Exploration Licences 4320 and 4321
Hay River, Northern Territory
Jones Mining N.L./BHP Minerals Joint Venture

Report for the year ended
7th September, 1984.

OPEN FILE

NORTHERN TERRITORY GEOLOGICAL SURVEY
CR85/044
CONTENTS

1. INTRODUCTION
2. GEOLOGY
3. GEOPHYSICS
4. WORK CARRIED OUT AND COMMENTS ON RESULTS
5. EXPENDITURE
6. APPENDIX

   GRAVITY MEASUREMENTS

FIGURES

1. LOCALITY
2. REGIONAL GEOLOGY TOOMBA RANGE AREA
3. 1:250,000 GEOLOGY MAP WITH TRAVERSE LOCATIONS AND OVERLAYS
   (i) Regional Gravity
   (ii) Regional Aeromagnetics
   (iii) Detailed Aeromagnetics
4. GROUND GRAVITY AND MAGNETIC PROFILES
1. **INTRODUCTION**

A joint venture was agreed to between BHP and Jones Mining, the holders of two tenements EL 4320 and EL 4321 on the Hay River 1:250,000 sheet (Figure 1.).

The areas were chosen on the basis of possible co-occurrence of gravity and magnetic highs on government survey data, within a region with graben controlled Adelaidean sedimentation adjacent to a basement high (Figure 2.).

The coincidence of "permissive" geophysics on widely spaced data points and favourable tectonics/sedimentation which were suggested to extend back to the late Carpentarian, gave the tenements potential as Roxby Downs targets.

It was intended that this potential be tested by ground magnetics and gravity traverses over the +500 nt magnetic and +5m gal gravity features. This work would determine whether more intense and closely co-incident anomalies were present than detected by the previous, widely-spaced data.

2. **GEOLOGY** (Figures 2 and 3)

Rocks outcropping in the area consist of flat-lying Adelaidean shallow marine, terrestrial and glaciogene sediments overlain by shallow marine Cambro-Ordovician sediments.

These sequences unconformably overlie metamorphics of the Arunta Complex, which is comparable with Willyama-Gawler Complexes of South Australia, and outcrops to the south and west.

Alkali granitoids intrude the basement and unconformably underlie the Adelaidean rocks. A K/Ar date of 1662 ±25 m.y. has been derived for the Mt. Dobbie Granite.
Recent work by the BMR suggests that the Adelaidean sequence is thin in the area, with basement less than 1km deep over much of the area of interest. The Adelaidean and younger sequences thicken considerably to the north east (up to 10km) and to the south west (up to 7km), and the area of interest appears to be a major structural high similar to the Stuart Shelf.

The Toomba Fault bounds the area of thin Adelaidean on the northeastern side and is considered to represent a hinge zone across which marked thickening of the sequence occurs.

A number of grabens have been delineated on the broad structural high, analagous to the Stuart Shelf. Although the age of sedimentation in those grabens is strictly Adelaidean there are rapid variations in thickness and deep piles of material extending back in age to at least early Adelaidean and possibly to late Carpentarian (Roxby equivalent).

3. GEOPHYSICS

A broad north westerly trending gravity high coincides with the area of thin Adelaidean, and is flanked on either side by parallel gravity lows. This gravity ridge is similar to that developed on the Stuart Shelf. A broad aeromagnetic high follows the gravity ridge.

Within the Toomba Range gravity ridge there are several discrete "bullseye" gravity highs with similar half-widths and magnitudes to those at Olympic Dam (as it appears on the regional data). Some of these features are accompanied by aeromagnetic highs.

The separation of anomaly centres is greater at Toomba Range (about 5km.) than Olympic Dam, but this is possibly a function of the greater spacing of gravity stations at Toomba Range (about 11km. compared with 5km.) resulting in poorer definition of gravity anomaly centres.
4. WORK CARRIED OUT AND COMMENTS ON RESULTS:

Following literature search and previous data compilation, field work was commenced during the period.

EL 4320

Anomaly 1 - Tested with magnetics and gravity with detailed aeromagnetics utilised for accurate traverse location.
- Result: Strong bullseye magnetic feature located, no gravity anomaly associated with this.

Anomaly 2 - Assessed from the detailed aeromagnetics to be too large and diffuse to be a target of the type sought.
- Result: No further work required.

Anomaly 3 - Assessed from the detailed aeromagnetics to be a linear feature not of the target type sought.
- Result: No further work intended.

