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GEOPEKO

A DIVISION OF PEKO EXPLORATION LTD

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EL 54/89 GRASSY

REPORT ON EXPLORATION ACTIVITY

APRIL 1991 TO MARCH 1992

92-3351

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Ian Mathison
April, 1992

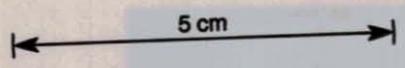
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Distribution: Geopeko, Parkes
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Dept of Mines, Hobart

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089003



GEOPEKO
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 EL 54/89 - GRASSY FIG. 1
LOCATION AND ACCESS
 SCALE 1:250 000



SOUTHERN OCEAN

BASS STRAIT

KING ISLAND

EL 54/89

61
 39°40'
 60
 59
 50'
 58
 57
 40°00'
 56
 55
 40°10'

61
 40'
 60
 59
 50'
 58
 57
 40°00'
 56
 55
 10'

24 144°00' 25 144°10' 26

CAPE WICKHAM
 Cape Farewell
 Wickham Hill
 Disapp Bay
 Lake Flinnigan
 PHOQUES BAY
 Egg Lagoon
 Lavinia Pt
 New Year I
 Christmas I
 Cooper Bluff
 Yambacoona
 Yellow Rock R
 Whistler Pt
 Reokara
 86 Counsel Hill
 The Mook Swamp
 The Mook Swamps Cr
 Lavinia Pt
 Pass River
 Sea Elephant
 Blowhole Cr
 Cowper Pt
 Counciller I
 King I Airport
 Parky Cr
 Sea Elephant River
 Fraser
 Naracoopa
 Fraser Bluff
 Currie
 Badger Box Cr
 Mary Hill 30°00'
 Ettrick River
 Yarra Creek
 Lymwood
 Bold Head
 Fitzmaurice Bay
 Cataract Pt
 Pearshape
 Seal Pt
 Mount Stanley
 Colliers Swamp
 Big Lake
 Surprise Bay
 Seal Bay

1.0 INTRODUCTION

1.1 Location and Access (Fig. 1)

EL 54/89 Grassy covers the SE corner of King Island. It surrounds the King Island Scheelite Mine Lease, ML 17M/79, which is excluded from the EL.

Road access throughout the EL is very good.

1.2 Tenure and Land Usage

EL 54/89 of 182 km² was granted to Peko Exploration Ltd in March 1990. The EL schedule is detailed in Appendix 1.

Almost all of the land within the EL is private property and most of this is open pasture. Small patches of tea tree and wattle scrub occur along creeks and in swampy areas. Some patches of coastal scrub occur in southern sections of the EL.

1.3 Regional Geology (Fig. 2)

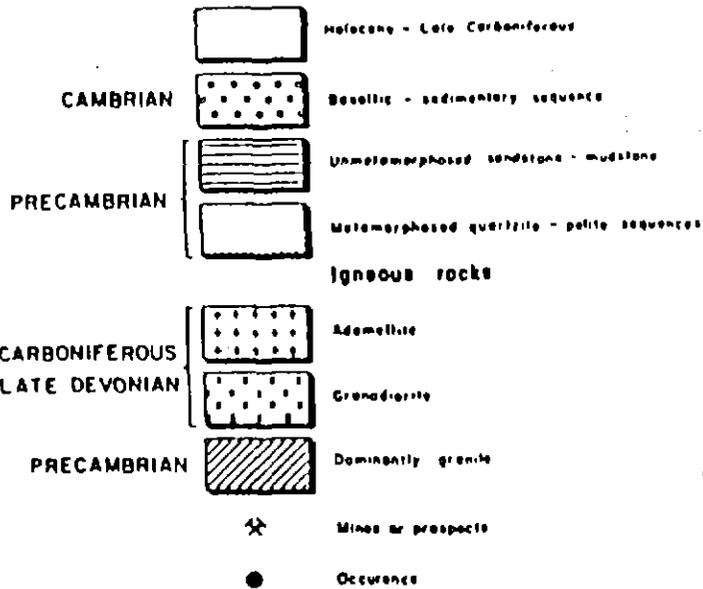
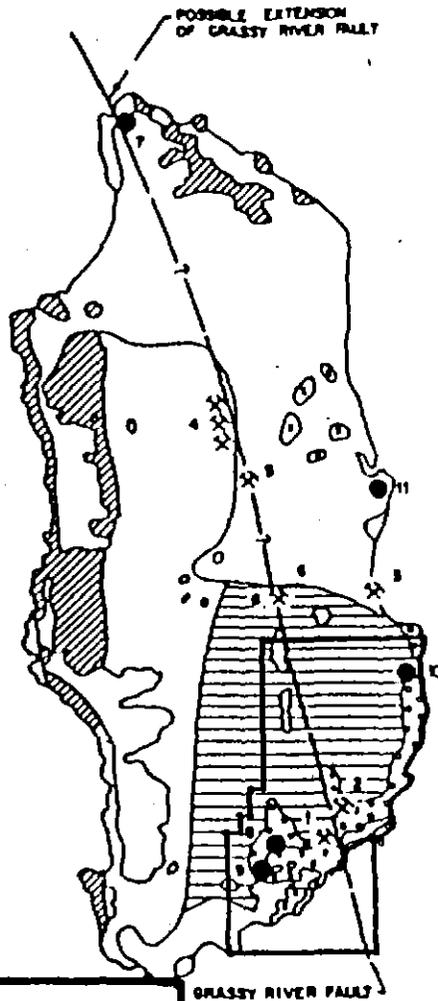
The oldest rocks in the area are the siltstones and mudstones of the Precambrian Rocky Cape Group. These outcrop in the north and west of the EL and underlie almost 50% of the EL. To the east and south the Precambrian rocks are overlain by Eo-cambrian carbonates, clastic sediments, mafic volcanics and volcanoclastics which dip east-wards and south-eastwards under Bass Strait. The contact between the Precambrian and Eo-cambrian rocks appears conformable.

In the south-east the Eo-cambrian rocks have been intruded by Devonian granites. A major fault, the Grassy River Fault, trends northwards across the central portion of the EL. This fault is adjacent to the major scheelite orebodies near Grassy. Several minor occurrences of tin, tungsten and gold mineralization are known from the fault zone.

