## Geological Section

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Surface</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Limestone</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Sand</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Limestone</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Clay</td>
<td></td>
</tr>
</tbody>
</table>

## Assay & Radiometric Results

<table>
<thead>
<tr>
<th>Location</th>
<th>Assay Results</th>
<th>Radiometric Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>10</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>20</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>30</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>40</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>50</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>60</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>70</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Legend:
- Thin line
- Thick line

C: Core
D: Drilling
### Geological Section

**Legend**

- **PA**: Pale yellow
- **PH**: Pale grey
- **A**: Arrows

**Assay & Radiometric Results**

<table>
<thead>
<tr>
<th>PA</th>
<th>PH</th>
<th>A</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

---

**NIRANGA AUSTRALIA LTD**

**EXPLORATION LICENCE #9360**

**SOUTH PORTION, LINE AS RECONNAISSANCE HOLE DRILLING**

**GEOTECH, RADIOACTIVITY &.Assay RESULTS**

---

**(Note)**

- **PLATE T1**

---

**APPROVED**

- **E.M. Walker**

---

**Dated:**

- **1970**
## Geological Section

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Sedimentary rock</td>
</tr>
<tr>
<td>B</td>
<td>Volcanic rock</td>
</tr>
<tr>
<td>C</td>
<td>Metamorphic rock</td>
</tr>
</tbody>
</table>

## Assay & Radiometric Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>Assay Result</th>
<th>Radiometric Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>100 ppm Ni</td>
<td>50 ppm Co</td>
</tr>
<tr>
<td>S2</td>
<td>150 ppm Ni</td>
<td>70 ppm Co</td>
</tr>
</tbody>
</table>

---

**Legend**

- S: Sedimentary rock
- V: Volcanic rock
- M: Metamorphic rock
- D: Diagenetic changes
### Geological Section

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Proxim</th>
<th>Anxim</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assay & Radiometric Results

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Proxim</th>
<th>Anxim</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
<th>Assay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Geological Section**

**Assay & Radiometric Results**

---

**Legend**

- [Legend items]

---

**Note:** Refer to the bottom section for more details.
### Geological Section

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sedimentary</td>
</tr>
<tr>
<td>2</td>
<td>Volcanic</td>
</tr>
<tr>
<td>3</td>
<td>Metamorphic</td>
</tr>
</tbody>
</table>

### Assay & Radiometric Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>Assay Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10% Gold</td>
</tr>
<tr>
<td>2</td>
<td>15% Silver</td>
</tr>
<tr>
<td>3</td>
<td>5% Uranium</td>
</tr>
</tbody>
</table>

**Legend**
- G: Gold
- W: Silver
- U: Uranium

---

**Note:**
- Layer 1: Sedimentary rock
- Layer 2: Volcanic rock
- Layer 3: Metamorphic rock

**Samples:**
- S1: Sedimentary
- W1: Volcanic
- U1: Metamorphic

**Measurements:**
- Length: 100m
- Width: 20m

---

**Company:** Noranda Australia Ltd

**License:** Exploration Licence 18080

**Location:** South Portland, Line 160, Reconnaissance Area, Spurling

---

**Plate:** 89

---

**Approving Officer:** D.M. Demcl

**Drawing Date:** 01-01-19**
SECTION LOOKING NORTH

FEET 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10

GEOLGY

Sample line

Late toised gneiss

trace melalchite

GEOLOGY

L L L L L L L L L L

hematitic quartz

mottled red, yellow, brown ferruginous clay with abundant quartz grains.

Latentised gneiss

Partly (laternised material)

hematitic quartz

hand brown pisolitic laterite

L L L L L L L L L L

RADIOMETRICS

QC20 | QC19 | QC18 | QC17 | QC16 | QC15 | QC14 | QC13 | QC12 | QC11 | QC10 | QC9 | QC8 | QC7 | QC6 | QC5 | QC4 | QC3 | QC2 | QC1 | Sample number

U3O8 7 | 6 | 10 | 12 | 18 | 41 | 59 | 39 | 24 | 61 | 18 | 11 | 6 | 7 | 4 | 5 | 5 | 5 | 7 | U3O8

Cu 100 | 100 | 140 | 190 | 300 | 740 | 900 | 800 | 370 | 490 | 120 | 200 | 280 | 110 | 110 | 80 | 62 | 76 | 88 | 100 | Cu

Pb 56 | 50 | 84 | 80 | 90 | 210 | 400 | 420 | 180 | 280 | 320 | 140 | 98 | 68 | 86 | 54 | 48 | 36 | 40 | 54 | Pb

