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1. SUMMARY AND CONCLUSIONS

Much of EL5421 is covered by an unknown thickness of Permian sediments of the Lucas Formation and Pedestal Beds. The Lower Proterozoic, host to known gold mineralization in the region, does not crop out in the licence area. Airborne magnetic data suggest that magnetic units of the Lower Proterozoic Mount Charles Beds occur in the northern and north-eastern part of the licence. Image processing of open-file airborne magnetic and radiometric data has been completed. In conclusion EL5412 is not suitable for surface geochemical sampling and further exploration would need to involve deep drilling on magnetic targets.
2. **INTRODUCTION**

Exploration Licence 5421 is located on Tanami Downs Station (Pastoral Lease 695) approximately 60 km south-west of the Tanami Mine (Fig.1). The licence area lies between Longitude 129° 00' and 129° 29' East and Latitude 20° 21' and 20 46' South abutting the Northern Territory - Western Australia boundary. The area is accessed by good graded tracks leading westwards from Tanami Downs homestead which is located 25 km east of the licence boundary. The homestead is reached by a 55 km gravel road running south westwards from the main Alice Springs-Halls Creek road from a point 5 km west of Rabbit Flat.

The licence covers an area of 1,562 km² (485 blocks) and was granted on 15th October 1987 to Harlock Pty Ltd. On 1st May 1988 the Tanami Joint Venture gained control of the licence. Pursuant to the Mining Act 242 blocks were nominated for relinquishment on 15th September 1989.

This report outlines exploration work carried out in the second year of the licence between 15th October 1988 and 14th October 1989.
3. PREVIOUS WORK

Previous geological work carried out in the area is summarized as follows:

1962 BMR carried out an airborne magnetic and radiometric survey of Tanami and The Granites Sheet areas (Spence, 1964; BMR, 1965a, 1965b).

1967 BMR carried out a reconnaissance gravity survey of The Granites Sheet area (Whitworth, 1970).

1972 BMR geologically mapped the area as part of a larger mapping programme covering the Granites - Tanami block. (Blake et al, 1973; Hodgson, 1976; Blake et al, 1979). At the same time as the geological mapping, a programme of shallow stratigraphic drilling was carried out by BMR drilling crews (Blake, 1974).

1981-83 BHP Minerals Ltd held four EL's (EL.2943, 2944, 3244 and 3568) in the present licence area primarily to explore for diamonds. Work carried out included procuring coloured aerial photography, and an airborne magnetic and radiometric survey was flown with 500m line spacing and 90m terrain clearance.

1962-85 At least 39 water bores were drilled in the licence area. Logs are located in the 1988 Annual Report (Nicholson, 1988).
4. GEOLOGY

The following geological units have been recognized in the licence area and immediate environs:

**Lower Proterozoic Tanami Complex**
This unit consists of folded and cleaved rocks of greenschist and amphibolite metamorphic facies. Lithologies include banded chert, silicified siltstone, quartzite, phyllitic sandstone, schistose greywacke, amphibolite, jaspilite, gossanous ironstone and acid porphyry. BMR mapping shows this unit to be present near the northern and eastern boundaries of the licence area. The Tanami Complex is of economic interest, as it is host for known lode gold deposits at Tanami and The Granites. No sequence has been established in the Tanami Complex because of tight folding, probable complex faulting and relatively poor exposures.

**Middle Proterozoic (Carpentarian)**
Arenites and conglomerate of the Birrindudu Group are mapped as cropping out to the north-east and north-west of the licence area.

**Upper Proterozoic (Adelaidian)**
Shallow-dipping (30°-35°) arenites of the Muriel Range Sandstone (Redcliff Pound Group) are mapped as cropping out in the south-east corner of the licence area.

**Cambrian**
Fine and medium-grained porphyritic basalts of the Antrim Plateau Volcanics crop out between the eastern boundary of the licence area and the Tanami Downs homestead. These basalts are unaltered and unmetamorphosed. Irregular vesicles infilled with chlorite are common. Low rises capped by laterite obscure areas of Antrim Plateau Volcanics north-west of the homestead.
Permian
Much of the licence area is covered by calcareous sandstone, sandstone and siltstone of the Lucas Formation and Pedestal Beds. These Permian rocks have an estimated maximum thickness of 1,000m in the region. Drilling in the licence area shows the Permian attains a thickness of at least 100m.

Pommies Knob, a prominent hill about 5m high, in the central-west part of the licence area, is formed of flat-lying Lucas Formation, consisting of thinly interbedded lithic sandstone and maroon and grey banded mudstone. The sandstone is both coarse and fine-grained, non-calcareous, and contains abundant mudstone pellets.

