

**RL APPLICATIONS FOR FLOW-ON TITLES FROM ELS 10, 11 AND
12/2000 – MONARCH FLATS, SOUTH MT CAMERON AND PIONEER, NE
TASMANIA**

FOR MINERAL HOLDINGS AUSTRALIA PTY LTD

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1.0 INTRODUCTION

ELS 10, 11 and 12/2000 were applied for by Mineral Holdings Australia Pty Ltd on 5th May 2000 and granted on 8th December 2000.

The licences were selected to allow exploration and evaluation of the alluvial resources and their contained heavy minerals particularly cassiterite, ilmenite, rutile, zircon, monazite, tantalite and gold. Gemstones particularly sapphire and topaz are held under SEL 22/99 but are an essential part of the evaluation.

Each licence covers an area of 4 sq km in NE Tasmania (Plan 1) and secures the residual resources of cassiterite in the former alluvial tin mines at Monarch, Endurance and Pioneer.

Desk studies of the three deposits over three years from 2000 have allowed a modern evaluation and recalculation of the residual resources allowing for pre-stripping of the barren overburden resulting in an enhancement of the grade and volume of the alluvial resource figures. The studies have progressed to a stage which has encouraged Mineral Holdings to apply for Retention Licence status for the three alluvial tin deposits.

These areas are an integral part of Mineral Holdings' Ringarooma Tin Project of northeastern Tasmania which consolidates all of the potential tin resources in the region and allows exploration and promotion to proceed in a coherent manner with subsequent economies of scale. The project as a whole is currently under option to Hanbury Ltd of Sydney.

2.0 PREVIOUS EXPLORATION

Exploration activities by Mineral Holdings Australia Pty Ltd on these licences in Year 1 focused on the Monarch and Endurance alluvial deposits (Duncan, January 2002). The Monarch deposit was bulk sampled and in addition desk studies were carried out at both Monarch and Endurance to recalculate the alluvial resources leaving out the barren overburden. These studies were carried out by Niugini Resources Pty Ltd and are contained in project reports already lodged in Mineral Resources Tasmania (Monarch, Kinnane, August 2001 and Endurance, Kinnane, December 2001).

In Year 2, the emphasis was on the Endurance and Pioneer alluvial deposits (Duncan, December 2002). Desk studies involving recasting of resources were carried further on Endurance and commenced at Pioneer and were forwarded to the Department (Pioneer, Kinnane, December 2002).

Year 3 saw the compilation of the old drill data, its tabulation with conversion to metric units and the recalculation of the resource base by deletion of the overburden at Pioneer. The resource figures at Endurance were also revised and brought up to date. This information is contained in the two current project reports by Niugini Resources Pty Ltd (Kinnane, September 2003 and November 2003) which have just been lodged in the Department.

3.0 EXPENDITURE

Exploration expenditure for the twelve months to September 2003 as expressed in the quarterly reports has been EL 10/2000 - \$822, EL 11/2000 - \$5853 and EL 12/2000 - \$13,370. When added to the expenditures for Years 1 and 2, these amounts bring the total expenditures for the three years on the licences as follows-

EL 10/2000 Monarch	\$51,046
EL 11/2000 South Mt Cameron	\$14,763
EL 12/2000 Pioneer	\$18,277

As all of the work involved desk studies, there was no surface disturbance and consequently no need for rehabilitation.

4.0 RESOURCE INVENTORY

These modern resource figures have been calculated by Niugini Resources Pty Ltd following extensive study of the previous exploration and mining history of the alluvial tin deposits. They involve the metrification of the old imperial data, the use of modern computer software, the elimination of the barren overburden in the calculation and an appreciation of the geological setting of the deposits. The detailed information is contained in **the five project reports** already lodged in the Department and cited in the Reference Section of this report.

5.0 MONARCH – EL 10/2000

Tin was first discovered at Monarch in the late 1800s and most initial work was carried out by Chinese miners.

The main mining phase was 1923 to 1935 when 71.5 tons of tin concentrate were recorded for the period.

