INTRODUCTION

The Licence area is located in the Napperby 1:250,000 map sheet area. It was granted on March 15, 1977. It is considered to be prospective for uranium mineralisation.

GENERAL GEOLOGY (Refer Fig. 5)

The major topographic feature in the Licence area is the Anmatjira Range (highest point Mt. Finniss, 979m), which consists of a series of Lower Proterozoic leucocratic and mafic gneisses, granulites and granites. The Tyson Creek Granulite (a fine grained massive biotite-hypersthene-clino-pyroxene-plagioclase mafic granulite) overlies the Weldon Granulites. These are a series of gneisses, granofels and granulites; sillimanite, oligoclase, orthoclase, garnet, biotite and cordierite forming the major mineral assemblages, with occasional clino and orthopyroxene, hornblende and spinel. Relationships between the members are confused, due to the intense folding, accompanied by faulting.

North-east of this sequence is the Anmatjira Granite, a coarse foliated granite, with porphyritic feldspars.

The Lower Proterozoic Lander Rock Beds outcrop sporadically in low hills on the southern margin of the Reynolds Range.

South of Pine Hill Homestead occurs the Yaningidjara Granite - a granite similar in mineralogy and texture as the Anmatjira Granite, but with garnet. Strong fault and shear zones, all trending north-west to south-east cut the rock types. Most are quartz filled, some are filled with mylonitic material.

No mineral occurrences have previously been reported from the Licence area. Minor copper, lead and zinc mineralisation occurs within brecciated vein quartz and muscovite schists of the Lander Rock Beds, at the Reward Mine, 20 kilometres west of the Licence area. Separate occurrences of very minor wolfram, gold and copper mineralisation are known from the Reward Mine area.

Copper mineralisation has also been reported from the White Hill Yard area, 7 kilometres south of the Licence area. Lander Rock Beds are faulted against formation of the Reynolds Range group (quartzites and locally calc-silicates), at this location.
A rare earth /uranium prospect has been discovered recently in the southern Anmatjira Range, to the north of the Pine Hill homestead, in the south of the Licence area.

**WORK COMPLETED (1978-1979)**

This has included office and fieldwork with the object of identifying the more significant airborne anomalies from the various airborne surveys, (Otter 1977, BMR 1976 plus an early undocumented BMR survey), and evaluating these anomalies in the field. A plan showing geology, anomalies and sample locations at a scale of 1:100,000 has been drawn up. Data sheets for anomalies and other sample locations are located in the Appendix, together with an Assay Data Summary.

Additional bore water samples have been taken and analysed for uranium. Results for all bore water analyses in the Napperby/Mt.Peake region, (which includes the Pine Hill Licence area), have been plotted on a 1:250,000 scale plan for the purpose of locating possible hydrothermal skarn uranium deposits in the Reynolds and Anmatjira Ranges and defining prospective targets for secondary uranium concentrations in Tertiary calcretes/carbonaceous sediments.

**RESULTS**

Following the 1977 airborne spectrometer survey, 41 anomalies were found. These did not include 2 anomalies reported from the earlier BMR radiometric survey. Of the 41 anomalies, 15 occurred over Quaternary alluvial sand, 26 on the granite or gneissic outcrop. Most anomalies were investigated in a short reconnaissance trip in December 1978 none proved to be due to anomalous concentrations of uranium and thorium.

However, two anomalous sources of radioactivity were found during ground traverses.

- **NL-4.** This sample was found amongst rubble on a steep scree slope. Background readings on the Scintrex BGS-1SL average from 60 cps to 150 cps, highly localised (up to 1 metre across), anomalous zones gave 1000 cps on the surface. Shallow pits gave greater than 10,000 cps (off scale). Petrographic and assay results show that the radioactivity is due to uranium and thorium concentrations
(1000 ppm and 6.3% respectively) in the mineral monazite, a rare earth phosphate. The monazite occurs as the dominant mineral in a monazite-garnet gneiss. The unit in which the monazite-garnet gneiss occurs appears to have a maximum width of 300 metres (air-photo interpretation only). No field relationships are as yet known, as the anomalous rocks were found in shallow pits dug into a scree/rubble slope. Quartz-feldspar-biotite-gneisses outcropping nearby had a low count (less than 200 cps).

