

PRELIMINARY EVALUATION
PROGRAMME

BEACH SANDS
AT
STRAHAN AND ANN BAY

TASMANIA

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MICROFILMED

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INTRODUCTION

Following a reconnaissance survey of the Ann Bay and Strahan beach sand deposits in January 1970, a scout programme was carried out between March 9th and March 21st (see appendices 5 and 6).

Drill lines were spaced generally 1,000 feet apart along the beaches, with holes at multiples of 25 feet along the lines. Some additional holes were drilled in the back dune areas to test for possible extensions away from the shore line (see Figs. 1 and 2).

The samples taken were treated at Rosebery using heavy liquid (bromoform) separation to recover the heavy minerals. The heavy mineral fractions were then composited and analysed by R.K. Newman Pty. Ltd., Public Analysts of Sydney, using both optical and chemical methods of analysis (see appendices 3 and 4).

A preliminary evaluation of the deposits was made assuming FOB values per ton for the various constituents as follows: Ilmenite \$12, chromite \$20, rutile ¹¹⁵⁻¹²⁵ \$140, zircon \$35, leucoxene \$80 and cassiterite ^{2,000} \$1,300. Recoveries were assumed on the basis of normal plant results for this type of deposit: ilmenite 75 per cent, chromite 75 per cent, rutile 60 per cent, zircon 60 per cent, leucoxene 50 per cent, cassiterite 60 per cent (see appendix I).

2.

SUMMARY AND CONCLUSIONS

Mineralogical and mineragraphic studies carried out in conjunction with preliminary test work by Mineral Deposits Ltd. of Southport have shown that the rutile, zircon, leucoxene and cassiterite minerals are probably recoverable to a large degree but that the chromite and ilmenite may not be separated from one another except at considerable cost. (See appendix 2).

Allowing for the recovery of all of the valuable heavy minerals at normal rates of recovery the raw sand may be valued as follows:

Ann Bay	\$0.66/ton of which cassiterite = 17 cents/ton
Strahan	\$0.75/ton of which cassiterite = 22 cents/ton

(see appendix 1).

It has been shown that the ilmenite and chromite fractions are difficult to separate and the deposits should therefore be valued for their recoverable content of rutile, zircon, leucoxene and cassiterite. On this basis the value of recoverable minerals in the raw sand becomes:

Ann Bay	\$0.63/ton of raw sand
Strahan	\$0.60/ton of raw sand.

Treatment would probably be aimed at the immediate rejection of magnetic minerals by high intensity wet magnetic separation. Cassiterite would then be recovered using gravity methods of concentration and rutile, zircon and leucoxene would be recovered

using standard methods of separation. Attritioning would be necessary to remove grain coatings ahead of the dry treatment processes.

The quantities involved are quite small and while some additional reserves might be calculated by including minerals in the surf zone at Strahan, the overall tonnages will still be of minor importance only.

Nevertheless, there appears to be sufficient cassiterite present to justify a limited amount of additional work. This would be largely directed towards finding out what recoveries can be expected under actual plant conditions. (Recovery grades used for the purposes of this exercise must be checked experimentally before conducting further close drilling and sampling work.)

It is recommended, therefore, that separate 500 lb. samples be obtained from each of the two beaches and forwarded to Mineral Deposits Ltd. of Southport, Queensland for bench scale tests. The samples should be obtained from borings taken over the full areas of known mineralization and your own staff should have no difficulty in preparing representative samples in this manner. At Mineral Deposits the samples will be tabled to produce a heavy mineral concentrate. Done carefully, this work will yield recovery rates comparable to those of a well designed treatment plant.

A complete analysis of the products will determine if further tests are justified and, if so, along what lines they should be proceeded with.

DESCRIPTION OF DEPOSITSANN BAY

The deposits at Ann Bay near Marr^awah are located approximately 35 miles west of Port Latta on the west coast of Tasmania. Heavy minerals occur in the frontal dunes for the full length of the beach and are concentrated in possibly economic quantities for about 5,000 to 6,000 feet in the southern section. Some low grade mineralization has been found in the back dune areas but only one of the holes (AX6) sampled during the current program encountered values as high as 0.5 per cent. This is not an economic grade.

An earlier study by Pickands Mather gave the following results:

Heavy Mineral Sands

Sand	3,000,000 cu.yds (3.5 million tons)
Average heavy mineral content	3.6%
Total heavy minerals	108,000 tons

Heavy Mineral Concentrates

Total	108,000 tons
Rutile 2.5% in H.M.	2,700 tons
Zircon 5% in H.M.	5,400 tons
Cassiterite 0.098% in H.M.	103 tons (80 tons Sn).

A higher average grade was aimed at for this exercise and thus the quantities of sand are lower. The results summarised in the same manner show:

5.

Heavy Mineral Sands

Sand	1,913,000 cu.yds (2.5 million tons)
Average heavy mineral content	5.3%
Total heavy minerals	100,000 tons

Heavy Mineral Concentrates

Total	100,000 tons
Rutile 2.8% in H.M.	2,800 tons
Zircon 6.3% in H.M.	6,300 tons
Cassiterite 0.43% in H.M.	430 tons

For a cut off grade resulting in an average of 3.6 per cent H.M., instead of 5.3 per cent as above, the overall quantities of sand, rutile and zircon would be slightly higher than estimated by Pickands Mather. However there is a marked difference between the two cassiterite estimates. 11

Pickands Mather calculated a grade of 0.098 per cent cassiterite in the heavy mineral concentrates from the results of 62 X-ray spectrometric analyses but reported that 6 cassiterite determinations by grain count averaged 1.73 per cent. It was then stated that check analyses by another laboratory "confirmed more or less the X-ray spectrometric analyses."

The cassiterite determinations for this study were conducted using standard wet methods of assay and are considered more reliable. Nevertheless, if this property is ever considered for the recovery of cassiterite alone, more work should be done to determine accurately both grade and grain size parameters.

6.

A preliminary study of the separation characteristics was made by Mineral Deposits Ltd. of Southport, Queensland (see appendix No. 2) from a sample of sand collected by the writer in January 1970. This material was dried and separated with bromoform (SG 2.8) to yield a heavy mineral fraction. On examination it was found to be coated and the grains were then cleaned using caustic soda to remove the organic stains.

Mineral Deposits reported that in their opinion:

- a) The ilmenite and chromite grains would be difficult to separate by normal physical means but that chemical and pyrometallurgical techniques would be worthy of investigation.
- b) Good separation of the rutile and zircon concentrates would depend upon the efficiency of the removal of grain coatings.
- c). If the grains are properly attritioned, conventional techniques should be satisfactory for producing saleable rutile and zircon concentrates, and a magnetic conductor product for further treatment.

These conclusions are probably quite valid but they do point to the relative complexity of any proposed treatment plant designed to produce a range of mineral products. For such a plant to be economic, much greater reserves would be needed than are available at Ann Bay.

STRAHAN

The mineral sand deposits on Ocean Beach, near Strahan, Tasmania, are contained in an area 6 miles long and a few hundred yards wide. They are very largely confined to the beach between low water and high water mark but some high grade seams have been found at a number of places in the frontal dune system.

The deposits were tested originally by Australian Titan Products Pty. Ltd. and Strahan Sands Pty. Ltd. who reported the following approximate mineral contents of the area:

Rutile	12,000 tons
Zircon	38,000 tons
Chromite	11,500 tons
Ilmenite	11,500 tons
Garnet - possibly	30,000 tons

They observed that the ilmenite was of poor quality and not worth recovering and that the rutile and zircon grains were of reasonable quality but heavily iron stained and difficult to separate.

They suggested that the quantities involved might warrant a small recovery plant to produce 500 tons of rutile and equivalent zircon each year.

The results from the recent scout drilling program conducted at Strahan have indicated a total of some 1,450,000 tons of sand containing an average of 9.8 per cent of heavy minerals in 5 zones along the beach front area. The sampling width

8.

was obviously less than that of A.T.P. but this may have been due to tidal variations. Possibly the quantity indicated could be increased by sampling out into the surf zone but mining would be extremely difficult and hazardous.

For the quantities and grades involved, the following tonnages of valuable minerals are estimated.

Rutile	2,800 tons
Zircon	6,700 tons
Chromite	7,700 tons
Leucoxene	4,000 tons
Ilmenite	11,500 tons
Cassiterite	430 tons

Except for the ilmenite content, which is assessed in each case at 11,500 tons, there is no agreement whatsoever between the two sets of results.