Zn 52 | 84 | 140 | 150 | 100 | 180 | 360 | 440 | 260 | 490 | 110 | 100 | 110 | 52 | 66 | 72 | 40 | 50 | 38 | 36 | Zn

ASSAY RESULTS (U3O8, Cu, Pb, Zn in ppm)

0.40 | 0.40 | 0.20 | 0.40 | 1.00 | 0.40 | 0.20

NOTE For location see Plate 85

LEGEND

\[\text{Loose, large ferruginous quartz fragments and brown loam.}\]

\[\text{Red, brown pisolitic laterite}\]

Scintillator: 885-15 No. 902264

PLATE 87
EXPLORATION LICENCE No. 280
NORTHERN TERRITORY

REPORT ON 1970-1973 INVESTIGATIONS
ON THAT PORTION SURRENDERED IN
DECEMBER 1973

Report No. 213 Volume 2

Note: Volume 1 contains a report on 1973 prospecting over both surrendered and retained portions of E.L. 280

By:
C. P. Pedersen, Senior Geologist
A. T. J. McKee, Geologist
D. McLaughlin, Geologist
G. J. De Ross, Geologist
# TABLE OF CONTENTS

1. **INTRODUCTION**
   1.1. Introduction  
   1.2. Access  
   1.3. Tenure  

2. **GEOLOGY**  

3. **GEOPHYSICAL SURVEYS**  

4. **GEOCHEMISTRY**  

5. **DETAILED INVESTIGATIONS**
   5.1. Anomaly Q
      5.1.1. Introduction  
      5.1.2. Surface Investigations  
      5.1.3. Percussion Drilling  
      5.1.4. Diamond Drilling  
      5.1.5. Assessment  
   5.2. Reconnaissance Augering in the Southern Portion of Exploration Licence
      5.2.1. Introduction  
      5.2.2. Geology  
      5.2.3. Geochemistry  
      5.2.4. Geophysics  
      5.2.5. Assessment  

APPENDIX 1 - Plans to accompany Report No. 213. Volume 2
# APPENDIX 1

## LIST OF PLATES

To Accompany Report No. 213, Volume 2

<table>
<thead>
<tr>
<th>Plate No.</th>
<th>Description</th>
<th>Scale</th>
<th>Drawing No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Locality Map - Exploration Licence No. 280</td>
<td>1:250,000</td>
<td>401-B-540</td>
</tr>
<tr>
<td>2</td>
<td>Geological Interpretation</td>
<td>1:25,000</td>
<td>411-C-1629</td>
</tr>
<tr>
<td>3</td>
<td>Airborne Radiometric Survey - 1969 - Sheet 1</td>
<td>1:24,000</td>
<td>410-D-514</td>
</tr>
<tr>
<td>4</td>
<td>Airborne Radiometric Survey - 1970 - Sheet 1</td>
<td>1:24,000</td>
<td>410-D-208</td>
</tr>
<tr>
<td>5</td>
<td>Airborne Magnetic Survey - 1970 - Sheet 1</td>
<td>1:24,000</td>
<td>410-G-202</td>
</tr>
<tr>
<td>6</td>
<td>Hunting Geology and Geophysics - 1970</td>
<td></td>
<td>A/1003/1645</td>
</tr>
<tr>
<td></td>
<td>Airborne Radiometric Anomalies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard Sheet 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Airborne Geophysical Survey - 1973</td>
<td>1:24,000</td>
<td>410-D-513</td>
</tr>
<tr>
<td></td>
<td>Flight Lines and Significant Anomalies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sheet 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mt. Brockman Region</td>
<td>1:25,000</td>
<td>411-E-1235</td>
</tr>
<tr>
<td></td>
<td>Radiometric and Geochemical Location Map</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mt. Brockman Region</td>
<td>1:25,000</td>
<td>411-E-1236</td>
</tr>
<tr>
<td></td>
<td>Geochemical Stream Sediment Survey - Assay Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Anomaly Q - Geological Map</td>
<td>1:1,200</td>
<td>411-C-1434</td>
</tr>
<tr>
<td>11</td>
<td>Anomaly Q - Radiometric Map</td>
<td>1:1,200</td>
<td>411-D-1435</td>
</tr>
<tr>
<td>12</td>
<td>Anomaly Q - Costean Geology</td>
<td>1:96</td>
<td>411-C-1501</td>
</tr>
<tr>
<td>13</td>
<td>Anomaly Q - Percussion Hole Sections - Geological Fact</td>
<td>1:240</td>
<td>411-I-1608</td>
</tr>
<tr>
<td>14</td>
<td>Anomaly Q - Percussion Hole Sections - Assay Results</td>
<td>1:240</td>
<td>411-I-1505</td>
</tr>
<tr>
<td>15</td>
<td>Anomaly Q - Sections - Diamond Drill Holes QDH 1, QDH 2 - Geology and Assays</td>
<td>1:600</td>
<td>411-J-1573</td>
</tr>
<tr>
<td>Plate No.</td>
<td>Description</td>
<td>Scale</td>
<td>Drawing No.</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>16</td>
<td>Exploration Licence No. 280 - South Portion Reconnaissance Auger Drilling - Locations</td>
<td>1:25,000</td>
<td>411-C-1569</td>
</tr>
<tr>
<td>17</td>
<td>Exploration Licence No. 280 - South Portion Reconnaissance Auger Drilling - Geology</td>
<td>1:25,000</td>
<td>411-C-1575</td>
</tr>
<tr>
<td>18</td>
<td>South Portion - Line A1 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1564</td>
</tr>
<tr>
<td>19</td>
<td>South Portion - Line A2 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1570</td>
</tr>
<tr>
<td>20</td>
<td>South Portion - Line A3 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1581</td>
</tr>
<tr>
<td>21</td>
<td>South Portion - Line A4 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1583</td>
</tr>
<tr>
<td>22</td>
<td>South Portion - Line A5 Extension - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1620</td>
</tr>
<tr>
<td>23</td>
<td>South Portion - Line A10 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1619</td>
</tr>
<tr>
<td>24</td>
<td>South Portion - Line A11 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1612</td>
</tr>
<tr>
<td>25</td>
<td>South Portion - Line A12 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1614</td>
</tr>
<tr>
<td>Plate No.</td>
<td>Description</td>
<td>Scale</td>
<td>Drawing No.</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------</td>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td>26</td>
<td>South Portion - Line A13 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1615</td>
</tr>
<tr>
<td>27</td>
<td>South Portion - Line A14 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1616</td>
</tr>
<tr>
<td>28</td>
<td>South Portion - Line A15 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1617</td>
</tr>
<tr>
<td>29</td>
<td>South Portion - Line A16 - Reconnaissance Auger Drilling - Geology, Radiometrics and Assay Results</td>
<td>Horizontal 1:6,000 Vertical 1:240</td>
<td>411-C-1618</td>
</tr>
</tbody>
</table>
1. **INTRODUCTION**