Subsequently, the most important evaluations on the resources including drilling were carried out by BHP (1964), Austminex (1965), BMI in the early 1970s and Amdex in the early 1980s. Test pitting by Mineral Holdings in June 2001 confirmed the general tenor of the resource in B Lens and allowed estimates of the grades of the accessory heavy minerals zircon, rutile, ilmenite and monazite.

Recent recalculation of the resources by Niugini Resources Pty Ltd (**Kinnane, August 2001**) involving the removal of the barren overburden increases average grades by a factor of three and gives –

An Indicated Mineral Resource- A, B and E Lens (at a cut off grade of 200g/BCM) of-

556,751 bank cubic metres (BCM) at an average grade of 1,220g/ BCM of 70% Sn concentrate to give 679 tonnes of 70% Sn concentrate-

- **with the estimated accessories of 19g/BCM of zircon as ZrO₂ and 48g/BCM of rutile and ilmenite as TiO₂.**

A fourth lens “D” has the capacity to contribute an additional 8.2 tonnes of concentrate.

Overburden to ore ratios are about 3.5 to 1.

The Monarch ore reserve estimation sheets are reproduced in the Appendix to this report.

The resource blocks including most of lens E are open to the southeast where they escape off the present mineral tenements towards the lower slopes of Mt Cameron where there must be prospects of more alluvials (Plans 2, 3 and 4).

The main cassiterite deposits are arranged in a thin basal alluvial wash horizon of coarse sands, grits and conglomerates of granite derivation plus occasional clasts and blocks of (meta?) sandstone resting immediately on a decomposed granite bedrock. The deposits also contain zircon, monazite, ilmenite, rutile and corundum. The basal mineralized zone is overlain by barren, granite-derived clayey sands and sandy clays.

The tin deposits are thought to be Tertiary fluvial deposits derived from Mt Cameron with NW trending elongate lenses parallel to the present drainage and perhaps modified to the north and west by a marine transgression.

5.1 Mining Strategy and Feasibility

Mining logistics are excellent at Monarch with all weather roads and 240 volt mains power already as close as several kilometers to the north along the Gladstone-Bridport Road (Plan 4).

Previous mining techniques involved hydraulic monitors, gravel pumps and sluice boxes. BMI introduced a dragline. All methods used to date have resulted in high losses of tin to tailings by the failure to remove the barren sticky clay from the treatment circuit and by basement dilution.

The use of modern gravity circuits and mining incorporating controlled stripping of barren clay horizons using hydraulic excavators is expected to improve recoveries of cassiterite and the accessory heavy minerals, zircon, rutile, ilmenite, tantalite, gold and sapphire (Kinnane, internal memo).

Only preliminary feasibility studies have been carried out on the deposit.

On the above resource figures and taking the current price of tin metal to be \$A 7,465 (LME 19th November 2003) per tonne the insitu value of the Monarch deposit would be about \$A 3,500,000 making no allowance for the accessory minerals or sapphires.

Based on a number of mining techniques such as a single bucket ladder, an overburden stripping and smaller dredge, a double ladder dredge and backhoe mining, the operating costs would be around Aus\$1.68, \$1.59, \$1.40 - \$1.50 and \$1.44 - \$2.22/ cu m respectively.

Kinnane (internal memo) has suggested using other methods such as strip mining using scrapers, bulldozers or large hydraulic excavators and mining using conventional backhoe, trucks or gravel pumps or the removal of overburden by dragline and mining of wash by conventional methods. Preliminary estimates suggest that running a 100 cu m/hour alluvial plant with backhoe and bulldozers and jig based gravity plants would cost from \$2.50- \$10.00/ cu m depending on a number of variables such as overburden to ore ratios, grade, water and labour availability, location, access and infrastructure.

In a specific case, Kinnane has calculated that for a two dredge or pre-stripping operation, the estimated cost would be \$1.70/ cu m. It is also expected that similar costs and surplus figures could be achieved using a "dry mining" method. More recently, the estimate of a current dredge operator using modern technology advocated the possibility of getting the costs down close to \$1.00/ cu m (Kinnane, pers com).

