1987 ANNUAL REPORT

EL 3491

COX PENINSULA

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1. INTRODUCTION

This report is submitted to the Northern Territory Department of Mines and Energy and details exploration carried out by Greenex and behalf of Barbara Mining Corporation and Greenbushes Ltd on EL 3491 during the period August 1986 - August 1987.

Exploration Licence 3491 is located on Cox Peninsula south-west of Darwin (Figure 1). This licence is one of a number held in the region by the Bynoe Joint Venture. These licences are actively being explored for tin/tantalum mineralised pegmatite and alluvial deposits.

2. LOCATION AND LEASING

EL 3491 is located on the Finniss River Station road approximately 30 kms SSE of Darwin. The licence originally covered an area of 145 sqk kms and 46 graticular blocks was granted on the 2nd August 1984. On the 2nd August 1987 the licence area was reduced to 11 graticular blocks.

3. PREVIOUS MINING AND EXPLORATION

3.1 History

Tin mining commenced on the field in 1886. Since 1978 when there was a significant improvement in tantalum price, there has been a resurgence in mining activity. Mining operations with small plants have worked Hang Gong, Mt Finniss, Wiggs, Picketts and Welcome Extended, pegmatite deposits. All except Mt Finniss are now closed down with the slump in tantalum prices in 1982.
3.2 Greenbushes Ltd Exploration

The following work was carried out by Greenbushes Ltd in the Cox Peninsula region:

1979 - 33 line km of survey grid
         900 holes and 2,593 m of auger drilling
         490 m of trenching
         140 individual pegmatites mapped
         1,815 samples collected and processed

1980 - 57 line km of survey grid
         2,560 holes and 6,950 m of auger drilling
         955 m of trenching
         5,249 samples collected and processed

1984 - 60 line km surveying
         18,100 m of auger drilling
         1,800 m of trenching
         5,300 exploration samples processed and assayed

1985 - Processed 80,000 tonnes of ore in pilot plant investigation
         Trenched  4,150.6 m of pegmatites
         Trenched  832  m of deep alluvials
         Drilled   446.5 m of auger drilling

3.3 1986/87 Programme EL 3491

The 1985/86 programme identified three new areas prospective for tin and tantalum mineralisation in addition to the Ah Bung, Jans, Lianas and Sue pegmatites which were mapped, trenched and channel sampled in 1985 and 1986. The new prospects were:--
- 3 -

- Ah Hoy South
- Rocky Ridge
- Charlotte Prospect

The prospects were identified after aerial photographic evaluation followed by exhaustive ground reconnaissance investigations. The Ah Hoy South prospect was mapped, the Rocky Ridge Prospect mapped, trenched, channel sampled and auger drilled. The Charlotte prospect was only identified. The Ah Bung prospect has been mapped, trenched and auger drilled.

4. 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 the prospect.

Secondary cassiterite and tantalite deposits have formed from the erosion of pegmatites and deposition within broad shallow drainage systems.

4.1 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. In outcrop the unit is generally red or brown reflecting deep weathering. 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.
4.2 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, but it is assumed that granites within the complex are the source of the Finniss River Pegmatites. The granites are the subject of a project sponsored by the Bynoe Joint Venture and being carried out by W.A.I.T. and the Kalgoorlie School of Mines.

4.3 Finniss River Pegmatite

The Finniss River Pegmatite Belt is approximately 55 kms long and up to 12 kms wide. Within the belt are swarms of pegmatite veins and sills varying from a few metres to 350 x 25 m. The larger pegmatites eg. Hang Gong, Mount Finniss and Lees pegmatites are predominantly sills owing their extensive surface expression to a horizontal dip. Others like Grants, Bells Mona and Old Bucks pegmatites are steeply dipping dykes. The attitude of pegmatite intrusions is conformable with the schistosity of the Burrell Creek Formation although local discontinuities are common. The strike direction generally varies from north, north east to north, north west in the north, to north east in the south of the belt.

Weathering of bedrock associated with the development of the lateritic profile has kaolinized 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. Therefore, conclusions about the internal structure and pegmatite mineralogy are preliminary.