(Plate 1)

1.1 **Location**

Exploration Licence No. 280, formerly Prospecting Authority No. 2564, lies within the Alligator Rivers district of the Northern Territory.

The second schedule of Exploration Licence No. 280 defines the area as:

"ALL THAT piece or parcel of land in the Northern Territory of Australia containing an area of 55 square miles more or less, the boundaries of which are described as follows:

Commencing at the intersection of latitude 12 degrees 45 minutes 00 seconds with longitude 132 degrees 55 minutes 10 seconds thence proceeding to the intersection of latitude 12 degrees 50 minutes 40 seconds with longitude 132 degrees 49 minutes 00 seconds thence proceeding to the intersection of latitude 12 degrees 51 minutes 30 seconds with longitude 132 degrees 45 minutes 00 seconds thence north along the said longitude to its intersection with the eastern boundary of the Woolwonga Aboriginal Reserve, thence northerly along the said boundary to its intersection with latitude 12 degrees 45 minutes 00 seconds thence to the point of commencement, subject to any applications for mining tenements and excluding therefrom all mining tenements granted or registered and all reserves as defined by Section 7 of the Mining Ordinance 1939-1971".

1.2 **Access**

Present vehicle access into the area is via the main Darwin/Oenpelli road, a viable dry season road. A bush track leaves this road at approximately the 137 mile post, just north of Nourlangie Creek and runs easterly to Noranda's Baroalba airstrip. Several other minor bush tracks traverse the Exploration Licence.

1.3 **Tenure**

Prospecting Authority No. 2564 was originally granted to Noranda on 16th January, 1970. The original prospecting authority was cancelled after a change in the Northern Territory Mining Ordinance and on March 13th, 1972 an identical area was granted to Noranda as Exploration Licence No. 280.
An application was lodged on November 16, 1973 for the renewal of the Exploration Licence over a reduced area as prescribed by the Mining Ordinance. A description of the area applied for is as follows:

"ALL THAT piece or parcel of land in the Northern Territory of Australia containing an area of 27.5 square miles (7122.2 hectares) more or less, the boundaries of which are described as follows:

Commencing at a point latitude 12 degrees 50 minutes 00 seconds south longitude 132 degrees 45 minutes 00 seconds east thence proceeding east to a point latitude 12 degrees 50 minutes 00 seconds south longitude 132 degrees 48 minutes 00 seconds east thence proceeding north to a point latitude 12 degrees 47 minutes 00 seconds south longitude 132 degrees 48 minutes 00 seconds east thence proceeding east to a point latitude 12 degrees 47 minutes 00 seconds south longitude 132 degrees 50 minutes 00 seconds east thence proceeding north to a point latitude 12 degrees 46 minutes 00 seconds south longitude 132 degrees 50 minutes 00 seconds east thence proceeding east to a point latitude 12 degrees 46 minutes 00 seconds south longitude 132 degrees 52 minutes 00 seconds east thence proceeding north to a point on the existing boundary of Exploration Licence No. 280 at latitude 12 degrees 45 minutes 00 seconds south longitude 132 degrees 52 minutes 00 seconds east thence proceeding east along that boundary to a point latitude 12 degrees 45 minutes 00 seconds south longitude 132 degrees 55 minutes 10 seconds east thence proceeding south westerly along the existing boundary of Exploration Licence No. 280 to a point at latitude 12 degrees 50 minutes 40 seconds south longitude 132 degrees 49 minutes 00 seconds east thence proceeding south westerly along the existing boundary of Exploration Licence No. 280 to a point latitude 12 degrees 51 minutes 30 seconds south longitude 132 degrees 45 minutes 00 seconds east thence proceeding north along the existing boundary of Exploration Licence No. 280 to the point of commencement at latitude 12 degrees 50 minutes 00 seconds south longitude 132 degrees 45 minutes 00 seconds east.

Area: 27.5 square miles (7122.2 hectares) more or less.

The remainder of the area originally granted as Exploration Licence No. 280 has been relinquished. The results of Noranda's investigations within the area relinquished are described in this Volume 2 of Report No. 213. This description includes all investigations conducted in earlier years as well as those done during 1973.
2. GEOLOGY (Plate 2)

The area not retained subsequent to the 1973 Exploration Licence reduction is considered to be mainly underlain by gneissic rocks of the Nanambu Complex. These are not exposed at surface anywhere in the area but their presence is inferred by a complete lack of photo linears typical of meta-sediments, an ubiquitous sandy soil and virtually no aeromagnetic expression.

Percussion and diamond drill holes at Anomaly Q in the northwest corner, referred to in more detail later in the report, intersected paragneiss, pegmatite and minor amphibolite. Auger drill holes in the southern portion of the Exploration Licence outlined the southern limit of the Nanambu Complex. Within the Complex, rock types were mainly gneiss with minor amphibolite and quartz mica schist. To the south, rocks in the schist belt consisted of amphibolite, quartz mica schist and barren milky vein quartz.
GEOPHYSICAL SURVEYS

Three airborne geophysical surveys of the area have been completed.

The first was flown in November 1969 when an airborne spectrometer survey was completed on lines 1,000 feet apart, direction 325° magnetic at 300 feet mean terrain clearance. A more detailed survey was completed in November/December 1970 by Hunting Geology and Geophysics using a Nuclear Enterprises 8424 Mk. 15 differential gamma ray spectrometer. Flight line spacing was 500 feet with a mean terrain clearance of 250 feet. Direction was 45° magnetic.

The area was relown in early October 1973 using more sophisticated equipment. The survey utilised the Geometrics DiGRS-3001 differential spectrometer system with a crystal size of approximately 1,000 cubic inches, and a G-803 proton magnetometer with a sensitivity of 0.5 gammas. This spectrometer system provided significantly greater resolution and detection efficiency than had previously been employed in the licence area, and thus permitted more accurate definition of gamma ray emitters.

All three surveys have detected anomalous radioactivity in swamps in the area. The anomalies are considered to be dispersion features from sources outside the area relinquished. The latest survey detected Anomaly Q which had previously been located by field work. No other results were considered to be significant.

During the 1970 survey a Gulf Mk. 3 magnetometer was carried. Magnetic response over the Nanambu Complex was minimal. Strong magnetic anomalies were present over meta-sediments in the southern portion of the area.
A geochemical stream sediment sampling programme was carried out over the Exploration Licence in 1972. The minus 80 mesh fraction of the stream sediments was analysed for $\text{U}_3\text{O}_8$, copper and lead. Weakly anomalous lead values were noted in the vicinity of Anomaly Q but no other significant results were noted in the area relinquished.