A.T.P. apparently overlooked the possibility of recovering cassiterite from these sands and the 430 tons estimated above constitutes a bonus.

However, the rutile and zircon quantities are so small in comparison to the A.T.P. estimates that some valid reason must be sought and the probability of error seems to lie with A.T.P. analyses. The following table sets out the ratios of ilmenite and chromite to rutile and zircon respectively from A.T.P., R.K. Newman and Mineral Deposits Ltd.

9.

? (circumference)

<u>Laboratory</u>	<u>Ratio II + Chromium</u>	
	<u>: rutile</u>	<u>: zircon</u>
A.T.P.	1.9 : 1	0.6 : 1
R.K. Newman	6.9 : 1	2.9 : 1
Mineral Deposits Ltd.	11.5 : 1	4.3 : 1

Since R.K. Newman's assays were by both grain count and by chemical assay I believe that they should be accepted as being most likely to be representative.

Test work by Mineral Deposits Ltd, of Southport indicated that recovery plant practice could be similar to that required for the Ann Bay deposits.

CALCULATION OF OVERALL AVERAGE GRADE,

Sample ST1 represents		185,000 cu.yds.	x	$\frac{6.6}{1}$	=	1,221.0
Sample ST2	"	185,000	"	"	x	12.2 = 2,258.5
Sample ST3	"	465,000	"	"	x	9.8 = 4,557.0
Sample ST4	"	83,000	"	"	x	8.4 = 697.2
Sample ST5	"	202,000	"	"	x	10.0 = 2,020.0
		<hr/>				<hr/>
		1,120,000				10,753.7

Overall Average grade = 9.6%

SAMPLE STI

Sample No.	Interval	Grade %	Average Grade %	
SAO	0' - 5'	9.6%	7.4%	10 x 7.4 = 74.0
	5' - 10'	5.1%		
SBO	0' - 5'	6.2%	3.9%	10 x 3.9 = 39.0
	5' - 10'	1.6%		
SCO	0' - 5'	4.9%	3.5%	10 x 3.5 = 35.0
	5' - 10'	2.1%		
SDO	0' - 5'	3.6%	3.4%	9 x 3.4 = 30.6
	5' - 9'	3.2%		
SFO	0' - 5'	11.8%	11.8%	5 x 11.8 = 59.0
SIA	0' - 5'	12.5%	8.1%	10 x 8.1 = 81.0
	5' - 10'	3.6%		
S2A	0' - 5'	9.4%	5.4%	10 x 5.4 = 54.0
	5' - 10'	1.4%		
S3A	0' - 5'	13.4%	7.2%	10 x 7.2 = 72.0
	5' - 10'	1.0%		
S4A	0' - 5'	18.3%	11.2%	10 x 11.2 = 112.0
	5' - 10'	4.2%		
				84 = 556.6

Average grade 6.6% HM

SAMPLE ST2

Sample No.	Interval	Grade %	Average Grade %	
SA5	0' - 5'	32.1%	23.0%	8 x 23 = 184.0
	5' - 8'	7.8%		
SB5	0' - 3'	30.9%	30.9%	3 x 30.9 = 92.7
SC5	0' - 5'	20.2%	12.4%	10 x 12.4 = 124.0
	5' - 10'	4.6%		
SA6	0' - 6'	20.0%	20.0%	6 x 20 = 120.0
SA7	0' - 5'	34.6%	18.4%	10 x 18.4 = 184.0
	5' - 10'	2.1%		
SAB	0' - 5'	28.0%	15.2%	10 x 15.2 = 152.0
	5' - 10'	2.4%		
SA9	0' - 5'	22.6%	14.0%	10 x 14.0 = 140.0
	5' - 10'	5.3%		
SAB5	0' - 7'	3.2%	3.2%	7 x 3.2 = 22.4
SAB8	0' - 5'	7.5%	6.9%	17 x 6.9 = 117.0
	5' - 10'	7.5%		
	10' - 17'	6.0%		
SAB9	0' - 5'	7.6%	5.0%	12 x 5.0 = 60.0
	5' - 12'	3.0%		
SX5	0' - 5'	27.6%	21.3%	8 x 21.3 = 170.4
	5' - 8'	10.7%		
SX7	0' - 5'	3.2%	2.1%	15 x 2.1 = 31.5
	5' - 10'	1.8%		
	10' - 15'	1.4%		

116 = 1398.0

Average grade 12.1%

SAMPLE ST2

Sample No.	Interval	Grade %	Average Grade %	
SA5	0' - 5'	32.1%	23.0%	8 x 23 = 184.0
	5' - 8'	7.8%		
SB5	0' - 3'	30.9%	30.9%	3 x 30.9 = 92.7
SC5	0' - 5'	20.2%	12.4%	10 x 12.4 = 124.0
	5' - 10'	4.6%		
SA6	0' - 6'	20.0%	20.0%	6 x 20 = 120.0
SA7	0' - 5'	34.6%	18.4%	10 x 18.4 = 184.0
	5' - 10'	2.1%		
SA8	0' - 5'	28.0%	15.2%	10 x 15.2 = 152.0
	5' - 10'	2.4%		
SA9	0' - 5'	22.6%	14.0%	10 x 14.0 = 140.0
	5' - 10'	5.3%		
SAB5	0' - 7'	3.2%	3.2%	7 x 3.2 = 22.4
SAB8	0' - 5'	7.5%	6.9%	17 x 6.9 = 117.0
	5' - 10'	7.5%		
	10' - 17'	6.0%		
SAB9	0' - 5'	7.6%	5.0%	12 x 5.0 = 60.0
	5' - 12'	3.0%		
SX5	0' - 5'	27.6%	21.3%	8 x 21.3 = 170.4
	5' - 8'	10.7%		
SX7	0' - 5'	3.2%	2.1%	15 x 2.1 = 31.5
	5' - 10'	1.8%		
	10' - 15'	1.4%		

 116 = 1398.0

Average grade 12.1%

015

826016

SAMPLE ST3

Sample No.	Interval	Grade %	Average Grade %	
SA10	0' - 5'	23.8%	23.8%	5 x 23.8 = 119.0
SB10	0' - 5'	13.1%	13.1%	5 x 13.1 = 65.5
SC10	0' - 5'	10.4%	10.4%	5 x 10.4 = 52.0
SD10	0' - 5'	9.8%	9.8%	5 x 9.8 = 49.0
SA11	0' - 5'	15.8%	15.8%	5 x 15.8 = 79.0
SA12	0' - 5'	12.2%	12.2%	5 x 12.2 = 61.0
SA13	0' - 5'	34.6%	34.6%	5 x 34.6 = 173.0
SA14	0' - 5'	23.0%	23.0%	5 x 23.0 = 115.0
SAB10	0' - 5'	7.3%		
	5' - 10' Assume	6.6%		
	10' - 15'	5.9%	11.5%	22 x 11.5 = 254.0
	15' - 20'	26.4%		
	20' - 22'	11.5%		
SAC10	0' - 5'	6.4%		
	5' - 10'	3.4%		
	10' - 15'	1.7%	4.0%	33 x 4.0 = 132.0
	15' - 20'	2.6%		
	20' - 25'	2.3%		
	25' - 30'	5.1%		
	30' - 33'	8.1%		
SAD10	0' - 5'	8.4%		
	5' - 10'	5.2%		
	10' - 15'	8.5%	5.9%	30 x 5.9 = 177.0
	15' - 20'	3.6%		
	20' - 25'	2.5%		
	25' - 30'	6.9%		
SX11	0' - 5'	3.7%		
	5' - 10'	2.0%	7.3%	19 x 7.3 = 139.0
	10' - 15'	6.1%		
	15' - 19'	20.0%		
				<hr/> 144 = 1415.5

Average grade 9.8%

018

SAMPLE ST4

Sample No.	Interval	Grade %	Average Grade %	
SA15	0' - 5'	18.1%	11.3%	9 x 11.3 = 101.7
	5' - 9'	2.8%		
SB15	0' - 5'	11.6%	11.6%	5 x 11.6 = 58.0
SC15	0' - 5'	8.4%	8.4%	5 x 8.4 = 42.0
SA16	0' - 5'	9.9%	9.9%	5 x 9.9 = 49.5
SA17	0' - 5'	3.6%	3.6%	5 x 3.6 = 18.0
SAC15	0' - 5'	5.2%	9.3%	12 x 9.3 = 111.6
	5' - 12'	12.0%		
SAD15	0' - 5'	5.0%	3.8%	10 x 3.8 = 38.0
	5' - 10'	2.6%		
SX15	0' - 5'	Missing	10.4%	5 x 10.4 = 52.0
	5' - 10'	10.4%		
SX16	0' - 5'	11.0%	8.4%	10 x 8.4 = 84.0
	5' - 10'	5.7%		
				<u>66 = 554.8</u>

