

**PETER H. STITT & ASSOCIATES PTY. LTD.**  
MINING AND GEOLOGICAL CONSULTANTS

626001

5TH FLOOR,  
KING YORK HOUSE,  
32 YORK STREET,  
SYDNEY N.S.W. 2000  
PHONE: (02) 29 1403  
FAX: (02) 262 2395

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MINES	
E.L. 45/86	
1989	
LETTER	
15.6.89	
REFERS	

REPORT NO 12/89

E.L. 45/86

Relinquishment Report for Exploration Carried Out  
on the Northern and North Western Areas  
of King Island, Tasmania

Prepared for National Mineral Sands Pty. Ltd.

A. Dove  
June, 1989

AMG REFERENCE POINTS ADDED

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Distribution List

Brian Williams, Geopeko

David Gillett, National Mineral Sands Pty. Ltd.

Tasmanian Department of Mines

Andrew Dove, Peter H. Stitt & Associates Pty. Ltd.

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    Showing Relinquished Areas up to 17.4.89

1. AIM

To investigate the potential for mineral sand occurrences in the north-western and eastern areas of King Island.

2. REASON

During the past three years the demand for mineral sand products has outstripped the supply available from current production areas. As a consequence significant price rises have occurred in the mineral sand commodities - rutile, leucoxene, ilmenite (all TiO<sub>2</sub> raw materials), zircon and monazite.

King Island has a previous history of mineral sand production from the Naracoopa area on the east coast. This area is currently being examined by the title holder to fully determine the available resources. Exploration within E.L. 45/86 was directed towards locating resources which would supplement those at Naracoopa.

3. SUMMARY & CONCLUSIONS

3.1 E.L. 45/86 originally covered an area of 241 square kilometres on the northern end of King Island.

3.2 Following exploration work carried out to 17.4.88 the licence was reduced to 185 km<sup>2</sup>.

3.3 Subsequent work carried out to 17.4.89 resulted in a further reduction to 49 km<sup>2</sup>.

3.4 A study of aerial photographs covering the licence area was completed.

3.5 Field investigations were carried out on six traverse lines designated Manana (M), Yellow Rock (YR), Lake Flannigan (LF), Martha Lavinia (ML),

Whites Beach (WB) and Disappointment Bay (DB) using hand drilling methods.

3.6 Drillhole samples were subjected to laboratory heavy mineral separation and mineralogical investigations.

3.7 Mineralogical studies showed that some samples contained significant rutile, zircon and leucoxene values, however the total heavy mineral grades occurred in sub-economic concentrations.

4. RECOMMENDATION

Results obtained from exploration of this part of the licence have indicated that no further work is warranted. It is therefore recommended that this part of the licence be relinquished and that all future efforts be concentrated in the area around Counsel Hill.

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5. INTRODUCTION

National Mineral Sands Pty. Ltd. holds Exploration Licence 45/86, King Island, which was granted on 17th April, 1987 for a period of 12 months. The Licence was renewed on 17.4.88 for a period of 12 months, and subsequently a further renewal of 12 months occurred on 17.4.89.

Exploration within E.L. 45/86 has been directed at locating additional resources of rutile, zircon, leucoxene and monazite bearing sand which could supplement the known resources within E.L. 28/85 and E.L. 41/88.

During the past 3 years the world market has been dominated by a short fall in supply to meet the demand, particularly for TiO<sub>2</sub> pigment minerals, zircon and rare earth heavy minerals. As a consequence the price for these minerals has risen to historically high levels. Predictions for the future supply and price of titanium and zirconium raw materials is one of buoyancy.

Recent advances in technology and understanding of heavy mineral deposits has caused a re-evaluation of prospective areas. Chief points of advancement are:

- . Lower grade deposits are now economic.
- . Exploration methods have been developed particularly with regard to quantitative assessment of low grade areas.
- . Mineralogical determinations have seen the employment of the scanning electron microscope to identify minerals difficult to optically identify; particularly distinguishing black rutile from other black opaque minerals and identification of rare earth element minerals.
- . Mining technology has advanced, for example in dredging and dredge cutters, to lower costs and to make difficult areas now mineable.
- . Metallurgical treatment has seen the development of new spirals with higher throughput and suited to lower grade ore. Magnetic separators

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are now capable of more finely tuned separations to upgrade ilmenite and chromite products which have been rejected in the past.

- . Overall efficiency of the industry has advanced in order to meet market requirements.

