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1. **INTRODUCTION**

This report describes the results of the 1986/87 exploration programme for cassiterite-tantalite mineralisation on MLN 16 at Bynoe Project on Cox Peninsula. The programme was implemented by Greenex a division of Greenbushes Ltd on behalf of Greenbushes Ltd and Barbara Mining Corporation, a subsidiary of Bayer (Australia) Ltd.

The exploration programme was aimed at expanding the "soft rock" both alluvial and pegmatite hosted Sn-Ta deposits. It included:-

- 4,718.5 m of backhoe trenching
- 3,679 m of auger drilling
- 3,675 m of excavator trenching of alluvial deposits

This work substantially increased the project's reserves.

MLN 16 is located approximately 30 kms south west of Darwin (Figure 1). The area has a tropical monsoonal climate. It consists of broad flat uplands which slope gently into broad alluvial flats which may be up to 300 m wide. The pegmatites are usually found on the upland plains or the surrounding transitional areas. The alluvial deposits occur in the mature drainage systems, generally conforming with the present streams.

2. **PREVIOUS MINING AND EXPLORATION**

Greenbushes Ltd has been active in exploring the Finnis River Pegmatite Belt (including MLN 16 area) since 1977.

2.1 History

Tin mining commenced on the field in 1886 and although many attempts were made over the years, invariably the projects
closed down within a couple of years. Within the last 10 years, associated with the 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.

2.2 Greenbushes Ltd Exploration

The following work was carried out by Greenbushes Ltd:

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

2.3 Bynoe Joint Venture

2.3.1 During 1984 the Bynoe Joint Venture carried out:
59.44 line kms of surveying
drilled 18,113.3 m of auger drill holes
cut 306 backhoe trenches totalling 1,825 m
processed 5,321 exploration samples

In 1984 a water storage dam was constructed to supply process water for the project.

2.3.2 In 1985 the Bynoe Joint Venture carried out a pilot mining and processing programme. A 100 tonnes per hour pilot plant was constructed with feed bin, trommel, three
stage jig concentration of coarse mineral and two stage spiral concentration of fine mineral. A total of 80,000 tonnes of ore from nine pegmatite and two alluvial areas was processed to produce 27 tonnes of jig concentrate assaying 43%Sn, 18%Ta$_2$O$_5$ and 3.4 tonnes of spiral concentrate assaying 9%Sn and 6.6%Ta$_2$O$_5$. During 1985 a total of 20 pegmatites were mapped, 4,150.6 m of backhoe trenching, and 832 m of excavator trenching were carried out. A total of 446.5 m of auger drilling was carried out. This work was carried out for grade control purposes not to increase ore reserves.

3. 1986/87 EXPLORATION PROGRAMME

The work carried out in the 1986/87 exploration programme is summerized in Table I.

- A total of 14 pegmatite areas were gridded
- A total of 14 pegmatite deposits were mapped
- A total of 4,718.5 m of backhoe trenching of 17 pegmatites was carried out
- 12 pegmatite deposits were drilled for a total of 3,679 m
- 4 alluvial channels were gridded
- A total of 3,675 m of excavator trenching was carried out. These trenches were 3 - 6 m deep.

3.1 Pegmatite Exploration

3.1.1 Black Jade Prospect

Location:
The prospect is located 200 m south west of Rubiks prospect. Access is gained via the Lees B haul road and the track leading 10000E north along the 1000E baseline.
Table 1.

**MLN 16 - EXPLORATION SUMMARY 1986/87**

<table>
<thead>
<tr>
<th>PROSPECT</th>
<th>GRIDDING</th>
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<th>TRENCHING</th>
<th>DRILLING</th>
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<td>4718.5</td>
<td>3679.0</td>
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</table>

| **B. ALLUVIAL**         |          |         |           |          |
| Booths                  | x        | x       | 555       | -        |
| Johnstones              | x        | x       | 1210      | -        |
| Lees                    | x        | x       | 1440      | -        |
| Little Alluvial         | x        | x       | 470       | -        |
| **TOTAL**               |          |         | 3675      | -        |
Topography:
The pegmatite is located on the crest of a quartz capped ridge which parallels the southern end of Johnsons drainage. Outcrop is restricted to blocks of milky quartz on the crest and metasediment exposed in breakways along the eastern side of the ridge.

History:
Old workings are minor and there is no record of production.

1986 Work:
The exploration grid was extended westward from the 100000E baseline to include the area. Mapping was completed at a scale of 1:500 and costeaming totalled 19.5 m.

General Geology:
Old workings expose a narrow kaolin-quartz-muscovite pegmatite vein striking NNE and having a maximum exposed width of 2.5 - 3 m. Costeaming north and south of the pit has established a strike length of 25 m which remains open-ended. Contacts dip steeply east, parallel to the host rock foliation. The vein intrudes ferruginous mica shales which are tourmalinized adjacent to the contact (Figure 2).

Cassiterite and Tantalite Mineralisation:
The channel samples gave an average grade of 0.081 kg/tonne SnO₂ and 0.074 kg/tonne Ta₂O₅ (1.5 tonne/LCM), the SnO₂:Ta₂O₅ ratio is 1.095 (Figure 18).

Potential Reserves:
The strike length is unlikely to exceed 25 m and therefore the volume is restricted, limited drilling is required to substantiate grades.
3.1.2 Booths Extended

Location:
Booths Extended prospect is located 600 m south of the Observation Hill plantsite and 150 m east of the road leading to the freshwater dam.

Topography:
The pegmatite is exposed in shallow workings which extend along a narrow ridge of metasediment. The ridge forms the western margin to the upper regions of Booths drainage.

History:
There is no history of production from this area. Workings are scattered and of minor extent.

1986 Work:
The exploration grid was extended north to cover the area which was mapped at a scale of 1:500. 89 m of costeanning was completed.

General Geology:
Costeanning has exposed a narrow vein-like pegmatite over a strike length of 75 m, having a variable, moderate dip to the east. The maximum exposed width is approximately 2 m. The vein reappears on the crest of a ridge some 60 m south of the Booths pegmatite haul road, costeans north and south of this occurrence have intersected only metasiltstone and shale. At the northern extremity the vein flattens out to become sub-horizontal and further work (ie drilling) should determine the possible dimensions in this area (Figure 3), otherwise the pegmatite can be classified as a narrow vein-type of probable high grade but with limited volume potential.
Cassiterite and Tantalite Mineralisation:
Five channel samples show wide variation in $\text{SnO}_2:\text{Ta}_2\text{O}_5$ ratios, ranging from 0.268 to 8.117. The average grade of five samples is 0.113 kg/tonne $\text{SnO}_2$ and 0.042 kg/tonne $\text{Ta}_2\text{O}_5$ (1.5 tonne/LCM). Figure 20.