An appropriate treatment plant circuit is featured in Plan 12 - and recognises the complex assemblage of accessory heavy minerals including gold, sapphire, ilmenite, rutile, zircon and tantalite which substantially increase the value per cubic metre of the alluvial deposits. Preliminary costs suggest an amount of \$1.25million for the plant although the availability of second hand plant would reduce this figure substantially.

The treatment plant could be mobile and would either be on site or at a central locality depending on the other sites to be mined in the Ringarooma Tin Project.

Environmentally, the old tin mining areas have been disturbed and degraded in the past. However, any new mining operations will have to be subject to the modern planning and environmental provisions. Mineral Resources Tasmania has carried out erosion control work and other rehabilitation measures in the area and the mining plan would recognise and preserve these remediation features as much as possible.

A Retention Licence of 4 sq km is required to secure the resource so that MHA can carry out the following –

- convert all old data to modern metric, AMG and digital format,
- commence a full economic assessment of the resource including the value of the accessory minerals,

- complete a pre-mining feasibility study involving mining technique, processing methods and environmental considerations, and
- complete marketing studies and allow time for the metal prices to rise.

6.0 SOUTH MT CAMERON- EL 11/2000

Tin was discovered in the Endurance area in 1875.

Initially miners worked the shallow alluvial deposits in the small, deeply incised (but rich, at 2,000 to 3,000g/ cu m) streams such as Clifton Creek perched above the buried Endurance lead.

The Endurance Tin Mining Company formed in 1922 and after small-scale tribute mining restructured in the early 1930s acquiring the hydroelectric power station at Frome Dam to electrify its operations exploiting the shallow ground of the Endurance lead.

The main mining period of 1946 to 1959 saw the production of 1,220 tonnes of tin concentrates from the main lead although operations were hampered by the inability to dispose of tailings. In the period 1960-66, an average of 70 tonnes per annum was generated from the narrowing lead to the east and in the next two years to 1968 only 75 tonnes of concentrates were produced giving a total figure of 1715 tonnes of tin concentrates from Endurance. Some 32 tonnes of monazite concentrates were sold in 1943 (Jennings and Williams, 1967).

In the early 1970s, BMI Mining took over the deposit and discontinued mining in the western part of the lead in favour of the shallow terrace ground to the east. In 1978, Amdex acquired the ground and continued shallow mining, exploration and evaluation until operations ceased in the early 1980s.

The drill data used in the recalculation of resources by Niugini Resources (**Kinnane, November, 2003**) was generated by the Mines Department (1958, 1968-69), by the Endurance Tin Mining Company (1943) and by BMI (1971-72) and is an upgrade of the Amdex estimate (1980).

The current resource base is considered to be-

A measured resource of 1,643,359 cu m at an average of 983.72 g/cu m of 70% Sn concentrate (1,611 tonnes of 70% Sn concentrate)

Prospective resources are 2,394,134 cu m at an average of 978.63 g/cu m of 70% Sn concentrate (2,343 tonnes of 70% Sn concentrate) to the west and along the northern and southern flanks of the deposit.

Mainly barren overburden could be removed at a ratio of 4.6 to 1.

The ore resource summary and drill hole results are reproduced in the Appendix to this report. The ore reserve outline is summarized on Plan 8.

Information on accessory minerals in the tin bearing alluvials elsewhere on the Gt Northern Plains suggest accessory minerals might have the following average grades- Au from 0.010 to 0.030 g/ cu m; gem sapphire at 2 g/cu m; Ta as tantalite at 1.50 g/cu m and zircon and rutile at an average combined grade of 200g/ cu m.

Lithological details of the tin-bearing alluvials are not well known. Descriptions from the drilling logs suggest the cassiterite is in granite-derived, basal, coarse sand and gravels on a granite basement (Standard, 1973). The Endurance deposit occupies a narrow gutter along the southern face of Mt Cameron but mostly separated from the main South Mt Cameron basin by a granite ridge. The alluvial deposits appear derived from streams shedding southwards from the Mt Cameron massif (Plans 5 and 6). Whether there is any contribution from the ancestral Ringarooma River is not completely clear. Microflora fossil evidence shows that the sediments of the tin deposit are of Early Miocene age.