- **N1-7,8.** These samples were taken from the south-east of the range near anomaly PH-4. High radioactivity (750 cps) was encountered over a small detrital fan, surrounded by porphyroblastic feldspar-biotite quartz pencil gneisses. Deeply weathered chloritic schist at the bottom of a shallow pit gave 2000 cps on the BGS-ISL scintillometer. However, assay results (see Appendix) showed that the radioactivity was due to the relatively anomalous concentrations of thorium in the schist and gneiss. The samples were not assayed for rare-earths, but the possibility of monazite in the alluvial fan, and surrounding lithologies cannot be ruled out, as sediment samples were not taken.

- Bore waters were sampled where possible, and assayed for uranium. The Pine Hill Stock Bore is directly downstream from the monazite occurrence at N1-4, so its anomalous value of 720 ppb U in the ground water may be due to leaching of relatively extensive deposits of monazite, or other uranium rich mineral assemblages in this area. The low U content in the waters of the Home Bore, in the same drainage channel, does not reflect the uranium concentration in the groundwaters, as it is a shallow well collecting subsurface stream waters.

Sandy Creek Bore downstream from Pine Hill Stock Bore gave a lower, but still anomalous, value of 430 ppb U. This indicates dilution by uranium-poor waters running off the Anmatjira Range, between Pine Hill Stock Bore, and Sandy Creek Bore.

Hawk's Nest Bore gave the anomalous value of 310 ppb U, but this may only represent leaching from the high uranium-content granites of the Reynolds Range, rather than leaching or precipitation of a uranium body of economic interest. Bore water results are shown on the enclosed plan. (Refer Fig-7)
PINE HILL - ASSAY RESULTS SUMMARY

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Airborne Anomaly No.</th>
<th>W (50)</th>
<th>Sn (1)</th>
<th>Ta (100)</th>
<th>Nb (20)</th>
<th>U (4)</th>
<th>Th (4)</th>
<th>Rock Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>N30-1</td>
<td>PH-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>36</td>
<td>Granite</td>
</tr>
<tr>
<td>N1-4A</td>
<td>BMR</td>
<td>1000</td>
<td>6.3%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gneiss</td>
</tr>
<tr>
<td>-4B</td>
<td>BMR</td>
<td>690</td>
<td>3.35%</td>
<td></td>
<td></td>
<td></td>
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<td>Gneiss</td>
</tr>
<tr>
<td>-4C</td>
<td>BMR</td>
<td>42</td>
<td>1950</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gneiss</td>
</tr>
<tr>
<td>N1-7</td>
<td></td>
<td>20</td>
<td>740</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Schist</td>
</tr>
<tr>
<td>N1-8</td>
<td></td>
<td>4</td>
<td>130</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pencil Gneiss</td>
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</table>

Detection limits in brackets, results in ppm unless otherwise stated.

Samples N1-4A, N1-4B, N1-4C were assayed for rare earth elements.

<table>
<thead>
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<th></th>
<th>Ce</th>
<th>La</th>
<th>Y</th>
<th>Nd</th>
<th>Gd</th>
<th>Sm</th>
<th>Dy</th>
<th>Er</th>
<th>Yb</th>
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<tr>
<td>N1-4A</td>
<td>10.1%</td>
<td>4.75%</td>
<td>2750</td>
<td></td>
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<td>N1-4B</td>
<td>6.9%</td>
<td>3.15%</td>
<td>1900</td>
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<td>2050</td>
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<td>N1-4</td>
<td>Composite</td>
<td>9.2%</td>
<td>3400</td>
<td>3.98%</td>
<td>0.80%</td>
<td>0.34%</td>
<td>640</td>
<td>900</td>
<td>110</td>
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STREAM SEDIMENT SAMPLES