1.4 Known Mineral Deposits/Occurrences (Fig. 2)

Mineralization in the SE quadrant of King Island is dominated by the scheelite skarn deposits around the Grassy and Bold Head Granites. The Dolphin and Bold Head Mines have been developed on this mineralization. These deposit are well described in the Geology & Mineral Resources of Tasmania. (Burrett & Martin, 1989)

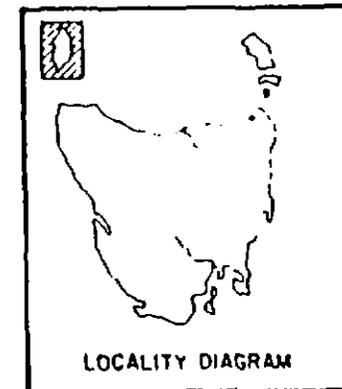
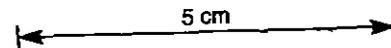
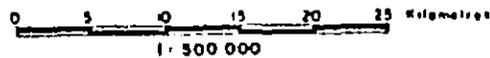
At Barrier Creek a series of quartz sulphide (\pm carbonate) veins have been tested by adits and shallow shafts. Previous assays indicate that these veins host lead, zinc, arsenic, silver and gold. However, the veins are only a few centimetres wide and mineralization does not appear to extend into the siltstone host rocks.



- 1 DOLPHIN/N91 OREBODY - W, Mo
- 2 BOLD HEAD - W, Mo
- 3 HARACOOPA - Beach Sands
- 4 REEKARA - W, Sn
- 5 HAWKES ALLUVIAL - Sn, W
- 6 FRASER RIVER - Au
- 7 VICTORIA COVE - W
- 8 LOOP ROAD - W, Mo
- 9 INVESTIGATOR 21 - W, Mo
- 10 BARRIER CREEK - Au, Ag, Pb, Cu, As
- 11 COWPER POINT - Beach Sands



EL 54/89



KING ISLAND GEOLOGICAL MAP

GEOPEKO
A DIVISION OF PEKO EXPLORATION LTD

EL 54/89 - GRASSY FIG. 2

REGIONAL GEOLOGY AND
KNOWN MINERALIZATION

089005

Just north of the EL, auriferous quartz veins have been tested by shallow adits, trenches and shafts. No production has been recorded. These workings are known as the Sea Elephant River and Fraser River workings. Verbal reports of deeper shafts which have since been filled in have not been substantiated.

High quality silica sands suitable for glass making occur within ML 17M/79 and extend westwards into EL 54/89 where they have not been tested.

An extensive deposit of lateritic iron ore has been defined near Pegarah. Reports suggest that this laterite has been developed by Tertiary weathering of a basic intrusive body. Previous work (Brown 1987) indicated that this deposit was too small and of too low a grade to be an economic source of iron ore.

1.5 Previous Exploration

Systematic exploration of the area for tin/tungsten mineralization was carried out by a Costigan Mining-King Island Scheelite Joint Venture over EL 15/66. Regional exploration included aeromagnetic surveys and reconnaissance auger drilling along roads. Geological outcrop mapping of the area at a scale of 1:12 000 was completed.

Magnetic anomalies were followed up by grid based geological mapping, soil geochemistry, jacro auger geochemistry, ground magnetics and IP. Several anomalies within ML 17M/79 were drilled. A base metal geochemical anomaly located south of Pegarah, the Ireland's Farm Anomaly, was tested by diamond drilling. No base metal mineralization was intersected. (Brown 1987)

Geopeko's exploration during 1990-91 is detailed in Geopeko report T256.(Mathison 1991)

1.6 Exploration Philosophy and Target Models

The area has been intensely explored for carbonate replacement scheelite and tin mineralization within the Eo-cambrian sequence. Current exploration is directed at base metal and gold mineralization in the rocks further away from the granite. The following mineralization models are considered appropriate:

- (i) Gold:- shear related gold deposits along the Grassy River Fault and within the mafic volcanics of the Grassy Group.
- (ii) Base metals:- McArthur River style lead-zinc deposits within the siltstones of the Rocky Cape Group.

1.7 Geopeko's 1990-91 Exploration

In June 1990, 89 water samples were collected from streams draining EL 54/89. These were forwarded to the Department of Mines in Hobart to be analysed for Au and As by the Huminex method. Because severe analytical problems with this technique were identified with water samples from the Arthur River area, analysis of these samples was delayed. Results from these samples were received in February 1992.

Rock chip samples from reconnaissance mapping and the Barrier Creek, Sea Elephant River and Fraser River Mines were analysed for base metals, arsenic and gold. No indications of significant mineralization were detected.

A trial Huminex soil traverse was sampled across the Grassy River Fault in the extreme north of the EL. Some gold and lead responses merit checking by another technique before detailed follow up is attempted.

2.0 EXPLORATION ACTIVITY

2.1 Aims

The 1991-92 field program was delayed to enable the results of the water sampling to be evaluated.

Previous exploration on ML 17M/79 has indicated a geological resource of 2 - 3 million tonnes of high grade silica sand. Air photo interpretation by Hooker Resources suggested that an additional resource of 15 - 20 million tonnes of similar sand might lie within EL 54/89. The aim of Geopeko's 1991-92 exploration was to evaluate the reliability of these estimates and to evaluate potential markets for this material.

2.2 Work Completed

Water Geochemistry

Water samples collected during June 1990 were analysed for Au, As and organic carbon. Samples were analysed by Dr Bill Baker of the Department of Mines in Hobart using the Huminex method. Results received in February 1992 were plotted and interpreted.

Silica Sand Deposits

Results of previous exploration were compiled and interpreted. The current market for silica sands was investigated.

2.3 Results Received

Water Geochemistry (See Appendix 2 and Plate 1)

Results for both gold and arsenic were very low. Results are summarized below. None merits follow up at this stage.

Element	Range (N=87)	Possibly Anomalous	No Anomalous
Au	<0.2-4.4 ppt	>5 ppt	0
As	<0.2-3.6 ppb	>5 ppb	0

Silica Sand Review (See Appendix 3)

Preliminary exploration conducted on ML 17M/79 allows crude estimates of the potential resource. These estimates are adequate to allow the following evaluation:

- * A saleable silica sand could be produced from the large sand deposits on King Island. Removal of heavy minerals, fines and oversize material would be necessary. Because the deposits are relatively thin (<3m), some problems with quality control during production can be anticipated.
- * No port capable of handling bulk tonnage commodities exists on King Island. The Grassy port could not be developed to handle large ships. Loading of large vessels would need to be from a specially constructed offshore loading facility or by shipping material from King Island in small vessels and transferring to larger vessels elsewhere. Either way, capital and/or operating costs will be relatively high.
- * Markets for large tonnages of silica sand exist in Japan, Korea and South East Asia. Current price for this material landed in Japan ranges from \$40 - \$45 per tonne. This market is already supplied by Cape Flattery Silica Mines. Freight and loading costs from King Island would be at least \$5 a ton greater than from Cape Flattery. Therefore King Island sand is not competitive in this market.
- * King Island sand may be suitable for special uses which require a higher purity sand. A typical annual production rate for mines supplying this sort of market is 20 000 to 50 000 tonnes/year. Current market prices are in the range \$100 to \$150 per tonne FOS in Japan. Production for this market would not be of interest to North Broken Hill Peko.

