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1. **INTRODUCTION**

This annual and relinquishment report is submitted to the Northern Territory Department of Mines and Energy. It details exploration carried out on EL 4183 during the period June 1987 - June 1988. The report therefore constitutes an annual report from the previous licence year (Section 34) and a report on the licence area which has been relinquished (Section 32).

Exploration Licence 4183 is located on Cox Peninsula south-west of Darwin (Figure 1). It is one of a number of licences held by the Bynoe Joint Venture (B.J.V) in the area. The B.J.V. consists of Greenbushes Ltd and Barbara Mining Corporation a subsidiary of Bayer A.G. of West Germany. The Joint Ventures aim is to explore, find and develop the tin and tantalum resources of the region.

2. **LOCATION AND LEASING**

EL 4183 was granted on the 20th June 1983 and during 1987 - 88 consisted of three graticular blocks (Figure 2). A major proportion of EL 4183 was absorbed into the Mining Lease N16, which was granted on the 5th March 1986.

3. **1987/1988 WORK PROGRAMME**

During the 1987/88 work programme BP6 pegmatite was investigated in detail including exploration trenching and sampling. Renewed interest was also taken in the BP2 and Roses pegmatite areas due to the limited amount of previous work on parts of BP2 prospect, in particular.

Bynoe Joint Venture has some considerable success over the last few field seasons with exploration for alluvial concentrations of tin and tantalum on the Cox Peninsula and in MLN 16 in particular.

Alluvial trenches were cut in several drainages encompassing EL 4183 and adjacent tenements during the 1987/88. These drainages were Ah Hoy, Mammoth and the northern part of Johnstones drainage, past the confluence of Johnstones and Hang Gong drainages. The sampling procedures for alluvial and pegmatite deposits have been described in previous reports. Similarly, the preconcentration and assaying techniques have also been described previously.
4. **EXPLORATION RESULTS - PEGMATITE**

4.1 The following description and assessment of the potential of pegmatite prospects within EL 4183 has not been investigated previously.

4.1.1 BP6 Pegmatite

**Location:**

This prospect is located in EL 4183, approximately 250 m east of Mammoth Pegmatite and approximately 1.2 km north of Mandorah Road (Figure 3). The Mandorah Road is an all weather road, but the 1.2 km to the prospect is on bush track accessible only in the dry season. BP6 Pegmatite is 4.8 km in a direct line from the Observation Hill Project Camp and Plantsite.

**Topography:**

This project is located on the south east bank of a creek immediately above the confluence of Hang Gong and Johnstones Drainages. It lies on a shallow alluvial flat, immediately abutting the creek, from which the pegmatite outcrops sandwiched between outcropping shales.

**History:**

There is no known record of production from the prospect. The workings consist of a main shaft to a depth of greater than 2 m, a small pit in laterite caprock and a shallow trench 0.4 m deep. The limited amount of work suggests that the prospect was tested for grade and after a limited term of production, abandoned. It appears that the shallow trench was put down since initial mining took place.

**1987 Work:**

An E-W trench 25 m long was cut as near as possible to the main shaft to locate extensions of the pegmatite and conform with the main area grid (Figure 4). A total of 4 samples (2 pegmatite and 2 eluvial) were taken from the trench and processed.
Number, Dimensions and Attitude of Pegmatites:

There is one prominent direction of pegmatite intrusion, comprised of a single unconformable vein with one measured contact which dips 67 degrees towards NNW. The vein is 2 - 2.5 m wide and has a strikewidth of at least 30 m.

General Geology:

Exposure at this locality is confined to the 2 m deep partly collapsed shaft, and other workings and the outcropping pegmatite within and adjacent to the creek. The pegmatite is kaolinised, with exposed surface material comprised of hard mica-kaolin-quartz pegmatite. Weathered pegmatite exposed in the trench had the same mineralogy, but was quite soft.

The one measurable pegmatite contact was sharp. Host rocks are dark grey-green metasiltstones. The only evident foliation parallels the pegmatite intrusion direction and dips towards the SSW.

Cassiterite and Tantalite Mineralisation:

The cassiterite and tantalite grades are subeconomic from the pegmatite and associated eluvium. On the basis of the two samples each from the pegmatite and eluvium the average SnO₂:Ta₂O₅ ratios were 14:1 and 5.6:1, respectively.