<table>
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<th>Sample No.</th>
<th>Airborne Anomaly No.</th>
<th>W (50)</th>
<th>Sn (1)</th>
<th>Ta (100)</th>
<th>Nb (20)</th>
<th>Rock Type</th>
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<tbody>
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<td>N1-1</td>
<td>PH-3</td>
<td>x</td>
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<td>x</td>
<td>20</td>
<td>Sediment</td>
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<tr>
<td>N1-2</td>
<td>PH-3</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>&quot;</td>
</tr>
<tr>
<td>N1-3</td>
<td>PH-3</td>
<td>x</td>
<td>1</td>
<td>x</td>
<td>30</td>
<td>&quot;</td>
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<tr>
<td>N1-5</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>&quot;</td>
</tr>
<tr>
<td>N1-6</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>&quot;</td>
</tr>
<tr>
<td>N28-4</td>
<td></td>
<td>x</td>
<td>1</td>
<td>x</td>
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<td>&quot;</td>
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x = denotes below detection limit.
ANOMALY NUMBER: PH - 1

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-9

ANOMALY LOCATION: 298552 (Ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 30/11/78

GENERAL GEOLOGY:
Coarse, foliated biotite-garnet granite

PROBABLE ANOMALY SOURCE:
Garnetiferous granite

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS-ISL
Reading at Outcrop: Max 220 cps
Av. B.G. 120 cps

ASSAY DATA:

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<th>Element (ppm)</th>
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<td></td>
<td>U</td>
<td>Th</td>
</tr>
<tr>
<td>N30-1</td>
<td>6</td>
<td>36</td>
</tr>
</tbody>
</table>

PETROGRAPHIC DESCRIPTION: Sample Number: 
ANOMALY NUMBER: PH - 2

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-9

ANOMALY LOCATION: 298522 (Ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 30/11/78

GENERAL GEOLOGY:
Coarse foliated biotite - garnet granite

PROBABLE ANOMALY SOURCE:
Garnetiferous granite.

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS-ISL
Reading at Outcrop: Max. 240 cps
AV. B.G. 120 cps

ASSAY DATA: None.

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PHYTOGRAPHIC DESCRIPTION: Sample Number:
RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: PH - 3
TENEMENT NUMBER: 1444
1:250,000 MAP SHEET: Napperby SF53-9
ANOMALY LOCATION: 299 529 (Ref. Fig. 5)
INVESTIGATED BY: G. Turner
DATE: 1/12/78

GENERAL GEOLOGY:
- Garnetiferous gneisses and granites,

PROBABLE ANOMALY SOURCE:
- Biotite - quartz - feldspar gneiss, medium grained, strong foliation.

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS-ISL
Reading at Outcrop: Max 250 cps
AV. B.G. 60 cps

ASSAY DATA:

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<th>Th</th>
<th>Sn</th>
<th>Nb</th>
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</thead>
<tbody>
<tr>
<td>Stream</td>
<td>N1-1</td>
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<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Samples</td>
<td>N1-2</td>
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<td>-</td>
<td>-</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>N1-3</td>
<td></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>30</td>
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</table>

PETROGRAPHIC DESCRIPTION: Sample Number:
ANOMALY NUMBER: PH - 4

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-9

ANOMALY LOCATION: 305 526 (Ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 1/12/78

GENERAL GEOLOGY:

Foliated gneiss, granites coarse porphyritic feldspar gneiss.

PROBABLE ANOMALY SOURCE:

Not found

RADIOMETRIC DATA:

Instrument Type: BGS - ISL

Reading at Outcrop: Average 60 cps

ASSAY DATA:

None.

PETROGRAPHIC DESCRIPTION:

Sample Number:
ANOMALY NUMBER: PH - 5
TENEMENT NUMBER: 1444
1:250,000 MAP SHEET: Napperby SF53-9
ANOMALY LOCATION: 10 527 (Ref. Fig 5)
INVESTIGATED BY: G. Turner
DATE: 2/12/78

GENERAL GEOLOGY:
Foliated, coarse porphyritic granite.

PROBABLE ANOMALY SOURCE:
Granite (Garnetiferous)

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS -ISL
Reading at Outcrop: Max 200 cps
Av. Background 150 cps

ASSAY DATA:
None

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PETROGRAPHIC DESCRIPTION:

Sample Number:
RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: PH - 6
TENEMENT NUMBER: 1444
1:250,000 MAP SHEET: Napperby SF53-9
ANOMALY LOCATION: 310 529 (Ref. Fig. 5)
INVESTIGATED BY: G. Turner
DATE: 2/12/78

GENERAL GEOLOGY:
Red sandy alluvium

PROBABLE ANOMALY SOURCE:
Not found

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS-ISL
Reading at Outcrop: Av. B.G. 62 cps

ASSAY DATA: None.

