208001

ZEPHYR MINERALS N.L.

(Incorporated in Western Australia)

A.C.N. 008 894 442

95-3703

PRE FEASIBILITY REVIEW,

RINGAROOMA ALLUVIAL TIN PROJECT

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DATE: 31/1/95

AMG REFERENCE POINTS ADDED

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EXECUTIVE SUMMARY

PROJECT SUMMARY:

The Project comprises two alluvial tin properties awaiting development, one onshore and one offshore in the Ringarooma River district near Gladstone in north east Tasmania. The location is 400 km south east of Melbourne across Bass Strait.

Onshore there is an Indicated Resource of 109 Million cu.m at 64 g tin /cu.m. At a realised price of AUD $7.00/kg tin, the contained tin and accessory heavy minerals would have a bulk value of $52 million. The bulk resource contains 18.6 M cu.m at 137 g/cu.m in higher grade blocks that are targets for backhoe mining.

Offshore there is an Indicated Resource of 16 M cu.m at 227 g/cu.m within an Inferred Resource of 130 Million cu.m. of potential tin wash. If a tenor of 200 g/cu.m is maintained in the inferred material the bulk value of the contained tin and other heavy minerals would be $195 million. This material is prospective for a large scale dredging operation and is augmented by an additional inferred 60 M cu.m of potential tin bearing wash lying within 0.5 km of the tenements.

TENURE:

Onshore:

Retention Licence 8715 of 6 sq km.
Retention Licence 8723 of 7 sq km.

Offshore:

Exploration Licence Application ELA 19/93 over 20 sq km of State waters.
Exploration Licence Application TI/MEL over 27 sq km of Commonwealth waters.

OWNERSHIP:

50% : Zephyr Minerals N.L., Manager
50% : Mineral Holdings Australia Pty Ltd

PREVIOUS ACTIVITY:

Onshore

Historically, 40,000 t of tin concentrates have been produced from the entire Ringarooma River alluvials. 4000 t concentrates plus 24.8 kg gold were produced locally.

An estimated 7400 m of drilling has been completed around the tenements by 7 parties since 1940. The cost of the drilling and other studies is estimated to be well over $1 million at today's values.

Offshore

Three parties completed geophysics and 930 m of drilling in 148 holes from 1966 to 1982.

Expenditure was $1,280,000 to 1982, and would cost an estimated $2.5 million today.

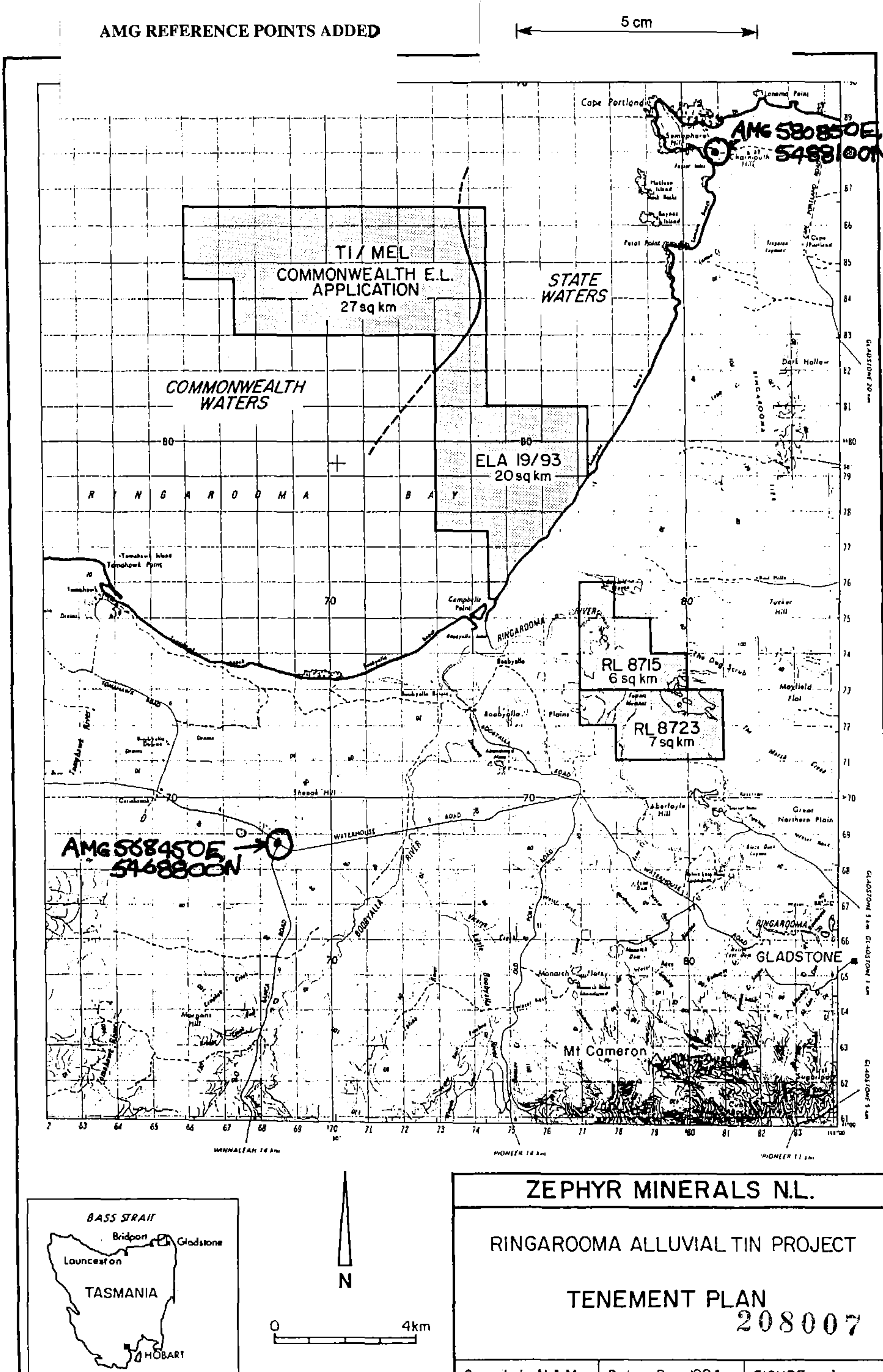
MINING OPTIONS:

1. Backhoe Mining with a floating wash plant in the onshore resource, at a rate of 100 cu m/hr.
2. Exploration and remodelling of the offshore resource with a view to large scale dredging at say 8 - 10 M cu.m /yr.
3. Development of onshore kaolin extraction or remnant mining in the medium term, and possibly dredging later.

RECOMMENDATIONS:

1. Carry out magnetometry and confirmatory drilling to prove up reserves for backhoe mining.
   Estimated Cost: A $150,000.
2. Commence backhoe mining.
   Estimated Cost: A $1,000,000.
3. Complete a program of offshore geophysics, resource modelling and scout drilling.
   Estimated Cost: A $300,000.
4. Pattern drilling offshore, 300 holes to a density of 1 per 6 ha.
   Estimated cost: A $1,200,000.

AMG REFERENCE POINTS ADDED



ZEPHYR MINERALS N.L.

RINGAROOMA ALLUVIAL TIN PROJECT

TENEMENT PLAN

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Compiled : N.A.M.	Date : Dec. 1994	FIGURE 1

1.0 INTRODUCTION

Zephyr Minerals N L is earning a 50% interest in a package of onshore and offshore alluvial tin properties based on the Ringarooma River in north east Tasmania, in a joint venture with Mineral Holdings Australia Pty Ltd, (MHA).

The area is a well known alluvial tin province which has produced 40 000 t of tin since discovery in the 1870's, from mines such as the Briseis, Arba, Pioneer, Endurance, and many others.

The package represents an unusual consolidation of tenure and offers opportunities for the development of two large properties for which considerable previous exploration data is available.

This report records key data about the properties and proposes methods and parameters for further development.

2.0 LOCATION AND TENURE

2.1 LOCATION (FIGURE 1)

The onshore property lies on the Great Northern Plains 10 km north west of Gladstone, a township 130 km by road from Launceston. Launceston is 204 km north of the State capital Hobart, and is regularly serviced by one hour flights air from Melbourne, 400 km to the north west.

The offshore property commences at the coastline 2 km north of the onshore area and extends 12 km offshore in Ringarooma Bay between Cape Portland and Tomahawk.

2.2 TENURE

2.2.1 Onshore

Tenure comprises 13 sq km in two Retention Licences, RL 8715 and RL 8723, of 6 and 7 sq km respectively, in the name of Mineral Holdings Australia Pty Ltd, (MHA).

A Retention Licence allows prospected ground to be held unmined pending economic or technical developments that would justify mining, and secures priority for mining.

There is a right of access onto the land for exploration subject to three days' notice to the landowner. Any further field work would require approval of a work program. This is submitted through Mines Department to an interdepartmental committee that represents the various statutory interests in, and values of, the land. Approval normally takes no more than three weeks.

To commence mining requires the grant of a Mining Lease from the State Mines Department, formal approvals from the Department of Environment and Land Management and the local Council, and the lodgement of a Rehabilitation Bond.

The tenements lie on a known wetland and have two small areas of land reserves at the northwest and southeast extremities of the tenements. These are not seen as impediments to the approval of properly prepared applications to the above authorities that recognise the relevant values.

Environmental investigations will be required for this in due course.

No aboriginal Mabo land claims are known of or expected in future.

2.2.2 Offshore

Tenure offshore consists of an exploration Licence application lodged in May 1994 in the name of Mineral Holdings Australia Pty Ltd but not yet granted. This comprises two parcels, of approximately 20 sq km in State waters recorded as ELA 19/93, and of approximately 27 sq km in adjoining Commonwealth waters recorded as TI/MEL.

2.3. ONSHORE TERRAIN

The tenements lie largely east of the Ringarooma River in meandering river bed, flood plain, tributaries and marsh land up to 5 m above sea level. The largest and most central marsh is Fosters Marshes, a name often used to identify the general area.

Higher ground appears on the borders of the leases; dunes in the far north, and preserved dunes and dissected terraces in the north east, east and south. To the west across the River, the land continues through lowlands then on to the Boobyalla Plain.

The climate is pleasantly warm and temperate but, monthly average rainfall is 50 mm and flooding may occur in winter. On a visit in late October much of the land was dry and in pasture, and mobility by four wheel drive was excellent.

The current land use is cattle and sheep grazing on the rich soils of the alluvial flats. Waterfowl breed in the wet land areas.

3.0 PREVIOUS WORK

3.1 PREVIOUS ACTIVITY ONSHORE

3.1.1 Historical Mining

Alluvial tin was discovered in the district in the 1870's and a large number of small workings operated up till the 1920's. These were generally sluicing or hydraulic mines which reached depths of 15 m or less.

Dredges also operated on the river, the first one in 1905. They recovered gold as well as tin, (visible gold occurs in a quartz reef near Gladstone) but no production data survives.

Workings relevant to the tenements followed three deep lead systems as follows:

(i) Scotia and Lochaber: these combined into the Scoloch Lead a few kilometres south east of the study area;

(ii) The McGregor Lead: McGregors, Taylors, Canary, Black Duck, Beltz, and others, occurring southeast wards of and to within 500m of the tenements.

(iii) Aberfoyle Lead: due south of the tenements, west of the McGregor group and likely to have joined the McGregor Lead before the tenements.

The Delta workings close to the south west corner of the tenements are probably on some part of the McGregor Lead. Further west on the Boobyalla Plain were the Dugard and Monarch mines.