6. TENEMENT INFORMATION

Exploration Licence 45/86 is held by National Mineral Sands Pty. Ltd. (formerly Butlers No. 27 Pty. Ltd.) and originally covered an area of 241 square kilometres on the northern end of King Island.

The area comprised 32 km<sup>2</sup> of Crown Land, 4 km<sup>2</sup> of private property. An area of 4 km<sup>2</sup> was excluded from the original application as it covered the Lavinia Nature Reserve.

Following exploration work carried out during the 12 months to 17/4/88 the licence was reduced to 185 km<sup>2</sup>. An area of 56 km<sup>2</sup> was relinquished by the company as it was deemed unprospective following the initial work. The relinquished area occurred on the west coast of the island extending south from Quarantine Bay to just north of Little Porky Beach.

Subsequent exploration work carried out during the 12 months to 17/4/89 indicated further unprospective areas and the licence has been reduced to 49 km<sup>2</sup>. The relinquished area includes all remaining titles with the exception of the area around Counsel Hill (see figure 1).

## 7. AERIAL PHOTOGRAPHY INTERPRETATION

Aerial photography interpretation using the most recently available black and white photography from Tasmap was carried out over the E.L. The photography is at a scale of 1:42,000 (approx) and dated as follows:

King Island

March/April, 1985

The maps prepared show sufficient geographic features to enable location using the 1:100,000 topographic series. Distortion between photographs created some problems in preparing these composites and is reflected by variation in the angle and length of some tenement boundaries.

The most prospective area for minerals is along the East Coast, particularly in the hinterland of Nine Mile Beach (see Fig. 1). This is also the most environmentally sensitive area, particularly since it adjoins the Lavinia Nature Reserve. It does, however, have a well-developed sequence of strandlines in a situation not dissimilar to Jerusalem Creek and Tea Gardens on the New South Wales North Coast. Unfortunately the strandline development continues into the nature reserve, which would also be highly prospective.

Along the West Coast on the southern end of Yellow Rock Beach a small development of strandline occurs. It is possible that the hinterland of Yellow Rock Beach contains strandlines overlain by Aeolian dunes.

Along the balance of the west coast of King Island Aeolian dunes occur but overlie Precambrian granite which outcrops along the present-day coastline. The potential for heavy mineral concentrations within these Aeolian dunes must be considered lower than for the strandline developments on other parts of the island.

## 8. FIELD INVESTIGATIONS

### 8.1 Survey

Drillholes where possible were located along straight traverse lines running nearly perpendicular to the strike of the strandlines or the coastline. Where possible the traverse lines were located along existing roads and tracks in order to minimise disturbance and allow ease of access during the reconnaissance stage.

Six traverse lines designated Manana (M), Yellow Rock (Y.R.), Lake Flannigan (L.F.), Martha Lavinia (M.L.), White's Beach (W.B.) and Disappointment Bay (D.B.) were drilled within the exploration licence (see Figure 1).

The survey of the drillholes was by tape, compass and Abney hand level. Holes were spaced 40 metres apart along traverse lines at Manana, Yellow Rock, Martha Lavinia, White's Beach and Disappointment Bay; and 80 metres apart along Lake Flannigan traverse.

### 8.2 Drilling

All drilling in the current programme was by hand auger and hand operated cased sludging, using Dormer Engineering equipment. The drilling was carried out using a Tasmanian drilling crew. Holes were hand augered to water table using 50 mm. diameter hand auger. When water table was reached 50 mm. casing was inserted into the hole and the hole was advanced by sludging using a whistle top sludger on aluminium extension rods.

Drilling was completed at rock basement, pebbles, thick clay or thick peat layers. Where there was no impediment to drilling, holes were terminated at 10m. depth, since hand drilling below this depth becomes increasingly slow.

Samples from the drilling were bagged at 1 or 2 metre intervals. Where samples were obtained by sludging they were weighed in the field to check on weight variation due to sand boiling into the casing.