In 1973 samples from the reconnaissance auger holes in the southern portion of the Exploration Licence were analysed for $\text{U}_3\text{O}_8$, copper, lead and nickel. The material was normally collected from the base of the 'B' horizon and weathered bedrock at total depth. Scattered weakly anomalous $\text{U}_3\text{O}_8$ and lead values occurred within Nanambu Complex gneisses but none were considered to be significant. Weakly anomalous copper and lead values were invariably associated with amphibolite and reflect mere background variations within differing rock types.
5. DETAILED INVESTIGATIONS

5.1. Anomaly Q (Plates 10-15)

5.1.1 Introduction

Anomaly Q, a uranium emitter, was discovered by geologist J. Dunbier during ground reconnaissance work in 1971. High radiometric readings associated with a quartz hematite breccia were found just east of the Darwin/Oenpelli road at the north-west corner of the Exploration Licence. A surface grab sample from the breccia assayed 507 ppm $U_3O_8$.

Formal application to percussion and auger drill the anomaly in 1972 was not approved by the Mines Department due to the proximity of an Aboriginal sacred site about half a mile to the north. The exact location of the anomaly relative to the Exploration Licence boundary and the sacred site was clarified, however, early in 1973 and detailed ground work was completed. This was followed by percussion and diamond drilling subsequent to approval by the Mines Department. A magnetic induced polarisation survey was also carried out.

5.1.2 Surface Investigations

The anomaly was gridded at 50 feet square spacing and geologically and radiometrically mapped. It occurs on flat lying ground with extensive laterite sheets. The only rock outcrops are of hematitic quartz breccia which extend for some 1,000 feet along a north-north-west strike. These breccias dip steeply to the west.

Radiometric mapping with a Scintrex BGS-1S scintillometer indicates an anomalous zone outlined by the 80 c.p.s. contour along 400 feet of strike in the northerly section of the hematitic quartz breccia. This is surrounded by a much larger area defined by a 60 c.p.s. contour.

One costean was excavated across the breccia. Mapping indicates an intensely siliceous zone some 30 feet in width dipping at about 70° to the west within a sequence of lateritised gneiss. Locally the siliceous zone is very ferruginous and traces of malachite are present. Channel sampling of the siliceous zone yields values of up to 59 ppm $U_3O_8$, 900 ppm copper, 400 ppm lead and 490 ppm zinc. Gold content averages 0.3 dwt/long ton. Values within the weathered gneiss are much lower.
An induced polarisation survey was unsuccessful apparently because of very dry conditions near surface. A magnetic induced polarisation survey was then carried out using electrodes at a depth of 70 feet in percussion holes drilled along the line of strike of the breccias. The work is described in a report by A.W. Howland-Rose of Scintrex Pty. Ltd. Briefly, three main anomalies were detected. They appear to be only partially coincident with the hematitic breccias noted on surface and trend across their line of strike. Two had already been adequately investigated by percussion and diamond drilling but the onset of very wet conditions prevented the return of a rig to drill the third.

5.1.3 Percussion Drilling

A total of nine percussion holes with an overall footage of 1,980 feet was drilled at Anomaly Q. These were laid out in three lines of three across the line of strike of the breccia at the main anomalous zone. The programme was terminated subsequent to a fire which badly damaged the rig just after the ninth hole was collared. By that time, however, adequate coverage of the area of interest had been achieved. Table 1 overleaf summarises the completed programme.

Results are shown on the accompanying plan and sections. The drill holes indicated a west dipping zone of intense silicification and chloritic alteration surrounded by an unaltered gneiss and amphibolite sequence. Within the zone of alteration very hematitic sections were noted; extensive pyrite occurred and in one hole, QPH 8, native copper was present.

Samples were collected from each 5 feet section and analysed for U$_3$O$_8$, copper, lead and zinc. Anomalous U$_3$O$_8$ values with a maximum of 120 ppm U$_3$O$_8$ were present on the two most northerly lines within the altered zone. Highly anomalous copper, lead and zinc was present on all three lines, peak values being 6400 ppm Cu, 1200 ppm Pb and 5,600 ppm Zn. These were again within the altered zone.
<table>
<thead>
<tr>
<th>Drill Hole No.</th>
<th>Co-ordinates (Local Grid)</th>
<th>Total Depth (feet)</th>
<th>Geology</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPH 2</td>
<td>585S 100E</td>
<td>200</td>
<td>Intensely silicified and altered rock to 105 feet, then biotite gneiss.</td>
</tr>
<tr>
<td>QPH 1</td>
<td>600S 50E</td>
<td>220</td>
<td>Intensely silicified and altered rock to 175', then biotite gneiss.</td>
</tr>
<tr>
<td>QPH 3</td>
<td>615S 0E</td>
<td>200</td>
<td>Intensely silicified and altered gneiss and schist.</td>
</tr>
<tr>
<td>QPH 5</td>
<td>685S 100E</td>
<td>250</td>
<td>Intensely silicified and altered rock to 215 feet, then biotite gneiss.</td>
</tr>
<tr>
<td>QPH 4</td>
<td>700S 50E</td>
<td>300</td>
<td>Intensely silicified and altered rock to 292 feet, then biotite gneiss.</td>
</tr>
<tr>
<td>QPH 6</td>
<td>715S 0E</td>
<td>160</td>
<td>Biotite gneiss to 120 feet, then highly silicified and altered gneiss.</td>
</tr>
<tr>
<td>QPH 8</td>
<td>870S 150E</td>
<td>225</td>
<td>Intensely silicified and altered rock to 202 feet, then altered gneiss.</td>
</tr>
<tr>
<td>QPH 7</td>
<td>885S 100E</td>
<td>400</td>
<td>Intensely silicified and altered rock to 355 feet, then amphibolite to 390 feet, then biotite gneiss.</td>
</tr>
<tr>
<td>QPH 9</td>
<td>900S 50E</td>
<td>25</td>
<td>Intensely silicified and altered rock.</td>
</tr>
</tbody>
</table>
5.1.4. Diamond Drilling

