CORONATION HILL JOINT VENTURE
REVIEW OF SOUTH ALLIGATOR RIVER
GEOPHYSICAL DATA

M. WHITEHEAD

PERTH

JULY, 1987
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SUMMARY

A number of different geophysical techniques have been used in the South Alligator River Valley area, Northern Territory. Radiometrics, both airborne and ground has been the dominant one; a reasonably large area has been flown with magnetics; and a range of ground surveys have been done.

Almost all of the data from ground surveys have been lost, and a significant proportion of the airborne data. Existing airborne magnetic and radiometric data are of 1970 and 1971 vintage, except for a very small good quality magnetics (and INPUT EM) survey done in 1979. Not only are the 1970 and 1971 data of a poor quality by today's standards, they cannot be located accurately and no digital data exist.

Companies involved in the region in the past have used airborne radiometrics for locating potential prospects within their tenements. This report reviews the follow-up on these anomalies. Many of the areas were downgraded after fieldwork was done. For a number of areas some encouragement on the ground was reported but the area not adequately followed up. Many anomalies marked on maps are not mentioned in reports.

Only total count contours of the radiometric data exist (and some of the analogue records). Anomalies in the data have been picked by BHP and listed for areas where no work appears to have been done in the past.

With the poorly located data it would be impossible or very slow to locate the new anomalies chosen and those old ones not downgraded by other companies. If no new data were collected, it may be worth attempting to locate these old anomalies on the ground. However the close association between gold and uranium in the region indicates that a good, new radiometric data set is vital.

Aeromagnetic data were used very little in the past. Existing data have a large contour interval (25 nT) and show irregularities in the data presumably caused by location errors. Present day aeromagnetic data are of a much higher quality and may detect alteration associated with gold-uranium deposits.

The old airborne radiometric and magnetic data suffer from the above problems. Good quality surveys have the potential to be very important in exploring for gold in the South Alligator River region. It is recommended that the region of interest to BHP be refloored with magnetics and radiometrics.
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<td>1:100,000</td>
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1. INTRODUCTION

The data discussed below are from the region of the South Alligator River valley southeast of Darwin. Figure 1 shows the location.

A reasonable quantity of geophysical data have been collected by various companies and the Bureau of Mineral Resources (BMR) in the region. This review concentrates on airborne geophysical data, as very little data from ground geophysical surveys still exist. Data from some airborne surveys have also been lost.

The geophysical data have been collected together and interpreted. Comments are made on work done in the past to follow up areas of interest shown by the geophysics. Finally recommendations are made for future work in the region.

2. GEOPHYSICAL SURVEYS DONE

2.1 Airborne Geophysical Surveys

Table 1 summarises the airborne geophysical surveys which have been done in the region and Figure 2 shows their locations.

The BMR surveys were done with east-west flight lines and a 1500 m flight line spacing. Digital data were collected in the 1974-76 survey, but only analogue data in the 1971-72 survey (see Table 1). Compilations of BMR radiometric and magnetic data in the region exist. They are titled 'Radionetric Contours - Total Count of the Pine Creek Geosyncline Northern Territory 1979' and 'Total Magnetic Intensity Contours of the Pine Creek Geosyncline Northern Territory 1979' and are available from the BMR at a scale of 1:500,000.

For ease of reference the survey areas which formed part of the Mary River Uranium Joint Venture are referred to throughout this report as Mary River Areas 1 and 2 and the remaining survey areas are simply referred to as Areas 1 to 5.

2.2 Ground Geophysical Surveys

The locations of the larger ground geophysical surveys done in the region are shown in Porter, 1987.
The BMR has conducted gravity surveys in the region with irregularly spaced stations. Mostly data were collected in traverses along roads, and between traverses stations are 10 to 20 km apart.

Ground geophysical surveys have been done to locate radioactive materials, conductors such as graphitic shales and magnetic rocks, and to assess the thickness of the Kombolgie Formation.

1. Radiometric Surveys

Radiometric surveys were the most common. They were mainly done to locate and define airborne radiometric anomalies.