A long section of the Endurance lead shows a shallow, west sloping bottom with the cassiterite-bearing sediments thickening with higher grades across a Tertiary fault in a narrowing palaeovalley immediately downstream of the fault.

The mineralisation appears open to the west beyond the current tenements and these areas would be prospective for additions to the resource base as well as on the northern and southern edges of the deposit where there is insufficient drilling (Plans 5 and 6).

6.1 Mining Strategy and Feasibility

As with the Monarch deposit, access and mining logistics are excellent at the Endurance deposit with water supplies in the old open cut at Blue Lake (3,000 megalitres) and top up water from the Ringarooma River and mains electricity following the sealed road from Pioneer to Gladstone township some 8km to the north. The site logistics have been described by Kinnane (November, 2003) covering access, water supply, power, communications, staff accommodation and treatment plant site (Plan 7).

On the above resource figures and taking the current price of tin metal to be \$A 7,465 (LME 19th November 2003) per tonne the insitu value of the Endurance deposit would be about \$A 8,400,000 making no allowance for the accessory minerals or sapphires.

The details of the operating costs, the mining methods and the environmental considerations are as described for Monarch deposit and will not be repeated here. The 4 sq km Retention Licence is also required for the same reasons of advanced economic assesment, studies of mining and processing techniques, environmental considerations including revegetated areas and marketing in a rising metal price regime.

7.0 PIONEER – EL 12/2000

Tin was discovered in the Pioneer district by William Bradshaw in 1877 where the present Ringarooma River cut and reworked the Pioneer lead.

A company was formed in 1882 to work the shallow deposits but was not successful and Chinese miners worked on tribute until the late 1890s when their efforts revealed the rich Pioneer deep lead to the west.

The Pioneer Tin Mining Company was restarted in 1900 and carried out the main production of tin concentrates with hydroelectrification from 1909 until 1929 when the workings were inundated by the Great Ringarooma Flood. In that period, 9,360 tonnes of tin concentrates were developed from nearly 11 million cu m of wash.

From 1930-46, tributers worked the mine for Endurance Tin Mining Company who had bought out the Pioneer Company and moved most of the plant to their South Mt Cameron Mine eventually abandoning the Pioneer leases.

In 1967 to 1976, Vern Woods worked the Pioneer Mine initially with sluice boxes and then with a modern jig plant. The Pioneer operations were then acquired by Triako and Buka operating as Kibuka Mines and their associate Amdex Mining continued mining the lead westwards.

Total production from the Pioneer Lead up to that time stands at 10,554 tonnes of tin concentrates. The operations ceased in late 1979 following the collapse of the world tin price and the introduction of production quotas. However, before closing the mine, Amdex had carried out an extensive drilling program mainly on the western and southern flanks of the open pit and it is this valuable program which has allowed the recent reassessment of the residual tin resources by **Kinnane (December, 2002 and September, 2003)**.

The recalculated resource by eliminating the overburden is considered to be-

A measured mineral resource at 100 g/ cu m cut off of 5,513,000 cu m at a grade of 859.96 g/ cu m SnO₂ at 70% Sn to give 4,740 tonnes of SnO₂ concentrates with a stripping ratio of 4.6:1, and

A measured resource at 200g/cu m cut off of 3,186,040 cu m at a grade of 1,164.82 g/cu m of 70% Sn concentrate containing 3,711 tonnes of 70% Sn concentrates with a stripping ratio of 6.2:1.

A summary of the ore resource data and the drill log recalculation sheets are reproduced in the Appendix to this report. The ore reserve outline is summarized in Plan 11.

This has effectively increased the amount of tin concentrates in the resource by a factor of 2 to about 3,700 tonnes.

Possible resource extensions occur both within the current tenement outlines and also outside to the west and down palaeoslope towards the centre of the South Mt

Cameron basin (Plans 9 and 10). These extensions have the potential to contain 3.5M cu m at an average grade of 1,000g/cu m of SnO₂ or some 3,500 tonnes of SnO₂ concentrates.