Four common mineralogical assemblages can be recognised in the weathered zone :-
Quartz Unit

Massive milky to translucent quartz zone which would correspond to E Cameron el al (1949)'s quartz core. At Hang Gong and Annie (2) these units are generally up to 10 m long and 2 m to 3 m wide. They can be distinguished from quartz veining common in the east, by accessory muscovite. This unit rarely contains any significant mineralisation.

Muscovite-Quartz Unit

This unit commonly surrounds the quartz cone with massive quartz and silver muscovite to 5 cm often intergrown in a bladed texture. Cassiterite and tantalite mineralisation have been noted in this zone, some 'locked' in quartz. Tantalum rich pegmatites like Hang Gong, Hendersons and Yan Yams often have significant muscovite rich zones with quartz and minor Kaolin.

Kaolin-Quartz Zones

This zone was probably derived from K.Feldspar-Quartz or Spodumene-Quartz assemblage. The grades of cassiterite and tantalite are uniformly low. An example of this unit is the footwall of Grants Pegmatite.

Kaolin-Muscovite-Quartz Unit

This unit was probably an Albite-Quartz Muscovite assemblage before weathering and is usually strongly cassiterite-tantalite mineralised. Several pegmatites, eg Hang Gong and Lees appear to be completely albitized with relatively uniform disseminated cassiterite and tantalite mineralisation. Others, eg Hordens, Far West and Crawfords have discrete segregations or 'pods' of high grade mineralisation in a
matrix of essentially barren pegmatite. This pattern is consistent with the replacement of K.Feldspar with an Sn, Ta mineralisation sodium rich pegmatite phase.

Accessory minerals and trace amounts of amblygonite (weathered), garnet, illmentite, zircon, various iron oxides, cassiterite and tantalite have been recorded. Tourmaline, a common accessory mineral at Greenbushes Pegmatite is absent from mineralised Finnis River Pegmatites. The pegmatite textures are primary and there is no evidence of significant post-intrusive tectonism or metamorphism. Contacts between the pegmatites and host rocks are sharp sometimes with a selvage of quartz and muscovite. The metasediments are altered to biotite garnet, tourmaline rich schist up to 2 m to 3 m from pegmatite contacts.

5. EXPLORATION PROCEDURES

5.1 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.

5.2 Sample Preparation

Between 6 litre 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.

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. No account has been taken of mineralised oversize in the evaluation of the Projects Mineralised Reserves. Any cassiterite or tantalite derived from oversize will be additional to that predicted by the projects reserve grade.
At the Greenbushes Laboratory or S.G.S. 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 Al$_2$O$_3$, SiO$_2$, K$_2$O, CaO, TiO$_2$, Fe$_2$O$_3$, ZrO$_2$, Nb$_2$O$_5$, SnO$_2$, Sb$_2$O$_3$ and Ta$_2$O$_5$ were determined on the disc. The accuracy of each determination was improved by the use of a matrix correction co-efficient. The concentration calculation was made after background and overlap correction using the DeJongh alpha Correction mode 1.

6. RESULTS 1986/87 EXPLORATION PROGRAMME

Exploration during 1986/87 was concentrated on the Rocky Ridge and Ah Bung Prospects. Both prospects were trenched and auger drilled.

6.1 Ah Bung

Location:
The Ah Bung prospect is located west of the Finnsiss Station Road and south of the Charlotte River crossing. A track leads 250 m west from the road. The prospect lies 6.1 km south-south west of Observation Hill Plantsite. The pegmatite is immediately south of the EL 4183 and EL 3491 boundary.

Topography:
The prospect is situated on sloping ground leading to the southern bank of the Charlotte River.

History:
There is no history of production from the prospect. Old workings consist of shafts and pits dug along the strike of narrow, parallel pegmatite veins.
1986/37 Work:
A total of 190 m of costeaning was completed over the old workings. Auger drilling totalled 134.5 m.

General Geology:
Two narrow, zoned, discontinuous vein-type pegmatites, separated by 10 m of ferruginous micaceous shales and metasiltstones strike NE over a distance of 75 m. The maximum exposed width is 8 m, including interspersed bands of metasediment. The pegmatites are vertical or dip steeply to the east, parallel to the foliation. The average grade of ten channel samples is 0.113 kg/tonne SnO₂ and 0.044 kg/tonne Ta₂O₅ (1.5 tonne/LCM).