2. Surveys to Locate Graphitic Shales

The BMR did a large volume of spontaneous potential (SP) work, aimed at locating graphite. The deposit at El Sherana West was discovered by SP (Battey et al, 1971).

Small electromagnetic (EM) surveys have been done. Newmont conducted a survey in 1968 (Ballantyne, 1968) using a Sharp SE-300 EM Tilt system. Only 1 line km was surveyed, and a weak conductor seen in their data in the vicinity of a carbonaceous shale. Carbonaceous material was successfully delineated by the Turam fixed source EM method (Battey et al, 1971).

3. Ground Magnetic Surveys

Newmont also did about 2 km of ground magnetics and found higher and more variable values over cherty ferruginous siltstones than carbonaceous shales (Ballantyne, 1968).

4. Seismic Survey

G.E.S. Pty Ltd conducted a 9 line kilometre seismic refraction survey in 1975 to investigate the thickness of Kombolgie Formation cover above the Lower Proterozoic (Pederson & Pietsch, 1975). The unconformity depth was assessed as being 20-70 m below the ground but the area never drilled.
<table>
<thead>
<tr>
<th>SURVEY TYPE</th>
<th>DATE DONE</th>
<th>COMPANY WHO FLEW SURVEY</th>
<th>COMPANY SURVEY DONE FOR</th>
<th>AREA COVERED BY SURVEY (See Figure 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mag/rad²</td>
<td>1970</td>
<td>GRD³</td>
<td>United Uranium</td>
<td>Areas 1, 2, 3, 5</td>
</tr>
<tr>
<td>Mag/rad²</td>
<td>1971</td>
<td>GRD³</td>
<td>United Uranium</td>
<td>Area 4</td>
</tr>
<tr>
<td>Radiometrics</td>
<td>1971</td>
<td>GRD³</td>
<td>Australian Geophysical</td>
<td>Mary River Areas 1, 2</td>
</tr>
<tr>
<td>Mag/rad²</td>
<td>1971-72</td>
<td>BMR</td>
<td>---</td>
<td>Includes Mundoglie, Jim Jim &amp; Gilruth 1:100,000 sheets</td>
</tr>
<tr>
<td>Mag/rad²</td>
<td>1972</td>
<td>Geometrics</td>
<td>Noranda</td>
<td>Area 5</td>
</tr>
<tr>
<td>Mag/rad²</td>
<td>1972</td>
<td>Geometrics</td>
<td>Noranda</td>
<td>Approx 617 miles in Area 3</td>
</tr>
<tr>
<td>Radiometrics - rim flying</td>
<td>1972</td>
<td>Geometrics</td>
<td>Noranda</td>
<td>Approx 56 miles in Areas 3, 4</td>
</tr>
<tr>
<td>Radiometrics - rim flying</td>
<td>1973</td>
<td>Geometrics</td>
<td>Noranda</td>
<td>Approx 157 miles in Areas 2, 3, 4</td>
</tr>
<tr>
<td>Survey Type</td>
<td>Date Done</td>
<td>Company Who Flew Survey</td>
<td>Company Survey Done For</td>
<td>Area Covered by Survey (See Figure 2)</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>--------------------------</td>
<td>-------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Mag/rad²</td>
<td>1974-76</td>
<td>BMR</td>
<td>---</td>
<td>Includes Ranford Hill, Stow &amp; Snowdrop 1:100,000 sheets</td>
</tr>
<tr>
<td>INPUT EM &amp; Magnetics</td>
<td>1979</td>
<td>Geoterrex</td>
<td>Utah</td>
<td>137 line km near Sleisbeck (Area 3)</td>
</tr>
</tbody>
</table>

1. All surveys are systematic traversing unless otherwise stated
2. Mag/rad = Magnetics and radiometrics
3. Geophysical Resources Development Co.
3. **EXISTING DATA**

Many of the original data have been lost. Table 2 lists the contour data and plans with anomaly positions on them that exist.

Area 5 was reflown by Geometrics with magnetics and radiometrics in 1972 (Curry et al, 1972). No data from this survey exist except 1:250,000 scale maps with radiometric anomaly positions marked on. It appears that the magnetic data were never compiled.