The Pioneer alluvial tin deposits are the best documented in the northeast because of the geological work and research by Morrison (1980) carried out shortly after the end of mining operations when the pits were still fresh, free from vegetation regrowth and unflooded.

The Tertiary stratigraphy of the deposit revealed in the open cut consisted of two sequences-

- the lower, 6m thick cassiterite-bearing sequence of stratified gravels, tabular cross-bedded sands and gravels, trough-cross bedded granules, and lenticular bodies of peat and clay,
- and an upper (overburden) sequence, some 30-40m thick of trough cross-bedded sands and granules and large bodies of kaolinite clay.

Reconstruction of the basement topography from the drilling in the mine area reveals a channel trending north west down palaeoslope. The best cassiterite grades are restricted to this channel and the deposit appears to terminate at its downstream margin although the coarse basal gravels are said to persist.

The geological setting is interpreted as a proximal, braided stream depositional environment with the heavy minerals concentrated in longitudinal bar, transverse bar and channel facies. Most of the heavy mineral deposition is thought to have taken place during the initial stages of waning flow after flooding. The clasts in the basal gravels are cleaved sandstone (63%), quartzite (23%), vein quartz (5%), massive sandstone (4%), clay (2%), shale (2%), wacke (0.5%) and conglomerate (0.5%). The source of the sediments was to the east of Pioneer. The origin of the cassiterite is thought to be greisen mineralisation such as present in the Anchor Mine.

The age of the deposit is quite well constrained with pollen from peat units, as lateral facies equivalents of the tin-bearing gravels, being shown to be Late Oligocene- Early Miocene or about 20 M years (plus or minus 5 M). Both the pollens and leaves indicate a temperate rain forest environment. Wood fragments, partially lignitised, are preserved in the gravels adjacent to the peat deposits.

Morrison (1989) went on to classify the major alluvial tin deposits of the Ringarooma Valley- the Arba, Valley, Briseis, Pioneer and Endurance as late Oligocene braidplain deposits. Earlier deposits occupying narrow, sinuous channels north and west of Mt Cameron (Scotia, Lochaber and Scoloch?) were probably older (Eocene) and terrace deposits of the present Ringarooma and Great Musselroe Rivers were probably younger at post-middle Miocene.

7.1 Mining Strategy and Feasibility

Infrastructure and access such as sealed roads, power and water are excellent with the deposit lying adjacent to Pioneer Township. The resources and infrastructure are

shown on Plan 10 from Kinnane, December 2002. Some facilities such as a shed and remnant stockpiles are present close to the township but a new mining operation would require a new plant site within the present tenement outlines and removed from the dwellings to minimize noise and dust and other adverse impact on the community. Alternatively, processing could be carried out at another site central to the other deposits at Monarch or Endurance.

On the above resource figures and taking the current price of tin metal to be \$A 7,465 (LME 19th November 2003) per tonne the insitu value of the Pioneer deposit would be about \$A19,400,000 making no allowance for the accessory minerals or sapphires. These accessory minerals have been partially quantified in other deposits in the region of similar geological derivation and could be present in grades such as 50-200g/cu m for rutile, ilmenite and zircon; up to 10mg/cu m for gold, and rare earths and Ta minerals in the order of 100-200g/cu m and 1-2g/cu m respectively. Sapphire is known from the deposit, is present in the tin shed tailings and grades of up to 1-5g/cu m of gem quality stone are predicted. Some work still has to be completed to fully value the resource.

The details of the operating costs, the mining methods and the environmental considerations are as described for Monarch deposit and will not be repeated here. The 4 sq km Retention Licence is also required for the same reasons of advanced economic assessment, studies of mining and processing techniques, environmental considerations including revegetated areas and marketing in a rising metal price regime. It will be necessary to come to an accommodation with RNB Trading Pty Ltd who hold Retention Licence 1/1995 for construction materials covering part of the Pioneer deposit.