3.0 CONCLUSIONS

Water sampling, Huminex soil sampling and rock chip sampling have partially tested the potential for gold mineralization within EL 54/89. No indications of significant gold mineralization were detected.

No testing of the potential for McArthur River style base metal deposits has been attempted. Modification of the geochemical environment by extensive use of trace element enriched super phosphate precludes the use of water or shallow soil geochemistry for many elements, as does the extensive cover of Tertiary sand deposits and laterites. The most effective way of testing for these deposits is probably by targeting deep drill holes on structural targets.

Further definition of the silica sand resource is not justified. While the deposit may be of some interest to a small scale operator, the deposit could not support a large scale company style operation under present economic conditions.

4.0 RECOMMENDATIONS

No further exploration for gold only mineralization should be attempted.

No further exploration of the silica sand deposit is warranted.

Exploration during 1992-93 should focus on assessing the potential for sediment hosted base metal deposits. Available data should be interpreted to enable a deep drill hole to be targeted on a significant stratigraphic or structural feature.

REFERENCES

- BROWN, S.G. 1987 Final Report. EL 15/66, King Island
Tasmania. Unpublished report for
Warman Services Limited. Report No.
12/87.
- BURRETT & MARTIN 1989 "Geology & Mineral Resources of
Tasmania". Geological Society of
Australia 15.
- MATHISON, I.J. 1991 EL 54/89 Grassy, Report on Exploration
Activity April 1990 to March 1991.
Unpublished Geopeko Report T256.

080011

APPENDIX 1
EL SCHEDULE

No. EL 54/89

(Regulation 6A)

The Mining Act 1929**EXPLORATION LICENCE**

Issued to PEKO EXPLORATION LTD of P.O. BOX 180, ROSEBERY, TAS, 7470
in respect of 182 square kilometres of land in the Land District
of KING ISLAND vicinity of GRASSY as described in the schedule
hereto.

This licence shall remain in force until the THIRTIETH day of MARCH
1991.

This licence is subject to the following conditions:-

1. That the licensee shall immediately on the issue of this licence take steps to commence preliminary works necessary for the investigation of the area.
2. That the licensee shall carry out investigations as may be necessary to determine the mineral potential of the area, and in particular will fulfil the proposals set out in the exploration programme and approved by the Director of Mines.
3. That the licensee shall employ such technical and other staff and equipment as may be necessary effectively to carry out such investigations.
4. The licensee shall satisfy a minimum expenditure commitment of \$72,000 during the first two years of the licence.
5. This licence shall apply to all minerals.
6. The licensee shall notify the owner and occupier of private land, in writing, at least three days before entering such land.
7. That the security (Private Land Deposit) provided by Section 15E (1) (a) & (b) of the Mining Act, 1929, (see below) shall be lodged with the Director of Mines before entering private land.
8. The licensee shall observe, perform and fulfil the conditions as set forth in Schedule 'A' (Revised) attached hereto.

9. The licensee shall be liable to pay the cost of any work carried out to remedy any damage arising from any breach of the conditions of this licence.
10. The licensee shall deposit an amount of \$10,000 (Performance Deposit) and \$10,000 (Private Land Deposit) as security that the conditions contained herein shall be observed. Upon expiry or sooner determination of the licence, if the licensee satisfies the Director of Mines that such conditions have been complied with, the Director of Mines shall refund such deposit or such portion thereof, as he may determine.
11. If it is found, that the operations hereby authorised, are causing any undue damage to, or erosion of, the subject land or other land in the vicinity thereof or are unnecessarily disturbing the environment, the Minister may cancel the licence without compensation to the licensee by giving seven days' notice in writing of his intention so to do.
12. The licensee shall obtain the written permission of the Director of Mines before carrying out any work in a Forest Reserve.
13. The licensee shall arrange and keep in good standing public liability insurance to the minimum of \$1,000,000. Evidence of currency shall be produced on demand.

SCHEDULE

Commencing at the south west corner at grid co-ordinates 242 000 metres E. 5 555 000 metres N. thence grid north to 5 563 000 metres N. grid east to 243 000 metres E. again grid north to 5 564 000 metres N. again grid east to 244 000 metres E. again grid north to 5 566 000 metres N. again grid east to 245 000 metres E. again grid north to 5 576 000 metres N. again grid east to 254 000 metres E. again grid north to the low water mark on the East Coast of King Island by that low water mark in a general south easterly and south westerly direction to its intersection with 252 000 metres E. grid south to 5 555 000 metres N. thence grid west to the point of commencement.

The area excludes: 23 skm Mining Leases
0.7 skm Crown Reserves

LAND TENURE:

The area comprises: State Forest
Private Property
Crown Land
Crown Land (Subject to Environment & Planning Department approval)

(NOTE: The land tenure table is a guide only)

EXCLUSIONS

The area embraced by this licence includes State Forests but does not include:

- (a) All other public reserves or municipal reserves or roadways.
- (b) All forms of mining tenements and water licences including leases, water licences, easement licences, special and exploration licences, prospectors licences, miners rights, permits to enter, owners consents and owners rights which were in lawful possession or marked out prior to the date of marking out of this licence.
- (c) Land exempt from the provisions of the Mining Act, 1929.
- (d) Land under the National Parks and Wildlife Act, 1970, not subject to the Mining Act, 1929.
- (e) All Crown reservations or other land set apart or dedicated for any public purposes.

MINISTER FOR RESOURCES AND ENERGY

Date

APPENDIX 2

WATER GEOCHEMISTRY - ANALYTICAL RESULTS

089016



Department of Resources & Energy
DIVISION OF MINES AND MINERAL RESOURCES

PO Box 56
ROSNY PARK
TASMANIA 7018
Gordons Hill Road
ROSNY PARK
☎ (002) 30 8333

FACSIMILE TRANSMISSION

DATE: 28-2-92
SUBJECT: KING IS. WATER SAMPLES

TO: GEPPECO EXPLORATION
ATTENTION: IAN MATHISON

SENDER: BILL BAKER
☎ 002 338 354

NUMBER OF PAGES (including this page): 4

MESSAGE:

Herewith the K.I results, Ian. 3 samples
for arsenic (N.D) gave interference possibly due to
salt.

Regards,
Bill

PLEASE NOTIFY SENDER IF ALL PAGES ARE NOT RECEIVED

FAX No: Within Australia: 002 442117
International: 61 02 442117

089017

GEOPEKO - KING IS.