Average grade 8.4%

SAMPLE ST5

Sample No.	Interval	Grade %	Average Grade %	
SA21	0' - 5'	9.5%	9.5%	5 x 9.5 = 47.5
SA22	0' - 6'	10.9%	10.9%	6 x 10.9 = 65.4
SA23	0' - 3'	12.8%	12.8%	3 x 12.8 = 38.4
SA24	0' - 2'	7.2%	7.2%	2 x 7.2 = 14.4
SA25	0' - 5'	12.5%	11.0%	5 x 11.0 = 55.0
	5' - 7.5'	9.4%		
SA26	0' - 5'	6.4%	6.4%	5 x 6.4 = 32.0
SA27	0' - 5'	26.9%	26.9%	5 x 26.9 = 134.5
SA29	0' - 6'	6.1%	6.1%	6 x 6.1 = 36.6
SA31	0' - 6'	6.4%	6.4%	6 x 6.4 = 38.4
SAB33	0' - 6'	3.9%	3.9%	6 x 3.9 = 23.4
				49 = 485.6

Average grade 10%

APPENDIX IWORK SHEETSSTRAHAN

<u>Samples STI - ST5</u>		<u>Av. grade</u>		<u>Est. Recovery</u>		<u>FOB Value/ ton</u>		<u>Possible Recoverable Value</u>
Ilmenite	$\frac{40.6}{5} =$	8.1%	x	75%	x	\$12	=	\$0.73
Chromite	$\frac{26.9}{5} =$	5.4%	x	75%	x	\$20	=	\$0.81
Rutile	$\frac{9.86}{5} =$	2.0%	x	60%	x	\$140	=	\$1.68
Zircon	$\frac{23.47}{5} =$	4.7%	x	60%	x	\$35	=	\$0.99
Leucoxene	$\frac{14.13}{5} =$	2.8%	x	50%	x	\$80	=	\$1.12
Cassiterite	$\frac{1.49}{5} =$	0.3%	x	60%	x	\$1,300	=	\$2.34
Total recoverable value								\$7.67

For average grade 9.8% Value ton = \$0.75/ton
of which cassiterite = \$0.22/ton

STRAHANSample ST1

Length 4,000' ft.

Width 125' ft.

Depth 10' ft.

Volume = $\frac{4,000 \times 125 \times 10}{27} = 185,000$ cu.yds.Sample ST2

Length 5,000' ft.

Width 125' ft.

Depth 8' ft.

Volume = $\frac{5,000 \times 125 \times 8}{27} = 185,000$ cu.yds.Sample ST3

Length 5,000' ft.

Width 200' ft.

Depth 12.5' ft.

Volume = $\frac{5,000 \times 200 \times 12.5}{27} = 465,000$ cu.yds.Sample ST4

Length 3,000' ft.

Width 100' ft.

Depth 7.5' ft.

Volume = $\frac{3,000 \times 100 \times 7.5}{27} = 83,000$ cu.yds.Sample ST5

Length 11,000' ft.

Width 100' ft.

Depth 5' ft.

Volume = $\frac{11,000 \times 100 \times 5}{27} = 202,000$ cu.yds.

Total

= 1,120,000 cu.yds.

= 1,120,000 x 1.3 cu.yd.

1,450,000 tons

STRAHAN

Ilmenite	1,450,000	x	$\frac{8.1}{100}$	=	118,000 tons	x	$\frac{9.8}{100}$	=	11,500 tons
Chromite	1,450,000	x	$\frac{5.4}{100}$	=	78,000 tons	x	$\frac{9.8}{100}$	=	7,600 tons
Rutile	1,450,000	x	$\frac{2.0}{100}$	=	29,000 tons	x	$\frac{9.8}{100}$	=	2,800 tons
Zircon	1,450,000	x	$\frac{4.7}{100}$	=	68,000 tons	x	$\frac{9.8}{100}$	=	6,700 tons
Leucoxene	1,450,000	x	$\frac{2.8}{100}$	=	41,000 tons	x	$\frac{9.8}{100}$	=	4,000 tons
Cassiterite	1,450,000	x	$\frac{0.3}{100}$	=	4,400 tons	x	$\frac{9.8}{100}$	=	430 tons

021

826022

4.

WORK SHEETSANN BAYComposite Samples 1 - 7

			<u>Av. grade</u>		<u>Est. Recovery</u>		<u>FOB Value/ ton</u>		<u>Possible Recoverable Value</u>
Ilmenite	$\frac{43.9}{3}$	=	14.6%	x	75%	x	\$12	=	1.31
Chromite	$\frac{9.5}{3}$	=	3.2%	x	75%	x	\$20	=	0.48
Rutile	$\frac{19.3}{7}$	=	2.8%	x	60%	x	\$140	=	2.34
Zircon	$\frac{44.3}{7}$	=	6.3%	x	60%	x	\$35	=	2.08
Leucoxene	$\frac{63.8}{7}$	=	9.1%	x	50%	x	\$80	=	3.64
Cassiterite	$\frac{1.29}{3}$	=	0.43%	x	60%	x	\$1,300	=	3.36

Total recoverable value: \$13.21

For average grade 5.1% H.M. = \$0.66/ton of raw sand
of which cassiterite = \$0.17/ton of raw sand.

516

5.

ANN BAY

Composite 1

Length 4,000 ft.

Width 300 ft.

Depth 15 ft.

Volume = $\frac{4,000 \times 300 \times 15}{27} = 665,000$ cu.yds.

Composite 2

Length 1,000 ft.

Width 400 ft.

Depth 12 ft.

Volume = $\frac{1,000 \times 400 \times 12}{27} = 178,000$ cu.yds.

Composite 3

Length 2,000 ft.

Width 300 ft.

Depth 24 ft.

Volume = $\frac{4,000 \times 300 \times 24}{27} = 1,070,000$ cu.yds.

Total = 1,913,000 cu.yds.

= 2.5 million tons

665 x 5.1 = 3,400

178 x 4.5 = 800

1,070 x 5.6 = 6,000

1,913 10,200

Average grade = 5.3%

6.

ANN BAY

(1)	AAI	5 x 3.92	-	19.60
	AA2	5 x 1.93	-	9.65
	AA3	10 x 2.31	-	23.10
	AA4	15 x 4.7	-	70.50
	AB3	30 x 4.7	-	141.00
	AC3	20 x 7.65	-	153.00
	AB4	20 x 6.0	-	120.00

105

536.85

5.1%

15' average

(2)	AA5	14 x 3.7	-	51.8
	AB5	15 x 4.5	-	67.5
	AC5	15 x 3.6	-	54.0
	AD5	14 x 4.8	-	67.2
	AE5	10 x 4.2	-	42.0
	AF5	15 x 5.2	-	78.0
	AG5	10 x 4.1	-	41.0
	AH5	3 x 9.4	-	28.2

96

429.7

4.5%

12' average

(3)	AA6	15 x 7.1	-	106.5
	AA7	30 x 3.6	-	108.0
	AA7A	28 x 6.9	-	193.2

73

407.7

5.6%

24' average

047

80N

70N

60N

50N

40N

30N

20N

10N

843000

AA9-15'

AX8-8'

AA8-27'

AA7-30'

AA7A-28'

AA6-15'

AX6-10'

AX6A-10'

AA5-AH5
○○○○○○○○

AX5A-10'

AX5-10'

AB4-25'

AA4-22'

AX4-7'

AC3-20'

AB3-30'

AA3-12'

AA2-9'

AA1-23'

AA5 - 14'	AE5 - 10'
AB5 - 15'	AF5 - 15'
AC5 - 15'	AG5 - 10'
AD5 - 15'	AH5 - 5'

5 cm

True North

MARRAWAH BEACH AREA

Scale: 1" = 1000'

APPENDIX IIMINERAL DEPOSITS LIMITEDRESEARCH AND DEVELOPMENT LABORATORIESSOUTHPORTQUEENSLANDAUSTRALIARESEARCH REPORT NO. 66(1)**SUBJECT:**PRELIMINARY STUDY OF T/O
BEACH CONCENTRATES ON BEHALF
OF E. H. MACDONALD FOR
ELECTROLYTIC ZINC**D.G. James**
CHEMIST.**3rd February, 1970.**

INTRODUCTION

Two samples of beach concentrate were submitted by Mr. Eoin Macdonald on behalf of E.Z. Industries. The two samples originated from Ann Bay and Strahan on the West Coast of Tasmania. Additional information pertinent to these samples can be obtained from "C.S.I.R.O. Ore Dressing Investigation" Report No. 551 by S.B. Hudson.