Two diamond drill holes were sited to intersect at about 250 feet below surface, the zone of alteration and mineralisation indicated by the percussion drilling. Each made a complete intersection of the mineralised zone. Core recoveries were excellent. Results are shown on the accompanying section. Summarised drill hole data is as follows:-

<table>
<thead>
<tr>
<th>DDH No.</th>
<th>Co-ordinates</th>
<th>Depth</th>
<th>Azimuth</th>
<th>Inclination</th>
</tr>
</thead>
<tbody>
<tr>
<td>QDH 1</td>
<td>945S 95W</td>
<td>470'</td>
<td>48° Mag.</td>
<td>-50°</td>
</tr>
<tr>
<td>QDH 2</td>
<td>740S 95W</td>
<td>417'</td>
<td>48° Mag.</td>
<td>-65°</td>
</tr>
</tbody>
</table>

Summarised logs are:

**QDH 1**

0' - 140' Decomposed quartz feldspar biotite gneiss.

140' - 215' Fresh quartz feldspar biotite gneiss and pegmatite.

215' - 238' Chloritized and saussuritized gneiss and pegmatite.

238' - 245' Chloritized dolerite or amphibolite.

245' - 365' Chloritized and saussuritized gneiss with hematitic and pyritic quartz veins.

365' - 384' Chloritized dolerite or amphibolite.

384' - 405' Chloritized and saussuritized gneiss.

405' - 412' Quartz feldspar biotite gneiss.

412' - 445' Amphibolite.

445' - 470' Quartz feldspar biotite gneiss and pegmatite.
QDH 2

0' - 85' Decomposed quartz feldspar biotite gneiss.
85' - 119' Fresh quartz feldspar biotite gneiss with minor pegmatite.
119' - 181' Chloritized and saussuritized gneiss and pegmatite.
181' - 184' Chloritized dolerite or amphibolite.
184' - 211' Chloritized and saussuritized gneiss.
211' - 220' Chloritized dolerite or amphibolite.
220' - 237' Chloritized and saussuritized gneiss.
237' - 241' Chloritized dolerite or amphibolite.
241' - 350' Chloritized and saussuritized gneiss with abundant hematitic and pyritic quartz veins.
350' - 363' Chloritized and saussuritized gneiss.
363' - 366' Quartz feldspar biotite gneiss.
366' - 381' Amphibolite.
381' - 417' Quartz feldspar biotite gneiss.

The mineralisation intersected by the percussion holes proved to be within an intensely chloritized and saussuritized zone associated with quartz veins which are themselves mineralised with sulphides and hematite possibly after sulphides. The country rocks are quartz feldspar biotite gneiss, pegmatite and amphibolite of the Nanambu Complex and these occur in unaltered form on either side of the mineralised zone. No above background radiometric count was noted in either diamond drill hole confirming the surface anomaly is mainly superficial. The mineralised intersections were assayed for U₃O₈, gold, copper, lead and zinc. No material approaching ore grade was encountered.
5.1.5. **Assessment**

The radiometric anomaly at Q is a superficial feature evidently related to a scavenging of uranium in hematite rich material near surface. Weakly anomalous $^3\text{O}^8_\text{U}$ values are present in a highly altered zone at depth but they do not approach ore grade.

The hematitic quartz breccia noted at surface is the product of an extensive system of mineralised quartz veins. These occur within an intensely chloritic and saussuritized zone of gneiss and amphibolite and are probably controlled by a north-north-west striking fault or shear zone. The base metal mineralisation does not approach ore grade and there is no indication that it will improve with depth.