Potential Reserves:
The Booths Extended pegmatite is a high grade pegmatite which is unlikely to significantly increase the volume of existing reserves. As with other high grade pegmatites there is potential for a mineralised eluvial/colluvial horizon downslope from the outcrop.

3.1.3 Booths South Prospect

Location:
The prospect is located west of the road leading to the main water storage dam. It lies 600 m south east of the Observation Hill plant site.

Topography:
The prospect is located on two prominent, parallel ridges of shale and siltstone. The shale and narrow pegmatite veins are restricted to the ridge and the wider vein to the western slope.

History:
Numerous small workings are scattered along the crest and slopes of the ridges. Eluvial workings are found at the base of the western ridge. There is no record of production from this area.

1986 Work:
Additional areas to the north of the Booths South opencut were gridded and mapped. A total of 524 m of trenching and 1022.5 m of drilling was completed.
General Geology:
The Booths South prospect is comprised of two sub-parallel pegmatite swarms separated by 100 m of intervening shales and siltstones. The western swarm consists of possibly three narrow veins which show great variation in thickness and orientation. The widest intersection is 11 m. The eastern pegmatite consists of a single main body having several smaller offshoots. Maximum exposed width is 30 m and north of this intersection the pegmatite begins to lense out. The main body strikes north-west and dips are predominantly to the east, however dips are variable and occasionally show a reversal of direction or are vertical. Proven strike length is approximately 150 m (Figures 5 & 6). Lithologies at Booths South tend to be homogeneous kaolin-quartz-muscovite, frequently ferruginized and sometimes showing quartz-muscovite enrichment at the contacts. Follow-up trenching of the western ridge did not intersect major pegmatites. The westernmost vein is a lenticular, discontinuous body having an established strike length of 25 m. The strike is N to NW, parallel to the foliation and contacts dip to the east, oblique to the sub-vertical foliation.

Two areas to the north and west of the Booths South open-cut were investigated following the discovery of scattered workings. Three discrete pegmatites have been located, the eastern body is directly along strike from the Booths South open-cut and outcrops in two small pits dug into quartz scree. The pegmatite strikes NNW over approximately 60 m and has a maximum width of 12 m.

A parallel pegmatite outcrops on a narrow ridge 80 m to the west. Trenching has established a strike length of 75 m and a maximum width of 10 m. Contacts dip to the east at moderate angles.
An additional pegmatite occurs on the western ridge of the Booths South prospect, 100 m north of the area previously mapped. A 16 m intersection has been exposed over a 25 m strike and remains open-ended to the north. The strike is NW and follows the local foliation.

Drilling of the north western, parallel pegmatites and the main Booths South body has demonstrated a highly irregular morphology. Generally the contacts dip moderately or steeply east and follow a gentle plunge to the north northwest. Flat lying lenses or apophyses are a feature of some cross-sections (Figures 7-9).

Cassiterite and Tantalite Mineralisation:
The SnO₂:Ta₂O₅ ratios vary greatly within individual pegmatites, the average ratio for the northern pegmatite is 3.77 ranging to 2.56 and 3.76 in the western pegmatites. Channel sample grades are shown in Figures 23 and 24.

Mineralised Reserves:
Total soft-rock pegmatite reserves stand at an estimated 103000 tonnes, having an average grade of 0.172 kg/tonne SnO₂ and 0.042 kg/tonne Ta₂O₅. The overburden to ore ratio is 0.49.

Potential Reserves:
Additional drilling is required on line 27775N to intersect the strike continuation of the pegmatite outcropping on the northern end of the western ridge.

Significant eluvial reserves are likely to occur in association with the pegmatite swarm.
3.1.4 BP 32 Prospect

Location:
The prospect lies within MLN 16, 2.9 km south southwest of the Observation Hill plantsite. Access is gained via the main track leading south from the Mandorah Road at the Hendersons prospect, then by a track leading east and south past the Shirley and BP 33 prospects.

Topography:
The prospect is located on the eastern margin of a low laterite plateau which forms part of the upland plains west of Booths drainage.

History:
There is no record of production from the area, workings are shallow and intermittent, extending over a distance of 25 m.

1986 Work:
Earlier costeaming was followed up by 247 m of auger drilling.

General Geology:
The pegmatite has been exposed over a strike length of 150 m. The width varies between 2 m and 11 m. It intrudes a succession of ferruginous micaceous shales and siltstones having a pervasive northerly foliation which dips steeply west, although occasional reversals of dip are noted (Figure 10).

The pegmatite is a vein-like body which strikes due north or north-north-west and exhibits a pinch and swell structure. The contacts dip at steep to moderate angles to the east, truncating the hostrock foliation.

Lithologies are dominantly kaolin-quartz-muscovite with zones of quartz enrichment (quartz-muscovite-kaolin and quartz-kaolin-muscovite) along both contacts.
Cassiterite and Tantalite Mineralisation:
Grades within the pegmatite tend to be uniformly distributed and relatively tantalite-rich. The average SnO₂:Ta₂O₅ ratio is 0.795. Grades of channel samples are shown in Figure 11.

Mineralised Reserves:
Auger drilling has established a soft-rock pegmatite reserve estimate of 19700 tonnes at 0.031 kg/tonne SnO₂ and 0.039 kg/tonne Ta₂O₅. The overburden:ore ratio is 0.706. Pegmatite cross-sections are shown in Figure 12.

3.1.5 BP 33

Location:
BP 33 is located approximately 200 m north of BP 32 and 2.7 km south of the Observation Hill plantsite.

Topography:
The prospect is situated on the eastern margin of low laterite ridge, west of Booths drainage.

History:
Old workings consist of shallow eluvial workings scattered over a distance of 50 m. There was no indication of a significant pegmatite deposit in the area.

1986 Work:
A total of 410 m of auger drilling was completed.

General Geology:
Costeaming has revealed a zoned pegmatite consisting predominantly of kaolin-quartz-muscovite and kaolin-quartz assemblages intruding micaceous shales having a steeply dipping, north striking foliation. Where measured the pegmatite contacts are irregular, sub-parallel and dip in opposite directions. The pegmatite strikes north northeast over 75 m and varies
in width between 25 m and 40 m (Figure 13). Subsequent drilling has outlined a vein-type pegmatite having contacts which dip steeply or moderately to the west. The pegmatite pinches out abruptly south of line 26075N (Figure 14).

Cassiterite and Tantalite Mineralisation:
High grade mineralisation is uniformly distributed throughout the pegmatite. The average SnO₂:Ta₂O₅ ratio is 2.298. Channel sampling results are shown in Figure 15.

Mineralised Reserves:
The soft-rock pegmatite reserves are estimated at 66,800 tonnes having an average grade of 0.131 kg/LCM SnO₂ and 0.057 kg/tonne Ta₂O₅. The overburden:ore ratio is 0.080. Drilling penetrated to a depth of 13.5 m before reaching the water table, it is almost certain that weathering extends below this level and therefore significant reserves remain.