A survey of 617 miles of magnetic and radiometric data and 895 miles of radiometric data only was conducted along systematic traverses by Geometrics in 1972. None of this data exists, and no plans exist which show the survey area. Apparently the magnetic data were never plotted. The combined magnetic and radiometric survey probably covered the area where Noranda assessed the GRD data of 1970 as being unsatisfactory (see 4.2). Pietsch et al, 1972 indicate that the radiometric data collected in the Geometrics survey were of a much higher quality than even the original GRD data that Noranda regarded as satisfactory.

Significant points to note are:

1. No photomosaics with the positions of the recovered fiducial points on them exist.
2. No contoured radiometric data exist for Areas 1, 2 or 5.
3. No magnetic data exist for Area 5.
4. Some of the analogue charts and flight strips have been lost, including all those for the Mary River areas and the Geoterrex INPUT EM and aeromagnetic survey.

The available contoured data have been reduced to a scale of approximately 1:100,000 and are shown in Figures 3 to 6.
<table>
<thead>
<tr>
<th>AREA</th>
<th>DATE OF SURVEY</th>
<th>TYPE OF DATA</th>
<th>CONTOUR PLANS</th>
<th>PLAN WITH ANOMALY POSITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1970</td>
<td>Magnetic</td>
<td>Yes&lt;sup&gt;1&lt;/sup&gt;</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>1970</td>
<td>Radiometric</td>
<td>No&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>1970</td>
<td>Magnetic</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>1970</td>
<td>Radiometric</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>1970</td>
<td>Magnetic</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>1970</td>
<td>Radiometric</td>
<td>T.C.&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Some anomalies plotted</td>
</tr>
<tr>
<td>Part of Area 3</td>
<td>1972</td>
<td>Magnetic</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Part of Area 3</td>
<td>1972</td>
<td>Radiometric</td>
<td>No</td>
<td>1:250,000 scale only</td>
</tr>
<tr>
<td>4</td>
<td>1971</td>
<td>Magnetic</td>
<td>Yes</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>1971</td>
<td>Radiometric</td>
<td>T.C.</td>
<td>Some anomalies plotted</td>
</tr>
<tr>
<td>5</td>
<td>1970</td>
<td>Magnetic</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>1970</td>
<td>Radiometric</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>1972</td>
<td>Magnetic</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>1972</td>
<td>Radiometric</td>
<td>No</td>
<td>1:250,000 scale only</td>
</tr>
<tr>
<td>Small parts of Areas 2,3,4</td>
<td>1972&amp;73</td>
<td>Radiometric rim flying</td>
<td>N/A</td>
<td>1:250,000 scale only</td>
</tr>
<tr>
<td>Part of Area 3</td>
<td>1979</td>
<td>INPUT EM</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Mary River Areas 1, 2</td>
<td>1971</td>
<td>Magnetic</td>
<td>Yes</td>
<td>N/A</td>
</tr>
</tbody>
</table>

1 Yes = data exist  
2 No = data lost  
3 Total count contours exist
4. QUALITY OF DATA

The data are of a poor quality especially when compared with present day surveys, and the locations are inaccurate.

Details of the Mary River Areas 1 and 2 data are not known, so the following refers to the Areas 1 to 5 data only.

The main problems are listed below.

4.1 Locating the Data

After the 1970 and 1971 surveys were flown, GRD transferred the positions of the fiducial points from photomosaics to flight path recovery plans. These plans have some geographical features on them and were used as base plans for the radiometric data. Each of the designated areas have some geographical features on the base plan. Since none of the photomosaics exist (for Areas 1 to 5 or Mary River Areas 1 & 2) the only way of locating the data is to use the flight path recovery plans.

Rodwell (1972) comments that some of the fiducial points plotted were grossly inaccurate. The obviously wrong positions were rejected, but locational errors probably still exist.

The base map scales of the areas were originally stated to be 1 inch to 2000 feet. However, discrepancies exist between the different areas and so the scales must have only been approximate. Splicing together the different areas results in large mismatches. All the data were reduced by BHP to approximately a 1:100,000 scale and the adjacent areas spliced together to give the best positioning of the data. When the flight path recovery base plans overlay standard 1:100,000 maps, large inaccuracies in positions of geographical features in the base plans are seen.