SAMPLE NO.	GOLD (ppt)	ARSENIC (ppb)	D.O.C (ppm)
20176	3.5	2.5	3.7
20177	2.1	2.1	6.8
20178	2.5	1.5	8.9
20179	3.0	<0.2	3.7
20180	2.0	1.6	9.2
20181	1.3	<0.2	12.8
20182	1.5	1.8	3.4
20183	1.1	1.8	5.5
20184	3.5	3.6	32.2
20185	2.7	1.0	9.5
20187	2.0	<0.2	6.8
20189	1.7	2.8	10.9
20190	2.1	1.0	16.1
20191	4.1	<0.2	12.1
20192	4.4	2.3	3.9
20193	1.5	<0.2	2.3
20194	2.2	0.8	2.6
20195	1.5	<0.2	4.6
20196	1.5	1.0	2.4
20197	1.5	<0.2	12.7
20198	1.4	<0.2	29.9
20199	1.9	1.6	69.6
20200	2.2	2.3	66.6
20679	1.3	<0.2	10.7
20680	0.9	1.8	3.7
20681	1.3	1.0	5.9
20682	0.9	2.2	6.8
20683	0.7	1.0	4.8

089018

SAMPLE NO.	GOLD (ppt)	ARSENIC (ppb)	D.O.C (ppm)
20684	0.3	1.5	6.9
20685	0.9	<0.2	2.9
20686	0.6	1.7	5.9
20687	0.4	1.5	10.7
20688	0.6	1.5	11.5
20689	0.5	1.3	12.9
20690	0.9	0.9	11.8
20691	0.5	1.5	4.8
20692	0.7	0.8	6.4
20693	0.4	2.3	5.7
20694	0.4	1.9	8.2
20695	0.5	2.6	2.9
20696	1.0	1.9	5.8
20697	0.9	1.6	8.9
20698	0.8	1.9	4.6
20699	1.1	1.9	11.4
20700	1.0	1.2	41.4
21001	0.7	2.4	27.6
21002	0.6	2.4	39.2
21003	1.0	2.3	15.9
21004	0.7	2.1	10.3
21005	0.5	2.7	10.3
21006	0.7	3.5	6.2
21007	1.0	3.1	26.8
21008	1.3	2.4	50.8
21009	0.7	1.8	22.0
21010	1.0	ND	2.9
21011	1.6	2.7	44.4
21012	1.7	3.1	10.1
21013	0.7	2.0	14.5

089019

SAMPLE NO.	GOLD) (ppt)	ARSENIC (ppb)	D.O.C (ppm)
21014	0.7	2.6	12.1
21015	0.4	3.4	1.7
21016	0.2	1.2	7.1
21017	0.6	1.0	66.8
21018	<0.2	1.4	31.6
21019	<0.2	0.8	6.8
21020	<0.2	0.6	7.9
21021	<0.2	1.0	6.6
21022	<0.2	0.4	18.9
21023	<0.2	1.6	5.5
21024	<0.2	2.2	6.9
21025	<0.2	<0.2	5.0
21026	0.2	0.8	3.7
21027	0.2	1.0	8.4
21028	0.3	1.8	10.1
21029	0.6	1.0	8.6
21030	0.8	ND	18.8
21031	<0.2	1.4	3.2
21032	<0.2	<0.2	3.4
21033	<0.2	1.7	7.2
21034	<0.2	1.5	14.7
21035	<0.2	<0.2	9.6
21036	<0.2	1.0	23.6
21037	0.5	0.8	9.8
21038	1.4	1.5	18.2
21039	<0.2	0.6	12.6
21040	<0.2	ND	2.9
21041	<0.2	<0.2	11.6
21042	<0.2	<0.2	5.9

APPENDIX 3

SILICA SAND DEPOSITS, KING ISLAND.

Appendix 3 - List of Contents

1. *Status of Silica Sand Deposit, King Island - P.R.*
Stephenson, July 1991.
2. Memo: King Island Silica Sand Project, P.R. Stephenson,
22/12/89.
3. Letter: King Island Silica Sand Project, P.R. Stephenson,
3/5/89.
4. Memo: King Island Silica Sand Project, P.R. Stephenson,
4/4/89.
5. Letter: Marine Consultant's Report - King Island, John
Hann (Hooker Resources), 10/1/89.
6. Excerpt from Macknight's proposed study, Macknight,
10/11/88.
7. Letter: Invitation to MacKnight to study the feasibility
of King Island Silica Sand Project, R. K. Knight (North
Group), 25/10/88.
8. Fax: Map of exploration licence application area, John
Hann, 27/10/88.
9. Minutes of meeting: King Island Silica Sand Project -
Hooker Resources & North Group, P.R. Stephenson, 23/11/88.
10. Map: Silica sand deposits, King Island Sheelite.
11. Results: Sampling results for silica sand, Hooker
Resources.
12. Results: King Island JV Sampling, Hooker Resources.
13. Results: Graphs of results - King Island.
14. Results: X.R.F Analysis of Bromoform Float from Glass
Sands.

15. Letter: Silica Sands - King Island, P.R. Stephenson,
27/6/88.
16. Memo: Sampling of "old" Dune Sands - Silica Sands Project
- King Island, Paul Balind (Geopeko), 16/6/88.
17. Results: Geological logs and sampling data for hand auger
sampling undertaken 6-11 June 1988, Geopeko.
18. Map: Grassy.
19. Memo: Silica Sand Project - King Island, P.R. Stephenson,
24/5/88.
20. *King Island Pre-Feasibility Study for Export of Mineral
Sands* (areas relevant to Silica Sand), Macknight, 2/89.
21. Memo: King Island Silica Sand Project, R.F. Scotford
(North Group), 2/8/91.
22. Table: King Island Silica Sands Project Strategic
Overview, North Group.
23. Table: Shipping Cost Comparison - Basis - Japanese
Market, North Group.
24. Data: Silica Sand - Typical Glass Specifications and
Grade of King Island Sand.
25. Data: Typical Silica Sand Grades.

P.R. Stephenson Pty Limited

Consulting Geologists

A.C.N. 003 742 943

36 North Crescent
Warrimung
New South Wales 2250
Australia

080023
PO Box 2271
Gosford NSW 2250
Telephone (043) 25 7304
Facsimile (043) 23 4654

STATUS OF SILICA SAND DEPOSIT, KING ISLAND.

PREPARED ON BEHALF OF NORTH BROKEN HILL PEKO LTD.

JULY 1991

KING ISLAND SILICA SANDS DEPOSIT

1. Introduction.

This report on the status of the silica sands deposit on King Island has been prepared at the request of I J Mathison, Senior Project Geologist, Geopeko - Tasmania. Attached to the report are a number of documents copied from files held at the Gordon office of North Broken Hill Peko Ltd.