High grade remnants remain in some of the old workings near the tenements. They were sampled by Portland Holdings Ltd, a forerunner of MHA, and could possibly be recovered by backhoe.

3.1.2 The Dorset Dredge

Between 1964 and 1971 the Dorset Tin Division of Storey's Creek Mining N L worked the river flats from Aberfoyle to McGregors with a bucket dredge which had a digging depth of 15.2 m.

Output totalled 672 t of 75% Sn concentrate from 8 M cu.m (Million cubic metres) dredged, for a recovered grade of 70 g tin metal/cu.m (Neale, 1980).

The dredge also recovered 24.8 kg of gold, or 3mg/cu.m.

The reasons for closure were low grades at a time of low prices, and the unavailability of a dredge path to better ground in Fosters Marshes.

3.1.3 Tin Production

Recorded output of tin concentrate is 1188 t for Scotia, 762 t for the Dorset dredge, and 300 t for Monarch (Neale, 1980). Allowing 500 t for Lochaber, near Scotia; 100 t for each of 12 other known workings; and 50 t for any previous dredges on the river; the estimated total is 4,000 t of concentrates.

3.1.4 Onshore Drilling Before Hellyer

From the 1930's onwards many companies were active in or near the tenements but none of the campaigns until Hellyer Mining and Exploration Pty Ltd (Hellyer) in 1982 systematically covered the present leases. At that time, Hellyer was a subsidiary of SANTOS.

All known boreholes within the tenements are shown on Figure 2. The data has come mainly from reports by Braithwaite, 1975, Preussag Australia P/L, 1978 and 1979; and Hellyer, 1983. Hence the older data is secondary, and there is some uncertainty in the borehole positions.

All grades are in grams Tin Metal per cubic metre, shown as g/cu.m. Cassiterite grades have been converted at 70% Sn.

<u>1930's: Austral Malay Tin:</u> scout drilling for dredging;

<u>1930/40's?: Delta Tin Mines</u>: 591 m in 33 holes in south Fosters Marshes - Delta area. Obtained an average tin wash grade of 290 g/cu.m;

<u>1956-58 approx (1967?): Dorset Tin Dredging</u> (a Commonwealth Co. and owner of the dredge at this time): 575 m in 37 holes broadly on an 800 m x 400 m grid, using a 400 mm bulk hole rig. Derived a resource of 45 M cu.m at 55 g/cu.m, and a tin wash grade of 250 g/cu.m;

<u>1958: Rio Tinto Australia Exploration</u>: found the Scoloch Lead crossing the east of the RLs but it was weak in trend and grade;

<u>1967: Dept of Mines:</u> much drilling throughout the region. Proved Braithwaites area with 737 m in 49 holes on a 180 x 150 m grid, 6.2 M cu.m at 95 g/cu.m.

<u>1966: Utah:</u> 100 auger holes and 27 churn holes, east and west of the RLs. Mostly barren or low grade and thus delineate the broad limits of the main wash;

<u>1972: WANEX:</u> 1244 m in 124 holes on an 83 m square grid. These were mostly in McGregors, looking for ground for the Dorset dredge. They obtained 1.5 M cu.m at 135 g/cu.m. (later assessments derived larger volumes at lower grades).

The drilling showed a 200 m wide channel trending towards the present tenements. Many holes were unbottomed because they were drilled for the 15.2 m depth of the dredge; holes below 6 m averaged 52 g/cu.m while those deeper than 6 m averaged 187 g/cu.m.

<u>1978 Preussag Australia Pty Ltd 1978:</u> 470 m in 23 reverse circulation holes in the Fosters Marshes-Chimneys area. Grades were comparable to Dorset Tin, i.e. 55 g/cu.m.

3.1.5 Hellyer Mining and Exploration Pty Ltd, 1981 - 82

Between 1981 and 1982, Hellyer completed 3263 m in 155 churn drill holes. Lines were 200 m apart with holes 100 or 200 m apart, as seen in Figure 2. Eight Calweld 760 mm bulk sample holes were also sunk.

This body of work is a considerable achievement. Nevertheless some comments should be made regarding its interpretation. (Presentation and discussion of the actual results follows in the next chapter.)

(i) Drilling

Definite geological cut offs were frequently not reached to east or west in Lines 5 to 13.

More importantly, four consecutive holes in line BL 5; three in BL 9; and certain others stopped in tin wash. Boulders were reported.

There is only sparse coverage around Line 3. This is in the richest part of the deposit and the sparseness is hard to understand unless difficult ground prevailed.

There is no drilling between Fosters and Braithwaites north east of The Chimneys, but this is a deep swamp.

(ii) Grades

Hellyer appear to have used measured volume for calculating grades. Many volume recoveries were below 60%, which raises some uncertainty, particularly because many of the richest intersections also had low recoveries.

However, the grades of the payzone reported for the Delta and Dorset drilling, 290 and 250 g/cu.m respectively, compare more than favourably with 205 g/cu.m calculated from Hellyer results in the present study.

The sample intervals and bottom depths in the Calweld check bores mostly differed from those in the original bores. Any comparisons are thus not conclusive.

A set of duplicate assays returned tin values 28% higher than the original samples.

3.1.6 Summary of Previous Onshore Drilling

The Hellyer program increased the basic resource from 50 M cu.m (Dorset Tin plus Braithwaites) to nearly 110 M cu.m. The tenor of 55 g/cu.m from the earlier drilling remained comparable with the bulk grade of 64 g/cu.m from Hellyer and Braithwaites drilling.

The queries regarding Hellyer's coverage and methods provide scope for increases in both volume and grade by additional drilling and attention to sampling and assays.

Resolving the question of the 200 m wide channel from WANEX' McGregors drilling, with unbottomed grades of 150 - 190 g/cu.m, might lead to an increased resource in the southern /Delta part of the licence and further south.

There is scope for recoverable remnants in the old workings using backhoe mining to reach material outside the hydraulic gradients that limited the historical methods.

3.2 PREVIOUS ACTIVITY, OFFSHORE

3.2.1 Tasmanian Offshore Exploration Company

Following a regional offshore bathymetric, seismic, and sampling program in 1966, TOEC (Tasmanian Offshore Exploration Company) a consortium led by Ocean Mining A G of Germany, drilled 138 holes in Ringarooma Bay in 1967 and 1968. This utilised a drill ship capable of drilling 30 m holes in 60 m of water.

Average borehole length was 6 m and the maximum 12 m. Water depth was up to 33 m of water.

This work outlined an offshore palaeochannel and defined a resource containing 23 M cu.m of sediments with a grade of 150 g/cu.m.

3.2.2 Utah Development Corporation

Utah together with BHP completed 15 holes to 18 m water depth up to 4.3 km offshore in 1968. Average hole depth was 8.7m. The best two holes were within 600m of shore and averaged 50 to 85 g/cu.m.

3.2.3 Hellyer Mining and Exploration Pty Ltd

During 1981 and 1982, Hellyer, using Hydrosets Ltd, completed a program of bathymetric, seismic and magnetic work, and a comprehensive reinterpretation of the TOEC data.

This confirmed the existence of a main river palaeochannel and revealed other prospective structures. Drilling was delayed by lack of equipment, and Hellyer subsequently changed priorities and withdrew.

3.2.4 CRAE Pty Ltd

CRAE (Conzinc Riotinto of Australia Exploration Pty Ltd) took tenure over available areas in 1983. They interpreted the identified resource to range from 21 M cu.m at 175 g/cu.m to 14 M cu.m at 200 g/cu.m depending on the area of influence assigned to the TOEC samples.

Together with an onshore review they concluded the potential was too small for their requirements.

3.3 PREVIOUS EXPENDITURE

3.3.1 Onshore

Hellyer reported $450,000 expenditure for 1981-82 in relation to 3263 m of drilling.

Given total recorded drilling of 7383 m by all parties, expenditure on drilling and evaluation onshore is estimated to be well over $1 million at 1982 prices, and *would cost much more than that today.*

3.3.2 Offshore Exploration Expenditure

TOEC offshore expenditure for a 138 hole campaign amounted to "approximately US $500,000" in 1967, which would convert to at least AUD$1 million at the then *exchange rate. Please note that all money in this report is in Australian dollars* unless otherwise identified.

The cost of the Utah programme was $203,000.

Hellyer's costs in 1981-82, which did not include any drilling, totalled $79,000.

Total expenditure offshore amounts to $1,282,000. The same work would cost well over $2 million today.

4.0 GEOLOGY

4.1 REGIONAL

The primary tin is hosted by Silurian - Devonian shales and quartzites known as the Mathinna Beds. These are intruded by Late Devonian granites with accompanying quartz - cassiterite veins and greisens.

A Jurassic dolerite, the Ringarooma Tier, outcrops in the east of the district, and in weathered clay form, occurs widely as bottom in mining areas.

Early Tertiary down faulting formed a coastal sedimentary basin bounded by the granites and the dolerite inland, and open to the coast and the west.

In the Tertiary, valleys and river channels were cut into the basement with the formation of stanniferous deep leads.

This was followed in the later Tertiary by land subsidence and marine transgression, and the burial of the deep leads by lake, estuary, and finally marine sediments. Peak subsidence basalts flowed.

In Post Basalt/Latest Tertiary/Quaternary time the land re-emerged, with stripping and reworking of the previously buried sediments, derivation of new tin concentrations, and development of the present course of the Ringarooma River.

4.2 ONSHORE GEOLOGY

4.2.1 Quaternary Palaeoenvironment

Somewhere between McGregors and Fosters Marshes the distinct McGregor and Scoloch terrestrial - fluviatile leads merge into a wide blanket of stanniferous wash.

The blanket wash occupies a river like channel 0.7 km to more than 1.7 km wide that heads north north west through Bowlers Lagoon to the coast. It then continues offshore in what is interpreted as the palaeochannel of the Ringarooma River.

The sediments overlying the blanket or sheet wash dominantly represents deposition and reworking in estuarine, shore line and marine environments, reflecting the progress of the marine transgression and regression.

4.2.2 Local Geology and Tin Concentrations

(i) Bottom

Bottom may consist of weathered forms of any of the older rock types but often consists of clayey dolerite or a grey-green clay ("marine bottom") commonly containing weathered pebbles.

Carbonaceous material in Braithwaites' bottom was dated as Quaternary.

Overall it is a good smooth bottom for dredging but drillers encountered occasional difficulties with boulders.

(ii) Basal Tin Bearing Horizon

Cassiterite in economically interesting amounts occurs dominantly in a single widespread basal sheet of shingle gravel (or "wash"), the blanket wash already referred to. Refer to the selected cross sections in Figure 3.

The sheet laps against dolerite in the east, and tends to lens out or hit bedrock westwards near the Ringarooma River. Its bottom slopes from 12 - 15 m below sea level near Braithwaites to 18 - 20 m below sea level near Bowlers Lagoon. The bottom is regular, although in any section there is often a small richer gutter.

Grades are extremely erratic and locally, horizons are lenticular. No large scale grade trends are evident.

The cassiterite itself is fine with approximately 10% passing 100 micron. Metallurgical tests indicate no major problems with recovery, though spirals may be needed as well as jigs.

(iii) Overburden

The overburden averages 14.5 m thick (maximum 26 m) and contains at most 5% of the tin occurring in the sheet wash.

The sediments largely comprise estuarine or marine sands and silts, with some significant thicknesses of clays or clayey sediments. Some peat and hard pans are also found.

Locally, a tin wash may occur perched above the basal sheet as a result of reworking from deeper horizons as the land re emerged from its marine inundation.

