1986/87
ANNUAL REPORT
EXPLORATION LICENCE
3490

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1. **INTRODUCTION**

This report is submitted to the Northern Territory Department of Mines and Energy and details exploration carried out on EL 3490 during the period July 1986 - July 1987 by Bynoe Joint Venture partners Greenbushes Ltd and Barbara Mining Corporation a subsidiary of Bayer AG of West Germany.

Exploration Licence 3490 is located on the Cox Peninsula south west of Darwin (Figure 1). It is one of a number of licences held by the Bynoe Joint Venture in the region, for the exploration and development of cassiterite and tantalite pegmatite and alluvial deposits.

2. **LOCATION AND LEASING**

EL 3490 is located on the Finniss River Station Road approximately 30 kms SSE of Darwin. The licence covering an area of 42 sq km and 14 graticular blocks was granted on 16th July 1984. In July 1986 this licence area was reduced to 4 graticular blocks.

3. **REGIONAL GEOLOGY**

Primary cassiterite and tantalite mineralisation is associated with pegmatite intrusions into the Burrell Creek Formation on the Cox Peninsula of the Northern Territory. The pegmatite intrusions probably have their origins in the Litchfield Complex of granitic rock on the western margin of EL 3490 (Figure 2).

Secondary cassiterite and tantalite deposits have formed from the erosion of pegmatites and deposition within broad shallow drainage systems within the region.
3.1 Burrell Creek Formation

This formation is part of the Lower Proterozoic Finniss River Group. It consists of medium to fine grained greywackes and siltstones with lenses of sandstone, conglomerates and carbonaceous shales. Flanking the Litchfield Complex the sediments have been altered to andalusite biotite schists and gneisses, and in contact zones with pegmatites tourmaline and biotite schists are common.

3.2 Litchfield Complex

The Litchfield Complex is a large mass of granitic rock including granodiorite, tonalite, granite and minor metamorphosed basic rocks. Little detailed information is available on the complex.

The distribution of localised swarms of pegmatites, suggests the pegmatites are probably related to basement features.

3.3 Finniss River Pegmatites

The Finniss River Pegmatite Belt is approximately 55 kms long and up to 12 kms wide. Within the belt are swarms of pegmatite dykes and sills varying from a few metres to 350 m x 25 m.

Weathering of bedrock associated with the development of the lateritic profile has kaolinitized the feldspars and made interpretation of the internal structure of the pegmatites difficult. With the exception of the quartz cores, outcrop of pegmatite is negligible.
In the EL 3490 region, the Litchfield Complex 'source rocks' are several kms west. In the east of EL 3490 there are several narrow highly segregated vein like pegmatites with significant tin and tantalum mineralisation. Between the 'source rocks' and segregated pegmatite veins there are a number of large (500 m x 100 m) and larger 'pegmatoidal granite' stocks. These occur in the west of EL 3490 and in a belt extending from Bynoe Harbour to an area west of the Leviathan Mine (Figure 2). It was decided that work would concentrate on the Megabucks Pegmatite on the boundary of EL 4082 and EL 3490 to determine whether any of these 'pegmatoidal granites' were significantly mineralised.

3.4 General

Vast areas of Cox Peninsula and the north west of EL 3490 are covered by ferruginous laterite caprock up to 2 m thick. The caprock varies from massive to cemented pisolitic, and is best developed in the north and west of the region. Several separate periods of Tertiary Lateritization are apparent in the region.

The Cainozoic geological and geomorphological history of the area is complex and requires evaluation as it may have implications in the alluvial and marine resource environment.

4. EXPLORATION PROCEDURES

4.1 Sampling Procedures

Samples of weathered pegmatite and alluvium were collected from auger drill holes and backhoe trench samples. Samples were collected at 1.5 m intervals from auger drill holes and stored in plastic bags. Aluminium tags stapled to the bags designated the hole co-ordinates and the
interval sampled. Generally the drill holes were continued until the drill bit could no longer penetrate or if unfavourable rock units were encountered the hole was abandoned. Often veins of quartz would halt penetration of the drill.

Each hole was geologically logged. The visible mineral assemblage was noted, the clay content, the consistency of the clay (its stickiness), the moisture content, colour, degree of weathering and the interval designated a rock type.