AIMS:

- (1) To analyse for constituent heavy minerals.
- (2) To carry out a preliminary study of the separation characteristics of the heavy minerals.

PROCEDURE:(1) Bromoform Separation

The two samples were dried and separated with bromoform (SG 2.8) into sink and float fractions. The large proportion of minerals with a specific gravity intermediate between 2.8 and 3.2 rendered definite separation impossible.

The percentage of heavy minerals in the samples supplied are as follows:-

	<u>% H.M.</u>
Strahan	46
Ann Bay	41

(2) Attritioning:

The two heavy mineral fractions were then conditioned in dilute caustic soda solution to remove the organic stain present on the surface of some of the grains.

(3) Preliminary Electrostatic Separation:

The machine used for all electrostatic separations was a plate type with perforations to allow removal of non conductors. The size of the sample did not allow for the use of the standard high tension roll machine, which for this fine mineral, would probably effect a better separation.

The cleaned samples were then passed over the plate electrostatic separator but the preponderance of middling particles did not allow a reasonable separation. All fractions were then recombined.

(4) Wet Table Separation:

The heavy mineral samples were then passed over the laboratory wet table in an attempt to produce a concentrate relatively free of "light heavies".

In Table I below the results indicate that the size distribution and mineral composition is quite different from that experienced on the east coast of the Australian mainland.

TABLE I
STRAHAN MATERIAL

<u>PRODUCT</u>	<u>DISTRIBUTION</u>
Concentrate	22.4
Middling	66.1
Tailing	11.5

<u>PRODUCT</u>	<u>COMPOSITION %</u>				
	<u>Ilmenite</u>	<u>Others</u>	<u>Leucoxene</u>	<u>Zircon</u>	<u>Rutile</u>
Concentrate	59.1	6.4	0.3	27.6	6.7
Middling	67.1	18.8	2.5	6.8	4.9
Tailing	8.2	75.3	0.7	12.4	3.4

A light coloured yellow mineral (probably monazite) constituted the top % of an inch of the table concentrate. A large sample is needed to show the occurrence or otherwise of cassiterite.

(5) Electrostatic and Magnetic Separation:

The three products from tabling operation were each separated on the plate electrostatic and roll magnet machines. The wet table concentrate separated relatively easily on the electrostatic separator, but high speed magnetic roll separation was needed to produce a clean

3.

The wet table middlings fraction was very difficult to separate electrostatically and repeated passes over the magnet and electrostatic separators were needed. It is quite possible that a film of caustic soda remained on the surface of some, or all of the grains. Attritioning tests using large samples are required to investigate this possibility further.

Table 2 shows the composition of the two heavy mineral fractions.

TABLE 2

AREA	COMPOSITION %				
	Ilmenite- Chromite	Others	Rutile	Zircon	Leucoxene
Strahan	58.5	22.5	5.1	12.1	1.8
Ann Bay	37.9	37.1	7.2	13.9	3.9

Others include garnet, monazite, aluminium silicates and ferro magnesian minerals.

A large proportion of highly susceptible non-conducting mineral was obtained from both Strahan and Ann Bay.

(6) Chemical Analysis of Chromite-Ilmenite:

The chemical analyses of the two ilmenite-chromite fractions are as follows:-

AREA	COMPOSITION		
	% TiO ₂	Cr O 2 3	Fe
Strahan	18	34	18
Ann Bay	25	26	24

CONCLUSIONS:

(1) Pure Rutile and Zircon products will be difficult to produce, particularly zircon. Several stages of air tabling will be necessary to remove the "light heavies" from the zircon in order to meet the ZrO_2 specifications. Not all the rutile present will constitute a rutile product, as many grains have siliceous coatings and some rutile will be lost during the removal of leucoxene.

(2) The sand must be attritioned.

(3) Cross belt testwork on the ilmenite-chromite fraction may show if a saleable chromite can be produced.

D. G. James
CHEMIST.

2nd February, 1970.

R. K. NEWMAN & CO. PTY. LTD.

PUBLIC ANALYSTS : CONSULTING CHEMISTS

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BH/IM.

PARKER HOUSE

17-23 PARKER STREET
 SYDNEY, N.S.W. 2000
 TELEPHONE: 211-4343

30th June, 1970.

Mr. Eoin H. MacDonald,
 Suite 3714,
 Australia Square,
SYDNEY. 2000

Dear Sir:

Following are the results of our examination of the five samples of Sand submitted to us on 8/6/70, marked as shown below:-

Magnetic Separation:

	<u>ST.1</u> %	<u>ST.2</u> %	<u>ST.3</u> %	<u>ST.4</u> %	<u>ST.5</u> %
Strongly magnetic	Trace	Trace	-	-	-
Weakly magnetic	91.1	85.5	81.6	84.6	90.0
Non-magnetic	8.9	14.5	18.4	15.4	10.0

Chemical Assay.Weakly Magnetic Fractions:

Sample No.	TiO ₂ %	Fe ₂ O ₃ %	FeO %	Cr ₂ O ₃ %
ST.1 ...	3.8	4.4	2.5	2.5
ST.2 ...	5.1	3.3	6.1	5.0
ST.3 ...	4.9	4.2	4.8	5.0
ST.4 ...	5.7	5.6	3.8	5.2
ST.5 ...	3.9	4.5	2.8	3.6

Non-Magnetic Fractions:

Sample No.	TiO ₂ %	ZrO ₂ %
ST.1 ...	33.8	19.0
ST.2 ...	30.4	24.6
ST.3 ...	29.1	21.9
ST.4 ...	28.6	27.7
ST.5 ...	31.5	21.7

Mr. Eoin H. MacDonald,

30/6/70.

Assay of original material for Tin:

	<u>ST.1</u>	<u>ST.2</u>	<u>ST.3</u>	<u>ST.4</u>	<u>ST.5</u>
% Tin as SnO ₂ .	0.038	0.045	0.038	0.037	0.030

From these results and from the results of grain counts carried out on the fractions, we are of the opinion that the material consists as follows:-

	<u>ST.1</u>	<u>ST.2</u>	<u>ST.3</u>	<u>ST.4</u>	<u>ST.5</u>
	%	%	%	%	%
Strongly magnetics	Trace	Trace	-	-	-
Ilmenite ...	7.0	8.8	8.1	9.7	7.0
Chromite ...	3.4	6.3	6.0	6.5	4.7
Other Weakly Magnetics ...	80.7	70.4	67.5	68.4	78.3
Rutile ...	0.86	2.15	1.88	2.97	2.00
Zircon ...	2.52	5.32	6.01	6.37	3.25
Leucoxene ...	2.86	3.04	4.67	1.98	1.58
Cassiterite ...	0.43	0.31	0.21	0.24	0.30
Other non-magnetics.	2.23	3.68	5.63	3.84	2.87

It is assumed that the Cr₂O₃ occurs as Chromite, although it may in fact occur as a spinel associated with Al₂O₃.

The weakly magnetic "others" consist largely of silicate minerals, no other worthwhile mineral being detected.

The non-magnetic "others" consist principally of silica and grains resembling Corundum. These have been observed in sands from King Island and tend to report in the Zircon product from which apparently they are completely separated only with difficulty. With these sands some consideration may be given to production of a "Leucoxene" product rather than Rutile.

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Mr. Eoin H. MacDonald,

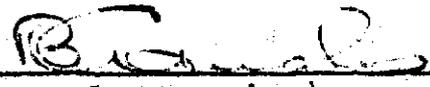
30/6/70.