3.1.6 Carlton Prospect

Location:
The prospect is located northeast of Central prospect and 2.8 km northwest of the Observation Hill plant site. Access is gained via the Lees B haul road and a track leading north along the 10000E baseline.

Topography:
The prospect lies on the lower slopes of the western margin of Johnstones drainage. Exposure is poor and limited to old workings.

History:
There is no history of production from this prospect. Shallow pits and trenches are dug across the strike of the pegmatite over a distance of about 70 m.
1986 Work:
The exploration grid was extended east from the 10000E baseline and the prospect was mapped at a scale of 1:500. Costeanning totalled 175 m and auger drilling 331.0 m.

General Geology:
Costeanning has exposed a narrow, zoned pegmatite having an established strike length of 150 m and a maximum exposed width of 11 m. The pegmatite strikes NNE parallel to the hostrock foliation, the contacts are vertical or sub-vertical. Old workings have exposed three narrow, sub-parallel pegmatite veins and associated quartz-muscovite veins striking NNE. Lithologies are predominantly kaolin-quartz-muscovite other than the easternmost vein which is quartz-kaolin-muscovite. North and south of the main workings the pegmatite occurs as a single vein with vertical contacts. Biotite schist and quartzite are developed on the eastern (hangingwall) contacts (Figure 16). The host rock is ferruginous mica shale or schist having a N to NNE vertical foliation.

Cassiterite and Tantalite Mineralisation:
Grades within the Carlton pegmatite are uniformly high and cassiterite enriched. There is an increase in grade from the south towards the wider, middle area of the vein. The average SnO₂:Ta₂O₅ ratio is 3.476. Channel sample results are shown in Figure 17.

Mineralised Reserves:
Auger drilling has established a reserve estimate of 63900 tonnes at 0.219 kg/tonne SnO₂ and 0.063 kg/tonne Ta₂O₅. The overburden to ore ratio is 0.40. Drill cross-sections are shown in Figure 18.
3.1.7 Far West Prospect

Location:
The prospect is located in the west of MLN 16. The area is accessible from the Darwin-Mandorah Road at the Grants pegmatite turn-off. The Far West North, Far West Central and Far West South prospects are approximately 3.5 km, 3.0 km and 2.75 km respectively west northwest of the Observation Hill plantsite. The Far West pegmatites form an 'en echelon' swarm of cassiterite rich pegmatite veins on the western margin of the pegmatite belt.

Topography:
The area is flat-lying ridge or upland plain terrain interspersed with shallow minor drainages. The cover of black organic soil and yellow sand overlies sub-outcropping laterite. Bedrock exposures are limited to old workings.

History:
There is no recorded history of production from the area. Workings are shallow and restricted to the eluvial zones.

1986 Work:
During 1986 a total of 1802 m of trenching was completed in the Far West area.

General Geology:
i) Far West North
Three prominent vein systems have been located in this area, the first has a proven strike length of 120 m and attains a maximum width about 6 m. The strike is NNE with contacts having variable dips to both west and east. Lithologies are mainly kaolin-quartz-muscovite with a central zone of quartz-kaolin-muscovite observed in one exposure. Minor indurated (silicified) zones are present on the eastern margins. Hostrocks are ferruginous mica schists and shales with interbedded metasiltstone having a steeply dipping to vertical NW foliation. The second vein occurs 150 m north of the first and has a strike length of about 100 m, the maximum exposed width is 8 m.
The vein strikes due north and contacts dip moderately to the northeast and east. The third vein is situated 50 m west of the second vein and extends a further 150 m to the NE. The maximum width is 10 m. Contacts have variable dips to the east and west. The lithology is predominantly kaolin-quartz-muscovite with a quartz-kaolin-muscovite zone (indurated) on the western margin (Figures 19 and 20).

ii) Far West Central
Costeaining within the southern section of the area was impeded by significant thickness of eluvial and alluvial cover, consequently strike extensions to old workings were not exposed. East of the Grants – Far West South track, at 30500N, trenching has revealed a large kaolinized pegmatite having a proven strike length of 125 m. The maximum exposed width is 39 m which lenses out to about 3 m, 50 m south of this intersection. The body strikes north and contacts have steep to moderate dips to the west and east. Lithologies are mainly kaolin-quartz-muscovite with a quartz-kaolin-muscovite zone noted on one contact. A narrow quartz-muscovite selvedge is common. A further 150 m north trenching has exposed two pegmatites 11 m (kaolin-quartz-muscovite + quartz-muscovite-kaolin) and 3 m (kaolin-quartz-muscovite) wide. The pegmatites strike NNE over about 50 m and contacts dip moderately to the west and east. The hostrock of quartz-mica schist and mica shale has a N to NE foliation with moderate to vertical dips (Figure 21).

iii) Far West South
Six pegmatite veins have been identified in this area, in the extreme south, overlooking Lees drainage, two bodies have been exposed by extensive old workings and recent trenching. The eastern vein strikes N to NNE over 50 m and has a maximum width of 10 m. Contacts have a general, moderate dip to the west. The lithology is kaolin-quartz-muscovite, partly ferruginized near the surface. The veins intrude ferruginous mica schists and metasiltstones having a moderate to sub-vertical N – NE foliation, tourmaline is frequently developed
adjacent to the contacts. The second, western vein has a NNE strike over 75 m and a maximum exposed width of 7 m. Contacts are vertical or dip at moderate or steep angles to the west. The lithology is kaolin-quartz-muscovite with quartz-muscovite selvedges on the contact. Biotite and tourmaline are developed within the hostrock adjacent to contacts. Small scale, tight recumbant and open folds are developed within mica schists adjacent to the vein. The fold axes strike NNE and are horizontal or sub-horizontal in contrast to the regional fold pattern. In some folds low pressure zones (fold hinge zones) have become the site for crystallization of pegmatite fluids eg. kaolin-muscovite and quartz-muscovite. The inference is that the deformation occurred contemporaneously with intrusion and therefore the intrusion was forceful. Two hundred metres north of the southern pegmatites there occur two small, sub-parallel veins of limited strike length (25 m to 50 m) and narrow width (2 m to 4 m). Both veins strike N to NNE and are quartz-rich grading into quartz-muscovite and finally massive quartz veins along strike. North of the western vein trenching has exposed a narrow, sinuous vein striking north over 120 m. The maximum width is 6 m. Contacts dip at moderate angles to the west truncating kaolin-quartz-muscovite, quartz-muscovite selvedges are developed on the contacts. Another pegmatite occurs 150 m to the east, the vein strikes NNE over 150 m and has a maximum exposed width of about 12 m. Contacts generally dip at moderate to steep angles to the east. The lithology is kaolin-quartz-muscovite (Figures 22, 23 and 24).