In the northern part of the licence area, in the Macfarlanes Peak Range, "about 20m of Pedestal Beds dips gently south. The basal 5m consists of ripple-marked medium-grained clayey quartzose sandstone with micaceous parts. This is overlain by about 5m of flaggy sandstone and minor thin beds of maroon siltstone, which is overlain by 10m of thick-bedded sandstone showing large-scale cross-bedding. Up to 10m of flat-lying sandstone is exposed in the Pedestal Hills. The sandstone here is medium-grained, mainly medium-bedded and sparsely micaceous. Cross-bedding is well developed, and some bedding surfaces show moulds of clay pellets" (Blake et al, 1979).

The Lucas Formation and Pedestal Beds have been affected by Tertiary lateritization.

Cainozoic
Much of the area is covered by Cainozoic superficial deposits. Laterite cappings and laterite surficial lag is widespread across the area. The cappings are remnants of a very extensive flat to gently undulating former land surface, much of which has been removed by erosion. In the licence area, the laterite is present on Tanami Complex, Muriel Range Sandstone, Antrim Plateau Volcanics and Permian Lucas Formation and Pedestal Beds.
Calcrete forms low rises and mounds in broad depressions that mark past and present drainage channels and is a chemical deposit formed by evaporation of groundwater.

Tertiary alluvium of unknown thickness is associated with the palaeochannels.

Aeolian sand of Quaternary age forms extensive sand plains in the area. A large dune-field, covering at least 180 km² occurs in the east-central part of the licence area to the south of Ferdies Bore (Fig.1). The dune-field is crossed by east-trending longitudinal (seif) dunes averaging 5m high. They are stationary and support a sparse vegetation.

Lacustrine sediments occupy the various claypans, including Lake Sarah, Bullocks Head Lake and a large un-named pan 5km NNW of Ferdies Bore, and consist of silt, clay and evaporite minerals.
5. EXPLORATION COMPLETED

5.1 Data Review
Midway through the licence year, i.e. April 1989, the Tanami Joint Venture resumed management of their own exploration licences from consulting geologists, Eupene Exploration Enterprises. This move resulted in comprehensive data reviews being carried out on all previous work. All work completed on EL.5421 including literature research, photo-interpretation, reconnaissance geological mapping, geophysical interpretation, water-bore logs and stratigraphic drilling by the BMR was reviewed.

In conclusion, the licence area is completely covered by sediments of Permian age and younger. There are no obvious outcrops of Lower Proterozoic rocks, the hosts of gold mineralization in the region. Small areas of Adelaidian sandstones occur in the south-east corner. The northern part of the licence having a Lower Proterozoic basement, is covered by a minimum of 67m of Permian:

Macfarlanes Peak Bore - 55m sandstone
Bore R.N.14177 - 67m sandstone and siltstone
(7km WSW of MPB)

A zone of high magnetic response traversed by a regional lineament occurs 5km-15km south-east of these bores. It is probable that at least a similar amount of Permian covers this area.

5.2 Geophysics
In order to obtain a better understanding of the geology on EL.5421 as well as the whole of the Tanami-Granites Region, the open-file airborne magnetic data from the recent BHP, North Flinders Mines and N.T.G.S. surveys were purchased. These data comprised residual magnetic contour plans and copies of tapes obtained from Geoterrex.
The data tapes were forwarded to Geoimage Pty Ltd, Brisbane, who processed them in conjunction with data tapes from the Tanami Joint Venture's own surveys elsewhere in the region.

EL.5421 is covered by the following contour plans:
- Macfarlane 1:100,000 sheet
- Pedestal Hills 1:100,000 sheet

The data covering EL.5421 were flown by Geometrics Int. Corp. in 1982 for BHP Minerals Ltd, using a Geometrics G813 magnetometer with traverse lines at 500 metres, mean terrain clearance of 100 metres, and a sample interval of 45 metres (cycle rate 0.73 second).

Geophysical Prospecting and Analysis Pty Ltd has assisted in new interpretations of the magnetic and radiometric data within the licence area. This work has included magnetic profile analysis to determine depth (to top of magnetic units) information, optimum drill hole positions and recommendations for further geophysical work such as ground magnetics.

5.2.1 **Image Processing of airborne magnetics and radiometric data**

Airborne geophysical surveys over the Granites-Tanami area covering exploration areas held by the Tanami Joint Venture have been image processed. The work involved
- reading data off a number of located data tapes
- gridding the data at 50 metres cell size over the full area for the following parameters
  - magnetics
  - vertical derivative
  - radiometrics
- processing and photography of the above files.
Flight line data from several surveys flown for various companies including the NT Geological Survey, BHP, North Flinders and the Tanami Joint Venture were processed. Other than a constant flight line spacing of 500 metres, the specifications for these surveys varied. The North Flinders surveys on the Frankenlia and Ptilotus 1:100,000 sheets were flown E-W whereas the remaining areas were flown N-S.

Two major problems were encountered with the gridding:

1. Individual surveys had completely different radiometric responses and this problem was overcome as much as possible by gridding the individual surveys and matching the statistics either over the overlap areas or over the full area.