2. History.

Hooker Resources approached Peko in early 1988 concerning what it believed to be a potentially exploitable deposit of silica sand on King Island Scheelite's Mining Lease. Hooker offered marketing expertise and contacts with potential customers, and suggested that a joint venture should be established subject to satisfactory preliminary evaluation of the deposit. Peko was amenable to this approach, and arranged for a number of samples to be collected by King Island Scheelite and delivered to Hooker for analysis.

It was concluded from this programme that 2.0-3.0 million tonnes of high quality (low iron) silica sand was available on the Mining Lease, but that exploitation of the resource was critically dependent on the cost and feasibility of shipping the product. Consulting Engineer Macknight Pty Ltd was therefore commissioned to provide some answers on this matter.

Macknight's initial report (February 1989) suggested that use of the Grassy wharf to ship sand at the rate envisaged by Hooker (0.25-0.5 million t.p.a.) was likely to be unattractive both from a cost and from a practical viewpoint. A second report was commissioned in May 1989 however I have not been able to locate either report at Gordon, and am not aware of the conclusions of the later report.

At this stage, only the sand on KIS's Mining Lease was under consideration. It was known that the deposit continued to the west on to a License then held by Pimex Pty Ltd, however the project did not proceed to the point of having discussions with Pimex. As a precaution, Hooker applied for a strip of land between Pimex's tenement and one held by the Naracoopa Joint Venture partners north of Seal Bay.

The project lapsed sometime in mid-1989, either because it was regarded as being non-viable or as a result of Pioneer's acquisition of Hooker's interests. In December 1989, I suggested to Argo Kuru that it should be re-examined to ascertain whether Geopeko's acquisition of the ground formerly held by Pimex had improved the project's viability. I am not aware whether any action eventuated.

3. Resource estimate.

On the basis of air photos and old records, Hooker made a preliminary

estimate of approximately 2.5 million tonnes of low iron silica sands on the Mining Lease and 10-20 million tonnes on Pimex's ground. A single grab sample taken by Hooker assayed 0.013% Fe and 0.25% Ti. In order to make a better assessment of the quality of the sand, Paul Balind (King Island Scheelite's Mine Geologist) hand augered 15 holes into the deposit and despatched the samples to Hooker for analysis. Hooker provided Peko with sizing and analyses (Fe₂O₃, Al₂O₃, TiO₂, Cr₂O₃) of the samples, details of which are included in the attached documents (Hooker provided results for 20 holes. I am uncertain of the source of the other samples).

The preferred grain size parameter for silica sand is no more than 10% passing 425µm. The King Island sand is slightly coarser than ideal, and Hooker considered that the top 10-15% would have to be scalped off. Iron content was considered to be very low, the samples averaging 0.006% Fe₂O₃. Other metals were present in minor to trace amounts. It should be noted that the analyses were carried out after a bromoform float, thus presuming the inclusion of a gravity treatment circuit as part of the mining operation.

From observations made by Paul Balind it appears as though the extent of the areas of high quality sand on the Mining Lease might be slightly greater than Hooker's estimate, but that the thickness of the deposit is less (~1.6m versus Hooker's estimate of 3m). Paul made no revised estimate of tonnage.

4. Quality of estimate.

Exploration carried out to date has not been comprehensive, and a tonnage estimate of (say) 2.0-3.0 million tonnes should be regarded as indicative only. The sizings and analyses provided by Hooker were carried out by Readings of Lismore, a company experienced in this field, and were appropriate for the early stage of an investigation (Fe₂O₃, Al₂O₃, TiO₂ and Cr₂O₃ are those normally assayed for). It is unlikely that any contamination of the samples occurred during collection since Paul was aware of the risk and used an aluminium auger provided by Hooker to ensure that no rust contacted the sand.

Overall I would suggest that the estimate should be classified no better than an Inferred Mineral Resource.

5. Discussion.

To summarise, by the time the project lapsed in mid-1989, preliminary investigations had indicated the presence of a few million tonnes of low iron silica sand on King Island Scheelite's Mining Lease, however the cost and logistical difficulties of establishing shipping facilities were considered to mitigate against the project in view of Hooker's estimate of the value of the sand (\$10-15/tonne ex-Grassy) and the market available. At that time, the additional 10-20 million tonnes thought to exist west of the Mining Lease was on ground held by another party. Geopeko has since acquired the ground, however in that time King Island Scheelite has ceased operation and potential cost saving through sharing of facilities and

*These were not considered
by MacKnight*

activities are no longer available.

The key to this project appears to be the market. Even if (say) 20 million tonnes of high quality glass sand is available, if its value is only ~\$10-15/tonne ex-Grassy, then economics would presumably dictate large volume production and the slim potential profit margin would be unlikely to justify establishment of an operation which would be technically risky and in which North Broken Hill Peko has no experience or expertise. If however the value of the sand was substantially greater and the production rate could be restricted to that which could be handled by the existing Grassy wharf facilities, both costs and risk would be markedly reduced and the project could become attractive.

The main markets for silica sand, in order of increasing requirements for purity, relate to containers, tableware and optical glasses, with maximum Fe₂O₃ contents ranging from approximately 0.03% for containers to <0.01% for optical uses. The King Island sand meets these standards although it probably falls short of the quality required for premium optical glass of <0.002 Fe₂O₃. Most silica sand produced in Australia is sold to customers in Japan and South-East Asia, and there appears to be little potential to sell within Australia (I understand that ACI manufactures glass tableware in Melbourne - this may be worth investigating). Silica sand marketing is not an area in which North Broken Hill Peko traditionally has expertise, and if this project is to be taken further I would suggest that it would be worthwhile supplementing research generated internally with advice from experts in the field. As a first pass I would suggest consulting Peter Stitt and Associates, a company with which NBHP has an established working relationship.

Although the project did not reach the stage of examining mining problems, it should be noted that the narrowness of the high grade sand layer and the fact that it is sandwiched between contaminated sand above and below (and humus above) would mean that extraction would have to be carried out very carefully. There are also environmental aspects to be considered as I believe that some of the few remaining stands of original King Island vegetation are in the area of the sand dunes. Treatment of the sand would almost certainly have to include on-site screening and washing to remove roots and other contaminants, and gravity separation to reduce the heavy mineral content.

could select areas with no contamination other than humus!

6. Recommendations.

On the assumption that NBHP wishes to re-examine the viability of this project, I would recommend as follows:

6.1. Research market aspects of the project to establish:

- required quality parameters
- market volume available
- probable unit value

Priority

I understand that Rodney Scotford of NBHP - Gordon, has some information on these matters, however I would suggest also seeking external advice.