Three lines drilled across the prospect reported minor intersections of pegmatite, on the northern line three holes intersected sub-surface pegmatite and remain open at depth. Drilling has provided little further information of pegmatite morphology other than indicating a gentle plunge to the NE (Figure 3 and 4).

The lithology is predominantly kaolin-quartz-muscovite with quartz-muscovite enrichment occurring on the contacts and within a central zone of the eastern pegmatite. Host rocks are weathered ferruginous micaceous shales and metasiltstone, minor grey-black quartzite is present on one dump.

A 50 m costean dug in quartz-rich eluvium on a broad ridge to the west of Ah Bung failed to intersect pegmatite or quartz veining.

Potential Reserves:
At present the volume of the pegmatites is insubstantial and the grades sub-economic. Additional drilling on line 22725N should attempt to establish the extent and thickness of the pegmatites.
6.2 Rocky Ridge

Location:
The prospect is located 600 m south west of Ah Bung, adjacent
to the former Finniss Station Road. The prospect is 6.6 km
south south-west of the Observation Hill plantsite.

Topography:
The prospect is located on a broad ridge of shale, metasiltstone
and arenites between the low-lying area of Ah Bung and the
pronounced strike ridges found to the south east.

History:
There is no history of production from this area. Old
workings are minor and more recent trenching exposed only
host rock. The main pit exposes 1 m pegmatite on the
south eastern slope of the ridge.

1986 Work:
The exploration grid was extended south from Ah Bung before
the prospect was mapped. A total of 142 m of costeanning
and 166.5 m of auger drilling was completed.

General Geology:
Costeanning across the crest of the ridge revealed a kaolin-
quartz-ruscovite pegmatite having a maximum width of 25 m.
The exposed strike length is 15 m and follows the local
bedding orientation to the NE. The contacts dip at steep
to moderate angles to the west truncating the bedding.
Although the width of the body is significant the strike
extent is likely to be limited as metasediments outcrop
along most of the ridge (Figure 5).

In cross-section the pegmatite is very irregular and cannot
be reliably classified as either vein-type or sill-type
(Figure 6).
Cassiterite and Tantalite Mineralisation:
The pegmatite is relatively enriched in tantalum, the
SnO$_2$:Ta$_2$O$_5$ ratio varies between 0.06% and 0.574 in drill
samples. The average ratio is 0.196. The average grade
of twelve channel samples is 0.008 kg/tonne SnO$_2$ and
0.054 kg/tonne Ta$_2$O$_5$ (Figure 7).

Mineralised Reserves:
Drilling intersected pegmatite on two lines to give indicated
reserves of 16,860 tonnes at an average grade of 0.011 SnO$_2$
kg/tonne and 0.058 kg/tonne Ta$_2$O$_5$. The overburden to ore
ratio is 0.00.

7. ESTIMATED EXPENDITURE 1986/87

The Fynone Joint Venture has spent in excess of $4 million
on its exploration licences on the Coet Peninsula since
1984. In the last 12 months expenditure has been approximately
A$400,000.

MOBILE PLANT

* Toyota - repair & maintenance
  tyres, hire vehicles $ 1,500

* J.D. Backhoe $ 1,200

* International 520 FEL
  Clear lines, construct roads $ 1,000

* Fuel Oil & Tyres (Backhoe & FEL) .50

CAMP CANISTER

* Facilities $ 2,000

* Food & Accommodation $ 500

* Power and Water $ 150

* Staff House - Darwin $ 200

WORKSHOP

* General
  tools, equip, rags, greases $ 500
### LABORATORY
- Sample Prep $200
- Transport $100
- Sample Analysis $2,000
- Sundries $100

### ADMINISTRATION
- Accommodation $500
- Communication $100
- Travel and Food $1,500
- Insurance $250
- Tech Materials $100
- Tenement Admin & Charges $400
- Office Overhead $2,500

### EXPLORATION SURVEYING
- Extend Baseline & Prospect Grid $500
- General (Salaries & Wages) $5,700
- Cone Prep $1,500
- Drafting and Reports $1,000
- Auger Drilling $2,500

**ESTIMATED EXPENDITURE** $26,350

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8. **EXPLORATION PROGRAMME 1987/88**

Exploration during 1987/88 will evaluate the alluvial potential of the main drainages in the north of the licence area. Exploration in the south will aim at identifying pegmatite targets for exploration.