Sieve Tests of original samples:

	<u>ST.1</u>	<u>ST.2</u>	<u>ST.3</u>	<u>ST.4</u>	<u>ST.5</u>
	%	%	%	%	%
Held on 30 mesh BSS.	Trace	Nil	Trace	Nil	Nil
Through 30, held 60.	0.1	0.1	0.1	Trace	0.1
" 60, " 100.	4.0	4.6	4.2	2.7	6.5
" 100, " 150.	76.6	60.5	57.9	53.2	70.4
" 150, " 200.	18.9	34.2	37.1	43.1	22.7
" 200.	0.4	0.6	0.7	1.0	0.3

Yours faithfully,

R. K. NEWMAN & CO. PTY. LTD.,



B. B. C. Hughes.

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APPENDIX IV

R. K. NEWMAN & CO. PTY. LTD.

826034

PUBLIC ANALYSTS : CONSULTING CHEMISTS

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PARKER HOUSE

17-23 PARKER STREET
 SYDNEY, N.S.W. 2000
 TELEPHONE: 211-4543

30th June, 1970.

Mr. Eoin H. Macdonald,
 Suite 3714,
 Australia Square,
 SYDNEY. 2000

Dear Sir:

We have examined the composite samples prepared from the samples of Heavy Mineral, submitted by you on 7/4/70.

The samples were composited as follows:-

<u>Composite Sample No.</u>	<u>Composed of:</u>
1. ...	AA1 0'-5'; AA2 0'-5'; AA3 0'-5', 5'-10'; AA4 0'-5', 5'-10', 10'-15', 15'-20'; 20'-22'
2. ...	AA5 0'-5', 5'-10', 10'-14', AB5 0'-5', 5'-10', 10'-15', AC5 0'-5', 5'-10', 10'-15', AD5 0'-5', 5'-10', 10'-14', AE5 0'-5', 5'-10', AF5 0'-5', 5'-10', 10'-15', AG5 0'-5', 5'-10', AH5 0'-3'
3. ...	AA6 0'-5', 5'-10', 10'-15', AA7 0'-5', 5'-10', 10'-15', 15'-20', 20'-25', 25'-30', AA7AG 0'-5', 5'-10', 10'-15', 15'-20', 20'-25', 25'-28', AA8 0'-5', 5'-10', 10'-15', 15'-20', 20'-25', 25'-30', AA9 0'-5', 5'-10', 10'-15',
4. ...	AC3 0'-5', 5'-10', 10'-15', 15'-20',
5. ...	AX6 0'-10',
6. ...	AB3 0'-5', 5'-10', 10'-15', 15'-20', 20'-25', 25'-30',
7. ...	AB4 0'-5', 5'-10', 10'-15', 15'-20', 20'-25'

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30/6/70.

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The seven composite samples were subjected to magnetic separation. The weakly magnetic and non-magnetic fractions of Nos. 1, 2 & 3 were assayed chemically and grain counted, while those fractions of Nos. 4, 5, 6 & 7 were grain counted only. Tin was determined on the combined weak-and-non-magnetics.

The results obtained were as follows:-

Magnetic Separation:

Sample number.	Strongly Magnetic.	Weakly Magnetic.	Non-Magnetic.
1 ...	2.3	71.8	25.9
2 ...	2.6	71.6	25.8
3 ...	0.2	79.3	20.5
4 ...	Trace	80.6	19.4
5 ...	Trace	64.0	36.0
6 ...	Trace	80.6	19.4
7 ...	Trace	82.1	17.9

Chemical examination of Weakly Magnetic Fractions:-

Sample No.	TiO ₂	Fe ₂ O ₃	FeO	Cr ₂ O ₃
1 ...	12.0	6.2	9.9	3.1
2 ...	9.2	6.8	8.9	3.4
3 ...	8.5	6.8	6.8	2.3

Chemical examination of Non-Magnetics:-

Sample No.	TiO ₂	ZrO ₂
1 ...	35.5	15.7
2 ...	34.0	21.3
3 ...	36.5	25.2

Tin determination in combined Weakly-Magnetics and Non-Magnetics:-

Sample No.	Tin expressed as % SnO ₂ .
1 ...	0.08
2 ...	0.15
3 ...	0.09

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30/6/70.

The tin content reported largely in the non-magnetic fraction.

From the foregoing results and from the results of grain counts, we are of the opinion that the material consists as follows:-

	Sample No.1	Sample No.2	Sample No.3
Strongly magnetic (probably magnetite),	2.3%	2.6%	0.2%
Ilmenite	17.2%	13.2%	13.5% 14.6
Chromite	3.3%	3.6%	2.6%
Monazite	Nil detected.	Nil detected.	Nil detected.
Other Weakly Magnetics	51.3%	54.8%	63.2%
Rutile	1.7%	2.8%	2.5% 2.3
Zircon	6.1%	8.0%	7.7%
Leucoxene	10.0%	8.2%	6.7%
Cassiterite... ..	0.30%	0.58%	0.41%
Other non-magnetics.	7.80%	6.22%	3.19%

It has been assumed that the Cr_2O_3 occurs as Chromite. It is possible that it, in fact, occurs as a spinel in association with Al_2O_3 .

Composite samples Nos. 4, 5, 6, 7:-

Weakly magnetic fractions: With the exception of sample No. 5 these samples closely approximated Nos. 1, 2 & 3 in microscopic appearance. Traces only of monazite were detected in Nos. 4 & 5, with none detected in Nos. 6 & 7. Sample No. 5 contained approximately 63% of "blacks" in the weakly magnetic fraction, roughly double that of the other six samples.

Non-magnetic fractions:

	No.4	No.5	No.6	No.7
Rutile	2.9%	3.9%	2.1%	3.4% 2.6
Zircon	4.5%	9.1%	3.2%	5.7%
Leucoxene	7.6%	15.7%	9.8%	5.8%
Other non-magnetics expressed as % of original material.	4.4%	7.3%	4.3%	3.0%

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The following observations apply to all samples:-

Weakly magnetic "others" consisted of silicate type minerals mainly. Some garnets and occasional tourmaline like grains were detected. Monazite appeared to be almost totally absent. No cassiterite was detected.

Non-magnetic "others" consisted primarily of Silica and grains which appear to be Corundum. The presence of these has been noted in sand from King Island and their complete removal from the Zircon product appears to cause some difficulty. The ratio of Rutile to Leucoxene does not favour production of a high grade Rutile product. Perhaps consideration might be given to production of a "Leucoxene" product as is obtained in Western Australia. The "Zinc Plate" test was applied to these fractions and it appeared that traces of Cassiterite were present. We are of the opinion that the tin detected by assay reports mainly in this fraction.

Yours faithfully,

R. K. NEWMAN & CO. PTY. LTD.,

B. B. C. Hughes.

B. B. C. Hughes.

DRILLING ANN BAY - MARRAWAH 9/3/70.AAI

Top of dunes 100' from beach

0 - 5' Brown sand
 5'-10' Brown sand - little clay, small consolidated (iron) modules.
 10' Water table
 10'-15' Brown sand
 15'-20' Quartz sand and black sludge
 6" clay 17 - 18
 20'-22' Quartz sand - black sludge
 22'-23' Brown lignitic clay

AA2

Beach 1000' north AAI

0 - 5' Quartz sand and black sludge 6" lignitic clay at 2'
 5' -9' White clay, yellow clay and nodules of cemented sand.
 Very light and difficult to drill. Water at 5'

AA3

Beach 1000' north of AAe

5'-10' Grey sand
 0 - 5' W.T. 5'
 5'-10' Brown sand - very wet
 10'-12'6" Brown sand - very wet
 12'6" Cemented bottom could not drill.

AB3

On top of dunes 100' west - 25' above AA3

0 - 5' Dune sand
 5'-10' " "
 10'-15' " "
 15'-20' " "
 20'-25' " "
 25'-30' " "

2.

AA4

Beach 1000' north of AA3

- 0 - 5' Dune sand
- 5'-10' Blackish sand - Water 9'
- 10'-15' Silver sand - black slurry
- 15'-20' Silver sand - little carbonaceous clay and mud water at 17'
- 20'-22' " " " " " " " "
- 22' White clay

AB4

Beach 100' west of AA4

- 0 - 24' Brown dune sand
- 24'-25' Grey sand - water 17'
- 25' Brown sand

AD5

Beach 50' west of AC5

- 0 - 5' Grey and black sand
- 5'-10' Grey and black sand - water 5'
- 10'-15' Black sand - black clayey sand at 14'

AC5

Beach 50' west of AB5

- 0 - 5' 0-2' Surface dune 2'-4' grey sand 4'-5' black sand
- 5'-10' Black sand - water 7' and peat
- 10'-15' Brown sand - brown filter sand 14'

AA5, AB5 etc. 50' apart

AB5

Beach 50' west of AA5

- 0 - 5' Dune sand
- 5'-10' 6' Black peaty clay - 8' black sand - 8' water
- 10'-15' Brown sand

3.