In summary, the data can only be approximately located.

4.2 Unsatisfactory Data

In an assessment of the GRD data, Rodwell (Battey et al, 1971) concluded that part of the Area 3 data was technically unsatisfactory and should be reflown. The area that he outlined as being unsatisfactory is that
part of Area 3 in Figure 2 which is labelled "Reflown 1972 Geometrics". Curry et al, 1972 state that all the GRD data within Area 5 were unsatisfactory and should also be reflown. All the reflown data have been lost (see Section 3).

4.3 Diurnal Corrections

No diurnal corrections were applied to the magnetic data (Rodwell, 1972).

4.4 Tie Lines

No tie lines were flown in the Central Valley area (Area 4) and sections of tie lines flown in Areas 1, 2 and 3 passed through zones with steep gradients in the magnetic data and could not be used for levelling the data (Rodwell, 1972).

4.5 Contour Interval

A contour interval of 25 nT was used for the magnetic data. While such an interval shows features in areas of high magnetic gradients, in areas of low gradients few features and structures can be seen.

5. REVIEW OF AIRBORNE RADIOMETRIC DATA

5.1 Introduction

The existing airborne radiometric contour data have been examined, which consist of data from Areas 3 and 4 and Mary River Areas 1 and 2.

As the data cannot be located accurately (see 4.1) and not all the radiometric analogue records exist, no attempt was made to go through the available analogue records to pick anomalies. Instead the following have been done:

1. The main anomalies in the total count data were identified and checked against available data.

2. A brief review of the work done on radiometric anomalies in the past in the above areas has been done.
5.2 BHP Anomalies

In Mary River Areas 1 and 2 most of the high total count areas have the main component of the radiation (potassium, uranium or thorium) marked on them. In Area 4 some of the high areas have the main component marked on. No anomalies were chosen which had thorium as the main cause of the anomaly. Those with a high potassium content were not downgraded, as potassic alteration could be associated with a uranium-gold unconformity deposit.

Relative not absolute high total count values were regarded as important in the choice of anomalies.

Anomalies were eliminated if they:

a) Corresponded with discrete lithologies
b) Were over a topographical high
c) Had been adequately followed up and then downgraded by other companies.

In the absence of digital data, the best way to find anomalies is to choose anomalies from uranium analogue records. Choosing anomalies from total count contours is not as good, but with the available data and location problems it was the best way to quickly check for possible omissions in previous work done.

The final anomalies are numbered and circled on the radiometric plans in Figures 3, 5 and 6 and are summarized below. The lithologies are taken from BMR 1:100,000 geology maps.

**Area 3** (see Figure 3)

3/1 Plum Tree Volcanics

3/2 Kurrundie Sandstone

3/3 Plum Tree Creek Volcanics

3/4 Big Sunday Formation (greywacke). Anomaly on a major fault marked on the BMR geology map.
Alluvium. Anomaly is southwest of Sleisbeck and coincident with a magnetic low in the Geoterrex 1979 survey which continues through anomaly 331 (see below).

C-16 Airborne anomaly in similar position to ground anomaly C-16 located by Noranda. The anomaly is caused by 'uranium mineralisation in haematitic and phosphatic boulders occurring in scree slopes derived from the Kombolgie Formation$^3$ (Foy et al, 1973a). They recommend that further work is done as anomaly is close to a major fracture but subsequent reports make no mention of work in the area.

3T Work done on this anomaly in Plum Tree Creek Volcanics by Noranda in 1973 (Foy et al, 1973a). The area was drilled and shown to contain uranium and phosphate mineralisation in pods and lenses in a fault zone. Further drilling was recommended but no work in the area discussed in later reports.

323 Big Sunday Formation (greywacke). Anomaly picked by GRD but no record of work done in the area has been found.

331 Anomaly picked by GRD but only comment made is that it was 'previously examined' (Wyntje et al, 1971). Anomaly on edge of Kombolgie hills with alluvium at their base. Anomaly in area covered by a small detailed airborne INPUT EM and magnetic survey flown by Geoterrex in 1979. Geoterrex interpreted a number of conductors from the EM survey which they suggested were carbonaceous shales (Whiting, 1979). One of these conductors has the same strike as the total count anomaly and is just north of it. The original EM data have been lost and none of the interpreted Geoterrex conductors have been drill tested yet.