Two of the three M.I.P. anomalies have been adequately tested by percussion and diamond drilling. It is not considered the third would be significantly better.

5.2. **Reconnaissance Augering in the Southern Portion of Exploration Licence (Plates 16 - 29)**

5.2.1. **Introduction**

From August to December 1973 an augering programme was conducted to locate the Nanambu Complex/Lower Proterozoic schist contact west of Baroalba Creek and to determine the nature of the schist sequence. Geochemical assays of auger cuttings were used to indicate whether anomalous amounts of uranium or base metals were present.

Photo linearis indicated the presence of meta-sediments associated with strong east-west striking aeromagnetic linearis. Favourable uranium host lithologies were anticipated in schists between the magnetic horizons and the Nanambu Complex margin.

Geological record and retention samples were taken from auger cuttings at 5 feet intervals. Assay samples were collected at the base of the 'B' horizon and at total depth.
5.2.2. Geology

Lines of holes were drilled across the regional strike, individual hole spacing being 1/10 mile. Average depth was 25 feet. This area is of very low relief and is blanketed with alluvial and eluvial deposits. Most of the auger holes penetrated into the 'C' soil horizon but the weathered rock was typically in an advanced state of decomposition. The main rock types distinguished were quartz feldspar (biotite) gneiss, quartz (feldspar) (muscovite, biotite) schist, amphibolite and dolomite. The similarity in mineralogical composition between the gneisses and the schists frequently made their distinction difficult, especially where the 'B' horizon was deeper.

The weathered gneiss, attributed to the Nanambu Complex, was characteristically a sericitic or coarsely micaceous mixture of small quartz granules and kaolinitic clay, frequently including white fragments of semi-weathered feldspars. Biotite-rich weathered gneiss was not uncommon and amphibolites are probably also present within the Nanambu Complex.

Within the Lower Proterozoic schist sequence depth of penetration was normally significantly greater than in the gneiss. The weathered schists were commonly very micaceous sandy clays with moderate quantities of coarse, angular vitreous quartz fragments. Occasionally prominent traces of medium grained magnetite were found. Laterite was usually present between 5-10 feet and a bleached 'B' horizon was common over inferred feldspathic schists immediately below the laterite. The most common rock type was a quartz feldspar mica schist but quartz muscovite schists were also encountered, frequently with a high proportion of chloritic biotite.

In a few localities slightly micaceous and sandy calcareous clays were observed in the 'C' horizon. Calcrete nodules noted in the 'B' horizon in these areas extended to nearby auger holes. The calcareous clays may reflect underlying dolomites.

A special feature of the area is the occurrence of pale brown and green mottled 'waxy' clays. These were sometimes observed to pass down into weathered amphibolites, and were usually associated with higher nickel and/or copper concentrations.
5.2.3. Geochemistry

Samples, which were generally selected from material near the base of the 'B' horizon and at total depth, were assayed for \( \text{U}_3\text{O}_8 \), copper, lead and nickel.

A threshold of 4.5 ppm for \( \text{U}_3\text{O}_8 \) in 'B' horizon material was obtained using a cumulative frequency plot. Some slightly anomalous values were obtained. Most of these are within the gneisses of the Nanambu Complex close to its contact with the schist belt to the south.

Two fairly well defined belts with associated high copper and nickel values are present. Both belts are clearly related to amphibolites. The first lies immediately south of the Nanambu Complex gneiss and the second about half a mile further to the south. In both copper and nickel values are in the 50 to 100 ppm range with peaks of between 100 and 200 ppm Cu and 300 and 400 ppm Ni.

High lead values, taking 50 ppm Pb as threshold, are mainly within the Nanambu Complex with one well defined zone of high lead being outlined just north of the schist belt on lines A4, A10 and A5. A peak value of 2200 ppm Pb in the 'B' horizon with 960 ppm Pb in the 'C' horizon occurred in one isolated hole AMAH 138, in this area. Calcrete and chloritic material were present in the hole which is close to a suspected cross fault.

5.2.4. Geophysics

All auger samples were radiometrically logged at surface using a Scintrex BGS-1S scintillometer. The radiometric background normally varied between 30 and 60 c.p.s. over weathered schist or gneiss. No counts significantly above the local background were recorded. Results are plotted on the appropriate sections.