AA5

Beach 1000' north of AA4

0 - 5' 0-4' Dune sand - 4'-5' black sand
 5'-10' Black sand - water 7'
 10'-14' Brown sand
 14' Brown/yellow sand

AX4

Beach 1500' west of AA4 - Black dunes

0 - 2' Trace
 2'- 7' Slight trace. Clear white sand 7' water.

AX5

Beach 750' north-north-east of AX4

0 - 5' White sand
 5' - 8' Yellow sand
 8' -10' Black sand - water 9'

AX5A

Beach 250' north-west of AX5

0 - 3' White sand 0-5' Nil.
 3'-10' Yellow sand 5'-9' slight trace of mineral
 9'-10' Nil.

AX6A

Beach 500' north-north-east of AX5A

0 - 5' White sand - slight trace of mineral
 5'-10' Yellow and brown sand
 0-1' Slight trace
 1'-10' Nil.

AX6

Beach 1000' north-east of AX5

0 - 3' White sand)
 3'-10' Yellow sand) Sample - trace

APPENDIX VIDRILLING OCEAN BEACH - STRAHAN 15/3/70.SA1

- Beach 200' south of road entrance, 40' from edge of dune.
- 0 - 5' Grey and black sand with high heavy mineral content.
Water table at 1'6"
- 5'-10' Grey sand with trace amounts of H.M.
Scattered pebbles 1/4 - 1" in diameter.

SA2

- Beach 1000' south SAI
- 0 - 5' Grey and black sand high H.M. content.
Water at 1'
- 5'-10' Grey sand with trace H.M. and scattered pebbles
up to 1" in diameter.

SA3

- Beach 1000' south SA2
- 0 - 5' Grey and black sand with high H.M.
Water at 1'
- 5'-10' Grey sand with trace H.M. and scattered pebbles
up to 1" in diameter.

SA4

- Beach 1000' south, 50' from edge of dune.
- 0 - 5' Grey and black sand with high H.M.
Water at 1'
- 5'-10' Grey sand - trace H.M. and scattered pebbles 1"-3" diameter.

SA5

- Beach 1000' south.
- 0 - 5' Grey and black sand with high H.M.
Water at 1'6"
- 5' - 8' Grey sand with trace H.M. Pebbles at 7'

SB5

- Beach 25' west from SA5
- 0 - 2 1/2" Brown and black sand with high H.M. Water at 1'
Bottomed on pebbles which prevented hole going deeper.

SC5

Beach 25' west from SB5

0 - 3' Grey sand with trace H.M. Water at 1'

3' - 5' Black sand with trace H.M.

5'-10' Grey sand with trace H.M. and scattered pebbles.

SX5

Beach 25' east of SA5

0 - 5' Black sand very high H.M. Water at 1'6"

5' - 8' Grey sand with trace H.M.

Pebble layer at 7'

SA6

1000' south of SA5

0 - 6' 0'-5' Brown and yellow sand.

5'-6' Pebbles and sand.

SA7

1000' south of SA6

0 - 5' Brown sand. Pebbles at 4'

5'-10' Yellow sand.

SX7

100' east of SA7 on dunes 50' from beach

0 - 5' Yellow sand. Water 4'

5'-10' " " "

10'-15' " " Values tr. at 14"

SA8

1000' south of SA7

0 - 5' Brown sand. Water at 3'. Pebbles at 3'

5'-10' " " 9'-10' trace.

SA9

1000' south of SA8

0 - 5' Yellow sand. Water 2'. No pebbles.

5'-10' " " Pebbles 7' 8' Trace.

3.

AX8

Beach 2000' north-north-west of AX6

0 - 6'	White sand)	0 - 5'	Nil
6' - 8'	Yellow sand)	5' - 8'	Slight trace.

AC3

Beach 100' west of AB3

0 - 5'	White sand
5' - 10'	Grey sand
10' - 15'	" "
15' - 20'	15' - 18' Grey sand 18' - 20' Black sand
	Water 18' - 18' - 20' Trace.

AA6

Beach 1000' north of AA5

AA7

Beach 1000' north of AA6

AA7A

Beach 300' east of AA7

AA8

Beach, 1000' north of AA7

50'	50'	50'	50'	50'	50'	50'	50'
Beach	AH5	AG5	AE5	AD5	AC5	AB5	AA5

SA10

042
1000' south of SA9 and 15' from dune.

- 0 - 5' Sand. Pebbles at 3'. Water 3'.
5' - 9' Yellow sand. 8' - 9' Trace.

SB10

25' west of SA10

- 0 - 5' Yellow sand. Pebbles 3'. Water 3'.
5' - 9' " " Some pebbles 8'-9' Trace.

SC10

25' west of SB10

- 0 - 5' Brown sand 2' Water 3' Pebbles 4'-5' Trace.
5' - 7' Brown sand. Trace. No samples.

SD10

25' west of SC10

- 0 - 5' Brown sand. Water 2' Pebbles 4'.
5' - 6' Trace. No sample.

SXII

Dunes 100' east of SAII

- | | | | |
|---------|---------|-------------|---|
| 0 - 5' | Yellow. | White sand. | |
| 5'-10' | " | " | " |
| 10'-15' | " | " | " |
| 15'-19' | " | " | " |

SA12

1100' south of SA11

- 0 - 5' Brown sand - good values 4'. Pebbles 5'. Water 3'.
5' - 6' Sand pebbles 1/4" only little sand - good trace.

SA13

1000' south of SA12

- 0-4'6" Grey/brown sand - Water 2'. Pebbles 3'.
At 4' hard pebble bed - good.
Values Trace 6" at 2'.

SA14

1000' south of SA13

- 0 - 5' Yellow brown sand pebbles 4'. Water 6".
5'-10' " " 8'-10' Trace.

SA15

1000' south of SA14

- 0 - 5' Yellow brown sand - best values 2'-3' Water 2'.
 5'- 9' " " " - pebbles 6' - 7' 8'-9' Trace.

SB15

25' west of SA15

- 0 - 5' Yellow brown sand - Values 2-3'
 Pebbles 4'-6' Water 2'
 5'- 6' Trace. No sample.

SC15

25' west of SB15

- 0 - 5' Yellow and brown sand - Values 3'- 4' Pebbles 4'.
 Water 1'-6"
 5' Trace.

SD15

25' west of SC15

- 0 - 2' Yellow sand
 2'- 4' Pebbles and little sand. Water 6".
 No sample.

SX15

50' east of SA15 in dunes 25' from beach.

- 0 - 5' White sand - Trace. No sample.
 5'-10' Yellow brown sand. Sample water 10'
 10'-11' Small pebbles. Trace.

SAO

1000' north of SAI

- 0 - 5' Yellow brown sand. Water 1'. Pebbles 2'.
 5'-10' Yellow sand and pebbles.

SA16

1100' south of SA15

- 0 - 5' Yellow grey sand. Best 0-2' gradually decreasing on
 values. Water 6".
 5'- 6' Sand and pebbles. Trace. Water 1'.

6.

SA18

1000' south of SA17

0 - 5' Yellow sand. Trace only. Water 3'.

Under big dune - No sample.

SA19

0 - 3' Yellow sand. Trace. 3' Water. No sample.

SX16

100' on low dunes for edge of beach.

0 - 5' 0 - 4' Yellow sand. 4'-5' Grey sand.

Trace to 2' gradually improving to 5' Water 5'

5'-10' Yellow and grey sand. No pebbles 5'-9'.

9'-10' Trace.

SBO

25' west of SAO

0 - 5' Yellow and brown sand. Water 3'.

0 - 3' Little 4'-5' Best values. Pebbles 4'6".

5'-9' Yellow sand.

9'-10' Trace.

SCO

25' west of SBO

0 - 5' Yellow and grey sand. Water 2'. Best values 2'-4'.

5'-10' Sand - few pebbles at 7'.

SDO

25' west of SCO

0 - 5' Yellow and grey sand. Water 2'. Best values 2'-4'.

5' - 9' Sand and sand pebbles. 9'-10' Trace.

SEO

25' west of SDO

0 - 5' Yellow and grey sand. Water 2'. Best value 3'.

5' - 8' Yellow sand. Pebbles 7'. Trace. No sample.

045

7.