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<th>Element (ppm)</th>
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PETROGRAPHIC DESCRIPTION: Sample Number:
RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: PH - 7

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-9

ANOMALY LOCATION: 301535 (Ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 2/12/78

GENERAL GEOLOGY:
Granitic creek sand, red sandy alluvium. No outcrop

PROBABLE ANOMALY SOURCE:
Unknown.

RADIOMETRIC DATA:
Instrument Type: BGS - ISL
Reading at Outcrop:
Sand 150 cps
Soil <100 cps

ASSAY DATA:
None.

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<th>Sample Location</th>
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<th>Element (ppm)</th>
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</thead>
<tbody>
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</table>

PETROGRAPHIC DESCRIPTION: Sample Number:
RADIOACTIVE DETAILS

ANOMALY NUMBER:  PH - 8

TENEMENT NUMBER:  1447

1:250,000 MAP SHEET:  Napperby SF53-9

ANOMALY LOCATION:  302 535  (Ref. Fig. 5)

INVESTIGATED BY:  G. Turner

DATE:  2/12/78

GENERAL GEOLOGY:

- Biotite rich granite

PROBABLE ANOMALY SOURCE:

- Tourmaline rich veins invading granite.

RADIOACTIVE DATA:

Instrument Type:  BGS-ISL

Reading at Outcrop:  Max. 250 cps
Av. BG.  150cps

ASSAY DATA:  None

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PETROGRAPHIC DESCRIPTION:

> 95% Tourmaline, some zircon.
RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: PH - 9
TENEMENT NUMBER: 1444
1:250,000 MAP SHEET: Napperby SF53-9
ANOMALY LOCATION: 301534 (Fig. 5)
INVESTIGATED BY: G. Turner
DATE: 2/12/78

GENERAL GEOLOGY:
Large quartz vein in granite.

PROBABLE ANOMALY SOURCE:
Unknown.

RADIOMETRIC DATA:
Instrument Type: BGS - ISL
Reading at Outcrop: <100 cps.

ASSAY DATA: None.

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<th>Location Number</th>
<th>Sample Number</th>
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</table>

PETROGRAPHIC DESCRIPTION: Sample Number:
ANOMALY NUMBER: PH-10

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-G

ANOMALY LOCATION: 303 531 (ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 2/12/78

GENERAL GEOLOGY:
Washouts in red alluvium no outcrop.

PROBABLE ANOMALY SOURCE:
Unknown.

RADIOMETRIC DATA:
Instrument Type: BGS - ISL
Reading at Outcrop: <100 cps

ASSAY DATA: None.

<table>
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<tr>
<th>Location Number</th>
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PETROGRAPHIC DESCRIPTION: Sample Number:
RADIOMETRIC ANOMALY DETAILS

ANOMALY NUMBER: PH-11

TENEMENT NUMBER: 1444

1:250,000 MAP SHEET: Napperby SF53-9

ANOMALY LOCATION: 305531 (Ref. Fig. 5)

INVESTIGATED BY: G. Turner

DATE: 2/12/78

GENERAL GEOLOGY:
Medium grained, homogeneous granite.

PROBABLE ANOMALY SOURCE:
Unknown

RADIOMETRIC DATA:
Instrument Type: Scintrex BGS-ISL
Reading at Outcrop: 120 cps background,

ASSAY DATA:
None.

<table>
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<th>Location</th>
<th>Sample Number</th>
<th>Element (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>U</td>
</tr>
</tbody>
</table>

PETROGRAPHIC DESCRIPTION: Sample Number:
KEY: +1(1#) Anomaly indicating Total Count in addition to regional background. Uranium (unwrapped) in addition to local background and Uranium-Thorium series.

-1# Fluid zone point and flight line from air photo. (Scale is 1:20,000.

OTHER EXPLORATION
Line Hill E.C.
Flight Plan and Radiometric Results
Jan '78.