EL 4321

Anomaly 4 - Tested with 3 traverses (Fig. 3)
- Result: Appears to be linear body with some minor gravity values (3mg) centred on a sharp magnetic anomaly. Further work to be carried out on what is not a good target, but requires resolution

Previously flown detailed aeromagnetics (BHP Mt. Whelan Survey) was utilised to better define and interpret the chosen magnetic features (refer to figs 2 and 3).
6. **EXPENDITURE**

Expenditure debited to Exploration Licences 4320 and 4321 during the year ended 7th September, 1984 was:

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wages and Salaries</td>
<td>12,303</td>
</tr>
<tr>
<td>Field Support</td>
<td>8,091</td>
</tr>
<tr>
<td>Vehicles</td>
<td>1,575</td>
</tr>
<tr>
<td>Equipment</td>
<td>949</td>
</tr>
<tr>
<td>Geophysics</td>
<td>3,349</td>
</tr>
<tr>
<td>Tenement fees</td>
<td>1,258</td>
</tr>
<tr>
<td>Services</td>
<td>890</td>
</tr>
<tr>
<td>Administration &amp; Overheads</td>
<td>2,841</td>
</tr>
</tbody>
</table>

$31,256
The Secretary,
Department of Mines & Energy,
P.O. Box 2901, 
DARWIN, N.T., 5794.

Attention: Titles Registration Branch

Dear Sir,

ANNUAL REPORT E.L.s 4320 & 4321

Reference is made to our letter dated 23rd October, 1984 which accompanied our annual report on Exploration Licences 4320 and 4321.

Due to a small oversight during the compilation of this report, Appendix 1 containing the gravity measurements was omitted.

We apologise for this omission and have attached the necessary pages for inclusion in the report.

Yours faithfully,
for BHP Minerals Limited

[Signature]
B. J. VIVIAN

Attach.
APPENDIX 1

Gravity Measurements
<table>
<thead>
<tr>
<th>STATION REF. NO.</th>
<th>TIME</th>
<th>GRADUATION READING</th>
<th>DIST. N/S (km)</th>
<th>BAROMETERS (millibars)</th>
<th>VALUE ACCEPTED</th>
<th>RAW HEIGHT</th>
<th>TEMPERATURES (°C)</th>
<th>STATION HEIGHT (m)</th>
<th>CORRECTED ANOMALY (mgals)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BASE 1</td>
<td>11:48</td>
<td>2.68</td>
<td>-1.95 998.70 990.25 991.53</td>
<td>0.0 0.0</td>
<td>12.0 20.5  -3.31 0.00 0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 km N</td>
<td>12:08</td>
<td>2337.34</td>
<td>1.45</td>
<td>-1.25 988.79 989.42 990.60</td>
<td>-0.92 7.98 12.0 20.5 1.69 0.27 1.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 km N</td>
<td>12:24</td>
<td>2336.53</td>
<td>0.62</td>
<td>0 988.72 989.31 990.48</td>
<td>-1.03 8.94 12.5 21.5 0.27 0.35 1.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 km N</td>
<td>12:37</td>
<td>2335.03</td>
<td>-0.93</td>
<td>0.53 988.32 988.96 990.24</td>
<td>-1.29 11.21 12.5 22.0 0.80 0.30 1.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 km N</td>
<td>12:49</td>
<td>2332.75</td>
<td>-2.27</td>
<td>1.42 987.72 988.24 989.60</td>
<td>-2.01 17.49 12.0 21.0 5.10 2.14 4.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BASE 1</td>
<td>13:12</td>
<td>2335.96</td>
<td>2.68</td>
<td>-1.95 998.27 992.15 990.08</td>
<td>-1.44 12.51 12.0 23.0  -3.31 0.00 0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Gravity Survey