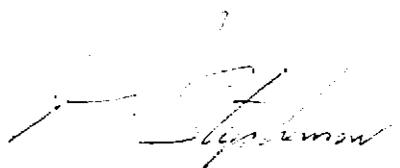
6.2. If 6.1. provides sufficient encouragement, carry out a reconnaissance sampling programme covering both the Mining Lease and the adjoining tenement. The aim of this programme should be to confirm the quality of the highest grade sand, so great care should be taken to ensure that no contamination of the samples occurs (for example, use of a stainless steel auger). The samples should be sized and analysed for Fe₂O₃, Al₂O₃, TiO₂ and Cr₂O₃, and the work should be carried out at a laboratory experienced in silica sands analysis. Ca Mg Ni Ca SiO₂

6.3. If, as a result of the findings of 6.1. and 6.2. (and taking into account Macknight's reports on shipping) the project appears to be promising, implement a sampling programme to establish the tonnage of sand available, and commence the activities necessary to begin an indicative feasibility study.

7. Shelburne Bay.

In a recent conversation with Peter Stitt of Stitt and Associates, he mentioned that the Shelburne Bay high grade silica sand deposit on the east coast of Cape York, which has been stymied by environmental and aboriginal objections, may still (in his terms) be rescueable. Geopeko is of course no stranger to the problems of the Cape York area, however given the size and quality of the Shelburne Bay deposit, it may be worth at least having a "quiet chat" with Stitt on the project.

*What grade is this material?
Cape St. Lucy in production*



P R Stephenson

July 1991

P.R. Stephenson Pty Limited

Consulting Geologists

36 North Crescent
Wagging, NSW 2250
Australia.

688028
P.O. Box 2271
Gosford, NSW 2250
Telephone & Facsimile (043) 25 7304
Facsimile (043) 234654

To: A.Kuru
From: P.R. Stephenson
Copies: M.J.Crow, E.Lovett, B.T.Williams

ROW	W/O	GHS	RJW	SES
	22/12/89			
	RECEIVED			
	17 JAN 1990			
SK55-01 Silica Sands JV				
General				

KING ISLAND SILICA SAND PROJECT

Approximately twelve months ago, Hooker Corporation approached Peko concerning what it believed to be a potentially exploitable deposit of silica sand on King Island Scheelite's Mining Lease. Hooker and Peko drew up a preliminary Joint Venture document, but decided not to sign it until initial technical and economic studies had been carried out. These were duly done and showed that:

- the quality of the sand is excellent
- the quantity of sand on the Mining Lease (from memory, I believe approximately three million tonnes) is small for a new silica sands operation
- the project would be marginal or non-viable mainly because of the low value of the product.

It appears that Pioneer have since acquired Hooker's interest. Errol Lovett and I clarified a couple of points recently after you forwarded the letter received from Pioneer to him, and Errol now intends to inform Pioneer that we have no interest in proceeding further with the Joint Venture.

The purpose of this memo is to acquaint you with a changed circumstance which may affect the economics of the project.

At the time of our discussions with Hooker, the ground immediately to the west of KIS' Mining Lease was held under Exploration License by a small speculative exploration company - Pimex Pty Ltd. The silica sand on the Mining Lease extends on to this ground, and Hooker guesstimated that the EL contained approximately twenty million tonnes of sand. Pimex has now dropped the ground, and Geopeko has applied for it.

With such a low value product, it is possible that the greater tonnage of sand now potentially available could result in economies of scale which improve the viability of the project. It is also possible however, that market restrictions, foreseen by Hooker, would restrict the production rate of a new project.

In any event, given the change in technical parameters, and the fact that NBHP would now have 100% of the project rather than 65% as under the old proposed Joint Venture, it is suggested that a brief reassessment of the project is warranted in order to ascertain whether it now has a chance of being a viable proposition.

P. Stephenson

089029

PEKO-WALLSEND LTD.

(INCORPORATED IN NEW SOUTH WALES)

METALLIFEROUS MINING DIVISION
25 MERRIWA STREET, GORDON, N.S.W. 2072, AUSTRALIA
P.O. BOX 217, GORDON, N.S.W. 2072
TELEPHONE: (02) 498 4566 FACSIMILE: (02) 499 2315 TELEX: AA24622

3rd May 1989

Mr A Macknight
Macknight Pty Ltd
Level 3 Kenlynn Centre
457 Upper Edward St
BRISBANE QLD 4000

Dear Alex

KING ISLAND SILICA SANDS PROJECT

Following our recent discussions on the King Island silica sands project, we now request Macknight Pty Ltd to prepare a preliminary technical study and cost estimate for the construction and operation of a ship loading facility at Grassy Harbour, based on the following criteria:

- Export of a minimum of 250 000 to a maximum of 500 000 tonnes per annum of silica sand.
- Shipping by export vessel direct to the consumer (Japan).
- Ship capacity to be the largest technically and practically feasible (anticipated to be in the order of 20 000 tonnes).
- Existing harbour facilities to be used, with construction of new facilities kept to a minimum.
- Loading facilities to be restricted to a conveyor (no storage shed required).
- Capital and operating costs to be minimised. As a guide, you may assume that capital costs should not exceed \$5 M.
- Particular attention to be paid to the technical and practical feasibility of operating a sizeable export vessel in the restricted area available, taking into account the erratic and often adverse weather conditions at Grassy.
- Other criteria to be as per those governing Macknight's initial shipping study dated February 1989.

We understand that the study will involve approximately one week's work by Macknight Pty Ltd and that a report should be available within 3 weeks. The cost is expected to be in the order of \$3 500 to \$4 000. We would appreciate initiation of the study as soon as possible, and we should be advised at an early stage if it appears that the cost could significantly exceed \$4 000.

I also wish to advise that as from this date, Mr Errol Lovett will take over from me as North Broken Hill Peko's representative on this project and all future correspondence should be directed to Mr Lovett. His address is:

North Broken Hill Peko Ltd
GPO Box 1903R
MELBOURNE VIC 3001

Tel: (03) 820 000
Fax: (03) 829 0122

Regards



P.R. Stephenson
Chief Geologist
Metalliferous Mining Division

cc: MJ Crow (KIS)
R Knight (NBHP-Sydney)
J Hann (Hooker Resources)
E Lovett (NBHP-Melbourne)

PRS:sk

PEKO-WALLSEND LTD.
METALLIFEROUS MINING DIVISION

089031

INTER OFFICE MEMO

From: P.R. Stephenson

25 Merriwa Street,
Gordon, 2072.

To: R. Knight

Date: 4/4/1989

Copies: M.J. Crow/ B.T. Williams

Proj 9-3

KING ISLAND SILICA SAND PROJECT

I met with John Hann at Hooker Resources' Sydney office on Thursday, 30th March, in order to discuss the status and future of the King Island silica sand project.