The Braithwaites block which rises above sea level, may be of this type but it also has deep lying levels. Its exact provenance is unclear.

4.2.3 Onshore Mineability

The deposit is well suited to dredging and the virtually barren overburden lends itself to pre stripping and thus a smaller cheaper dredge.

The nature of the deposit is also suitable for mining by hydraulic excavator/floating wash plant.

Both approaches depend on the cheap removal of overburden, which can include clay rich horizons. This could be a problem in some areas as shown by clays at the Endurance mine 20 km away which prevented low cost earthmoving equipment being used for stripping.

Water management will be important given the high rainfall and risk of flooding in winter.

4.3 OFFSHORE GEOLOGY

4.3.1 Tin Concentrations

The sea bed sediments are similar to those onshore.

However, the tin wash commonly lies directly on the seabed or with less than 2 m of cover.

Less frequently, tin wash occurs under up to 10 m of cover. However, much of this may due to overdrilling by TOEC in consequence of a failure to distinguish weathered and fresh basement, in seismic or drilling. Using what may have been a small rotary oil rig, TOEC state that they "drilled to refusal".

Bedrock is largely metasediment of the Mathinna Beds, with some inferred dolerite in the east.

The best grades are in medium to coarse sands to fine gravels, often with well rounded granules or pebbles to 75 mm diameter. Many of the richest intersections are underlain by a sticky silt/clay bottom. This may correspond to the onshore "Marine Bottom" or may be a false bottom.

In comparison with most alluvials where the grade decreases away from source, the tenor of the offshore tin wash, of 150 to 250g/cu.m, is not significantly different from the onshore sheet wash.

This could be due to three factors:

- Granite outcrops on the western shore of Ringarooma Bay may be part of a proximal source for fresh tin;
- Sub sea stripping of the overburden from the wash thus minimising dilution of bulk grades;
- Enrichment mechanisms specific to the subsea environment.

4.3.2 Bathymetry and Sea Bed Structure

The seabed slopes relatively steeply from shore to 15 m depth in a nearshore sediment wedge. A fossil wedge is inferred offshore of this. These are shown on Figure 8 as Area 2.

The sea bed then flattens off and plateaus at 25 to 30 m depth throughout most of the tenements (Figure 7) and deepens to beyond 35 m in the far north west. Sand waves are inferred also.

Structures in the sea bed comprise a central linear trend, interpreted as the palaeochannel of the Ringarooma River; a central plateau; and channelling off the plateau to the north, and to the north west.

Outlines are shown on Figure 8.

Between Tomahawk and the tenements is a sediment filled basin with a tin wash horizon that is too deep for economic interest. From the tenements to Cape Portland is gently sloping barren sea bed.

4.4 ACCESSORY MINERALS

4.4.1 Heavy Minerals

Gold and heavy minerals occur with the cassiterite. Fine sapphire is common but no recovery of gem pieces has been reported.

<u>Gold</u>

Gold is frequently noted in panning logs and the Dorset dredge recovered 3 mg/cu.m, worth approximately 5c/cu.m at current prices. A composited sample from one onshore drill hole assayed 6 mg/cu.m.

Rutile and Zircon

The same onshore composited sample indicated 8.75 g/cu.m rutile and 62.5 g/cu.m zircon. Offshore, TOEC assayed every sample for rutile and zircon as well as tin; averages were 55 and 110 g/cu.m respectively.

Ilmenite

Ilmenite is common in the panning logs but was not quantified in onshore mineral dressing tests. TOEC rated it of similar frequency to zircon offshore, say 110g/cu.m, but chromiferous, with an assay of 40.8% TiO_2 and 0.09% Cr_2O_3.

An onshore grab sample returned 50.04% TiO_2 and 0.58% Cr_2O_3.

These chrome levels are now acceptable for the newer ilmenite upgrading processes.

Monazite

Monazite is present on and offshore but remains unquantified. The Endurance mine sold 34t in 1943 but the mode of production is unknown.

Value of Heavy Minerals

At current prices the net value of the accessory heavy minerals onshore or offshore is 10c/cu.m of wash.

Onshore, the overburden dilutes this to a minor value on a per cubic metre basis. Offshore there is less overburden and the heavy minerals could make an immediate contribution to income.

In any future sampling all heavy minerals should be assessed properly: onshore and offshore. Prices are rising from their recent trough and may better assist project viability in future.

4.4.2 Kaolinite

Kaolinite was obtained from the bottom in Preussag Hole 6, at the end of line BT 1 in Braithwaites. The sample contained approximately 80% kaolinite and 20% diatomite.

Australian Pulp and Paper Mills Ltd regarded the material as suitable for a coating clay. They are a potential market because their kaolin clay plant in north east Tasmania is believed to have low reserves.

In 1984/85 CRAE Pty Ltd entered a joint venture with MHA to investigate the occurrence but withdrew before commencing field work because deposits were discovered on their Weipa leases.

5.0 RESOURCE ASSESSMENTS

5.1 *ONSHORE RESOURCE ESTIMATES*

A low cut off grade of 30 g/cu.m bulk (equivalent to 100 g/cu.m in the wash) was used to analyse the continuity of the resource for dredging.

This delineated two blocks named in Figure 2 as Fosters and Braithwaites. Boundaries are irregular and do not reflect geological trends, due to the empirical grade cut off which itself was frequently not reached laterally.

Estimates are rated as an Indicated Resource in terms of the AusIMM Code.

5.1.1 Bulk Resource Estimates

The estimated total resource is 109 M cu.m. at a grade of 64.0 g/cu.m. Details are shown in Table 1.

(i) Fosters

The Fosters resource contains an estimated 97 M cu.m of wash plus overburden, at a grade of 61.1 g/cu.m.

Excluding Delta, because it results from historical drilling without the wash-overburden split, the average grade of the tin wash is 205 g/cu.m. Average wash thickness is 6.1 m, and the maximum is 16 m.

Average overburden thickness is 14.5 m while the total deposit averages 20.6 m thick at an overburden ratio of 2.4:1.

The geometry of the resource is shown in the cross sections in Figure 3.

(ii) Braithwaites

The two Braithwaites blocks total 11.5 M cu.m at 88.4 g/cu.m.

TABLE 1

RESOURCE ESTIMATES, 30 G/CU.M CUT OFF

ITEM	THICKNESS m	VOLUME M cu.m	GRADE g/cu.m
Fosters Main	20.1	77.0	61.0
Delta Zone	16.3	20.1	61.4
Fosters Total	**19.5**	**97.1**	**61.1**
Braithwaites Main	14.2	10.0	86.4
Braithwaites Sub	15.4	1.5	101.6
Braithwaites Total	**14.3**	**11.5**	**88.4**
GRAND TOTAL	**18.8**	**108.6**	**64.0**

At higher cut off grades, the continuity and volume of the resource shrinks, as shown in Table 2.

At 60 g/cu.m cut off, the resource totals 43 M cu.m at 97 g/cu.m. The Fosters block becomes one main sinuous block, and Delta and another irregular block are then separate. Braithwaites (Sub) becomes sub-economic.

At 90 g/cu.m cut off, the total volume is 19 M cu.m. at a grade of 137 g/cu.m. The Fosters block becomes 5 small irregular zones 300 to 1300 m apart.

A low cut off grade is therefore required for a bulk resource for dredging. Conversely, the use of the 90 g/cu.m cut off reveals smaller blocks of higher grades of interest for backhoe mining, for example BKH 1 and BKH 2, Figure 2.

Further drilling would be expected to delineate zones of higher grades, improving the economic viability of the mining operations. Targets are given in Appendix I.

TABLE 2

RESOURCE ESTIMATES AT VARYING CUT OFF GRADES

CUT OFF	***30 g/cu.m***		***60 g/cu.m****		***90 g/cu.m****	
GRADE	**Volume**	**Grade**	**Volume**	**Grade**	**Volume**	**Grade**
	M Cu.M	**g/cu.m**	**M Cu.M**	**g/cu.m**	**M Cu.M**	**g.cu.m**
Fosters	97.1	61.1	36.0	95.7	15.0	143.5
Braithwaites	11.5	88.4	7.0	102.8	3.6	107.6
TOTAL	108.6	64.0	43.0	96.9	18.6	136.6

* Shaw, 1993

5.1.2 *Valuation of the Bulk Resource*

The Straits price is used as the basis since it is taken to represent the seller, ex smelter Malaysia. A discount of 12.5% is applied to this to cover mineral recovery losses, freight to smelter, and smelter charges.

At the current price level of US $2.75/lb, and a medium term Australian exchange rate of AUD $1.333 per US $1.00, the net value of field tin amounts to AUD $7073 per tonne. For convenience, AUD $7.00/ kg. will be used.

The unit value of the bulk Ringarooma material, having a grade of 64 g/cu.m, is then 44.8 c /cu.m. The contained tin in the resource amounts to 6950t, which has a bulk value of $48.6 million.

Based on 31.9 M cu.m of tin wash the value of the contained accessory minerals is $3.2 million, making the total bulk value of the onshore resource $52 million.

5.2 OFFSHORE RESOURCE ASSESSMENT

5.2.1 The Indicated Resource

(i) TOEC

From 18 holes spaced up to 900 m apart TOEC defined a resource using a 75 g/cu.m grade contour. See Figure 7. This contained 23 M cu.m of wash with a grade of 150 g/cu.m.

The better intersections included Hole 103 with 5.7 m at 235 g/cu.m (4.2 m wash at 319 g/cu.m under 1.5 m overburden), and Hole 89 of 4.2 m at 321 g/cu.m (3.0 m wash at 449 g/cu.m under 1.2 m cover).

The material lies directly on the sea bed or under less than 2 m of cover - the average thickness including overburden is 2.1 m.

The shape shown on Figure 7 appears as a north westerly palaeochannel starting from the shore line, but north of boreholes 28, 106, and 79, it curves broadly east - west sub parallel to the coast rather like a dispersed strand zone.

This suggests that the TOEC Indicated Resource as defined by cut off grade is only partly a palaeochannel, the rest being on the sea bed central plateau.

(ii) Hellyer and CRAE

Using the same 18 holes as TOEC, Hellyer calculated 20 M cu.m at 208 g/cu.m. CRAE, using varying zones of influence of the widely spaced holes, calculated from 14 M cu.m at 200 g/cu.m to 21 M cu.m at 175 g/cu.m.

The Hellyer data has been adopted for this report as it includes structural models and estimates of potential resources that CRAE did not attempt.

(iii) Present Estimate

Due to repositioning the present tenement boundaries under the Commonwealth offshore waters map grid from the State grid used previously, and differences in interpretation in hole positioning between Hellyer and TOEC, the resources defined by all of Hole 42 and parts of Holes 28 and 137 in the original Indicated Resource appear to lie outside the present tenement.

The material outside the boundary is an estimated 4 M cu.m at 115 g/cu.m which leaves the Indicated Resource inside as 16 M cu.m at 227 g/cu.m.

The gross value of this material, including 10 c/cu.m for accessory minerals totals $27 Million.

5.2.2 The Palaeochannel (Area 1)

The palaeochannel as delineated by Hellyer consists of a 500 m to 1500 m wide braided meandering system with subchannels and tributaries, that trends north (Figure 8). Sediment thickness inferred from siesmic and bathymetry varies from 2 to 8 m.

Drilling in the coastal strip indicates that the palaeochannel continues south east directly towards the onshore channel at Bowlers Lagoon.

Hellyer computed 27 M cu.m for the volume of the palaeochannel, of which approximately 20 M cu.m is within the present tenement.