Cassiterite and Tantalite Mineralisation:
Sixty six channel samples collected over the 2.4 km strike of the Far West pegmatites give an average grade of 0.039 kg/tonne SnO₂ and 0.030 kg/tonne Ta₂O₅, excluding one contact zone sample having a grade of 4.579 kg/tonne kg/LCM SnO₂ and 0.027 kg/LCM Ta₂O₅. Low (and sub-economic) grades are a feature of the pegmatite swarm, generally the pegmatites are enriched in cassiterite relative to tantalite however a few
instances of tantalum enrichment are noted, usually within exclusively tantalum-rich veins. As a rule high grades are confined to contact zones and narrow sections of the veins. Average SnO₂:Ta₂O₅ ratios are:

Far West North  -  8.533
Far West Central -  3.162
Far West South   -  8.520

Channel sample locations and grades are shown in Figures 25, 26 and 27.

Potential Reserves:
Additional costeanning and sampling has outlined the dimensions and grade of most pegmatite bodies within the Far West swarm. Sampling results suggest that soft-rock pegmatite reserves will not be significantly increased and further drilling should be selective for the higher grade, low volume veins. The eluvial horizon has not yet been fully evaluated and there is considerable potential for increasing reserves from this source.

3.1.8 Hendersons West Prospect

Location:
The Hendersons West prospect is located approximately 300 m west of the Henderson Prospect, immediately south of the Mandorah Road and approximately 1.2 km from the Observation Hill plantsite.

Topography:
The prospect is located on a ridge of schist and the western slope leading down to surrounding flats. The main pegmatite is located near the crest of the ridge and a second pegmatite occurs at the foot of the slope.

History:
Shallow shafts, some with visible mineralisation dot the area but there is no known record of production.
1986 Work:
A total of 102 m of trenching and 247 m of auger drilling was completed at Hendersons West. The work outlined the northern extent of the previously identified western pegmatite.

General Geology:
Four drill lines intersected the western pegmatite over a strike length of 75 m. The pegmatite is a vein-type body which strikes due north and contacts dip at moderate angles to the east, discordant to the foliation. Host rocks are ferruginous metasiltstones and shales (Figure 28).

Cassiterite and Tantalite Mineralisation:
Drilling penetrated weathered pegmatite to depths of 16.5 m however grades are generally sub-economic with sporadic higher grades occurring along the footwall contact. The higher grades are cassiterite-rich. The average grade of 53 drill samples is 0.045 kg/tonne SnO₂ and 0.016 kg/tonne Ta₂O₅ (1.5 tonnes/LCM), Figure 29. The average SnO₂:Ta₂O₅ ratio is 2.813, compared with approximately 0.500 for the eastern pegmatite.

Potential Reserves:
As the average grades throughout the northern extension of the western pegmatite are sub-economic at present, no additional reserves have been included. The pegmatite remains open to the north and line 29850N remains open to the east.

3.1.9 Highland Prospect

Location:
The prospect is located immediately north of the Kings Table turnoff leading from the Darwin-Mandorah Road. Access is via the Darwin-Mandorah Road, 2.2 km from the Observation Hill plantsite.
Topography:
The area lies on the crest and eastern slopes of a prominent metasiltstone and shale ridge.

History:
There is no history of production from this area. Several small pits are dug into eluvium overlying the pegmatite.

1986 Work:
The exploration grid was extended westward from the Hang Gong drainage to include the area. The prospect was mapped at a scale of 1:500 and 309 m of costeining was completed. Auger drilling totalled 391.0 m.

General Geology:
Early workings consist of shallow pits dug into quartz rich eluvium and underlying pegmatite to depths of 0.5 - 1 m. Subsequently a bulldozer has exposed the northern extension to a depth of 2 m, revealing a 5 m wide kaolin-quartz-muscovite pegmatite intruding interbedded metasiltstone and shale. The contacts strike NNW and are vertical or dip steeply east. Within the hostrock bedding and cleavage planes strike slightly east of north and have a vertical to steep easterly dip.

About 125 m to the south other dozer cuts have exposed ferruginous shale and lateritized eluvium beneath 1 - 1.5 m of unconsolidated quartz-rich eluvium. The most recent wrok has exposed a highly weathered kaolin-quartz-muscovite pegmatite striking NNW over a distance of 75 m. The maximum exposed width is 22 m at the northern end. In outline the pegmatite pinches and swells markedly and terminates abruptly to the north against outcropping metasiltstone. The southern extremity also terminates abruptly.

A subsidiary pegmatite (kaolin-quartz-muscovite) 7 m wide is exposed 40 m west of the main body, the strike extent has not been determined although it has lensed out 25 m to the south.
Another pegmatite or pegmatites have been exposed on the eastern slope of the ridge 45 m east of the main pegmatite. Here several closely associated kaolin-quartz-muscovite veins (maximum width 6 m) have been exposed over a distance of 25 m. The veins strike north or west of north, parallel to bedding orientations. Contacts appear to have variable dips to the east and west (Figure 30).

Drilling of the main and eastern pegmatites has shown them to be irregular vein/sill-type intrusions which truncate the hostrock bedding/foliation. Contacts of the main pegmatite dip at moderate angles to the east, whilst the smaller eastern pegmatite (intersected over a 25 m strike) also dips to the east it appears to more closely resemble a sill-type body (Figure 31).

Cassiterite and Tantalite Mineralisation:
High grades are uniformly distributed throughout the pegmatites, there is no major variation between the main and eastern bodies (Figures 31 & 32).

A relatively cassiterite-rich pegmatite is indicated by the average $\text{SnO}_2$:$\text{Ta}_2\text{O}_5$ ratio of 1.45.

Mineralised Reserves:
Auger drill has established soft-rock reserves of 32,800 tonnes having an average grade of 0.132 kg/tonne $\text{SnO}_2$ and 0.091 kg/tonne $\text{Ta}_2\text{O}_5$. The overburden:ore ratio is 0.42.

Potential Reserves:
Drill line 30425N remains open to the east. An extensive eluvial/colluvial horizon on the eastern and southern slopes of the ridge remains untested, exposures indicate that thickness of up to 1 m can be expected.
3.1.10 Johnstones Prospect

Location:
The prospect is located immediately south of the Darwin-Mandorah Road and 3 km northwest of the Observation Hill plantsite.

Topography:
Johnstones pegmatite is exposed in shafts and in an open cut on the western margin of Johnstones drainage. With partial alluvial cover there is poor exposure of bedrock even in the old workings.

History:
The prospect is variously called Johnstons, Johnsons and Johnstones pegmatite in the mine records, but there is no recorded production for the deposit. Old workings are extensive with a 20 m x 10 m open pit and a number of shafts connected by underground workings.

1986 Work:
A further 81 m of costeaneing was completed to determine the strike extent of the pegmatite.

General Geology:
Johnstones pegmatite is approximately 50 m x 60 m long and 15 m wide. Within the pegmatite are xenoliths of mica schist to 10 m thick. The pegmatite appears to dip to the west from 50° to 75°, estimates of the strike direction vary from 045° to 330°. The body had intruded sub-parallel to strike but normal to the dip of host micaceous metasiltstones and shales (Figure 33).