SXO

150' east of beach in dunes

0 - 5'	Yellow sand)	
5'-10'	Brown sand)	Trace.
10'-13'	White sand)	No sample.
14'-14'	Black sand)	
14'-15'	White)	

SA21

1000' north SAO

0 - 5'	Yellow and grey sand. Water I'
5'- 6'	Yellow sand - strong trace. No sample.
6'	Pebble bed - little sand.

SA22

1000' north of SA21

0 - 5'	Yellow and grey sand. Water I'
0 - 6'	Sample - sand over all.
6'- 8'	Pebbles and sand. Trace. No sample.

SA23

1000' north of SA22

0 - 3'	Yellow and grey sand. Sample.
3' - 4'	Yellow sand and pebbles. Trace. No sample.

SA24

1000' north of SA23

0 - 2'	Brown yellow sand. Water 6". Sample.
2'	Pebble bed.

SA25

1000' north of SA24

0 - 5'	Yellow and grey sand. Water 2'6"	
5' - 7'6"	"	"
		Sample.
7' - 6'	Pebble bed.	

046

8.

SA26

1000' north of SA25

0 - 5' Yellow and grey sand. Water 2'

5' - 6' Yellow sand. Trace. No sample.

SA27

1000' north of SA26

0 - 5' Grey sand - good values to 4'6". Water 2'

5' - 6' Pebbles and yellow sand. Trace.

048

APPENDIX VII

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MINERAL DEPOSITS LTD.

RESEARCH AND DEVELOPMENT LABORATORIES.
SOUTHPORT QUEENSLAND.

71-802

PROJECT NO. 66/2

ELECTROLYTIC ZINC INDUSTRIES LTD.
TASMANIA.

RESEARCH REPORT NO. 66/2-(a)

SUBJECT: GRAVITY CONCENTRATION AND
DRY SEPARATION OF STRAHAN
AND ANN BAY MINERAL SANDS.

I.J. Terrill
Chief Metallurgist.

20.1.1971.



INTRODUCTION

At the instruction of Mr. E.H. Macdonald, samples of Tasmanian Beach Sands from Strahan and Ann Bay were concentrated on a shaking table and the gravity concentrates so achieved were subjected to standard dry mill separation procedures.

The work was completed but regrettably the samples from each area were combined prior to tabling. The responsibility for this action rests clearly with the writer and was most unfortunate.

However, a study of the mineral assembly and the recoverable values present in the composite sample indicates that the work completed was still relevant as neither the combined or original samples were of significantly high grade.

The tests indicated generally that standard high capacity gravity concentration followed by electrostatic and magnetic separation of the dry concentrate could produce good quality rutile and zircon products.

Cassiterite was recovered into the rutile fraction without problems and further wet tabling provided a reasonable upgrading and recovery of SnO_2 .

The details of testwork on the combined samples are given below.

A general exercise based on a 1000 tph gravity plant was calculated and the data is summarized in the conclusion.

TEST PROCEDURE

304 Kg of combined sample were dried, weighed and gravity separated on a full size shaking table (Flowsheet 1) The table was fed via a drum wet magnetic separation to extract any magnetite present but only 110 gms were recovered. Middlings from the table were constantly recirculated to head feed and a very high recovery of valuable heavies was achieved by a relatively small continuous tailing extraction.

Primary concentrate was retabled to produce a

final concentrate (Con.1) containing the bulk of the valuable minerals and a lower grade fraction (Con.2). A good delineation of high and low grade fractions was evident on the table indicating that a dry mill feed preparation circuit containing spirals and shaking tables could produce a good quality concentrate containing a minimum of valueless ferromagnesian particles.

A cassiterite top cut could be taken at this point on the shaking tables. This would produce a more easily separable Zircon/Monazite/Cassiterite concentrate. There were insufficient values in the primary concentrate obtained to give this procedure a trial and no attempt was made to produce an initial cassiterite concentrate.

Concentrates 1 and 2 were dried and given the separation treatment indicated in flowsheet 1 attached. Small samples of each stage product were extracted for reference and analysis but not sufficient to appreciably affect the final recoverable values. The emphasis was laid on producing saleable products at maximum recovery.

After allowance for reserve samples at each stage the proportions of each product are indicated in Table 1. Concentrate 2 products were not analysed chemically but an optical examination proved to be very low quality materials containing large proportions of diluent particles and composites.

Observation of both the gravity concentration behaviour and dry separation indicates that a very low recovery of the residual values in these Con. 2 fractions would be made to the final products. Cassiterite was not visible in any product except the stage II "rutile" fraction and this to a negligible extent.

In general only the mineral reporting to Con.1 could be considered as recoverable by the normal processes of beach mining. Only a full scale test on many tons of heavy mineral could provide a complete estimate of recoverable second grade or magnetic zircon. The ilmenite analysis indicates a non saleable material

due to low TiO_2 and high Cr_2O_3 .

All the economics of the sands rest on Rutile, Zircon and Cassiterite contents.

An economic exercise assuming a 1000 tph operation would provide the output of valuable minerals shown below.

Rutile - 1000 tph x 7000 hrs x 0.21% = 14,700 tons.
Premium Zircon - 1000 tph x 7000 hrs x 0.325% = 22,750 tons.
Cassiterite - 1000 tph x 7000 hrs x 9.7 gms/ton = 67.9 tons.

A significant increase in cassiterite and/or rutile and zircon grades would be necessary to mount a viable dredging operation.

Reserves would have to provide for up to 10 years operation to amortize the wet and dry plants.

Subject to favourable exploration indications, a 50 tph pilot operation using a front end loader as the digging unit, would allow a very good assessment of the deposits.

Bulk samples of heavy mineral concentrate could be cheaply produced for dry mill testwork.

Large samples of final products could be obtained for contract negotiation and trial cassiterite separations.

The sample mixing is very much regretted but there appears to be no problem in handling the component materials from either area by standard techniques.


I.J. Terrill
Chief Metallurgist.

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TABLE 1

Wet Tabling Section	Wt. Kgs.	% Wt.
Con. 1	11.6	3.8
Con. 2	9.7	3.2
Tail	282.3	93.0
Head Feed	303.6	100.00

DRY SEPARATION SECTION

	CONCENTRATE 1			CONCENTRATE 2		
	Wt. rec gms	% Dist in product	% Dist in head feed	Wt. rec gms	% Dist in product	% Dist in head feed
Oversize 52 mesh B.S.S.	116	1.0	0.038	49	0.5	0.016
Reject Conductor Fraction	1044	9.0	0.344	727	7.5	0.239
Primary Zircon Magnetics	1740	15.0	0.573	6790	70.0	2.236
Secondary " "	232	2.0	0.076	97	1.0	0.032
Zircon product	986	8.5	0.325	485	5.0	0.160
Magnetite Fraction	174	1.5	0.057	49	0.5	0.016
Ilmenite Fraction	6554	56.5	2.159	1261	13.0	0.415
Reject Non Conductors	116	1.0	0.038	97	1.0	0.032
Rutile/Cassiterite Fract.	638	5.5	0.21	145	1.5	0.048
Totals	11600	100.0	3.8	9700	100.0	3.2

Recoverable Sn as cassiterite - 9.7 gms/metric ton.