Only 4 holes intersect this channel which indicates that the apparently widespread TOEC drill coverage is not at all dense enough to have revealed all possible major resource concentrations.

Given the lack of holes a grade of 150 - 250 g/cu.m based on the results for the Indicated Resource is taken to be the possible tenor of the wash.

5.2.3 Other Potential Resources

Hellyer derived volumes of potential tin wash for the other prospective sea bed structures by sea bed profiling and confirmation by any TOEC drilling if thought reliably located in the structure.

As with the palaeochannel, these volumes relate to a previous tenement, EL 42/80, whose boundary was approximately 0.5 km outside the present one. For this report, these values were subdivided to the nearest 5 M cu.m into volumes inside and outside the present tenements.

The estimates are classed as an Inferred Resource. They have been derived from geophysical data with some drill confirmation, and detailed original plans and sections have not been available for rechecking.

The areas are as labelled on Figure 8.

Area 2: Inshore Sediment Wedges

Longshore currents tend to flow along the sea floor at the foot of such wedges and stringer heavy mineral concentrations of great length can occur.

The bathymetry indicates a present and possibly a fossil sediment wedge in the Bay. BHP-Utah drilled near these but missed any concentrations at the toe.

Modem geophysics not available to Utah can locate linear bodies of offshore heavy minerals with great precision and could be applied here.

Volumes are probably relatively small but grades could be higher than most other sea bed concentrations.

Area 3: Central Plateau

This is a 13 sq km plateau in the centre of the Commonwealth waters. Winnowing by currents or some other form of sub sea concentration has been or still is active.

Unselectively taking all 27 holes drilled into this structure shows a resource of 33 M cu.m at 95 g/cu.m in a 2.6 m thickness of sediment.

The potential for a richer more selective resource is seen in 12 holes with grades from 100 to 320 g/cu.m. At least one of these stopped within the tin wash. Some of these holes also contribute to the Indicated Resource, mostly those in the west arm of the TOEC resource as shown in Figure 7.

A volume of 15 M cu m is taken as a potential higher grade resource.

Area 4: Central North Channels

Infilled channels 6 - 8 m thick are cut into the basement in the central area of the Commonwealth waters north of the Area 3 plateau. The estimated volume of these possible tin leads is 100 M cu.m of which an estimated 70 M cu.m is within the tenement.

No firm grade data is available as TOEC drill holes here were sparse and uncertainly placed.

Area 5: Deep North Western Channels

The north west region of the Commonwealth area contains channels to 10 or 12 m depth, in water 35 m deep or more. These contain an estimated 50 M cu. m of possible wash of which an estimated 25 M cu.m is inside the tenement.

No drill holes intersected any of this material.

The depth from sea level to the bottom of the sediments is 45 m which is towards the limit of present bucket line dredges, though not of trailing suction dredges.

Submerged Strand Line

Primary strands are capable of extremely rich grades and modern offshore techniques can find them with great precision.

A submerged strand line representing a -35 m depth stillstand may occur in the north west of the tenement.

5.2.4 Summary of Offshore Resource Estimates and Bulk Value (Table 3)

The inferred resource within the tenements amounts to 130 M cu.m. This includes 16 M cu.m of the core Indicated Resource of 227 g/cu.m.

An additional inferred 60 M cu.m of material lies outside the tenements.

The expected tenor of the inferred material is 150 - 250 g/cu.m.

No volume is presented for the linear targets. However, with an expected higher grade than the sea bed cover material these could make a contribution to project viability through higher early cash flow rather than increased volumes.

TABLE 3

ESTIMATES FOR OFFSHORE RESOURCES

STRUCTURE	INSIDE TENEMENTS	REMAINDER	TOTAL
	M Cu.M	M Cu.M	M Cu.M
Palaeochannel	20	5	25
Plateau	15	0	15
Nth Channel	70	30	100
NW Channel	25	25	50
Inshore Wedge	Data Awaits Exploration		
Strand Line	"	"	"
TOTAL	130	60	190

If the Indicated Resource grade of around 200 g/cu.m were upheld in the inferred material inside the tenements it would contain 26,000 tonnes of tin metal and its value at $7,000/t would be $180 million. With 10c/cu.m for gold and heavy minerals the bulk value would be $195 million.

This estimate is purely at the inferred level of confidence, but indicates the potential for a sufficiently high resource value to justify further exploration.

6.0 MINING METHODS AND COSTS

6.1 *ONSHORE - DREDGING*

A single large bucket ladder dredge will be used as the base case because it can handle the widest range of likely deposit conditions.

A mining rate of 5 million cubic meters per year is envisaged, allowing at least a 15 year life for the Fosters resource.

Capital costs allow for a Tin Shed, and shore infrastructure and services. Amortisation is based on paying back capital over 15 years at 15% interest, in which case the annuity factor is 5.8474.

6.1.1 Single Bucket Ladder Dredge

This has a relatively high capital cost but low operating costs.

Capital Cost:	$20 million (new dredge case)
Amortisation:	$3.42 M / year $0.68 / cu.m mined
Operating Cost:	$1.00 / cu.m
Unit Cost:	**$1.68 / cu.m - Single Large Dredge**
Breakeven Grade:	**240 g/cu.m**

The acquisition of a second hand dredge could lead to significant reductions in capital cost and hence of breakeven grade.

6.1.2 Overburden Stripping and Smaller Dredge

Overburden is stripped ahead of dredging, which reduces the subsequent pond depth and dredge size and therefore capital costs significantly. See the schematic in Figure 4.

The economics depend on stripping the overburden for less than the operating cost of the smaller dredge, which is taken as $1.50/cu.m. A cost of NZ $1.10/cu.m is known for removing bouldery alluvials in New Zealand and is converted here to AUD $1.00/cu.m.

The stripping ratio is 2.4:1.

Capital Cost:	$13 Million (new dredge case)
Amortisation:	*$2.22 M / yr ($0.44/cu.m)*
Stripping Cost:	$3.5 M (3.5 Mcu.m x$1.00/cu.m)
Dredging Cost:	$2.25 M (1.5 Mcu.m x $1.50/cu.m)
Total Operating Cost:	$5.75 M / yr ($1.15/cu.m)
Annual Cost:	$7.97M / yr
Unit Cost:	**$1.59 / cu.m - Dry Stripping**
Breakeven Grade:	**227 g/cu.m**

6.1.3 Double Ladder Dredge

A double ladder dredge (Figure 5) has an upper ladder with a cutter wheel to remove overburden, and a bucket line ladder underneath to extract the pay zone on the bottom. This provides a higher bulk mining rate for the same wash mining capacity.

A prototype was trialled at Grey River Gold Mining Ltd and in spite of being under designed, was working at breakeven when the venture ceased.

Conceptual costs are $25 - 30 M capital and $0.85 /cu.m operating, at a production rate of 8 M cu.m /yr.

Unit Cost: $1.40 - 1.50 /cu.m - Double Ladder

6.1.4 Viability of Dredging

The costs for the two conventional dredging methods are $1.60 - $1.70 / cu.m which are above the value of the ground at the present tin price.

The prototype double ladder concept has a lower estimated cost but would require a larger reserve.

Dredging does not appear viable at present but could be re-examined if an economical second hand unit became available, or when the double ladder technology is more certain or the tin price has moved significantly upwards.

6.2 ONSHORE - BACKHOE MINING

6.2.1 Applicability

The tin wash is dug by backhoe feeding into a floating wash plant with the equipment moving together through the deposit like a dredge. The method is more flexible than dredging, however, and is applicable in smaller or shallower blocks.

Backhoe mining has been brought to a high degree of efficiency and reliability in N Z. Figure 6 shows examples of small and large plants. The smaller is the more appropriate for Ringarooma on present data.

Thick wash beyond the reach of a backhoe, say more than 5 to 8 m thick, could be mined by benching down, and overburden can be prestripped. For example, at the Island Block mine of Perilya Mining NL in NZ, 14 m of overburden is removed to allow the mining of 4 m of payzone.

Final applicability at Ringarooma depends on being able to deal with the clayey zones in the overburden.

6.2.2 Cost Estimates For Backhoe - Floating Plant System

The base case for costing an operation for Ringarooma is as follows:

- A wash mining rate of 100 cu.m/hr, at 6000 op.hrs/yr giving 600,000 cu.m/yr of wash mined;
- A stripping ratio of 1.5:1, intermediate between 2.4 and 1 as seen in deposits: total wash plus waste per year 1.5 M cu.m;

- Contractor stripping of the overburden. In comparison with $1/cu.m used for the dredge prestripping estimates. $1.50/cu.m is believed more realistic for the smaller scale backhoe operation.

- Two hydraulic backhoes, 40 t for main *production and 20 t for ancillary* earthmoving, contouring, and production back up;

- A jig based floating plant;

- An onshore base including Tin Shed, *workshop, and other services.*

Based on New Zealand experience such a system would have an estimated capital cost of $1 Million and an operating cost of approximately $2.00/cu.m of wash mined.

A life of 5 years is considered sufficient. The amortisation factor at 15% is 3.3522.

(i) Base Case:

Capital Cost:	$1,000,000
Amortisation:	$298 000
Mining Wash @ $2.00/cu.m	$1,200,000
Stripping @ $1.50/cu.m @ 1.5:1	$1,350,000
Total Operating Cost	$2,550,000
Annual Cost	$2,848,000
Unit Cost (1.5 M cu.m moved)	**$1.90/ Cu.M**
Base Case Breakeven Grade :	**271 g/cu.m**

(ii) Favourable Case:

A stripping cost of $1.00/cu.m at a stripping ratio of 2.4:1, other factors staying the same:

Unit Cost - Favourable: $1.44/ Cu.M

Breakeven Grade - Favourable:206 g/cu.m

(iii) Adverse Case:

Capital of $1.5 M, *a mining cost of* $2.20/cu.m, a stripping cost of $1.50/cu.m and a stripping ratio of 1:1.

Unit Cost - Adverse: $2.22 / cu.m

Breakeven Grade - Adverse: 318 g/cu.m

Profit margin is a final factor. A 30% return say, on capital of $1 million in the base case would require an extra 20c/cu.m return, or 29 g/cu.m, making the Base Case Grade with profit, 300 g/cu.m. Allowing for the Favourable Case, a *minimum* target mining grade of 250g/cu.m is proposed.

6.3 OFFSHORE MINING

No drilling difficulties indicative of hard ground or boulders were recorded by TOEC, and follow up sampling was to be by vibracore. It is assumed that the wash is readily extractable by dredge.

A trailing suction dredge is proposed for the sea bed material.

A bucket line dredge is proposed for thick or buried tin wash which may be proven up in future work. This type of dredge would also be able to extract some of the shallowly buried resource although at much reduced efficiency in thicknesses less than 3 or 4 m.

The use of a remotely controlled seabed tracked vehicle has not been proven in mining production but should be looked at when more detail is available on the deposit. Trials in association with a gold dredge in Alaska and activity in offshore diamond fields in Namibia indicate that this equipment is best suited to a high grade patchy deposit where high selectivity is paramount.

Such equipment could be more applicable to strands or other narrow leads, in Ringarooma Bay.

Order of magnitude costs follow with grades rounded to 5 g/cu.m. Amortisation interest is at 15%.

6.3.1 Trailing Suction Dredge

This is a free moving self contained vessel. It trails a collection head on the sea bed by means of a swell compensated suction pipe and extracts material by conventional dredge pumping. See Figure 9.

The method is well established worldwide for gravel extraction and the Metromix partners will use it for gravel recovery offshore of Sydney.