The anomaly is coincident with a magnetic low in the Geoterrex 1979 survey and has the same strike direction.

Area 4 (see Figure 3)

4/1 Edge of Kombolgie Formation and Cainozoic sediments.
4/2 Anomaly is over Kombolgie sandstone and follows joint direction, and may be partly caused by topography. Anomaly may be the downgraded Melanie Anomaly (Battey et al, 1971).

4/3 Kurrundie Sandstone.

4/4 Anomaly over boundary between Plum Tree Creek Volcanics and Kurrundie Sandstone.

4/5 Kapalga Formation greywacke.

4/6 Kombolgie Formation covered by Cainozoic ferruginous sands.

4/7 As above.

4/8 Kombolgie Formation.

4/9 Kombolgie Formation ferruginous sandstone and sandstone.

4/10 Kombolgie Formation.

4/11 Kombolgie Formation adjacent to Waterfall Creek Fault shown in 1:100,000 BMR geology maps.

4/12 As above.

Mary River Area 1 (see Figure 5)

1/1, 1/2, 1/3 Cainozoic sediments

1/4 Koolpin Formation

1/5, 1/6, 1/7, 1/8 Cainozoic sediments

T75-6 Anomaly marked on map in report by Ada Explorations (Cotton et al, 1972) but no record of any work done on it exists. Anomaly over Cainozoic sediments.
Mary River Area 2 (see Figure 6)

2/1 Anomaly over boundary of Cullen Granite and alluvium

2/2 Anomaly near edge of Mundogie Sandstone

2/3 Masson Formation

AG Adjacent anomaly AF checked in field (Australian Geophysical, 1971). AF caused by concentration of uranium in laterite over shales, and Australian Geophysical assumed AG caused by the same without checking it.

AL Anomaly picked but not checked in the field due to lack of time (Australian Geophysical, 1971). Anomaly over Quaternary sediments.

AP As above

AR Anomaly within Masson Formation. Assessed by Australian Geophysical (1971) to be the most prospective of their anomalies on the sheet. Not checked in field by Australian Geophysical due to lack of time.

5.3 Anomalies Chosen by Other Companies

5.3.1 Areas 2, 3, 4

An attempt has been made to locate all the airborne radiometric anomalies interpreted by other companies in Areas 1 to 5 and to check whether the anomalies in Areas 2, 3 and 4 have been properly investigated.

From most surveys flown, maps do not exist which show all the anomalies chosen. Figure 2 is a compilation of those anomaly positions which could be found.

Most of the reports which describe radiometric interpretations list numbers of anomalies, with high and low priorities, which are never mentioned again. It appears from Battey et al, 1971, Foy et al, 1972 and Pietsch et al, 1972 that Rodwell interpreted the GRD data and later reinterpreted it but this is not clear.
The information which exists on interpretations and follow-up work is summarised in Table 3.

Apart from the 3 reports mentioned above, the following reports were used in preparing Table 3: Australian Geophysical, 1971; Cotton et al, 1972; Curry et al, 1972; Foy et al, 1973a; Foy et al, 1973b; Foy et al, 1973c; Foy et al, 1974a; Foy et al, 1974b; Miezitis et al, 1973; Pedersen and Duncan, 1975; Pedersen and Pietsch, 1975; Pietsch et al, 1976; Pietsch, 1977a; Pietsch, 1977b; and Wyntje et al, 1971.

5.3.2 Mary River Areas 1, 2

Records of the Mary River anomalies are much better than those of Areas 2, 3 and 4.

All of the airborne radiometric anomalies which were drilled in Mary River Area 1 and all of the airborne anomalies except anomaly I in Mary River Area 2 are shown in Figure 2.