9. LABORATORY TESTING9.1 Heavy Mineral Determination Procedure

All samples that were assayed for heavy minerals on a routine basis during the programme were treated by R.H.F. Laboratories, Smithton, or the Tasmanian Mines Department, Metallurgical Laboratories, Launceston, using the procedure outlined below:

1. Dry sample as received
2. Weigh and record dry weight.
3. Screen on a 2 mm coarse sieve to break up lumps.
4. Riffle split approximately 100 gm working sample.
5. Re-pack balance of sample.
6. Weigh working sample.
7. Screen on 1000 micron sieve and weigh plus 1000 micron fraction.
8. Caustic wash using a 2 percent NaOH solution, agitate and allow sand to settle (on selected samples only).
  - 8.1 Decant NaOH solution, wash and decant with clean water in repeated steps until all NaOH is removed.
  - 8.2 Dry washed sample.
  - 8.3 Weigh washed and dried sample and calculate percentage lost as slimed during washing.
9. Using TBE, separate heavy minerals.
10. Dry and weigh heavy minerals.
11. Calculate heavy minerals as a percentage of the sample weighed in step 6 above.
12. Package heavies for despatch.
13. Record results for:
  - . dry weight of sample as received.
  - . weight % of +1mm material.
  - . weight % slimes.
  - . weight % heavy minerals.

## 9.2 Mineralogical Investigation

Mineralogical studies were carried out on bulk composites of heavy mineral. For most composites the 1.2 amp non-magnetic fraction was examined with selected samples being subject to examination of all magnetic fractions. The method adopted for mineralogical study was:

1. Magnetically separate the heavy concentrate into:

- . hand magnetics
- . 0.5 amp Frantz magnetics
- . 1.0 amp Frantz magnetics
- . 1.2 amp Frantz magnetics
- . 1.2 amp Frantz non-magnetics

using a Frantz magnetic separator with forward slope of  $25^{\circ}$  and side tilt of  $18^{\circ}$ .

2. Weigh each magnetic fraction.

3. Optically identify mineral grains and point count a minimum 500 points for the relevant magnetic fraction.

Mineralogical examinations were carried out by Applied Petrographic Services, Sydney.

## 10. TRAVERSE LINE SUMMARIES

The location of all traverse lines is shown on Figure 1.

### Yellow Rock Traverse:

Traverse extended 480 metres, incorporating 12 drillholes. Heavy mineral was not detected, with most holes only penetrating calcareous sand.

### Lake Flannigan Traverse:

Traverse extended 1760 metres, incorporating 24 drillholes. Like Yellow Rock traverse, most drilling only penetrated the calcareous sand, with heavy mineral concentration not detected.

### Disappointment Bay and White Beach Traverses:

These two adjoining areas are located on the northern coast of the island (see figure 1) and were drilled during April, 1988, using hand drilling techniques. Exploration reports available from the Tasmanian Department of Mines include references to heavy mineral concentrations occurring in these areas.

Two traverse lines were drilled at White Beach, one near the eastern end of the beach and the other in about the middle of the beach. A total of 10 holes for 53.3 metres was drilled with samples showing a visual trace of heavy mineral.

At Disappointment Bay only one traverse line was drilled in the middle of the beach. Five holes for a total of 30.0 metres were drilled with samples again only showing a visual trace of heavy mineral.

### Martha Lavinia Traverse:

Traverse was only short, due to heavily vegetated dunes with only 6 drillholes managed along a 160 metre line. Concentrations of heavy minerals were present on the beach, though further inland they were not visible.

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11. RESULTS AND DISCUSSION

The Yellow Rock drillhole (YR 16) showed consistent grades for all intervals approximately 0.5% with an increased percentage for the final interval 8.0 - 8.5m. at 1.3%. This sudden increase probably represents an older beach deposit underlying the more recent calcareous dune.

The mineralogy of the holes consists of only 1% rutile, 3% zircon and 6% leucoxene, with the major minerals being ilmenite and tourmaline (see Table 1).

The Lake Flannigan drillholes shows consistently poor grades  $\leq 0.3\%$  for every interval, with the average for all three holes of 0.2% heavy mineral.

The mineralogy in the Lake Flannigan area LF 32 (Table 1) shows that rutile, zircon and leucoxene only make up 4% of the total heavy mineral. The sample is dominated by tourmaline, and has a large percentage of shell, indicating an aragonite rich calcareous sand.

The drillholes tested at Martha Lavinia showed encouraging signs, especially with an interval of 4.2% heavy mineral. However this is an isolated concentration which has no economic significance. The mineralogy however is dominated by ilmenite, tourmaline and garnet, with the economic minerals being 9% rutile, 9% zircon and 1% leucoxene (Table 2, sample MLO 0 - 3.0m.).

Mineralogical studies for each of the samples containing significant rutile, zircon and leucoxene values show that these minerals can readily be magnetically concentrated into the non-magnetic or the 1.6 amp magnetic fraction from the Frantz separation.