It is the most sea capable of dredges and was proposed for alluvial gold recovery in 100 m deep water on the exposed West Coast of New Zealand. Under these conditions the expected operating availability was 75%.

The dredge would process the tin wash on board and discharge tailings overboard. However, on board processing in a sea vessel is unconventional and would need to be confirmed by testwork.

Given the large capital investment, conceptual production is 10 M cu.m/yr over 15 years.

Capital Cost: (including shore facilities and contingency)	$60 Million
Amortisation:	$1.03 / cu.m
Operating Cost:	$1.50 / cu.m
Unit Cost:	**$2.53 / cu.m**
Breakeven Grade:	**360 g/cu.m**

6.3.2 Bucket line Dredge

Bucket line dredges have long been used for tin in offshore Thailand and Indonesia.

However, Ringarooma Bay is in a more demanding position open north west to Bass Strait. A sea state analysis estimates a dredge operating availability of 55%.

An offshore dredge has a higher capital cost than the same dredge onshore and requires support vessels for moving anchors, men, and materials. Operating costs are up due to these ancillary services and corrosion management, although tailings disposal is cheaper.

In view of these factors the trend is to large capacity, and 8 M cu.m/yr is proposed.

Capital Cost:	$40 Million (new dredge case)
Amortisation:	$0.86 / cu.m
Operating Cost:	$1.50/cu.m
Unit Cost:	**$2.36 / Cu.M**
Breakeven Grade:	**335 g/cu.m**

The acquisition of a second hand dredge could lead to significant reductions in capital costs and hence of required breakeven grade.

7.0 MINING OPTIONS

7.1 REVIEW OF OPTIONS

The combined properties offer a staged program of options for development.

1. Backhoe mining in the onshore tenements is the immediate priority, subject to proving up reserves.

2. The offshore prospect has potential for exploration with a view to later large scale dredging and cash flow.

3. In the medium term there are possibilities onshore such as kaolin and remnant mining which merit attention. Longer term, dredging may become attractive.

7.2 BACKHOE MINING

A reserve of 6 to 10 M cu.m depending on overburden ratio would be required for a 5 year life for a 100 cu.m/hr wash plant. The material need not be in one continuous block.

A mining grade of 250 g/cu.m or greater is proposed allowing for profit and depending on actual costs and stripping ratios once the reserve data is clear.

However, field grades of 150 g/cu.m or more are of interest; (i) because higher grades may lie near some medium grade areas given the gaps in drilling and the erratic distribution of grades, and (ii) to allow for a firming in the tin price.

At present the Indicated Resource is 18.6 M cu.m at 137 g/cu.m (90 g/cu.m cut off grade). It is reasonable to expect that a mining reserve can be delineated within this material and in additional areas particularly around Braithwaites.

Drilling is recommended with a view to proving up volumes for backhoe mining.

Target areas are detailed in Appendix I.

7.3 LARGE SCALE OFFSHORE PROSPECT

Within the offshore tenements there is an Indicated Resource of 16 M cu.m at 227 g/cu.m within an inferred 130 M cu.m of possible tin wash in channel and plateau structures. These continue into adjoining waters with an additional inferred 60 M cu.m of material. In total this amounts to an exploration target of 190 M cu.m to meet a mining requirement of 8 - 10 M cu.m/yr for 10 - 15 years.

The present database was generated with techniques that are 10 to 30 years old and now surpassed both in geophysics and data analysis. What is needed is a new offshore bathymetric and geophysical survey with exact satellite positioning technology, and remodelling of the resource estimates.

This could then be followed by scout and in fill drilling which would provide data for feasibility studies.

The tenor of the wash is below the dredging breakeven grades at present. However, -

- Six of the TOEC holes bottomed in tin wash including one in 370 g/cu.m.

- Some of the target structures have had very little drilling and some grade upside is considered allowable given the large search volume.
- 10 c/cu.m, or 15 g/cu.m, could be credited to the value of the wash for accessory minerals since overburden is so far, insignificant offshore.
- The tin market has been steadily stabilising over recent years and the price could firm considerably from now on.
- The acquisition of a second hand dredge could lead to significant reductions in capital cost and hence of required head grade.

In particular, dredging systems should be further investigated and resized if necessary. As a comparison, the Sydney offshore Metromix proposal is economic based on extracting a marine sand resource at 0.4 M - 0.8 M cu.m/yr in water from 25 to 65 m deep.

7.4 MEDIUM TERM ONSHORE

1. Kaolinite

The kaolinite intersected in the far east of Braithwaites deposit was rated as a coating clay by Australian Pulp and Paper Manufacturers Ltd (APPM) although a better brightness was preferable.

Current prospects have improved because it is believed that APPM reserves of kaolin are decreasing. Their plant is within Tasmania so that any local producer would have a market advantage.

Drilling to confirm product quality and outline a resource volume is required.

2. Further tenement acquisition

Remnant mining is of interest due to the high grades obtained in backhoe channel sampling by Portland Holdings Pty Ltd in 1969. The average of 61 samples was 390 g/cu.m.

However, the areas are outside present tenure and many lie in a block of land in the National Estate Register. This would necessitate proper justification before mining could proceed.

Onshore dredging could be kept in view for the possibility of a strong rise in the tin price. Additional prospective ground for dredging includes the unbottomed channel in McGregors, and 2 to 3 km away, the Scoloch Lead with 8 M cu.m at 133 g/cu.m.

8.0 RECOMMENDED WORK PROGRAMS

8.1 BACKHOE MINING

The following activities are recommended for confirmation of mining by backhoe. Capital investment and the commencement of mining can then proceed.

- Investigations to confirm the workability of clayey overburden.
- The use of helicopter magnetometry for detailed pre drilling assessment of target areas.
- Drilling (churn, reverse circulation, or Calweld) to confirm grades and prove reserves.
- Backhoe pitting or costeaning with processing in a mobile bulk sampling plant, wherever possible.
- Metallurgical and environmental studies.

Onshore Cost Estimates

	$
Helicopter Magnetometry	15,000
Stage 1 Drilling, say 25 - 30 holes	45,000
Pitting and Costeaning	20,000
Stage 2 Drilling 25 - 30 holes	45,000
Environmental Studies, Testwork	25,000
Sub total Onshore Fieldwork	150,000
Backhoe-floating Wash Plant Estimated Capital Cost	1,000,000
TOTAL BACKHOE MINING	1,150,000

8.2 EXPLORATION OFFSHORE

The aim is to develop the inferred large scale resource to the confidence level of Indicated Resource. The proposed drilling provides for approximately 1 borehole per 6 ha. Proving up drilling and feasibility studies can then proceed on a firm basis.

The recommended activities comprise:

- Bathymetric, seismic, side scan sonar, and magnetic surveys; sea bed sediment profiling.
- Data analysis and re modelling of potential resource volumes and grades.
- Scout and fill in drilling.

Bulk sampling would be considered for feasibility level proving of a resource.

200002

Offshore Cost Estimates

	$
Stage 1	
Geophysics and Bathometry	150,000
Scout Drilling, 40 holes	130,000
Geologist/Supervisor	20,000
Sub total	300,000
Stage 2	
Fill in Drilling, 300 holes	1,050,000
Metallurgical, Sea State and other Studies	80,000
Geologist/Supervisor	70,000
Sub total	1,200,000
TOTAL COST OFFSHORE	1,500,000

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

1. The onshore property offers the most immediate prospect for mining.

2. Drilling to prove reserves, and confirmation of a low cost method for removing clayey overburden, are needed to ensure a mining go ahead.

3. Other prospects for development exist onshore such as kaolin, and, extending beyond the current tenements, remnant mining and dredging.

4. The offshore property represents an exploration prospect for a large scale (8 - 10 M cu.m /yr) dredging operation.

5. Significant inferred volumes continue into areas adjoining the offshore tenements.

6. Further exploration is needed offshore to confirm potential volumes and bring estimates to the level of Indicated Resource. By then the feasibility of mining *could then be assessed in detail.*

Cost estimates and related breakeven grades are given, utilising new dredging equipment. *The purchase of suitable second-hand equipment* could lead to significant capital cost savings which would reflect in lower breakeven tin grades.

9.2 RECOMMENDATIONS

1. Commence the work program proposed for onshore confirmatory investigations.

2. Extend offshore tenure.

3. Commence the proposed offshore exploration program.

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APPENDIX I: BACKHOE MINING TARGETS

Mining grades of 250 g/cu.m or more are required. However, field grades of 150 g/cu.m or more are of interest, (i) because higher grades may lie near some medium grade areas given the gaps in drilling in places and the erratic distribution of grades, and (ii) to allow for a firming in the tin price.

No recommendation is made yet whether churn drilling or some other method should be used. However, in shallower ground costeans pits or bulk sampling can be fully utilised.

A. **Fosters**

(i) Block BKH 1

BKH 1 is in the north of Fosters, Figure 2. The present resource is:

Volume: 6.4 M cu.m

Grade: 178 g/cu.m

Stripping Ratio: 1.4:1, 18.4 m thickness

There is a shelf of shallower rich material in the east of Line 3 where Hole 16 returned 409 g/cu.m over 14 m including 6 m of overburden. The shelf extends to Line 5.

The present drill spacing is too wide to confirm mineable grades and more drilling is recommended. Additional drilling would then be needed to prove up volumes.

Estimated Drilling: 20 boreholes

(ii) Block BKH 2

This is smaller and more sinuous than BKH 1. The present resource is:

Volume: 2.8 M cu.m

Grade: 136 g/cu.m

Stripping Ratio: 2.2:1 over 17.9 m

The dilution of grade from mining batters, not included in the resource estimates, could be significant due to the 120 m average width of the body.

Estimated Drilling: 10 boreholes

(iii) Other Areas

Grades over 160 g/cu.m occur in Lines 5 and 6, with extra potential because four holes on BL 5 did not bottom.

Grades greater than 100 g/cu.m also run north west to Line 3 from the west of BL 5 and BL 6, and at least one hole appears to be unbottomed.

Line 13 has Hole 13 at 124 g/cu.m, and east of centre shows a perched wash horizon that continues to Line 14. This is of low grade but is at a favourable elevation, so drilling or costeaning nearby for better grades is merited.

B. Braithwaites

(i) Central Block

This is defined by holes DM 17/20 on Line BT 1 (Figure 3) which has 208 g/cu.m to 12 m thickness (162 g/cu.m over an 18 m total thickness), and DM 18/23, with 18 m at 232 g/cu.m.

However, for continuity, additional lower grade holes along DM Line 18 must be added, which results in a resource of 2.6 M cu.m at 141 g/cu.m.

Recommended Drilling: 16 boreholes

(ii) North East Block

In the north east, Hellyer Hole 16 on Line BT 1 shows 364 g/cu.m over 10.5 m including 5 m overburden. It also has an upper low grade lens.

A block 700 m x 150 m around Hole 86 including an unlabelled hole at 195 g/cu.m has a resource of 1.1 M cu.m and a grade of 150 -200 g/cu.m depending on which edge holes are included.

The volume around Hole 16 is 375,000 cu.m at 364 g/cu.m, so that a reserve of at least 500,000 cu.m is possible.

Recommended Drilling: 8 boreholes

Field work should also investigate the upper wash layer. This would be accessible by costeaning or pitting.

(iii) South East Shallow Block

Hole 17.5/25 shows 410 g/cu.m over the top 1.5 m, or 222 g/cu.m over the top 3 m and DM 17/26 shows 3 m at 104 g/cu.m.