Mineralised Reserve Outlined:

To a depth of 10 m there is an estimated reserve of 1,320 tonnes at an average grade 0.167 kg/tonne SnO₂ and 0.012 kg/tonne Ta₂O₅. The eluvial grade is somewhat lower in respect to SnO₂ and higher in respect to Ta₂O₅ at 0.084 kg/tonne SnO₂ and 0.015 kg/tonne Ta₂O₅. The estimated ore:waste ratio is 1:1.66.

Potential Reserves:

There is a potential for a limited volume of additional reserves in the associated drainage with additional input further upstream from the Mammoth and Mammoth Extended prospects.

The pegmatite is open to the east and west so there is a necessity to follow these possible extensions up. Pods of higher grade mineralisation may be encountered in this work.
4.2 The following are descriptions and assessments based on reappraisals of pegmatite deposits previously investigated within EL 4183.

4.2.1 BP2 Pegmatite

Location:

This prospect is located in EL 4183, approximately 1.6 km north east of the Mandorah Road and 1.4 km east of Mammoth Pegmatite (Figure 3). The 1.6 km to the prospect is on bush track accessible only in the dry season. BP2 Pegmatite is 4.65 km in a direct line from the Observation Hill Project Camp and Plantsite.

Topography:

This prospect is situated on a flat lying plain with a laterite, quartz and schist gravel cover. The plain has an open cover of eucalypts with a scattering of open shrubs and grasses.

History:

There is no known record of production from this prospect. The degree of development is unknown, however, shallow workings are apparent which could be restricted to the eluvial zone. From available evidence, the limited amount of work suggests a low grade deposit. But, it is uncertain whether the difficult ground or the relatively low surface grades desuaded the early miners from continuing their efforts. Perhaps both.

1984 Work:

During 1984, 183 m of backhoe trenching in 7 trenches was completed across the BP2 pegmatite. The prospect was mapped and the trenches mapped and sampled and a total of 37 trench samples were processed and assayed. Follow-up work consisted of 71 auger drill holes totalling 432.5 m, from which 139 auger drill samples were taken for processing and assay (Table 1).
Number, Dimensions and Attitude of Pegmatites:

There is one prominent direction of pegmatite intrusion consisting of one main vein, which, although it has a sinuous attitude, has an overall strike direction of north-south. To the west of the main vein are a number of pegmatite veinlets and pods, which may be offshoots as there strike direction (045 degrees) suggests that some could intersect the main vein near its apparent terminus in the north. The main BP2 pegmatite has a measured strikelihood of 250 m and width varying from 1 - 12.5 m. Contacts vary from 30 degrees east to 40 degrees west.

General Geology:

The area is covered by 0.5 - 1 m of laterite quartz-schist eluvium. Where exposed the pegmatite is kaolinised and consists of quartz-muscovite-kaolin and bladed quartz-muscovite. There is little evidence of segregation, apart from variation in cassiterite values, and a quartz pod has been mapped at the southern extremity of the pegmatite, which gives some suggestion of partial segregation to a quartz core.

Host rocks consist of sheared metasiltstones and fine grained sandstone. Depth of weathering varies from 5 - 7 m (Figure 5).

Cassiterite and Tantalite Mineralisation:

Potentially economic weathered pegmatite and associated eluvial reserves are closely tied to an enhanced area of cassiterite mineralisation on section 33,325N (Figures 6 and 7). Elsewhere, cassiterite and particularly tantalite grades are exceptionally low. The SnO₂:Ta₂O₅ ratio of approximately 80:1 suggests there is little or no "free tantalite", that is, the Ta₂O₅ present is mostly in solid solution with SnO₂. An enhanced tantalite pod is, however, recorded in the drill hole along 33,457N (10,675N). The Ta₂O₅:Nb₂O₅ ratio averages 1:1.

Mineralised Reserve Outlined:

To a depth of 6 m (the average depth of weathering at this locality) there is an estimated reserve of 2,900 tonnes at an average grade of 0.617 kg/tonne SnO₂ and 0.007 kg/tonne Ta₂O₅ (1.5 tonnes/LCM). This material is minable from the surface so the ore:waste ratio is nil.
Potential Reserves:

Mining of the high grade cassiterite zone may ultimately lead to the evaluation of cassiterite grades in the hardrock. An expanded reserve is therefore possible from this source.