The Mary River Area 2 data were interpreted in 1971 by Australian Geophysical. Fifty three anomalies were picked. Thirty five were checked thoroughly on the ground and downgraded. Fourteen appeared to have similar features to some in the first 35 and were assessed to be probably not of interest. They recommended ground checks on the 4 remaining anomalies (AX, AR, AT & BA) but they appear not to have been done (Australian Geophysical, 1971).

The Mary River Area 1 data were interpreted by Ada Explorations in 1972. Thirty one anomalies showed ground radiometric anomalies. Of these, 17 appeared interesting and were drilled. No significant uranium occurrences were found, and the area was recommended for relinquishment (Cotton et al, 1972).
<table>
<thead>
<tr>
<th>AREA</th>
<th>COMPANY WHO FLEW SURVEY</th>
<th>COMPANY WHO DID INTERPRETATION</th>
<th>YEAR INTERPRETED</th>
<th>NO. OF ANOMALIES</th>
<th>FOLLOW-UP WORK (see Fig 2 for location of anomalies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>GRD</td>
<td>GRD</td>
<td>1971</td>
<td>?</td>
<td>All evaluated by Noranda with disappointing results</td>
</tr>
<tr>
<td>2</td>
<td>GRD</td>
<td>Noranda</td>
<td>1971</td>
<td>21</td>
<td>?</td>
</tr>
<tr>
<td>2</td>
<td>GRD</td>
<td>Noranda</td>
<td>1972</td>
<td>18</td>
<td>All investigated. 17 not of interest. One (2J) drilled but downgraded in 1974 as low grade uranium mineralisation only</td>
</tr>
<tr>
<td>3</td>
<td>GRD</td>
<td>GRD</td>
<td>1970/71</td>
<td>?</td>
<td>Ground follow-up done. Results not reported</td>
</tr>
<tr>
<td>3</td>
<td>GRD</td>
<td>Noranda</td>
<td>1971</td>
<td>10</td>
<td>3Q, 324 percussion drilled with some encouragement and then no more work done</td>
</tr>
<tr>
<td>AREA</td>
<td>COMPANY WHO FLEW SURVEY</td>
<td>COMPANY WHO DID INTERPRETATION</td>
<td>YEAR INTERPRETED</td>
<td>NO. OF ANOMALIES</td>
<td>FOLLOW-UP WORK</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>--------------------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>3</td>
<td>GRD</td>
<td>Noranda</td>
<td>1972</td>
<td>23</td>
<td>All investigated on ground. Results not reported on</td>
</tr>
<tr>
<td>3</td>
<td>Geometrics</td>
<td>Noranda</td>
<td>1972</td>
<td>92</td>
<td>At least 18 investigated. 3-110, 3-117, 3-123 downgraded in 1974. 3-171 downgraded in 1976 after drilling</td>
</tr>
<tr>
<td>4</td>
<td>GRD</td>
<td>GRD</td>
<td>1971</td>
<td>?</td>
<td>12 followed up with 'disappointing results' in 1971, 20 more checked in 1972. 6 grouped together as the Sandstone Anomaly and drilled but no significant uranium values</td>
</tr>
<tr>
<td>4</td>
<td>GRD</td>
<td>Noranda</td>
<td>1971</td>
<td>23</td>
<td>?</td>
</tr>
<tr>
<td>AREA</td>
<td>COMPANY WHO FLEW SURVEY</td>
<td>COMPANY WHO DID INTERPRETATION</td>
<td>YEAR INTERPRETED</td>
<td>NO. OF ANOMALIES</td>
<td>FOLLOW-UP WORK</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>---------------------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>4</td>
<td>GRD</td>
<td>Noranda</td>
<td>1972</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>2 &amp; 4</td>
<td>Geometrics (rim flights)</td>
<td>Noranda</td>
<td>1972</td>
<td>2</td>
<td>Window Anomalies 1 &amp; 2 had diamond drilling recommended in 1975 but no further work reported</td>
</tr>
<tr>
<td>2,3,4</td>
<td>Geometrics (rim flights)</td>
<td>Noranda</td>
<td>1973</td>
<td>16</td>
<td>Anomalies assessed as not significant uranium emitters</td>
</tr>
<tr>
<td>3,4</td>
<td>Geometrics (rim flights)</td>
<td>Noranda</td>
<td>1972</td>
<td>9</td>
<td>Only 1 (R-22) regarded as significant</td>
</tr>
</tbody>
</table>
6. **INTERPRETATION OF AEROMAGNETIC DATA**

6.1 **BMR Data**

The most distinctive features in the regional BMR aeromagnetics (see section 3) are:

1. A series of northeast trending dykes and lineaments.
2. The dominantly northwest striking Lower Proterozoic lithologies.
3. Large rounded anomalies with high values in a low gradient background. The anomalies have different sources such as Masson Formation near a granitic intrusion and Mundogie Sandstone.