The estimated resource, which would be mineable without stripping, is 165,000 cu.m at 206 g/cu.m or 220,000 at 162 g/cu.m if the 3 m grade is used.

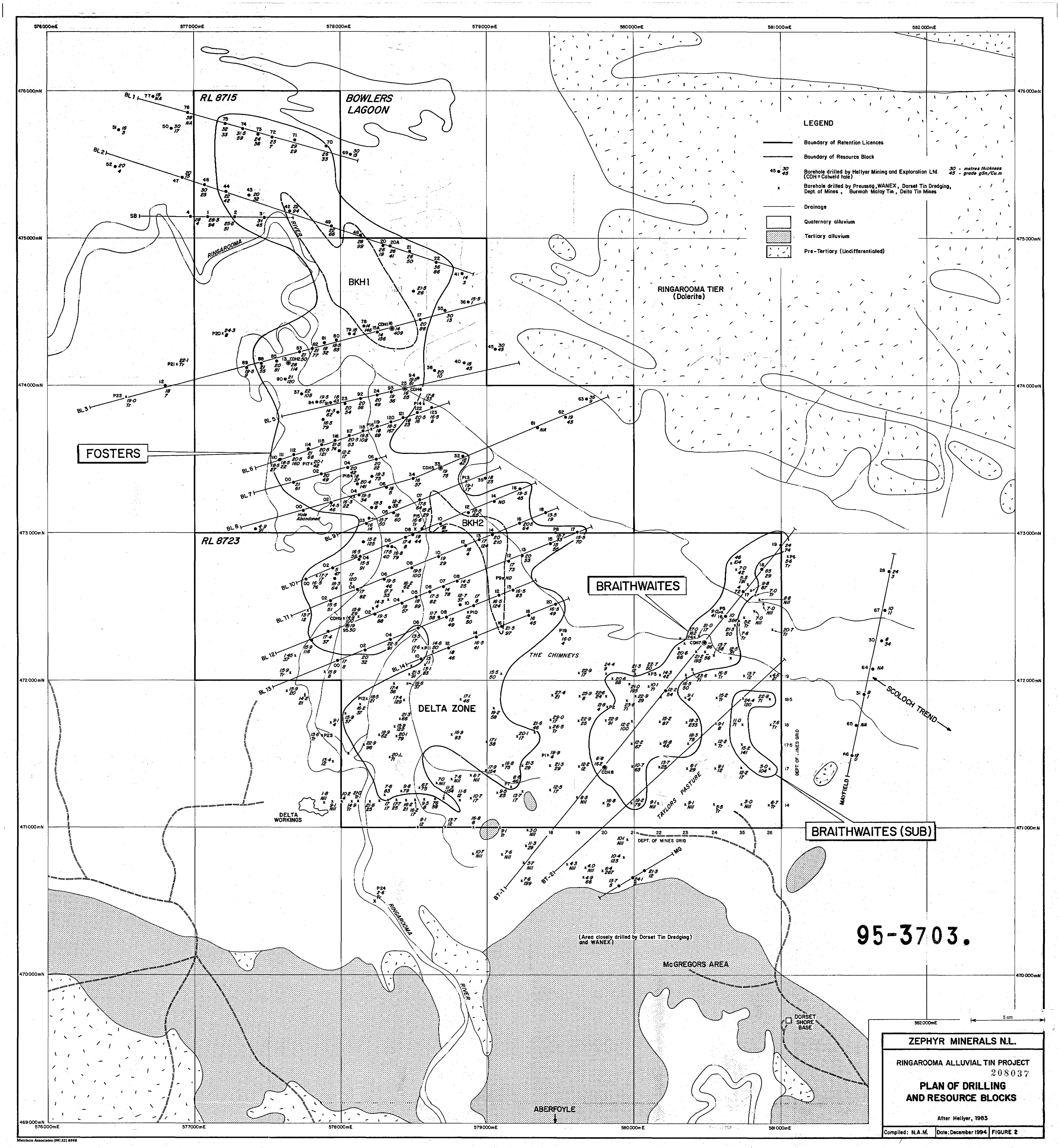
The block is open to the east and south and is highly promising.

And being shallow it could be pitted or costeaned and processed through a mobile bulk sampling plant.

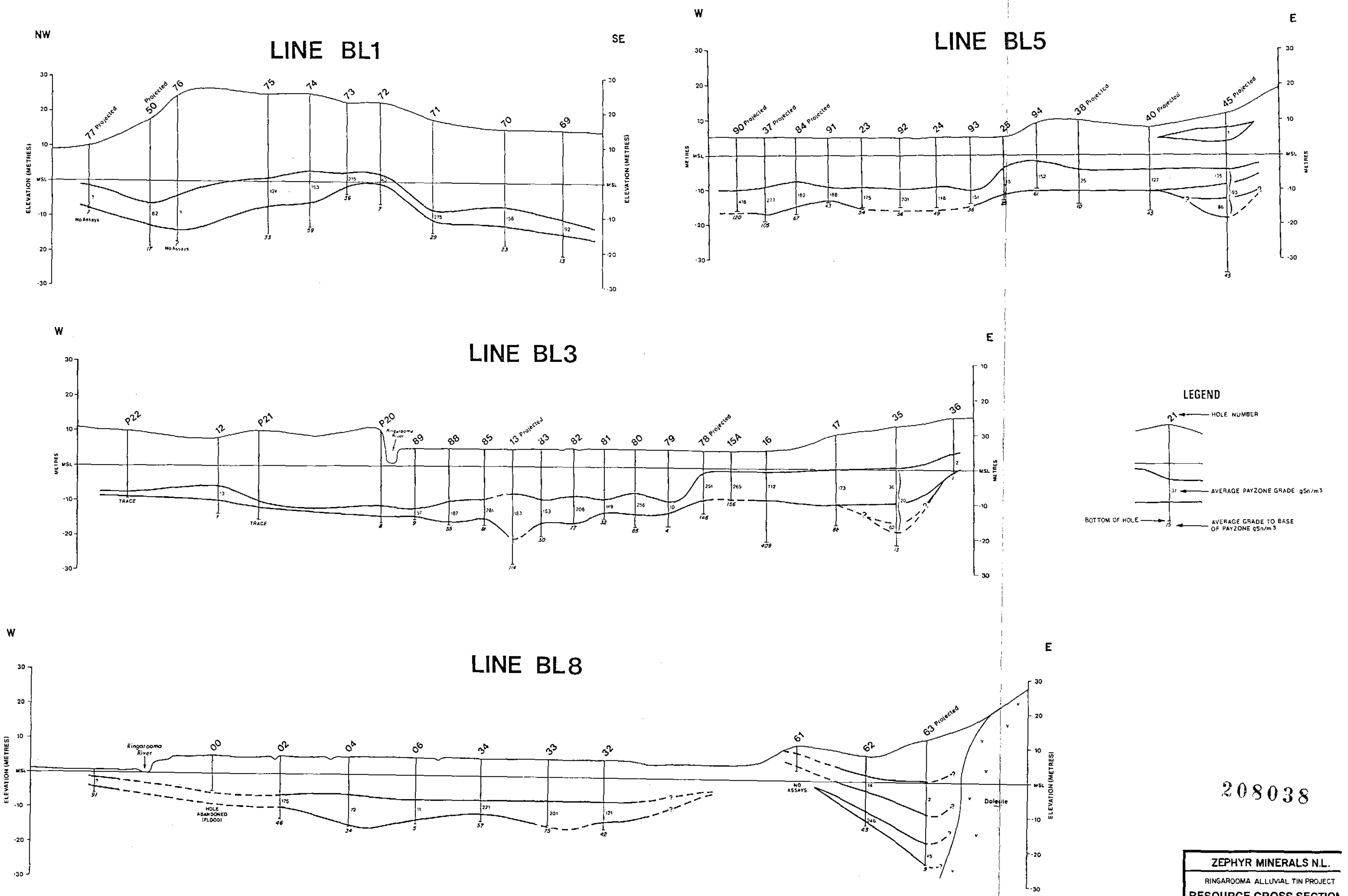
C. Undrilled Ground

Braithwaites contains both shallow and deep resources and remains a highly prospective area.

There is a low lying area between Braithwaites and Fosters that has not been drilled since it is a deep swamp.



LEGEND
Boundary of Retention Licences
Boundary of Resource Block
Borehole drilled by Hellyer Mining and Exploration Ltd (CDH = Calweld hole)
30 - metres thickness
45 - grade gSn/Cu.m
Borehole drilled by Preussag, WANEX, Dorset Tin Dredging, Dept. of Mines, Burmah Malay Tin, Delta Tin Mines
Drainage
Quaternary alluvium
Tertiary alluvium
Pre-Tertiary (Undifferentiated)
RL 8715
RL 8723
BOWLERS LAGOON
RINGAROOMA RIVER
BKH1
BKH2
FOSTERS
RINGAROOMA TIER (Dolerite)
BRAITHWAITES
BRAITHWAITES (SUB)
THE CHIMNEYS
DELTA ZONE
DELTA WORKINGS
TAYLORS PASTURE
SCOLOCH TREND
MAYFIELD
DEPT. OF MINES GRID
(Area closely drilled by Dorset Tin Dredging and WANEX)
McGREGORS AREA
DORSET SHORE BASE
ABERFOYLE
95-3703.
ZEPHYR MINERALS N.L.
RINGAROOMA ALLUVIAL TIN PROJECT
208037
PLAN OF DRILLING AND RESOURCE BLOCKS
After Hellyer, 1983
Compiled: N.A.M.
Date: December 1994
FIGURE 2
Merrison Associates (09) 321 8398