There is a potential for a reasonable volume of mineralised eluvium associated with this deposit. Due to the flat nature of the country upon which BP2 is located this reserve is not likely to be far removed from the main areas of outcrop. About 4 - 500 tonnes of minable eluvium is likely, that is, with a tin equivalent grade of greater than 0.5 kg/tonne.

4.2.2 Roses Pegmatite

Location:

Roses pegmatite is located in EL 4183, approximately 1.4 km north east of the Mandorah Road and 1.25 km east of Mammoth Pegmatite (Figure 3). The Mandorah Road is an all weather road, but the 1.4 km to the prospect is on bush track accessible only in the dry season. Roses Pegmatite is 4.5 km in a direct line from the Observation Hill Project Camp and plantsite.

Topography:

The prospect is located on the eastern margin of a laterite capped ridge. It is covered with ferruginous laterite caprock, eluvium and in the east and north by black alluvial soil.

History:

There is no known record of production from this prospect, but Department of Mines and Energy records show that it was worked about 1900. Workings are comprised of several shallow open pits which appear to be concentrated in the eluvial zone.
1984 Work:
During 1984, 77 m of backhoe trenching in 3 trenches was completed across Roses pegmatite. The prospect was mapped and the trenches mapped and sampled. Two trench samples were taken for processing and assay. Follow-up work consisted of 20 auger drill holes totalling 134.4 m, from which 58 auger drill samples were taken for processing and subsequent assay (Table 1).

Number, Dimensions and Attitude of Pegmatites:
The mapped extent of pegmatite in Roses Prospect consists of what appears to be three parallel veins striking 010 degrees and dipping from 30 - 50 degrees to the east. These veins may coalesce at depth to form a single main vein, but the amount of work carried out to date has not produced sufficient data to support this hypothesis. Trenching and auger drilling has exposed Roses Pegmatite over a strike length of 60 m. Individual veins vary in width up to a maximum of 8.5 m.

Approximately 10 m west and 50 m east of the main body there is evidence of other unexplored pegmatite veins. But, the eluvial-alluvial cover and laterite caprock in the area combine to make exploration difficult.

General Geology:
The Roses Pegmatite has intruded sheared quartz mica schist. Contacts are sharp with the alternation halo in the schists containing fine tourmaline and perhaps tantalite. The quartz-muscovite pegmatite has been weathered from 10 m to 18 m.

The eluvial-alluvial cover varies from 0 m to 4.5 m. The high degree of segregation of cassiterite and tantalum values would suggest the pegmatite is zoned (Figure 5).

Cassiterite and Tantalite Mineralisation:
Grades of both cassiterite and tantalite were uniformly low except for a particularly high grade hanging wall mineralised interval on section 32975N. The pegmatite is essentially cassiterite rich with a SnO2:Ta2O5 of approximately 30:1. Figures 6 and 7 show the pegmatite in cross-section.
5. EXPLORATION RESULTS – ALLUВIAL DEPOSITS

5.1 Alluvial Deposits

During the 1987/88 field season sections of Ah Hoy, Johnstones and Mammoth drainages in EL 4183 were tested on grid spacings of 100 and 200. This work was either a follow-up to initial trenching to obtain a reserve estimate or preliminary trenching to test the potential of individual drainages.

The drainages are described in the 1984 Annual Report as long, broad, shallow, mature systems varying up to several kilometres in length and 200 m to 300 m in width. At their deepest they rarely contain more than 4 m of alluvium although the southern sections of Booths drainage sometimes exceeds 6 m. In profile the drainages are virtually the same and consist of a surficial black soil horizon 100 mm to 200 mm thick, underlain by a mottled ferruginous clay which grades into a sandy clay to clayey gravel wash containing significant cassiterite and tantalite concentrations.

Within the alluvial sediments at least three sedimentary cycles are recognised, the earliest produced the basal clayey sand or clayey gravel wash which is up to 2.5 m thick and usually contains subangular quartz and siltstone clasts of up to 200 mm in length. This basal, or C horizon, contains the major portion of tin tantalum reserves. Directly overlying the C horizon, and usually combined within it or separated by thin bands of clayey sand is a second minor gravel horizon (B horizon) which is up to 1 m thick. The B horizon contains minor concentrations of cassiterite and tantalite and may be absent due to reworking or unrecognised if it is represented by the A horizon, a thin, rarely observed band of small 5 - 10 m pebbles which usually occurs about 0.5 m below the organic clay layer. The A horizon is generally no more than 0.5 m thick and is essentially unmineralised. In places all horizons have been subjected to recent reworking and resultant in-filling with black organic clays.