8.0 OUTLOOK

The LME price graph for refined tin metal (Plan 13) shows that the tin price is on an upward cycle from about US\$4600/tonne in March 2003 (although it has been rising since August 2002) to about US\$5,350/tonne at end November 2003.

This is higher than forecasts by CRU International in the Mining Journal (June 13th, 2003) that tin prices were at a two-year high and would be at an average of US\$4,750 by end of 2003 and increase to US\$6,000/tonne in 2004.

Meanwhile, tin stockpiles at the LME have decreased to only 15,175 tonnes (19th November) or 6% of world production of 261,000 per annum.

The key to the rising tin price is that Asia now accounts for more than 50% of world demand and that China has displaced the US as the world's largest consumer. Asia also dominates the production having three of the top five producers contributing 40% or 102,000 tonnes of tin in concentrates. Four of the top five smelters and refiners are also in Asia giving 45% (237,000t) of refined tin output.

However, CRU have also forecast a 50% decline in refined tin production from Asian smelters this year. Both the Malaysian and Thai smelters have a shortage of tin concentrate feed due to a move by Indonesian authorities against illegal tin miners

and the consequent banning of exports of concentrates. Indonesia with limited smelter capacity cannot take up the shortfall in refined tin. The prognosis is that the tin market will have 11,990t deficit in 2003 and will move to a 16,000t deficit in 2004.

This has prompted Malaysian Smelter Corporation to take a 30% equity in Marlborough Resources based on their Ardlethen tin deposit in New South Wales and enter into talks with Mineral Holdings and Hanbury Ltd to secure alluvial cassiterite from NE Tasmania.

9.0 CONCLUSIONS

9.1 Exploration and evaluation by Mineral Holdings of three previously mined alluvial tin deposits in the middle Ringarooma River Valley over the period 2000-03 have recalculated and redefined the residual resources.

9.2 The resources of alluvial tin wash in the deposits are-

**Monarch 556,751BCM at 1,220.00g/BCM of 70% Sn concentrate for
679 tonnes of 70% Sn in concentrates
Indicated Mineral Resource**

**Endurance 1,643,359BCM at 983.72g/BCM of 70% Sn concentrate for
1611 tonnes of 70% Sn in concentrates
Measured Mineral Resource**

**Pioneer 3,186,040BCM at 1,164.82g/BCM of 70% Sn concentrate
for 3711 tonnes of 70% Sn in concentrates
Measured Mineral Resource**

9.3 Accessory heavy mineral and gem contents have only partly been quantified in some deposits and remain to be measured and are expected to add significantly to the value of the alluvial wash. They include rutile, ilmenite, zircon, gold, monazite, tantalite and sapphires.

9.4 Recent studies have indicated that modern mining techniques involving pre-stripping the barren overburden will increase the yield of tin concentrates from all deposits. These studies also cover operational and mining methods and environmental considerations. The access and infrastructure to those deposits are generally considered to be advantageous.

9.5 On the basis of the re-evaluated resources and preliminary economic studies fully documented in numerous project reports, Mineral Holdings Australia Pty Ltd applied on 13th November 2003 for a retention licence of 4 sq km to cover each deposit at Monarch, Endurance and Pioneer, such area to cover the defined resources, the potential satellite deposits on the margins and the potential mining and processing plant sites. The retention licences will allow time to carry out the further evaluation, engineering and marketing studies required to construct a pre-feasibility report which must precede the application for mining leases and to allow the tin price to firm as anticipated by financial analysts with the looming global shortage of tin concentrates.

9.6 The alluvial resources are an integral part of the Ringarooma Project of Mineral Holdings which seeks to explore and develop the cassiterite and associated heavy mineral and sapphire placer deposits of the Ringarooma River Basin including the Great Northern Plains and offshore. The relatively well-defined deposits at Monarch, Endurance and Pioneer as well as Scotia offer the best potential for the first production of tin concentrates in a phased mining operation in NE Tasmania. The project which has the potential to yield a resource base of up to 100,000 tonnes of cassiterite concentrates is currently optioned to Hanbury Pty Ltd of Sydney.

10.0 REFERENCES

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