**Project:** Rocky

**Prospect:** Hay River

**1:250,000 Traverse:** Traverse 1. (to 3 km)

**BEARING:** E-W

**Date:** 29/7/84

**Obs.:** A. Brown

**Meter:** 0.587

**Cal.:** 1.02731

**Latitude:** 23°04'

**Weather:** Breeze, cloudy

<table>
<thead>
<tr>
<th>Station Ref. No.</th>
<th>Time</th>
<th>Gravity Meter Dial Reading</th>
<th>Drift Corrected Reading</th>
<th>Dist. N/S (km)</th>
<th>Barometers (millibars)</th>
<th>Value Accepted</th>
<th>Raw Height</th>
<th>Temperature (°C)</th>
<th>Station Height/m</th>
<th>Corrected Anomaly (mgals)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base 1</td>
<td>09:30</td>
<td>2336.06</td>
<td>0.0</td>
<td>0</td>
<td>989.41 993.90 991.16</td>
<td>0.0</td>
<td>0.0</td>
<td>10.5</td>
<td>16.0</td>
<td>-0.81 -1.54</td>
<td></td>
</tr>
<tr>
<td>1 km W</td>
<td>09:43</td>
<td>2335.07</td>
<td>-1.02</td>
<td>0</td>
<td>989.52 990.15 991.28</td>
<td>0.12</td>
<td>-1.03</td>
<td>11.5</td>
<td>17.5</td>
<td>-0.82 -2.01 -2.75</td>
<td></td>
</tr>
<tr>
<td>2 km W</td>
<td>09:56</td>
<td>2334.23</td>
<td>-1.89</td>
<td>0</td>
<td>989.50 990.06 991.27</td>
<td>0.10</td>
<td>-0.86</td>
<td>12.0</td>
<td>19.5</td>
<td>-0.45 -2.80 -3.53</td>
<td></td>
</tr>
<tr>
<td>3 km W</td>
<td>10:15</td>
<td>2333.15</td>
<td>-3.00</td>
<td>0</td>
<td>989.36 989.88 991.05</td>
<td>-0.04</td>
<td>0.36</td>
<td>12.5</td>
<td>21.0</td>
<td>1.08 -2.58 -4.28</td>
<td></td>
</tr>
<tr>
<td>Base 2</td>
<td>10:51</td>
<td>2336.08</td>
<td>0.0</td>
<td>0</td>
<td>989.36 990.06 991.26</td>
<td>0.15</td>
<td>-1.29</td>
<td>12.5</td>
<td>21.5</td>
<td>0.0 -0.81 -0.81</td>
<td></td>
</tr>
<tr>
<td>Base 2</td>
<td>10:51</td>
<td>2336.08</td>
<td>0.0</td>
<td>0</td>
<td>989.36 990.06 991.26</td>
<td>0.0</td>
<td>0.0</td>
<td>12.5</td>
<td>21.5</td>
<td>0.0 -0.81 -0.81</td>
<td></td>
</tr>
<tr>
<td>1 km E</td>
<td>11:12</td>
<td>2337.08</td>
<td>1.03</td>
<td>0</td>
<td>989.36 989.88 991.11</td>
<td>-0.16</td>
<td>1.40</td>
<td>13.6</td>
<td>24.0</td>
<td>0.19 0.17 -0.55</td>
<td></td>
</tr>
<tr>
<td>2 km E</td>
<td>11:25</td>
<td>2339.98</td>
<td>2.99</td>
<td>0</td>
<td>989.58 990.35 991.42</td>
<td>0.19</td>
<td>-1.68</td>
<td>14.0</td>
<td>24.5</td>
<td>4.26 1.24 0.45</td>
<td></td>
</tr>
<tr>
<td>3 km E</td>
<td>11:40</td>
<td>2339.69</td>
<td>3.52</td>
<td>0</td>
<td>989.60 990.24 991.34</td>
<td>0.21</td>
<td>-1.85</td>
<td>13.0</td>
<td>24.0</td>
<td>5.57 1.49 0.67</td>
<td></td>
</tr>
<tr>
<td>Base 2</td>
<td>12:26</td>
<td>2332.05</td>
<td>0.0</td>
<td>0</td>
<td>988.53 989.33 990.44</td>
<td>-0.82</td>
<td>7.21</td>
<td>14.0</td>
<td>25.0</td>
<td>0.0 -0.81 -0.81</td>
<td></td>
</tr>
<tr>
<td>Base 1</td>
<td>12:40</td>
<td>2332.04</td>
<td>8.68</td>
<td>0</td>
<td>987.74 989.37 990.67</td>
<td>-0.60</td>
<td>-1.94</td>
<td>14.0</td>
<td>25.0</td>
<td>3.31 0.0 0.0</td>
<td></td>
</tr>
<tr>
<td>Base 2</td>
<td>12:54</td>
<td>2326.02</td>
<td>0.0</td>
<td>0</td>
<td>988.24 988.92 990.14</td>
<td>-1.13</td>
<td>2.74</td>
<td>14.0</td>
<td>25.5</td>
<td>0.0 -0.81 -0.81</td>
<td></td>
</tr>
</tbody>
</table>