing imagery (Landsat Thematic Mapper) of the Mantangula and Tawallah Range areas at 1:100,000 scale. A report on this work entitled "Landsat T.M. Imagery from the McArthur Basin, Northern Territory, Australia" by E. Swarbrick and Associates, has been submitted to the Department of Mines & Energy.
- Redigitising of BMR aeromagnetic survey data for the Wallhallow and Bauhinia Downs areas and interpretation of the results.
- Compilation of geological interpretation maps at 1:100,000 scale, using all available geological data from published and unpublished sources.
- Once compilation of the solid geological interpretation maps was complete areas were targeted for ground inspection, either by vehicle or by using a helicopter. Targets were selected using the following criteria:

1. **Favourable Host Rocks or Geological Setting:**

   Formations known to contain shale units were selected (e.g. Barney Creek Fm., Caranbirini Fm., Tooganinie Fm. and ferruginous portions of the Emmerugga Dolomite) as was the unconformity surface between the Reward and Balbarini Dolomites.

2. **Favourable Structural Position**

   Special attention was given to areas interpreted to be sub-basins (c.f. mineralisation at H.Y.C.) and to position relative to faults known to be associated with mineralisation in other areas.

3. **Areas of Known Mineralisation**

   Small mineral occurrences were located and inspected.
6. **RESULTS**

Figures 7 - 10 are the portions of the solid geological interpretation plans produced for the areas surrendered. Most of the targets chosen for follow-up during this programme are located on the areas retained, but four sub-basins defined by the interpretation lie within the area relinquished.

These are as follows:

6.1 **KULAMPIRRI SUB-BASIN**

**Location:** Central northern part of EL 5606, approximately 26km NNW of Lorella Springs Station.

**Host Rocks** Undivided McArthur River Group Sediment.

**Structural Setting** Sub-basin adjacent to a large NW trending fault.

The area was inspected by helicopter and was found to be largely covered by deep sand. The only outcrop located was clean coarse grained quartz sandstone. No samples were collected and no further work is recommended.

6.2 **ROSIE CREEK SUB-BASIN**

**Location** Near the central-eastern boundary of EL 5606, approx 14km ENE of Lorella Springs Station.

**Host Rocks** Interpreted position of Barney Creek Formation.

**Structural Setting** Interpreted sub-basin to west of the NE-trending Rosie Creek Fault.

The area was inspected by helicopter and found to be totally covered by deep sand with scattered silcrete. No sampling was possible and no further work recommended.
6.3 **DINGO CREEK** *(Figures 3 and 4)*

**Location**
SW of Abner Range 1:100,000 sheet.

**Host Rocks**
Barney Creek Formation.

**Structural Setting**
Small sub-basin between the Yah Yah Fault and the Top Spring Sub-Basin.

**GEOCHEMISTRY**

**ROCK CHIP**

<table>
<thead>
<tr>
<th>Element</th>
<th>ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu</td>
<td>88</td>
</tr>
<tr>
<td>Pb</td>
<td>18</td>
</tr>
<tr>
<td>Zn</td>
<td>13</td>
</tr>
<tr>
<td>Ba</td>
<td>860</td>
</tr>
<tr>
<td>Au</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

1 sample

**ADDITIONAL COMMENTS:** No ferruginous beds or gossanous units. No further work recommended.

6.4 **TOOGANTIIE SOUTH SUB-BASIN** *(Figures 5 & 6)*

**Location**
West of Abner Range 1:100,000 sheet on the eastern side of Emmerugga Creek.

**Host Rocks**
Barney Creek Formation

**Structural Setting**
In a sub-basin developed at the intersection of the NW trending Cockatoo Fault and the NE trending Yah Yah Fault

**GEOCHEMISTRY**

**ROCK CHIP**

<table>
<thead>
<tr>
<th>Element</th>
<th>ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu</td>
<td>6 - 37</td>
</tr>
<tr>
<td>Pb</td>
<td>&lt;5 - 180</td>
</tr>
<tr>
<td>Zn</td>
<td>8 - 45</td>
</tr>
</tbody>
</table>

**SOILS**

<table>
<thead>
<tr>
<th>Element</th>
<th>ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu</td>
<td>17 - 21</td>
</tr>
<tr>
<td>Pb</td>
<td>9 - 15</td>
</tr>
<tr>
<td>Zn</td>
<td>29 - 33</td>
</tr>
</tbody>
</table>

**STREAM SEDIMENTS**

<table>
<thead>
<tr>
<th>Element</th>
<th>ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu</td>
<td>1 - 3</td>
</tr>
<tr>
<td>Pb</td>
<td>1 - 5 ppb</td>
</tr>
</tbody>
</table>

Total 37 samples on 2 lines.

**ADDITIONAL COMMENTS:** Well developed breccia units, graded beds and pink K-tuff bands. Low to moderate bedding dips. Good Pb soil stream geochemistry but no gossans or Fe-rich zones noted during reconnaissance.
7. REFERENCES


832ST:hg/11