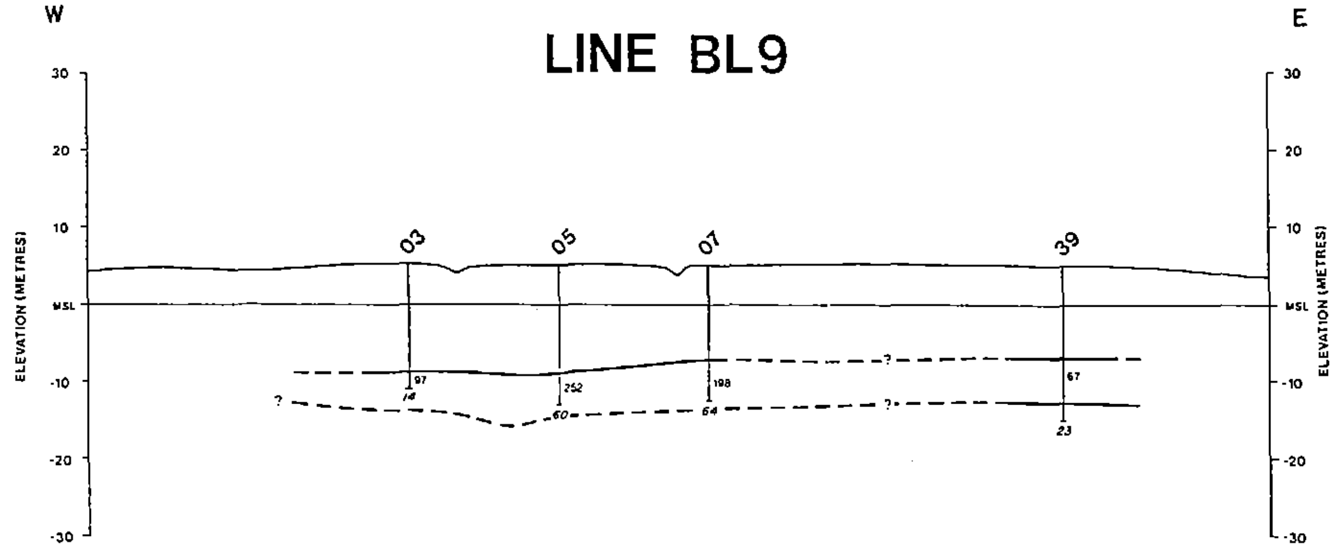
208038

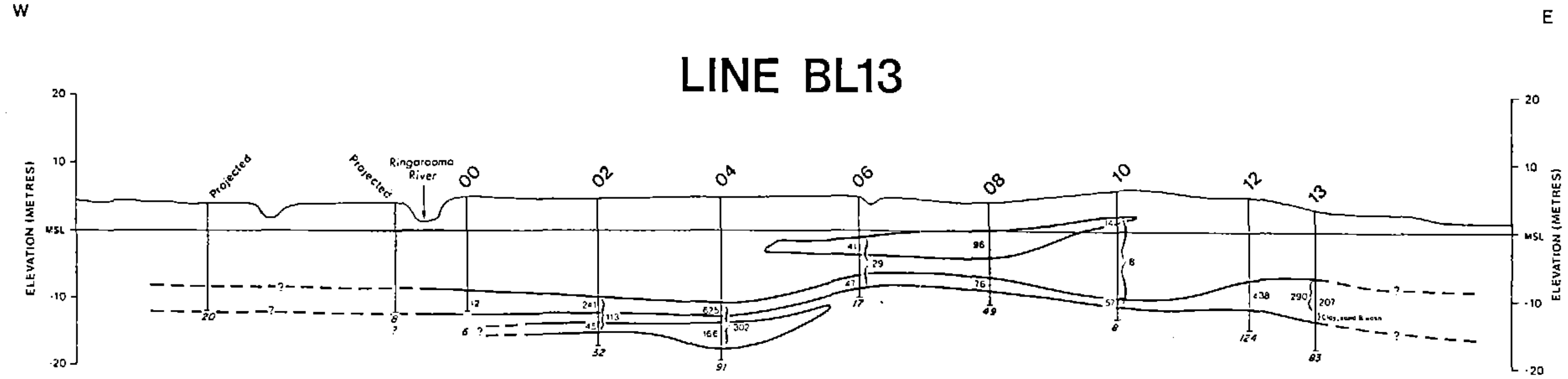
ZEPHYR MINERALS N.L.

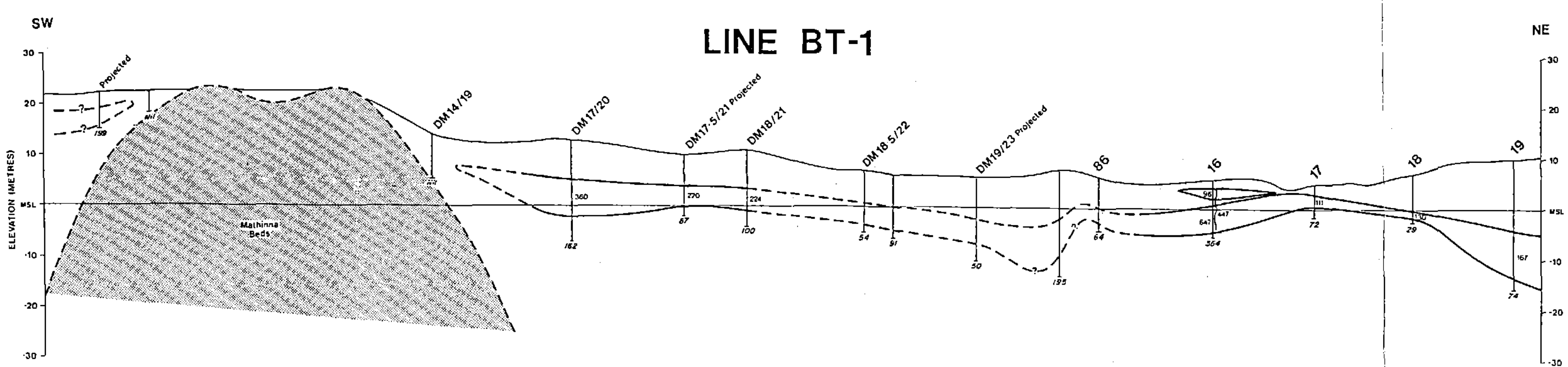
RINGAROOMA ALLUVIAL TIN PROJECT

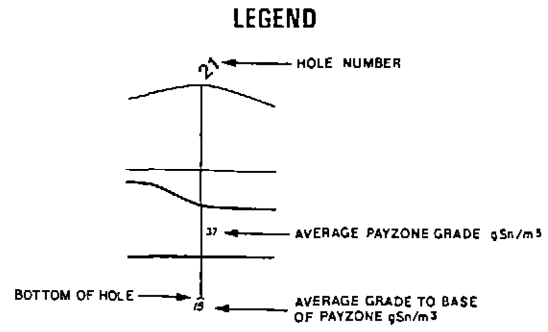
RESOURCE CROSS SECTION
LINES BL 1, BL 3, BL 5 AND BL8

After Hellyer









208039

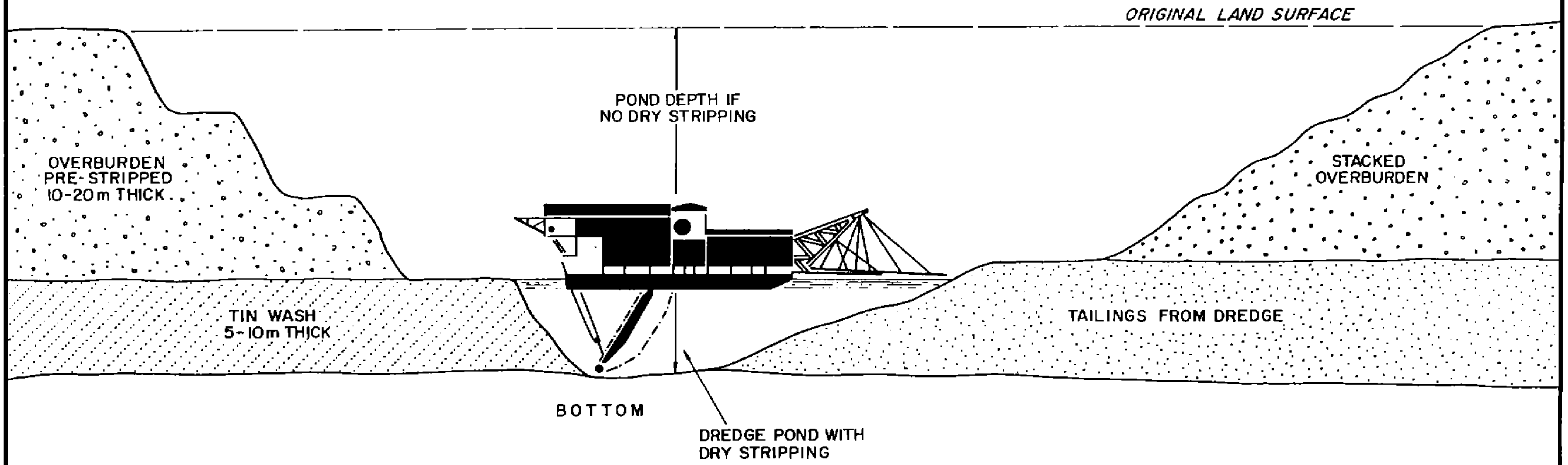
ZEPHYR MINERALS N.L.

RINGAROOMA ALLUVIAL TIN PROJECT

RESOURCE CROSS SECTION

LINES BL9, BL 13 AND BT-1

After Hellyer



208040

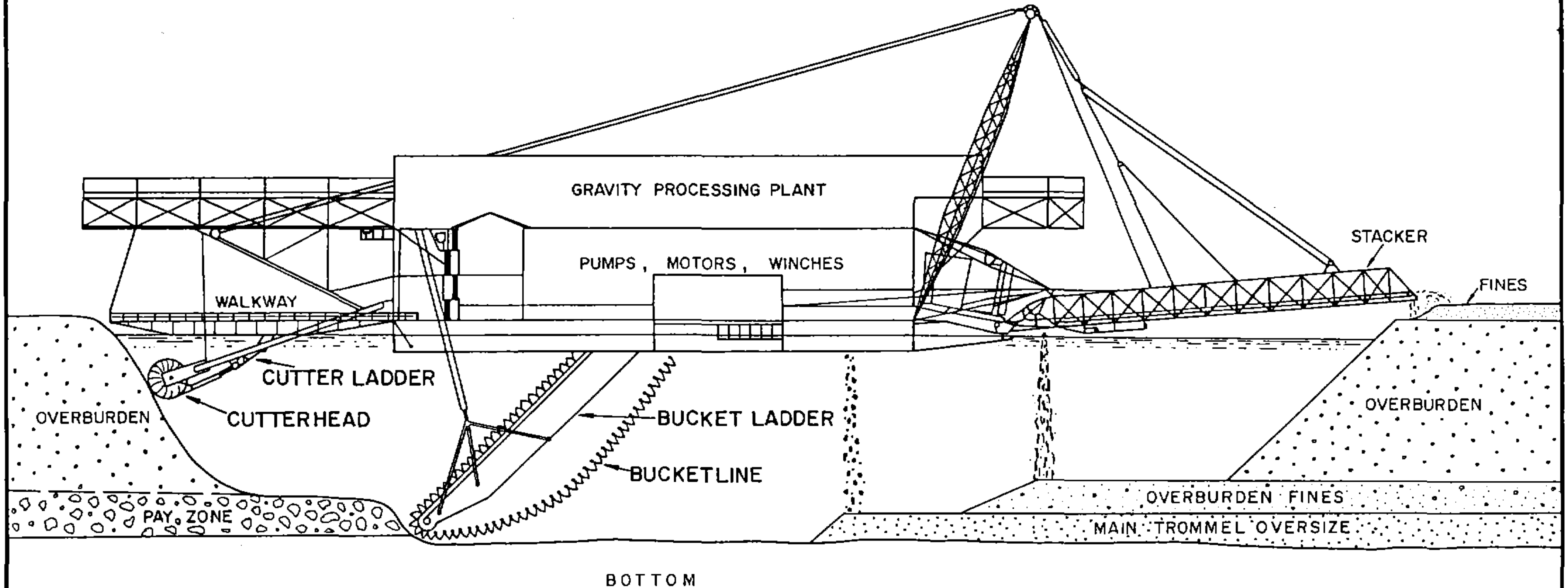
ZEPHYR MINERALS N.L.