Main points arising:

At a product value of (say) \$15/tonne, and with a limited available market of 250 000 to 500 000 t.p.a., the project cannot stand a high capital cost. Hann estimates that capital costs would have to be less than \$10M, of which approximately \$4M would be required for a dry plant.

Estimates prepared by Macknight, the cheapest of which included a capital component of \$25M, show that construction of a new ship loading facility for the project would not be economically feasible.

The project would stand a chance of being viable if bulk loading from the existing wharf or breakwater facilities, using a (minimum) 20 000 - 30 000 tonne export vessel, and with a capital cost requirement of less than \$5M were possible. This was one of the options being considered for the Naracoopa project, although David Gillett tells me that is no longer being actively pursued.

I would like to discuss the matter further with Alex Macknight before we make a final decision on the project (he is unavailable until next week). If the Grassy harbour option still appears a possibility, I would suggest that we commission Macknight to prepare a preliminary technical study and cost estimate. Hann is agreeable to deferring a decision while this option is being studied.



P.R. Stephenson

PRS:sk

HOOKER RESOURCES

A division of
HOOKER CORPORATION LIMITED
INCORPORATED IN NSW

10th January 1989

Head Office:
American Express Tower
5th Floor 388 George Street Sydney
GPO Box 2724 Sydney NSW 2001 Australia
Telephone (02) 239 2222
Telegrams & Telex HOOKCO AA22894
FAX G3 (02) 239 2600 DX 839 Sydney

Mr Pat Stephenson
Peko-Wallsend Limited
Metalliferous Mining Division

OUR REF 10JAN2/JH5:c1

YOUR REF

Fax: 499 2315

Dear Pat

RE: MARINE CONSULTANTS REPORT - KING ISLAND

Ron Haile and myself have perused the consultants report and the following comments are appropriate:

1. Slurry Pumping:

- a) There are no technical problems to our knowledge in delivering wet sand to the vessel, provided the vessel is equipped with suitable de-watering pumps. A final moisture content of 5% should be easily achieved on a voyage to Japan.
- b) Special vessels are required to handle slurry loading and de-watering. This effectively increases the freight costs.

2. Pneumatic Loading:

- a) The sand would need to be dried prior to loading, adding considerable cost to the operation. Although, there may be an opportunity to negotiate with end-users who require a dried product.
- b) Pneumatic loading of silica sand would involve a dust handling problem, particularly in regard to worker health regulations.

Yours faithfully
for and on behalf of
HOOKER RESOURCES


JOHN HANN
Divisional Manager
Exploration & Development

Excerpt from Macknight's proposed study
10/11/88

For the option of exporting through Grassy Harbour it will be necessary to include the capital and operating costs of trucking products from the mine and the cost of additional storage facilities at the Port.

The second mining operation to be investigated is the export 250 000t (up to 1,000,000t) of low iron silica sand directly overseas. Discussion with Mr Crow of King Island suggest that the mine will be near Sandblow Point to the south of Grassy Harbour.

One possible option for loading of the silica sand is by pumping offshore to a single buoy mooring (SBM). Assuming that the sand can be pumped as a slurry this option could provide an economical solution to the export operation.

The SBM enables the vessels to moor at sea and load material in a wide range of weather conditions and expensive breakwater protection is not necessary. Slurry is pumped via flexible hoses and provided the specific gravity is high enough the sand should settle quickly and excess water would decant over the side.

The traditional ship loading option will also be considered but will depend heavily on sea conditions and potential downtime. A shiploader could be located 300m off Sandblow Point in 15m of water but if downtime is too high and breakwater protection is necessary then the cost of this option could be excessive.

The range of alternatives will be defined after visiting the site and in discussions with Peko-Wallsend.

Ranking will take place on broad costing and operational aspects to eliminate unfeasible alternatives leaving a number of potentially suitable options for further

25th October 1988

Mr. A. MacKnight
Alex MacKnight and Associates
457 Upper Edward Street
BRISBANE. QLD. 4000

Dear Mr. MacKnight,

Peko-Wallsend Ltd, through King Island Scheelite (KIS), operates a tungsten mine at Grassy, King Island, Tasmania, and is currently, in conjunction with joint venturers, evaluating two sand mining projects on the island. These are

- * Naracoopa mineral sands (with National Mineral Sands),
- * Grassy silica sands (with Hooker Mining).

National Mineral Sands is the Operator of the Naracoopa JV for the project feasibility study; Peko's Metalliferous Mining Division will handle the feasibility study for the second project.

The feasibility of both projects hinges to a greater or lesser extent on the capital and operating costs associated with loading and shipping the various products. Before either joint venture commits significant funds to resource assessment and engineering studies, Peko wishes to commission a preliminary study of the technical and economic feasibility of marine loading and shipping requirements.

The most likely annual tonnages of product from the two operations are

- * Naracoopa JV

- 15 000 tonnes rutile
- 20 000 tonnes zircon

either

- bagged/palletised and/or bulk in container,
- bulk shipments up to 5 000 tonnes, if practicable

for

- transshipment in Melbourne, or
- shipment direct to overseas consumers.

Some consideration is also needed of the shipment of ilmenite in bulk. The joint venturers have placed no value on this mineral.

* Grassy JV

- minimum 250 000 tonnes low-iron silica sand. The potential market may be as great as one million tonnes.
- in bulk
- shipment direct to overseas consumers.

King Island lies in an exposed position within Bass Strait. Shipping facilities are limited to the port of Grassy which is serviced by the M.V. 'Straitsman' en route from Stanley to Melbourne. This vessel carries King Island's present exports of scheelite (1500 - 2000 tonnes/year) and agricultural products. It does not have the capacity to handle commodities in significantly greater bulk. Mineral sands have been exported in times past using a primitive unprotected wharf facility at Naracoopa.

Before proceeding with detailed studies on its present projects, Peko wishes to ascertain

- * whether bulk exports on the scales nominated above are in the first instance a practical consideration,
- * the nature and mode of operation of the port and handling facilities required to handle such tonnages,
- * their order-of-magnitude capital and operating costs.

We are seeking to retain the services of a specialist consultant for this assignment. We would like confirmation of your interest in this work together with

- * a copy of the CV of the engineer(s) nominated to undertake the assignment,
- * a preliminary description of the approach to be taken, together with a budget estimate of cost and timing.

I shall be overseas for three weeks from this date, returning Wednesday, 16th November. In my absence, further information on local conditions may be obtained from Mr. Michael Crow, Manager of Operations, King Island Scheelite, telephone (004) 61 1200, facsimile (004) 61 1114.

I would appreciate confirmation of your interest in this assignment along the lines requested above by my return date.

Yours sincerely,

R.K. Knight
Group Executive
Metalliferous Mining Division.