The trenches were channel sampled and logged. Approximately 10 litres of sample was collected from each interval. Care was taken in digging and the sampling of the trenches to get below the enriched eluvial zone.

All samples were hauled to a central processing facility by the main camp site at Observation Hill.

4.2 Sample Preparation

Between 6 litres and 10 litres of sample was collected from each trench or auger drill hole interval. A 6 litre volume of loosely compacted sample was measured in volume cylinders. The sample was mechanically mixed with calgon and water in a steel bucket. In this process the clay was dispersed and formed a slurry. Water was slowly injected into the sample bucket forcing the suspended clay to be decanted. Care was taken to avoid the overflow of 'fine heavies'. The de-slimed sample was fed through a trommel with 10 mm screen onto a 1.75 m diameter concentrating cone, the slope of the cone and the water velocity flowing against the slope caused the heavy minerals: cassiterite, tantalite, ilmenite, magnetite, rutile, zircon, etc: to be separated from the light fraction, which was predominantly quartz and muscovite.
Like any form of gravity concentration the recovery of heavy minerals will be dependent of their grainsize relative to that of the gangue minerals.

The plus 10 mm trommel oversize was rejected. Within the pegmatite belt the trommel oversize carried significant 'Locked' cassiterite and tantalite in various portions of the pegmatite. Careful monitoring of the oversize will be necessary during mining and processing, and a stockpile of mineralised oversize made for possible crushing and re-processing. Any cassiterite or tantalite derived from oversize will be additional to that predicted by the projects reserve grade.

At the Greenbushes Laboratory or SGS (Perth) the entire concentrate sample was pulverized for 2 minutes in a 200 ml chrome steel bowl on a vibrating pulverizer. The pulverizer sample was fused with lithium borate containing lanthanum oxide to make a suitable glass disc for X-ray spectrographic analysis. The following elements Nb₂O₅, SnO₂ and Ta₂O₅ were determined on the disc. The accuracy of each determination was improved by the use of a matrix correction coefficient.

5. PROSPECT EVALUATION

Two deposits were subjected to detailed evaluation during 1986/87, the Megabucks Deposit and Old Bucks Pegmatite. In addition reconnaissance work was carried out on the Annie and Leviathan Creeks to determine whether they had potential for alluvial tin and tantalum mineralisation. Traverses were carried out east of Old Bucks to locate any further pegmatites (eg P1 - 3 Figure 3).
5.1 Megabucks Prospect

Location:
The prospect is located 600 m to 700 m west southwest of the Old Bucks pegmatite. The prospect is accessible via the Finniss Station Road, and by bush track through the Old Bucks workings. The prospect is located 13 km from the Observation Hill plantsite.

Topography:
Megabucks is exposed on a gently sloping flat-topped laterite ridge flanked to the east and north by alluvial flats. Outcrop is restricted to shallow pits and shafts. Ferruginous laterite capping sub-outcrops over the entire prospect area.

History:
Megabucks was rediscovered by Greenbushes geologist G Clynick when searching for the Old Bucks pegmatite. There appears to have been no activity in the area since it was abandoned by the Chinese at the beginning of the century. Workings are shallow, probably concentrating on eluvial pegmatite and grouped together in an area 30 m x 40 m.

1986 Work:
The exploration grid was extended and the area mapped at a scale of 1:500. A total of 888 m of trenching and 358.0 m of auger drilling was completed during 1986/87.

General Geology:
Initial trenching was located immediately north and south of the old workings. The costean to the south intersected a narrow (4-5 m), steeply inclined vein-type pegmatite whilst to the north only muscovite-andalusite schists were exposed. Trenching of massive quartz outcrops 100 m north of the old workings exposed a zoned pegmatite having a maximum exposed width of 60 m. Contacts are irregular and vary from shallow to steep dips generally to the east.
Massive quartz or coarse quartz-muscovite intergrowths are commonly found on the contacts. Additional costeaning has revealed that the Megabucks pegmatite strikes north for over 600 m and remains open ended, the eastern contact is steep or vertical whilst the western contact assumes moderate to shallow dips.

Weathering is intense, however zoning is evident and lithologies include massive quartz, quartz-muscovite and kaolin-quartz-muscovite associations.