RINGAROOMA ALLUVIAL TIN PROJECT

BUCKET LADDER DREDGING WITH DRY STRIPPING

After Palmer

Compiled : N.A.M.	Date : Dec. 1994	FIGURE 4



ZEPHYR MINERALS N.L.		
RINGAROOMA ALLUVIAL TIN PROJECT DOUBLE LADDER DREDGE After Griffiths 1990		
Compiled: N.A.M.	Date: Dec. 1994	FIGURE 5

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208041

208042

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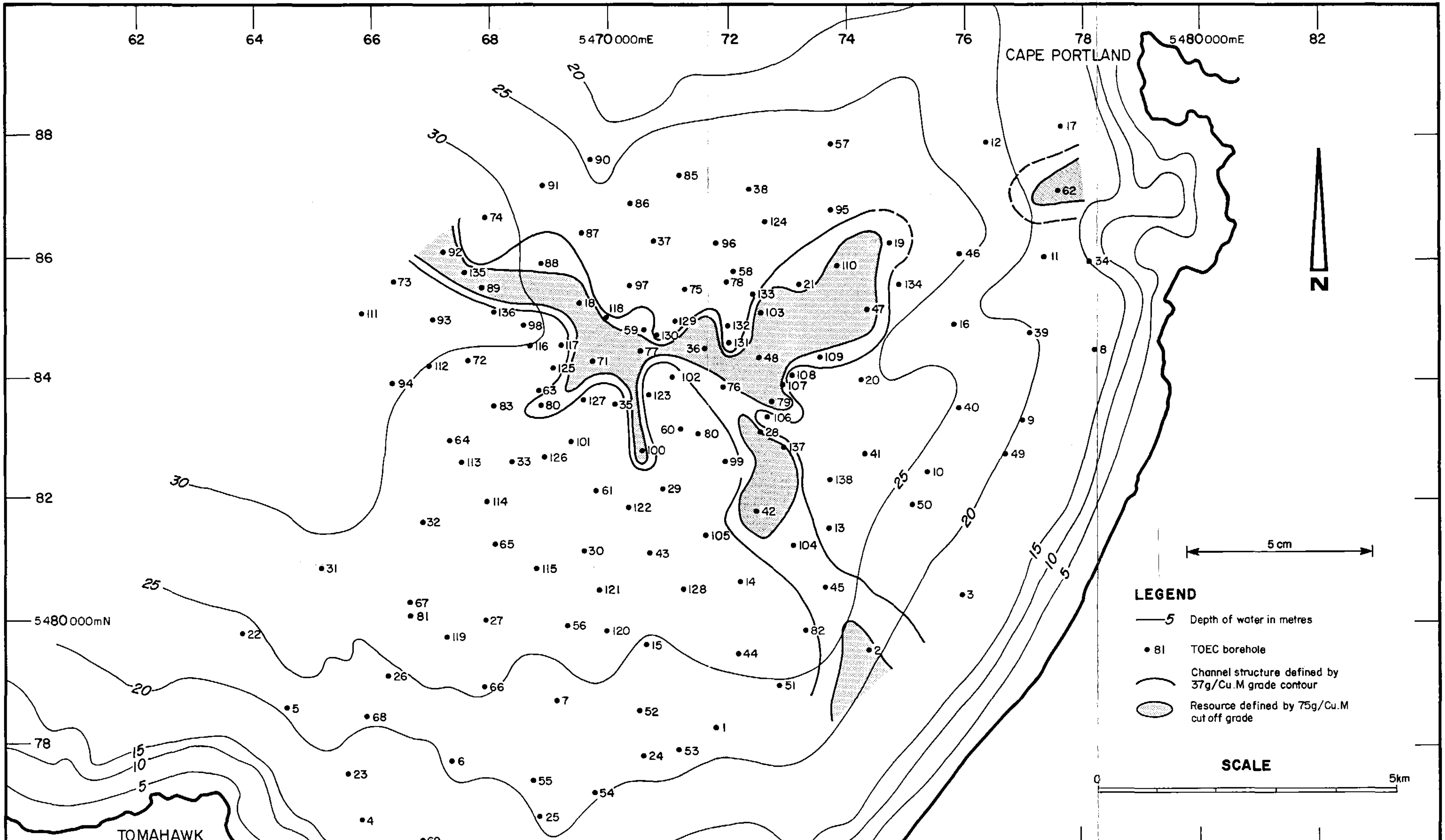
RINGAROOMA ALLUVIAL TIN PROJECT

BACKHOE - FLOATING WASH PLANTS

UPPER : 100 Cu M/Hr
LOWER : 300 Cu M/Hr

Compiled: N.A.M.	Date: Dec. 1994	FIGURE 6



ZEPHYR MINERALS N.L.

RINGAROOMA ALLUVIAL TIN PROJECT

PLAN OF TOEC DRILLING AND MINERALISATION

After TOEC 1969

208043

Compiled: N.A.M.	Date: Dec. 1994	FIGURE 7

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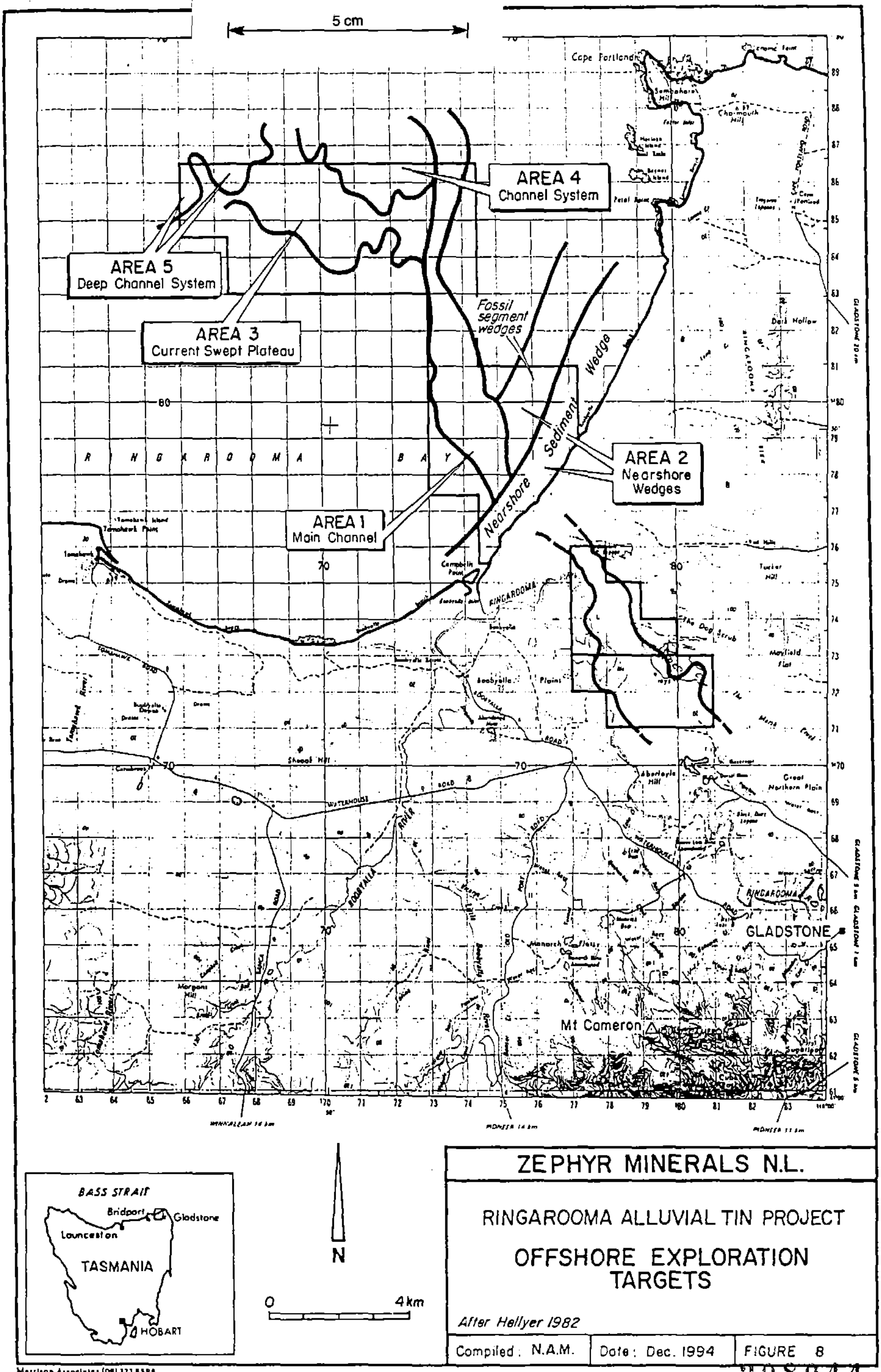

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RINGAROOMA ALLUVIAL TIN PROJECT

OFFSHORE EXPLORATION TARGETS

After Hellyer 1982

Compiled: N.A.M. | Date: Dec. 1994 | FIGURE 8

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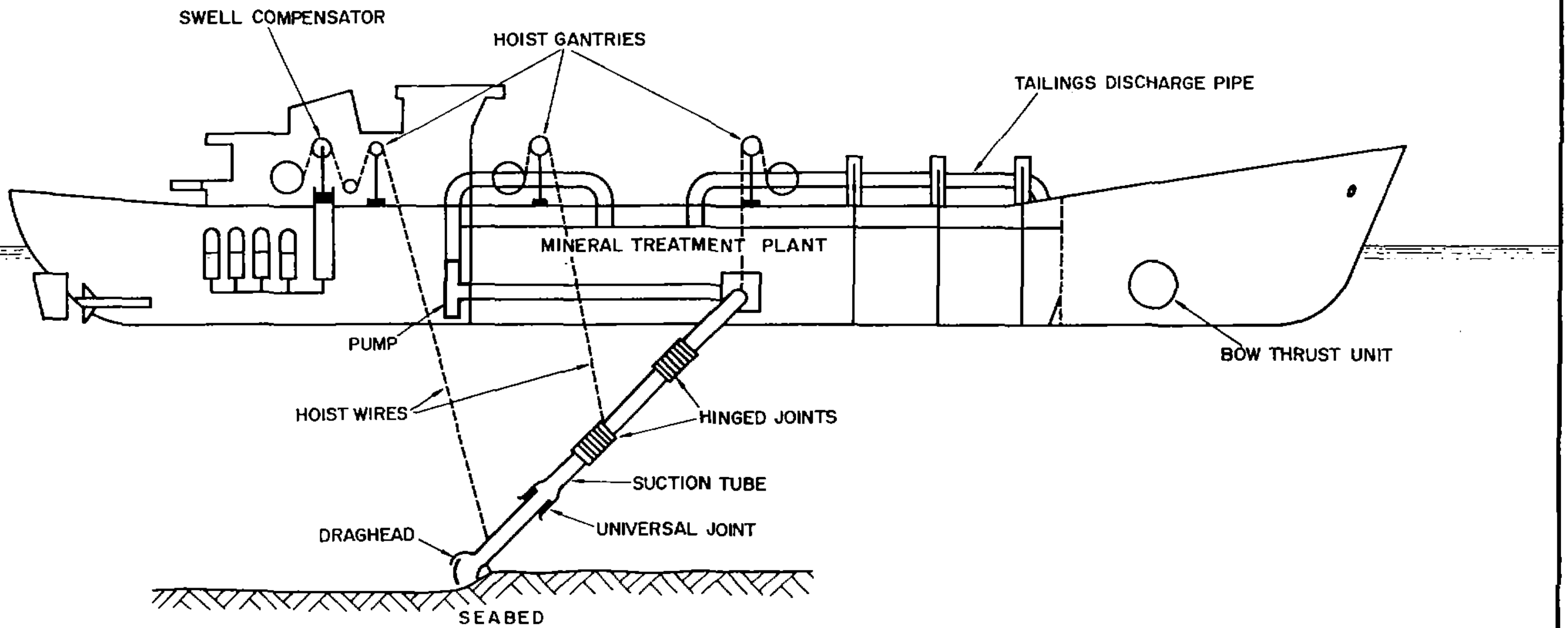
208044



208045

ZEPHYR MINERALS N.L.

RINGAROOMA ALLUVIAL TIN PROJECT

TRAILING SUCTION DREDGE FOR SEABED DEPOSITS

After Bray from de Koning

Compiled: N.A.M.	Date: Dec. 1994	FIGURE 9

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