Weathering in the immediate vicinity of Johnstones pegmatite is developed to a depth of at least 20 m. The pegmatite is kaolin-quartz rich with minor muscovite. The surrounding eluvial horizon is well developed and in the south is cassiterite rich.
Cassiterite and Tantalite Mineralisation:
Cassiterite values are patchily developed with apparent enrichment on the footwall. Elsewhere the grades are low. Tantalum values are more homogeneous in their distribution. Throughout most of the pegmatite the SnO₂:Ta₂O₅ ratio is 1:2, but due to one high grade pod of cassiterite mineralisation the average ratio is 3:1. The Ta₂O₅:Nb₂O₅ ratio is approximately 1:1.

Mineralised Reserves Outlined:
The total pegmatite and eluvial reserves outlined to date are 34400 tonnes 0.129 kg/tonne SnO₂ and 0.025 kg/tonne Ta₂O₅ (1.5 tonne/LCM). Due to the lack of information as to the orientation of the pegmatite the estimation of waste is only approximately at 8000 tonnes, giving an overburden:ore ratio of 0.524.

Potential Reserves:
Costeaving has closed the pegmatite along strike, however auger drilling has yet to define the footwall of the pegmatite. Auger drilling has already shown the eluvial potential of the area to be substantial and trenching and sampling are expected to add considerably to these reserves.

3.1.11 Jubilee Prospect

Location:
The Jubilee prospect is located immediately northwest of Shirleys North prospect. Access is via the main track leading south to the E Charlotte crossing, a track branching southeast at Golden Boulder leads directly to the prospect which lies 2.3 km from the Observation Hill plantsite.

Topography:
The area is flat and covered in shale and quartz scree. It lies on the upland plains above the western margin of Booths drainage.
History:
There has been no production from the area.

1986 Work:
The exploration grid was extended north from Shirleys North prospect and the prospect was mapped at a scale of 1:500. 244 m of costeaneing was completed.

General Geology:
A narrow, discontinuous pegmatite vein occurs over a strike length of 200 m. The maximum exposed width is 6 m. The vein strikes due north and where measured the contacts dip at moderate angles to the east. The lithology is kaolin-quartz-muscovite with some quartz zoning occurring on the contacts. Host rocks are ferruginous shales and metasiltstones having a variable NW-NW cleavage/foliation (Figure 34).

Cassiterite and Tantalite Mineralisation:
The average grade of five channel samples is 0.015 kg/tonne SnO₂ and 0.014 kg/tonne Ta₂O₅ (Figure 55).

Potential Reserves:
Low grades exclude this prospect as a pegmatite reserve. Weathering may have concentrated mineralisation in the eluvial horizon, this can be determined by check sampling.

3.1.12 Kookaburra Prospect

Location:
The prospect is located on the lower slopes above the western margin of Johnstones drainage. The prospect is 700 m south east of Johnstones pegmatite and 2.6 km north west of the Observation Hill plantsite. Access is via the Darwin-Mandorah Road and a track leads south along Johnstones drainage.
Topography:
The prospect is situated on a scree covered slope overlooking Johnstones drainage. Outcrop is restricted to old workings.

History:
Workings are minor and possibly restricted by the relatively unweathered nature of the pegmatite. One pit is dug in pegmatite to a depth of about 2.5 m and the remaining pits are dug in quartz-rich eluvium.

1986 Work:
The exploration grid was extended east from the surveyed lines in Johnstones drainage and the prospect mapped at a scale of 1:500. Costeening and auger drilling totalled 190 m and 136 m respectively.

General Geology:
Shallow workings have been dug on the contact zone of a relatively unweathered quartz-rich pegmatite which exhibits intergrown K-feldspar megacrysts. Due to the lack of weathered eluvial workings predominate. The pegmatite strikes NE over a distance of 25 m. The maximum width attained is 29 m and a trench 20 m south of this intersection exposed only eluvium and shales, indicating an abrupt lensing out or a plunge to the southwest. Contacts are normally obscured by weathered eluvium overlying the pegmatite, only one contact orientation was noted with any certainty and this dips at 30° to the NE. The hostrock shales have a N-NE vertical clearance (Figure 35).

Drilling has shown the pegmatite to be a flat-lying body now no more than about 9 m thick, drilling on line 31130N failed to intersect the possible southern extension, however the possibility of a sub-outcropping intrusion remains if the plunge is greater than about 17°.
Cassiterite and Tantalite Mineralisation:
Meaningful channel sampling was hampered by the presence of unweathered areas, however seven samples were collected from the southern (29 m) intersection and returned assays of up to 1.703 kg/tonne SnO₂ and 0.103 kg/tonne Ta₂O₅. Neglecting this result the remaining six samples have an average grade of 0.044 kg/tonne SnO₂ and 0.012 kg/tonne Ta₂O₅ (Figure 36).

Mineralised Reserves:
Soft rock pegmatite reserves have been calculated for section 31150N giving an estimated 6000 tonnes at 0.122 kg/tonne SnO₂ and 0.033 kg/tonne Ta₂O₅. The pegmatite is cassiterite rich with a SnO₂:Ta₂O₅ ratio of 3.697. As the pegmatite dips shallowly to the west in the northern section, minor overburden may be encountered (Figure 37).

3.1.13 Lama Prospect

Location:
The Lama prospect is located 300 m west of Grants pegmatite. Access is via the Darwin-Mandorah Road and the Grants haul road.

Topography:
The area is covered by lateritized eluvium and quartz scree and forms a low rise within the upland plains.

History:
Production is minor and unrecorded.
1986 Work:
The exploration grid was extended west from Grants and the prospect was mapped at a scale of 1:500. Costeaning and auger drilling totalled 137 m and 94.5 m respectively.

General Geology:
Costeaning was impeded by highly indurated lateritized cover, however a narrow, highly weathered quartz-rich pegmatite has been exposed over a strike length of 50 m. The strike is NNW and contacts dips moderately to steeply west. The maximum exposed width is 6 m. Host rock is rarely exposed, ferruginous mica schist having a westerly dipping schistosity occurs adjacent to one contact, elsewhere the costeans exposed eluvium.

A second pegmatite is exposed in the bottom of a trench 30 m west of the main vein, subsequent drilling of the prospect yielding only minor intersections of narrow vein pegmatite (Figure 38).

Cassiterite and Tantalite Mineralisation:
Grades are uniformly low, seven trench samples give an average grade of 0.014 kg/tonne SnO₂ and 0.012 kg/tonne Ta₂O₅. The average SnO₂:Ta₂O₅ ratio is 2.278 (Figure 67).

Four drill samples gave an average grade of 0.004 kg/tonne SnO₂ and 0.010 kg/tonne Ta₂O₅ (Figure 39, 1.5 tonne/LCM).