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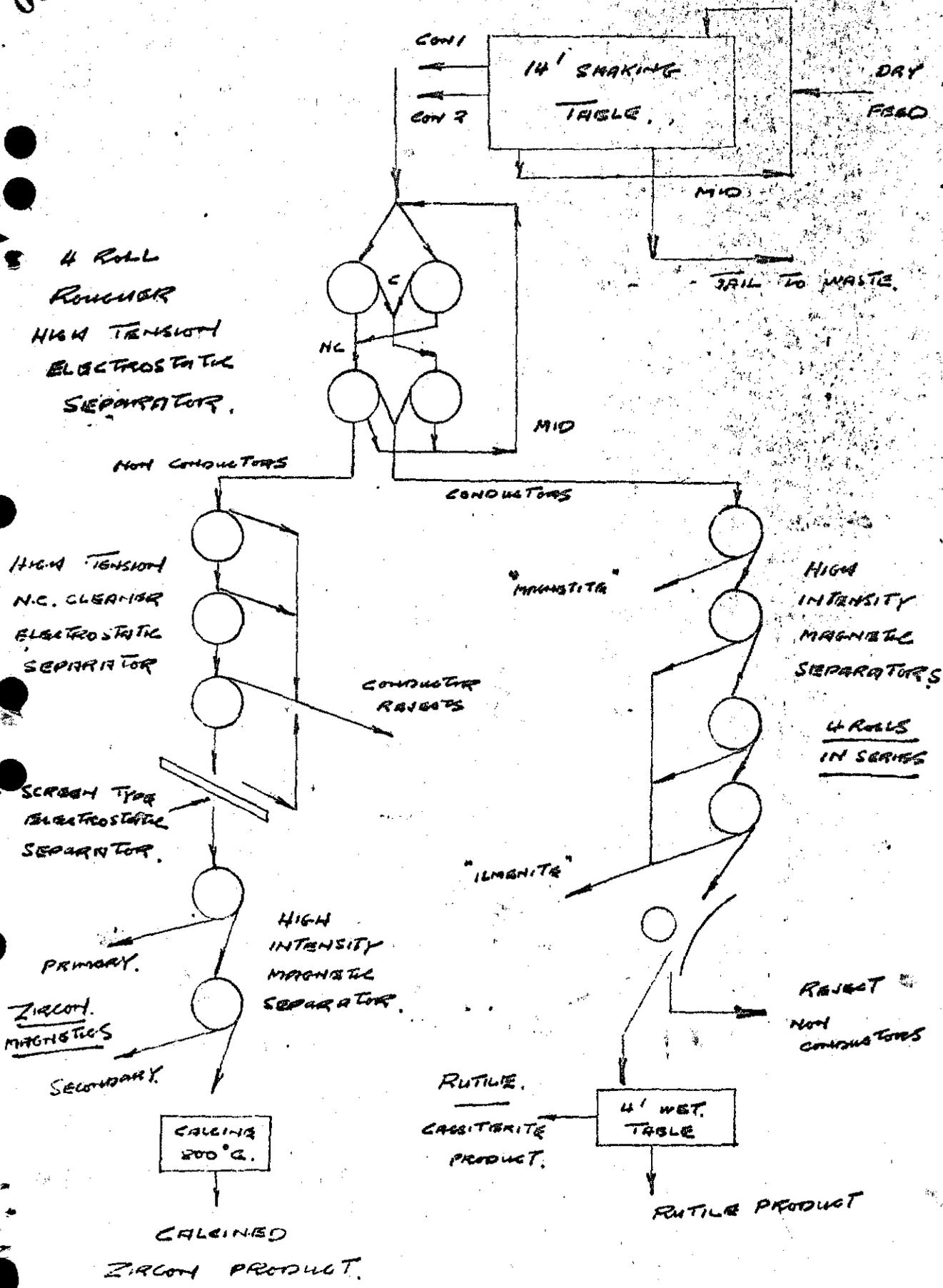
TABLE 2.ANALYSIS OF CONCENTRATE 1 PRODUCTS

	<u>TiO₂</u>	<u>Cr₂O₃</u>	<u>Fe</u>	<u>Sn</u>
Rutile/Cassiterite product.	84.0	0.77	3.45	0.46
Ilmenite Product	24.0	2.88	19.8	-
Magnetite product	30.0	2.25	32.1	-
<hr/>				
Zircon product -	0.07 TiO ₂ . 0.8-1% quartz. (Physical analysis).			

TABLE 2ASEMI QUALITATIVE ANALYSES OF CON. 1
PRODUCTS BY ATOMIC ABSORPTION.

	<u>Lead</u>	<u>Zinc</u>	<u>Copper</u>	<u>Nickel</u>
	ppm	ppm	ppm	ppm
Rutile/Cassiterite	1060	620	190	250
Ilmenite	2800	1880	630	310
Magnetite	2800	1400	470	940

054



REICHERT MINING EQUIPMENT DIVISION
MINERAL DEPOSITS LTD. -SOUTHPORT, QUEENSLAND

FLWSHEET
66/2-A

TEST FLOWSHEET USED ON COMBINED
ANN BAY / STRAUGHAN SANDS.

DRAWN: I. J. T
DATE: 18.1.71
SCALE: _____

MARRAWAH BEACH AREA

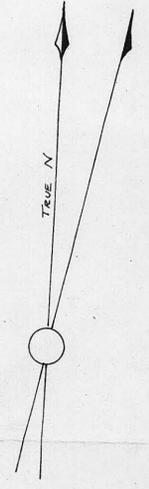
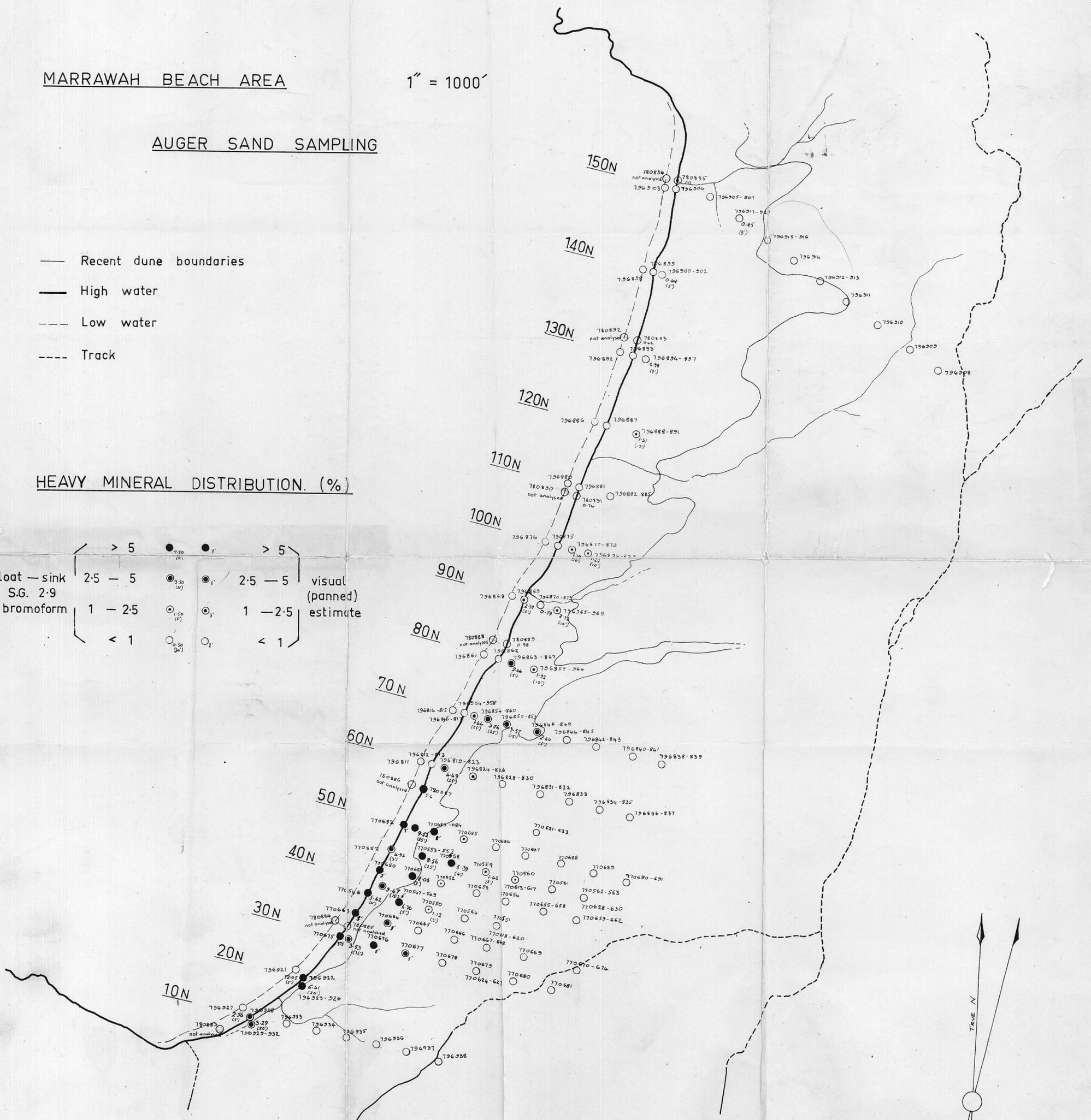
1" = 1000'

AUGER SAND SAMPLING

- Recent dune boundaries
- High water
- - - Low water
- Track

HEAVY MINERAL DISTRIBUTION. (%)

float - sink	> 5	●	> 5	●	visual
S.G. 2.9	2.5 - 5	○	2.5 - 5	○	(panned)
bromoform	1 - 2.5	○	1 - 2.5	○	estimate
	< 1	○	< 1	○	



5 cm

Fig 1
6671

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