A 200 by 50 feet grid was laid out to cover the highly anomalous lead value and a uranium high of 16 ppm \( \text{U}_3\text{O}_8 \) in an auger hole about 1,200 feet to the east. The results indicated a low order radiometric anomaly defined by the 50 c.p.s. contour. This was open to the northeast. The anomaly is largely coincident with above background lead and patchy anomalous uranium. It may be indicative of an area of 'hot' granite.
5.2.5. Assessment

The augering programme has defined the southern margin of the Nanambu Complex and confirmed the presence of schists and amphibolites to the south. Radiometric and geochemical investigations provide no real indication of economic grade uranium mineralisation west of Baroalba airstrip.
SECTIOON LOOKING NORTH

FEET  100  90  80  70  60  50  40  30  20  10

GEOLOGY

RADIOMETRICS

<table>
<thead>
<tr>
<th>Sample</th>
<th>QC20</th>
<th>QC19</th>
<th>QC18</th>
<th>QC17</th>
<th>QC16</th>
<th>QC15</th>
<th>QC14</th>
<th>QC13</th>
<th>QC12</th>
<th>QC11</th>
<th>QC10</th>
<th>QC9</th>
<th>QC8</th>
<th>QC7</th>
<th>QC6</th>
<th>QC5</th>
<th>QC4</th>
<th>QC3</th>
<th>QC2</th>
<th>QC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_3O_8</td>
<td>7</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>16</td>
<td>41</td>
<td>39</td>
<td>34</td>
<td>31</td>
<td>18</td>
<td>18</td>
<td>11</td>
<td>5</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Cu</td>
<td>100</td>
<td>100</td>
<td>140</td>
<td>190</td>
<td>300</td>
<td>400</td>
<td>800</td>
<td>800</td>
<td>370</td>
<td>400</td>
<td>200</td>
<td>280</td>
<td>60</td>
<td>76</td>
<td>88</td>
<td>88</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>58</td>
<td>50</td>
<td>84</td>
<td>80</td>
<td>90</td>
<td>210</td>
<td>420</td>
<td>420</td>
<td>260</td>
<td>260</td>
<td>140</td>
<td>140</td>
<td>68</td>
<td>68</td>
<td>54</td>
<td>54</td>
<td>48</td>
<td>48</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Zn</td>
<td>52</td>
<td>84</td>
<td>140</td>
<td>150</td>
<td>170</td>
<td>360</td>
<td>440</td>
<td>440</td>
<td>260</td>
<td>490</td>
<td>52</td>
<td>66</td>
<td>72</td>
<td>40</td>
<td>50</td>
<td>38</td>
<td>36</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ASSAY RESULTS (U_3O_8, Cu, Pb, Zn in ppm)

|  | 0.40 | 0.40 | 0.20 | 0.40 | 1.00 | 0.40 | 0.20 |

LEGEND

- Loose, large ferruginous quartz fragments and brown loam.
- Red, brown pisolithic laterite
- Latentised gneiss - Mattened red, yellow, brown ferruginous clay with abundant quartz grains.

NOTE: For location see Plate 10

NORANDA AUSTRALIA LTD.
EXPLORATION LICENCE No. 280
Northern Territory
COSTEAN - ANOMALY 'Q'
GEOLOGY
Scale 1" = 8 feet

APPROVED: O.H. Marshall | DRAWING No.: 411-C-1501

Scintillator: BGS-15 No. 902264 PLATE 12
### GEOLOGICAL SECTION

**LEGEND**

- **SA**: Sample Number
- **AN**: Analyte
- **CAT**: Category
- **BT**: Background Type
- **RA**: Radiometric Result

#### ASSAY & RADIONUCLIDE RESULTS

<table>
<thead>
<tr>
<th>Sample</th>
<th>Analyte</th>
<th>Category</th>
<th>Background Type</th>
<th>Radiometric Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** For further information, please refer to page 4.

**ORANDA AUSTRALIA LTD**

EXPLORATION LICENCE NW820

NOTES ON THE GEOLOGY OF THE AREA

**SOUTH PORTION, LINE A4 RECONNAISSANCE AUGER DRILLING**

**GEOLOGY, RADIONUCLIDE B ASAY RESULTS**

**DRAWN BY:**

**CHECKED BY:**

**APPROVED BY:**

**DATE:**

**SCALE:**

**DRAWN:**

**SCALE:** 1:10,000

**DRAWN:** 1:10,000
**Geological Section**

**Assay & Radiometric Results**

**Legend**

- **Gold**
- **Silver**
- **Lead**
- **Copper**
- **Molybdenum**
- **Other**
### Geological Section

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assay & Radiometric Results

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Assay Result</th>
<th>Radiometric Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Legend**

- **Legend**: Describes symbols used in the geological section.

---

**Notes**

- **Note 1**: Details specific to the geological section.
- **Note 2**: Additional information for the assay and radiometric results.