Potential Reserves:
The low grades present little scope for developing pegmatite reserves, the eluvial horizon is extensive and well developed and may contain higher concentrations of mineralisation.
3.1.14 Lees Extended Pegmatite

Location and Topography:
The prospect is located within MLN 16 on the southern side of Lees drainage and approximately 1.5 km from the Observation Hill plantsite. Lees extended is located immediately south of Lees pegmatite. It primarily refers to the pegmatites exposed on the upland slope south of Lees drainage, however it includes pegmatites under Lees drainage. Outcrop is restricted to ridges of schist south of the workings and sub-outcrop of laterite.

History:
There is no history of production from this area. Shafts and pits are shallow and it would appear that most of the production came from the eluvial horizon. During 1984 costeanning and drilling was carried out over the middle and eastern pegmatites.

1986 Work:
Follow up costeanning and auger drilling totalled 786 m and 406 m respectively.

General Geology:
The 1986 trenching programme has broadly defined the extent of the complex pegmatite swarm comprising Lees Extended.

Three main bodies are noted, two of which have received earlier investigation - (western (middle) and eastern pegmatites; see 1984 Annual Report). The latest work aimed to improve knowledge of the surface extent and distribution of mineralisation within these pegmatites.
The easternmost body has a minimum strike length of 50 m, being buried beneath eluvium to the north and branching into three widely separated veins to the south. Dip directions along the contacts are non-uniform and reflect the irregularity of the margins, within the area most contacts have a moderate dip to the east.

The pegmatite strikes in a NNW direction, parallel to the prominent foliation.

A local schistosity is developed within pelites hosting the pegmatite and small-scale folding with associated crenulation was observed at two locations. The exposed minor folds are at opposite ends of the pegmatite and plunge shallowly to the NNW and SSE. The deformation and development of schistosity is confined to a single pelitic horizon within more competent units (Figure 40).

Middle Pegmatite -

The middle pegmatite is the largest body of the Lees Extended swarm, having a strike length of 70 m which can probably be increased and a maximum width of greater than 60 m.

The pegmatite occurs on the eastern and northern margins of an outcrop of ferruginized metasiltstone. The strike is NNW and prevailing dips are to the east at moderate angles, coincident with the foliation. At the widest intersection, north of the siltstone ridge, the pegmatite contains numerous rafts and xenoliths of country rock and it lenses out abruptly to the south and west.

Western Pegmatite -

The western pegmatite is 50 m due west of the middle pegmatite and has been exposed over a strike length of 25 m. It attains a maximum width of 10 m. At its southern extremity it
terminates abruptly against outcropping metasiltstone and
to the north it remains open-ended and buried beneath eluvial
cover.

The country rock is ferruginized micaceous shales and
metasiltstone having a predominant N or NW, steeply dipping
foliation.

Drilling has shown this pegmatite to be flat-lying and
narrowing abruptly to the north and south of line 28175N.
The body appears to plunge gently north and reappears along
strike at 28300N (Figure 41,42).

Cassiterite and Tantalite Mineralisation:
Follow up drilling of the Lees Extended pegmatite has produced
an average SnO₂:Ta₂O₅ ratio of 3.5:1.

Mineralised Reserves:
A further 41500 tonnes of soft rock pegmatite reserves were
established for the western pegmatite (Zones A and B) having
an average grade of 0.159 kg/tonne SnO₂ and 0.045 kg/tonne
Ta₂O₅. The overburden:ore ratio is 0.59.

Potential Reserves:
Additional reserves are likely to occur within the eluvial
horizon adjacent to the western pegmatite and concealed
northern extensions to the middle and eastern pegmatites.
3.1.15 Lees South

Location:
The Lees South pegmatites are located 150 m to 200 m south and south east of Lees Extended.

Topography:
The pegmatites occur on the eastern flank of the metasiltstone ridge south of Lees Extended and on the laterite capped upland plain east of the ridge.

History:
There is no record of production from the area.

Scattered shallow pits suggest that production was minor and the eluvial horizon was of main interest.

1986 Work:
During 1986 a total of 309 m of trenching was completed in the area. A single line of 7 holes (42 m) drilled on line 27900N failed to intersect pegmatite.

General Geology:
i) On the ridge trenching has intersected at least four veins of the narrow vein-type, generally less than 5 m in width and having a marked pinch and swell structure. The veins are parallel and strike NW over a distance of 75 m, dip measurements are conflicting but generally lie to the west at moderate angles.

ii) The other area of Lees South lies 200 m east of the ridge, above the southern margin of Lees drainage. Old workings are extensive and located over a narrow vein-type (5 m) pegmatite. Four trenches have shown the strike extent to be limited, north of the main pit only minor veinlets are observed and no pegmatite was intersected to the south. The pegmatite strikes NW parallel to the local foliation.
Host rocks are intensely weathered ferruginous micaceous shales and metasiltstones (or greywackes and arenites on the ridge) having a N to NW foliation. Subvertical bedding strikes N to NE.

Pegmatite lithologies throughout the area are generally kaolin-quartz-muscovite, frequently ferruginized at the surface and showing quartz, muscovite development on the contacts. Lees South pegmatites are narrow and tend to have a greater quartz content than the Lees Extended swarm (Figure 43).

Cassiterite and Tantalite Mineralisation:
Nine samples collected from the tantalum-rich pegmatite vein in the southern area have an average SnO₂:Ta₂O₅ ratio of 0.279. A single sample collected from the eastern zone gave a ratio of 0.92. The average grade is 0.038 kg/tonne SnO₂ and 0.136 kg/tonne Ta₂O₅ (1.5 tonne/LCM). Figure 44.

Potential Reserves:
Soft-rock pegmatite reserves are minor however the high grade recovered from the southern area indicate that significant downslope eluvial/colluvial concentrations may be present. A single drill line failed to intersect pegmatite (Figure 45).

3.1.16 Middle East Prospect

Location:
The Middle East prospect is located south southwest of Rubiks prospect and approximately 1.9 km west northwest of the Observation Hill plantsite. Access is gained via the Lees B haul road and the track leading north along the 10000E baseline.
Topography:
The prospect lies on the lower slopes of a laterite plateau, above the northern margin of Lees drainage. Outcrop is limited to old workings.

History:
Workings are of minor extent and there is no record of production.

1986 Work:
The exploration grid was extended westward to cover the area and mapping was completed at a scale of 1:500. Costeining totalled 50 m.

General Geology:
Trenching has exposed a narrow (5 m) pegmatite which strikes due north for a distance of 50 m. It appears to bifurcate mid-way along its length before fingerling out to the south. Contacts are steeply dipping or vertical and generally conform to the N-NNE foliation/cleavage within hosting ferruginous metasiltstones and shales. The lithology is homogenous kaolin-quartz-muscovite (Figure 46).