2. In the case of the vertical derivative (VD), problems were encountered because the original flight lines were separated into individual 1:100,000 sheets. Because of the technique used to calculate VD's, the responses at the end of the lines differed and resulted in apparent E-W discontinuities where survey or line segments met.

The final grids for the area were:

- BLHC
- 498,000 E, 7,691,800 N
- Samples
- 5492
- Lines
- 3140
- Sample size
- 50 metres

for magnetics, vertical derivative (VD), and radiometrics. The VD image file was then used to derive shade images at various sun azimuth angles.
The magnetics, VD and VDG data were gridded using a minimum curvature algorithm, whereas the radiometrics were gridded using a bicubic spline algorithm.

The VD and VDG were processed on the flight line data using an along line 31 point FFT derived filter.

Vertical derivatives are used to improve the resolution of small scale anomalies caused by near surface magnetic sources, and to suppress the longer wavelength anomalies resulting from deeper sources. Derivatives can be calculated using a one dimensional operator and this is usually done on the original flight line data prior to gridding, or using a two dimensional operator on the grid file.

One dimensional operators tend to suppress local anomaly trends which parallel or near-parallel the flight line direction. This however can also be an advantage of the one-dimensional operator in that on poorly levelled data it will suppress or even remove artifacts caused by poor levelling.

In image products produced from vertical derivative grids, the usual distribution of data is such that the major anomalies will be very obvious however the weaker trends in the less magnetic units will tend to fall around a greyscale value of 127 and be difficult to see. This can be overcome using the technique of "Automatic Gain Control" (AGC) as suggested by S. Rajagopalan (Conference Volume, 5th ASEG Conference, 1987). In this technique, the vertical derivative is calculated along the flight line and the relative amplitude of each data point is adjusted by dividing by the gain in a window around the data point.
The gain is defined as the inverse of the root mean square of the original data values in the window.

The result of the vertical derivative with AGC is to emphasize small anomalies in low gradient areas while suppressing high amplitude anomalies in high gradient areas.

Geoimage routinely carries out vertical derivative and vertical derivative with AGC operations on the original flight line data prior to gridding.

5.3 Sampling
Due to the excessive cover of Permian sediments over the licence area surface geochemical sampling methods have not been used. As part of a regional helicopter-borne sampling (rock-chip and laterite) programme, the northern part of the licence area was traversed at 500m-1km lines to locate possible Lower Proterozoic outcrop and for familiarization purposes. Additional traverses and sampling was curtailed after a request to avoid stock disturbance was made by the station manager.

One laterite sample was taken 2km north-west of Macfarlanes Peak Bore (see Enclosure 1).
The laterite was prepared by fine pulverizing 100g in a zircon bowl. Result as follows:

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6. EXPENDITURE

In the licence year EL.5421 carried an expenditure for $60,000. In September 1989, the N.T.G.S. allowed the TJV to spread the cost of their airborne geophysical surveys over all their EL's instead of over the areas actually surveyed. The total cost of the survey is approximately $250,000. An amount of $27,000 of this has been allocated to EL.5421.

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N.B. Administration costs include head office overheads and costs incurred by the Central Land Council in relation to such things as the Aboriginal Sacred Sites Act.
7. FUTURE EXPLORATION

Due to the extensive cover of Permian rocks within EL5421 it is necessary to have a high geophysical input into future exploration.

The proposed programme for 1989 - 1990 involves ground magnetics over the major magnetic anomaly in the north-easter part of the licence area, in order to position one or more drillholes.

It is anticipated that approximately 30 line-km of ground magnetics will be carried out in the next year, followed by a deep reverse circulation-diamond drillhole of maybe 250 metres.

The exploration commitment for 1989-90 will be $30,000.
REFERENCES:
Shallow Stratigraphic Drilling in The Granites-Tanami Region, Northern Territory and Western Australia.
1971-73
Bureau of Mineral Resources, Australia,
Record 1974/104 (unpublished)

Geology of The Granites and Precambrian parts of Billiluna,
Lucas and Stansmore
1:250,000 sheet areas, Northern Territory and Western Australia.
Bureau of Mineral Resources, Australia,
Record 1973/171 (unpublished)

Geology of The Granites-Tanami Region,
Northern Territory and Western Australia.
BMR Bulletin 197

BMR, 1965a
Tanami-Total magnetic intensity and radioactivity map,
1:126720, 4 sheets
BMR, Australia
E52/B1-5 to 8

BMR, 1965b
The Granites-Total magnetic intensity and radioactivity map,
1:126720, 4 sheets
BMR, Australia
F52/B1-5 to 8

Nicholson, P.M., 1988
Annual Report for First Year
Exploration Licence 5421,
Pedestal Hills, Northern Territory (unpublished)

Tanami/The Granites airborne magnetic and radiometric survey,
Northern Territory, 1962.
BMR, Australia
Record 1964/102 (unpublished)

Whitworth, R.I., 1970.
Reconnaissance gravity survey of parts of Northern Territory
and Western Australia, 1967.
BMR, Australia,
Record 1970/15 (unpublished)