Frequently coarse tourmaline intergrowths are found within quartz-rich zones. Coarse quartz-muscovite zones of up to 1 m width are developed on some contact margins and ferruginized kaolin-rich zones, lacking quartz, probably represent partially assimilated xenoliths of schists. The kaolin-quartz-muscovite association predominates and there doesn’t appear to be a consistent lateral zonation sequence over the exposed strike.

The country rock consists of ferruginized muscovite-andalusite schists and metasiltstones overlain by up to 2 m of variably lateritized quartz-rich eluvium. Bedding trends within metasiltstone are to the northeast and the foliation trends north to northwest (Figures 4 and 5).

Cassiterite and Tantalite Mineralisation:
With the exception of rare examples of contact mineralisation, the costean and drill samples returned sub-economic grades. Only 11 of 173 channel and drill samples assayed greater than 0.025 kg/LCM or 0.017 kg/tonne (1.5 tonne/LCM) \( \text{Ta}_2\text{O}_5 \) and 5 samples assayed greater than 0.100 kg/LCM or 0.067 kg/tonne \( \text{SnO}_2 \). The higher the grade samples are widely dispersed and do not define an ore zone (Figures 6, 7 and 8).
Potential Reserves:
Extensive costeanning and limited auger drilling have failed to identify economic mineralisation within the Megabucks pegmatite. However it did show that significant mineralisation was present within these deposits and opens the possibility for segregation to produce economic values.

5.2 Old Bucks Prospect

Location:
Old Bucks is located approximately 13 km southwest of the Observation Hill plantsite. Access is via the Mandorah Road from Darwin to the Finnis River Station turnoff, then 13 km to the Finnis Station gate. The prospect is 500 m south of the gate and 400 m west of the road.

Topography:
The prospect occurs on a flat; laterite-capped upland plain with extensive alluvial/eluvial cover. Outcrop is absent except when associated with old workings.

History:
The Old Bucks Mine was originally called Fords Claim and according to the Mines Department was the major producer in the region in 1905. In 1951 Drilling and Development T.C.N.L. took an option over the prospect and undertook drilling and sampling programmes. None of this information is available. The presence of the remains of a stamp battery, an old railway line and ore carts and a headframe would suggest a serious attempt was made to develop this prospect.

1986 Work:
Four costeans totalling 180 m were completed and the exploration grid extended.
General Geology:
A maximum pegmatite intersection of 8 m was exposed in a trench on line 10200N. The remaining three trenches located at the extreme north, south and middle regions of the prospect exposed mica schist and up to 2 m of overlying eluvium or in the case of the middle trench kaolin-quartz-muscovite grading to quartz-kaolin-muscovite. The vein strikes NNE over 200 m and has a steep to moderate dip to the east.

Trenching results suggest that the widespread small workings are dug into quartz and muscovite-rich eluvial material rather than the weathered surface of a major pegmatite. The trenches were dug to depths of greater than 2 m to expose unambiguous lithologies.

Lithologies evident in the widest intersection show the pegmatite to be strongly zoned and having a coarse texture. The zone sequence from west to east is (quartz-muscovite) - (kaolin-quartz-muscovite) - (muscovite-quartz-kaolin) - (kaolin-quartz-muscovite) - (quartz-kaolin-muscovite). Mica tourmaline schists have developed adjacent to the contact.

In common with Leviathan and Megabucks samples, the nine channel samples collected from the three intersections returned disappointing grades. The average grade is 0.014 kg/tonne SnO₂ and 0.017 kg/tonne Ta₂O₅ (1.5 tonne/LCM) (Figure 9).

Potential Reserves:
There is little potential for significant soft-rock pegmatite reserves based on the above information. Previous sampling of eluvium has produced encouraging tantalum grades and in view of the considerable thickness encountered this should receive further attention.
6. **ESTIMATED EXPENDITURE 1985/1986**

The Bynoe Joint Venture has spent in excess of A$4.0 million on the exploration licences and other tenements on the Cox Peninsula near Darwin in search of tantalum resources. During 1986/87 a total of approximately A$480,000 was spent. This section contains an estimate of the expenditure on EL 3490 in the 1986/87 period.

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EXPLORATION

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