Cassiterite and Tantalite Mineralisation:
Four channel samples returned an average grade of 0.159 kg/tonne SnO₂ and 0.022 kg/tonne (1.5 tonne/LCM) Ta₂O₅ contact enrichment is a feature of the pegmatite. The SnO₂:Ta₂O₅ ratio is 7.227 (Figure 47).

Potential Reserves:
The prospect has potential for low volume soft-rock pegmatite reserves which can probably be augmented by eluvial material.
3.1.17 Roadside Prospect

Location:
The Roadside prospect is located immediately west of the
dozer-cut track leading south from the Mandorah Road. It
lies 5.2 km south of the Mandorah Road and 3.9 km west
south-west of the Observation Hill plantsite.

Topography:
The prospect is located on a flat laterite plateau.

History:
There is no history of production from the prospect which
was gridded and mapped in 1985.

1986 Work:
A total of 126 m of costeaming was completed over the old
workings followed by 154.5 m of auger drilling.

General Geology:
Trenching has exposed a 19 m intersection of kaolin-quartz-
muscovite pegmatite beneath the main workings, the body has
an established strike length of 50 m and remains open-ended,
although it appears to be lensing out at the surface. The
strike is NNE and drilling has shown the contacts to be
dipping steeply west, indicating a concordant vein-type
intrusion. The host rock of ferruginized micaceous shales
and metasiltstones has a prominent foliation and bedding
orientation to the north or north east with vertical to
steep westerly dips (Figures 48,49).
3.1.18 Roulette Prospect

Location:
This prospect is located south of the Central pegmatite swarm and 600 m southwest of Rubiks prospect.

Topography:
The prospect lies on the western slopes of the ridge which parallels the southern end of Johnstones drainage. The surface is lateritized and outcrop is restricted to old workings.

History:
Production from the area is minor and unrecorded.

1986 Work:
The exploration grid was extended west to include the area and mapping was completed at a scale of 1:500. Costeaming totalled 74 m.

General Geology:
A shallow pit exposes weathered kaolin-quartz-muscovite pegmatite having an apparent width of 3 m. Trenching north and south of the pit has exposed a vein-type intrusion striking due north over 30 m and having a maximum width of about 8 m. The vein intrudes ferruginous mica shales and schists parallel to the foliation and contacts dip steeply east (Figure 50).

Cassiterite and Tantalite Mineralisation:
Five channel samples collected from the southern extensions have an average grade of 0.169 kg/tonne SnO₂ and 0.011 kg/tonne Ta₂O₅. This is biased by the inclusion of one contact zone sample which assayed 0.707 kg/tonne and 0.025 kg/tonne Ta₂O₅ (1.5 tonne/LCM), otherwise the grades are sub-economic (Figure 51). The SnO₂:Ta₂O₅ ratio is 15.364.
Potential Reserves:
Low grades and limited volume limit further development of this prospect.

3.1.19 Rubiks Prospect

Location:
The prospect is located south east of Central prospect and 600 m south of Carlton prospect. It lies 2 km north west of the Observation Hill plantsite. Access is via the Lees B haul road then north along the 10000E baseline.

Topography:
The pegmatite is exposed on the northern slope of a weathered outcrop of metasediment on the western margin of Johnstones drainage. On the eastern side of the ridge the slope cuts away sharply, exposing metasiltstones and shales. To the north the incline is gentle and covered with abundant scree of milky quartz overlying pegmatite. As the incline decreases northwards lateritization of the metasediments becomes more intense.

History:
There is no history of production from this prospect. Shallow workings at the base of the slope indicate that eluvial/colluvial material was the focus of interest.

1986 Work:
The exploration grid was extended from the 10000E baseline to include the area and mapping was carried out at a scale of 1:500. Costeaming totalled 264 m and 396.5 m of auger drilling was completed.

General Geology:
Costeaming exposed a NNE striking pegmatite over a distance of 90 m, and having a maximum exposed width of 29 m. To the east of this intersection a quartz-kaolin-muscovite sill
is exposed in the northern side of the trench. A narrow quartz-muscovite selvedge is developed on the lower contact which has an apparent steep dip to the north. The relationship between this body (9 m wide) and the main pegmatite has not been established by drilling which identifies the main body as a single, kaolin-quartz-muscovite, vein-type intrusion. The contacts dip steeply to the west.

Costeaming indicates that the main vein fingers out to the south and terminates abruptly at its northern end. A small pit 75 m NNE of the main vein contains pegmatite, however no intersections were recorded from trenches immediately north and south of the pit.

The host rocks are ferruginous metasiltstones and shales, some tourmalinization occurs along the contacts. Foliation directions vary from NW to NE, most strike NNE with vertical or sub-vertical dips (Figures 53, 54).

General Geology:
Costeaming has exposed a zoned pegmatite between 5 m and 14 m wide, over a strike length of about 75 m.

The pegmatite strikes northwest and at the northern end dips to the north-east moderate angles. Continuing south east the contacts become divergent, the western contact dipping steeply to the west whilst the eastern contact dips moderately or shallowly to the east. The pegmatite then bifurcates into two bodies of differing lithology, the western branch (zoned kaolin-quartz-muscovite, quartz-kaolin-muscovite) dipping east, sub-parallel to the foliation. Outcropping country rock about 10 m south of the western branch, indicates that it lenses out abruptly at the surface. In the southernmost costeane the contacts once again assume sub-parallel north-easterly dips. Drilling has shown the pegmatite to be a sill type intrusion which appears to be plunging gently to the north west (Figures 55, 56).
Cassiterite and Tantalite Mineralisation:
Grades are uniformly distributed and relatively cassiterite-rich, the \( \text{SnO}_2: \text{Ta}_2\text{O}_5 \) ratio varies between 2.570 and 5.692 (costeane samples are shown in Figure 57).

Mineralised Reserves:
Auger drilling has produced a soft rock pegmatite reserve estimate of 13600 tonnes at an average grade of 0.044 kg/tonne \( \text{SnO}_2 \) and 0.027 kg/tonne \( \text{Ta}_2\text{O}_5 \). The overburden:ore ratio is 0.220.

3.1.20 Siberia Prospect

Location:
The Siberia prospect is located west of Lees pegmatite on the northern margin of Lees drainage. Access is gained via the Lees B haul road and a track following the 10000E baseline runs north to the area. The prospect is 1.2 km west of the Observation Hill plantsite.

Topography:
The prospect lies on the margin of an extensive laterite plateau or upland plain. There is no exposure, outcrop being restricted to old workings.

History:
Most of the workings are shallow and restricted to eluvium overlying and surrounding weathered pegmatite. There is no record of production.