6.2 **Companies' Data**

The aeromagnetic data are shown in Figure 4.

Boundaries in the magnetic data can be seen between many of the major rock types. The Stag Creek Volcanics have quite distinctive linear high magnetic values in most places where they outcrop.

In some areas the Koolpin Formation has high magnetic intensities, but in other areas the intensities are moderately low. In the Central Valley area of old mines in the Koolpin Formation the magnetic intensities are fairly low. Part of the reason for the low values is the narrow valley where the aircraft clearance above the ground would have been greater than over the adjacent ridges. However as the ridge flattens out, the values are still lower than those over some outcrops of Koolpin Formation away from the Central Valley area.

The possibility of magnetite destruction where uranium deposits occur has been suggested (Price, 1987). With the 25 nT contour interval the old data set is inconclusive. Scinto 5 & Pallette fall within a small area with moderate magnetic intensities, probably caused by the aircraft flying lower as the main ridge is not close to the Koolpin Formation here. EL Sherana and Coronation Hill are in areas with low magnetic gradient.
The only existing data detailed enough to conclusively show whether a deposit is marked by low magnetic values are the magnetic data collected by Geoterrex with INPUT EM in 1979 over a small area which included Sleisbeck. The data are good quality and contoured at a 2 nT contour interval. The abandoned mine at Sleisbeck and the line of occurrences extending for a kilometre west of it occur between a magnetic low to the north and high to the south. (The magnetic contour map can be found in Whiting, 1979.) Thus Sleisbeck does not have a magnetic low over it.

There are a number of east/west to east-northeast/west-southwest trending lineaments, particularly in the southwestern part of the survey area. The main uranium deposits occur within this zone. Image processed digital magnetic data would be expected to show many more lineaments and faults than can be seen in the coarsely contoured existing data with pulls between lines. A relationship between the lineaments and uranium deposits may be seen in better data.

The available magnetic data, if located accurately, would have some usefulness as a regional mapping tool in areas of cover. Good quality digital data is needed to assess the use of magnetic data in upgrading some areas over others and in the direct detection of gold-uranium deposits.

7. **RECOMMENDATIONS FOR FUTURE WORK**

The existing airborne magnetic and radiometric data set is poor quality, incomplete, not digital and inaccurately located. It is recommended that the region of interest to BHP is refloated as proposed by Price (1987) for the following reasons.

1. Digital data would allow the radiometric and magnetic data to be displayed as images.

2. Good uranium data are important given the usual association between gold and uranium in the area.

3. Potassium anomalies could be areas of alteration associated with uranium/gold mineralisation.

4. Different ratios of the radiometric data could be displayed as images.
5. As well as being used for picking anomalies, radiometric images would be a valuable aid to mapping given the abundance of outcrop in the region.

6. Images of magnetic data would show faults and other structures.

7. The uranium deposits may have a signature in good quality magnetic data if the alteration has involved magnetite destruction.

8. Magnetic data would give information about different lithologies.

If a new survey is not flown, an attempt should be made to locate those radiometric anomalies discussed in section 5 which lie within areas that BHP is interested in. The anomalies which showed some encouragement when checked on the ground by other companies but had insufficient follow-up work done on them were 3Q, 324 and Window Anomalies 1 and 2 in Areas 2 to 4 (see Figure 2). In Mary River Area 2 anomalies which had ground checks recommended but not done were AX, AR, AT and BA. These anomalies are shown on the contour plan in Figure 6. Remaining anomalies which could be checked are those picked by BHP from total count contours and described in 5.2.
REFERENCES