TABLE 1

Tabulation of Heavy Mineral Grades

Depth (metres)	HEAVY MINERAL GRADES %											
	ML0	ML4	ML8	ML12	ML16	ML20	YR16	LFO	LF8	LF32	LF88	LF136
0-1	0.4	0.6	0.7	0.1	0.2	0.5	0.5	0.2	0.2	0.2	0.2	0.2
1-2	4.2	0.4	0.6	0.1	0.4	0.6	0.5	0.3	0.2	0.2	0.3	0.2
2-3	0.5	0.5	0.5	0.1	0.3	0.4	0.4	0.2	0.3	0.2	0.3	0.2
3-4	0.1	0.7	0.5	0.2	0.3	0.5	0.5	0.2	0.2	0.2	0.1	0.2
4-5		0.2	0.3	0.1	0.4	0.6	0.6	0.2		0.2	0.2	0.2
5-6		0.2	0.1	0.1	0.3	0.5	0.6	0.3		0.1	0.2	0.2
6-7		0.2	0.1	0.1	0.2	0.5	0.6			0.2	0.2	0.2
7-8		0.1	0.1	0.2	0.1	0.4	0.6			0.2	0.2	0.3
8-9		0.2		0.2		0.3	1.3			0.2	0.2	0.2
9-10						0.4				0.2	0.2	0.2
Average Grade	1.3	0.35	0.4	0.1	0.3	0.5	0.58	0.23	0.23	0.19	0.2	0.2

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TABLE 2

## COMPARISON OF MINERALOGY

MINERAL	YR 16 0-9m.	LF 32 0-10m.	ML 0 0-3m.
MAGNETITE	5	6	5
ILMENITE	12	10	26
GARNET	9	9	16
TOURMALINE	18	29	28
RUTILE	1	1	9
ZIRCON	3	1	9
STAUROLITE	1	1	2
PYROXENE	7	5	-
AMPHIBOLE	3	1	-
OLIVINE	-	-	-
EPIDOTE/ZOISITE	9	3	<1
ALUMINO-SILICATES	6	4	3
LEUCOXENE	6	2	1
QUARTZ	1	2	1
SHELL	7	13	1
ROCK FRAGS/COMPOSITES	7	10	<1
MICA/CHLORITE	2	3	-
SULPHIDES	-	-	<1
APATITE	4	-	-
CASSITERITE	-	1	-
MONAZITE	<1	1	<1
SCHEELITE	<L	-	-
SECONDARY DEP	-	-	-
AVERAGE GRADE H.M.	0.58	0.19	1.3

12. REFERENCES

Dove, A. and Lee, G., 1988. E.L. 45/86 Tasmania. Annual Report on Exploration Completed on the Northern Coastal Areas of King Island to 17.4.88.

Report No. 4/88. Peter H. Stitt & Associates Pty. Ltd.

Dove, A., 1989 E.L. 45/86 Tasmania. Annual Report on Exploration Completed on King Island to 17.4.89.

Report No. 2/89. Peter H. Stitt & Associates Pty. Ltd.

SOUTHERN OCEAN

BASS STRAIT

Cape Wickham

AREA RELINQUISHED 17-4-89

NOTE:- AEOLIAN DUNES ALONG MOST OF THE WEST COASTLINE OVERLIE PRECAMBRIAN GRANITE WHICH OUTCROPS ALONG THE PRESENT DAY SHORELINE.

AEOLIAN DUNES IN THIS AREA MAY OVERLY BEACH STRANDLINES

5604700 N 252000 E

Lavinia Point

Lavinia Nature Reserve

POSSIBLE OLD SHORELINES

EL 45/86

AREA RELINQUISHED 17-4-88

588000 N 254000 E

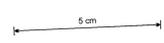
Cowper Point

AMG REFERENCE POINTS ADDED



LEGEND

-  AEOLIAN DUNES
-  STRAND LINES
-  SWAMP
-  LAKE
-  ROAD OR TRACK



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SCALE 1:42 000

0 800 1600 2400 3200 4000 m.

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**NATIONAL MINERAL SANDS**  
 EL 45/86 TASMANIA  
 AIR PHOTO INTERPRETATION  
 KING ISLAND (NORTH)  
 SHOWING RELINQUISHED AREAS  
 UP TO 17-4-89

Author: G. LEE Date: APRIL 1989 Fig. No.: 1

Whistler Point

Yellow Rock Traverse

Lake Flannigan Traverse

Disappointment Bay Traverse 1

POSSIBLE OLD AEOLIAN DUNES

White Beach Traverses

Martha Lavinia Traverse

Bungaree Lagoon

Parky Beach

Causeway

Sea Elephant River

Nine Mile Beach