1986 Work:
The exploration grid was extended to cover the area and mapping was completed on a scale of 1:500. Costeaning totalled 223 m and auger drilling 207 m.
General Geology:
The main workings have been dug along a narrow, quartz-rich pegmatite striking NE. In the southern area the target appears to have been eluvium. At the northern end of the workings a 3 m pegmatite is exposed, however contact orientations cannot be observed. Six metres northwest of this exposure is a 4 m shaft dug in shale, presumably to intersect the pegmatite down plunge. Recent trenching has exposed a 1 m wide kaolin-quartz-muscovite vein running through the workings, this widens to 10 m a further 25 m south. The pegmatite is highly weathered and contact relationships cannot be determined, the strike is generally N to NE. The hostrock consists of ferruginous mica shales and metasiltstones which have a vertical, north striking foliation.

Trenching of shallow pits in eluvium 60 m NW of the main workings exposed a second parallel pegmatite having an established strike length of 50 m. The maximum exposed width is 15 m and the contacts generally have vertical or steep dips to the east or west. Although the effects of weathering are severe there is little evidence of lateral zonation, some quartz enrichment is noted along strike to the south where the pegmatite narrows (Figure 58).

Drilling has shown the pegmatites to be shallow and flat lying (Figure 89).

Cassiterite and Tantalite Mineralisation:
Grades are low throughout, the average grade of seventeen drill samples is 0.004 kg/tonne SnO₂ and 0.011 kg/tonne Ta₂O₅ to give a SnO₂:Ta₂O₅ ratio of 0.364 (channel sample grades are shown in Figure 60).

Potential Reserves:
Given the low grade of the pegmatites it is unlikely that sufficient enrichment would occur within the eluvial horizon to form a potential resource.
3.2 Alluvial Deposits

During the 1986 field season large sections of Booths, Hang Gong, Johnsons, Lees and Little Alluvial drainages were tested by costeaging on 100 m grid lines (Figure 61).

The drainages are 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 exceeded 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 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 is usually absent due to reworking or unrecognised if it is continuous with the C horizon. The third and most recent cycle 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.

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.

3.2.1 Booths Drainage

Booths drainage is located within MLN 16 and has its source directly east of the campsite above the main freshwater dam. Trenching commenced about 2.4 km downstream from the headwaters in an area where the drainage has undergone rejuvenation. The alluvial flats are dissected by a well defined meandering channel about 15 m wide. The area was previously untested.

1986 Work:
Costeaming totalled 555 m between 25700N and 26500N (the area drains the Shirleys North to BP 32 mineralised pegmatites) and 149 samples were collected and processed.

Mineralised Reserves:
The 1986 work represents a significant (0.8 km) section of the total drainage (approximately 2 km) and one which could be expected to be well-mineralised.

Figure 62 shows the drainage cross-sections.
3.2.2 Hang Gong Drainage

The drainage is located north of the Mandorah Road and the catchment includes the Hang Gong, Hill, Highland, Crawfords, Roses etc pegmatites, at its northwestern extremity the drainage joins with Johnstones drainage before flowing north into West Arm.

1986 Work:
Trenching totalled 1255 m in the area of the drainage between the Hang Gong pegmatite and Johnstones drainage (1.2 km), and 246 samples were collected and processed.

Mineralised Reserves:
The drainage cross-sections are shown in Figures 63 and 64.

3.2.3 Johnstones Drainage

Johnstones drainage is located in MLN 16 and crosses the Darwin-Mandorah Road west of the Hang Gong Mine. The drainage is a 2 km long tributary of the Hang Gong drainage (although lines costeaneed beyond the confluence of Hang Gong and Johnstones drainage have been attributed to Johnstones reserves) and conforms with the broad flat nature of most of the drainages in the region. Beyond the Hang Gong outlet the drainage has developed a rejuvenated profile with a well defined channel.

1986 Work:
The drainage was costeaneed over a distance of 1.5 km on 100 m lines, costeaneing totalled 1210 m and 183 samples were collected and processed.
Mineralised Reserves:
The reserve figures include values for trenches dug on widely spaced lines south of 31000N. Mineralisation within this area south of Johnstones pegmatite has been derived from Rubiks, Carlton and Kookaburra pegmatites and probably from undiscovered bodies within the drainage itself. In-fill trenching should be completed in the source regions of the drainage.

Figures 65 - 68 show the drainage cross-sections and grades.

3.2.4 Lees Drainage

Lees drainage is located within MLN 16, south of the Darwin-Mandorah Road. The drainage has its headwaters immediately west of the project camp and plantsite and enters the tidal estuary of Bynoe Harbour approximately 5.2 km from the headwaters.

It is a typical broad, shallow drainage for a distance of 3.2 km from its headwaters then it narrows to a more steeply sided, rejuvenated drainage as it passes through the prominently outcropping, lateritized phyllites and schists, west of Litchfield and Luggs. The rejuvenated drainage, from line 8600E to line 7200E was the focus of this seasons activity.

1986 Work:
Costeaming totalled 1440 m and 341 samples were collected and processed. The costeaming continued to the tidal limit of Lees drainage.

Mineralised Reserves:
Costeaming has shown the distal reaches of Lees drainage to be well mineralised, possible sources include the Far West South pegmatites and numerous small bodies in the Litchfield and Luggs area, in addition to the larger pegmatites located near the headwaters.
Figures 69 and 70 show cross-sections of the lower drainage. Sections 7200 - 8600E

As there is no reduction in grade in the western section of the drainage it is probable that further potential lies in the tidal reaches beyond line 7200E.

3.2.5 Little Alluvial

Trenching within the Little Alluvial drainage continued north of the earlier (1985) trench, however progress was hampered by the poor definition of the drainage system and also the highly indurated nature of the gravel horizon which is sometimes overlain by a laterite capping. It appears that the channel system could be much wider than anticipated, thus requiring very time consuming exploration with the excavator. Often areas of wash are separated by wide intervals of indurated material and for this reason no reserve estimate has been attempted.

Cross-sections are shown in Figure 71. A total of 470 m of costeanning was completed and 53 samples were collected and processed.

4. ESTIMATED EXPENDITURE MLN 16

The Bynoe Joint Venture has a number of Exploration Licences and Mining Leases in the Cox Peninsula which were jointly explored in 1986/87. The total amount spent between May 1986 and May 1987 was $588,287 of which it is estimated 35% was spent on MLN 16, ie $205,900.
5. CONCLUSIONS

The 1986 - 1987 exploration programme for MLN 16 considerably expanded the project reserves. The two commodities under consideration i.e. tin and tantalum again had poor years although both finished on a higher level than they started the year.

The Joint Venture partners have predicted a strong demand led revival in tantalum price in 1987/88. With this in mind the 1987/88 programme will involve:

- Further exploration as in 1986/87
- A feasibility study to be carried out in Jan 1988 to access the projects viability.

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BYNOE JOINT VENTURE
BOO THS EXTENDED
GEOLOGY

SCALE 1:500

FIGURE 3
BYNOE JOINT VENTURE
KOOKABURRA PROSPECT
GRADE PLAN

SCALE 1:500

0 10 20 30 40 50 metres

FIGURE 36