The underlying bedrock is usually weathered to clay directly beneath the C horizon, weathering becomes less intense towards the margins of the drainage channel which are usually marked by an abrupt increase in bedrock elevation.
For reasons described in the 1985 Intermediate Report (Section 3.2.4) costeening has been selected as the method of appraisal of alluvial reserves. The Komatsu PC 400 excavator was used to costean the width of the alluvial channels on lines 100 m apart, it is usual for the trench to begin within a section of wash and proceed outwards until the limits of the channel are reached.

After a short period of familiarisation competent field crew are able to recognise the channel margins and the alluvial horizons of interest.

Vertical channel samples (6 l) are collected from the B and C horizons (if present) at 5 m intervals, the depth and thickness of individual horizons are noted and the samples processed according to standard practice.

The work carried out on alluvial channels involved 3725 m of excavator trenching of deep alluvial channels.

5.1.1 Ah Hoy Drainage

Location and Topography:

Ah Hoy drainage is located in EL 4183 (MLN 1035) with its source in the country south of Ah Hoy and Ah Bung pegmatites. Trenching commenced approximately 1.25 km upstream of the confluence of this drainage with the Charlotte River in an area where there was obvious terracing and evidence of stream rejuvenation. A well defined channel up to 15 m wide dissects the alluvial flats. The area was previously untested.

1987 Work:

Initial costeening was undertaken along line 8600E between 22650 and 22730N, with a section immediately about the present day channel excluded and 13 samples were collected and processed. Encouraging results led to the costeening of two additional trenches totalling 90 m, along 8800E (between 22555 and 22630N) and 22850N (between 8400 and 8500E). In each case steep or wet central sections were excluded and an additional 18 samples were taken and processed (Figures 9 and 10).
5.1.2 Johnstones North Drainage

Location and Topography:

Johnstones North drainage is located in MLN 16 and EL 4183. The work detailed in this section was carried out in the northern part of the drainage (Johnstones North) past its confluence with Hang Gong drainage. In this area the drainage has developed a rejuvenated profile with a well defined channel.

1987 Work:

At Johnstones North three costeans were dug (with a spacing of 100 m) along 32600, 32700 and 32800N over a total distance of 415 m (Figures 11 and 12). A total of 82 samples were collected from trenches and processed.

5.1.3 Mammoth Drainage

Location and Topography:

Mammoth drainage is located in EL 4183 and MLN 16, with its source south of the Mandorah Road in the Grants pegmatite area. It joins Hang Gong drainage near BP6 pegmatite.

The drainage has a broad profile, but is quite shallow, and the area was previously untested.

1987 Work:

Two trenches were dug (with a 100 m spacing) along 32700 and 32800N over a total distance of 100 m. A total of 20 samples were taken from trenches and processed (Figures 13 and 14).

6. **ESTIMATED EXPLORATION EXPENDITURE**

The Bynoe Joint Venture spent a total of $457,597 on its tenements on Cox Peninsula during 1987/88. The following is an estimate of expenditure in EL 4183 during 1987/88.
Workshop $ 600
Fuel and Oil $ 300
Camp/Canteen $ 2,500
Mobile Fleet $ 1,700
Geological $ 4,000
Surveying $ 1,000
Line Clearing $ 500
Alluvial Trenching $ 10,000
Pegmatite Trenching $ 300
Cone Preparation $ 700
Laboratory $ 1,000
Administration Communications $ 7,000
Accommodation and Messing $ 2,000
Drafting $ 1,500

ESTIMATED TOTAL $ 33,100

7. CONCLUSIONS

The 1987/88 exploration programme has continued to reinforce the concepts, which led Barbara Mining Corporation and Greenbushes Ltd into this project. It has shown the Finniss River Pegmatite Belt to be a significant rare metal pegmatite distinct on a world scale with pegmatites at an advanced state of fractionation.

Significant, potentially economic 'soft rock' weathered pegmatite and alluvial reserves have been demonstrated.

The alluvial potential of Ah Hoy drainage has been proved and work during the season has also increased known reserves in Johnstones drainage.

Renewed interest in the BP2 and Roses pegmatite appears to be warranted on the basis of past results and local potential. Alluvial trenching and further pegmatite evaluation will be the focus of exploration during the 1988/89 field season.

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