089036



FAX TRANSMISSION

HOOKER RESOURCES

AMERICAN EXPRESS TOWER
Level 5
388 George Street,
SYDNEY, NSW., 2000
AUSTRALIA

TELEPHONE (02) 239-2222
TELEX AA 22894
DX 830 SYDNEY
FAX (G3) 239.2600

To *Pat Stephenson*.....Date.....Time.....
Chief Geologist
Metalliferous Mining Div.

Address...*Peter Wallsend*...FAX No...*499 2315*...

From...*John Hann*.....

Number of pages
to follow...*1*.....

If transmission is faulty
please call.....

Please use this space for short messages

Pat,
As discussed today, attached
is a map showing the area applied
for on King Island, to cover additional
silica sands for the J.V.

Regards
John Hann

Hand to M. Crow.

12/10/88

P.R. Stephenson

R. Knight

6/10/88

cc: M Crow
BT Williams
I Calder

NOTES ON A MEETING HELD WITH HOOKER RESOURCES AT GORDON
ON 23RD SEPTEMBER 1988, FOR THE PURPOSE OF DISCUSSING
THE KING ISLAND SILICA SANDS PROJECT

Present: R Knight
PR Stephenson
R Haile (Divisional Manager, Industrial Sands
& Minerals, Hooker Resources)
J Hann (Divisional Manager, Exploration &
Development, Hooker Resources)

1. Review of check hand auger drilling results
(carried out by P. Balind in June 1988)
 - Quality of sand excellent with very low Fe content
 - Grain size acceptable, although some scalping of oversize would be required
 - Reserve potential on ML 17M79 thought to be around 2.5-3.0 million tonnes.
2. Suggested parameters for a mining operation (Hooker)
 - 250,000 tonnes per annum
 - Ship to Burnie in 2,000-4,000 tonne ocean-going barges
 - Ship from Burnie in (minimum) 20,000 tonne vessels (any smaller, and freight rates probably unacceptable)
 - Main market - Japan
 - Probable capital cost - \$2 million +
 - Probable FOB value ex Grassy - \$12/tonne
ex Burnie - \$20/tonne.
3. Assessment of probable viability (Hooker)
 - A mining operation could be viable. The critical factor is shipping (logistics and cost).
4. Agreed procedure (Peko and Hooker)
 - Draw up a short form Heads of Agreement (Peko)
 - Equity: Peko 60% and Operator
: Hooker 40% (Hooker Mining Pty Ltd)

- Hooker wish to retain the right to assign a portion of their equity to a Japanese consumer.
- Prepare a scope of work for a feasibility study for discussion once the Heads of Agreement is signed, the critical component of which will be a shipping study (Peko)
- Investigate Pimex Pty Ltd (Peko & Hooker).

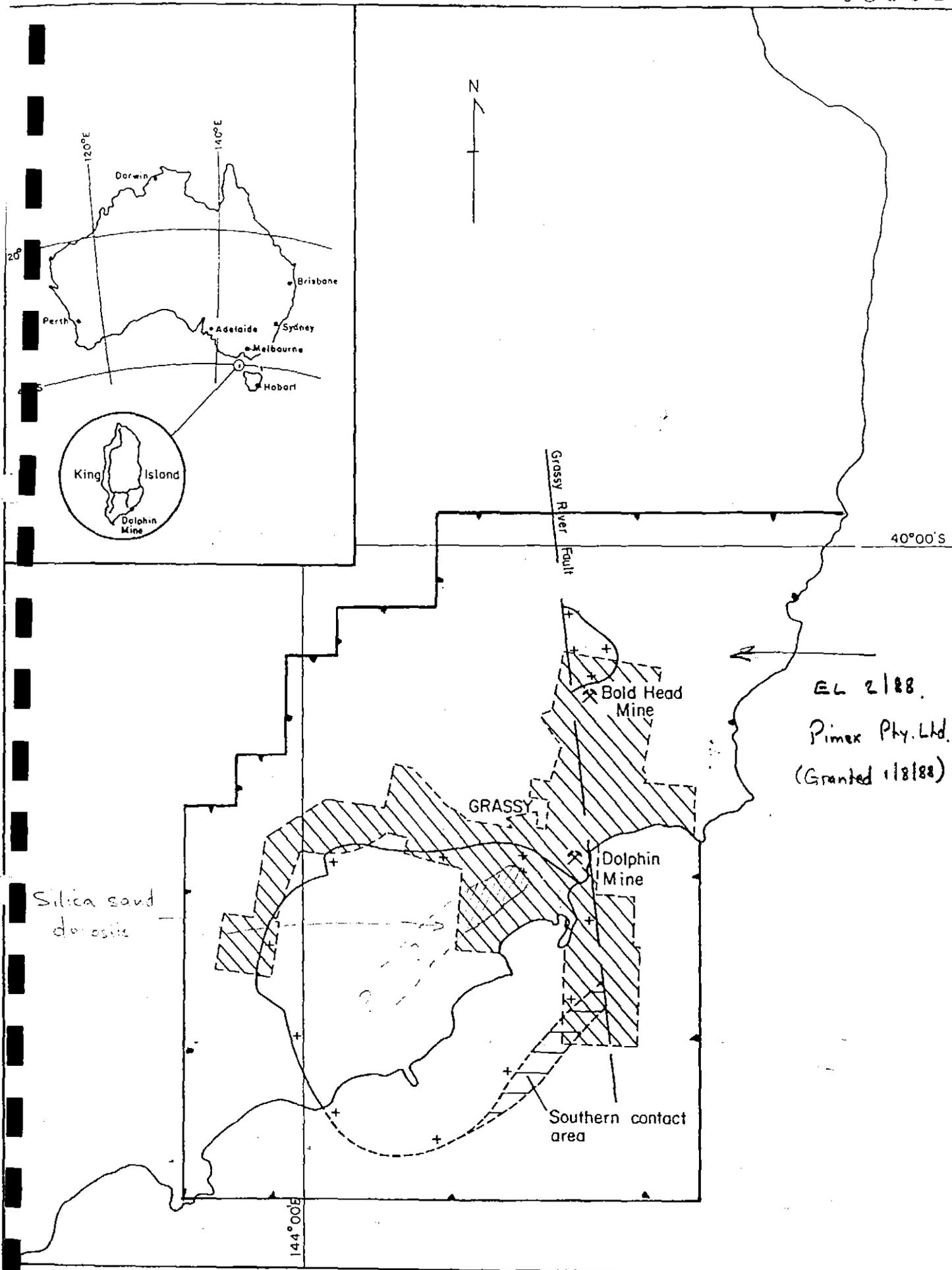
5. Also discussed

- Marketing of product. Hooker have established contacts and indicated a desire to handle the marketing.
- The possibility of dealing with Pimex and establishing a larger operation from the outset.



P.R. Stephenson

PRS:sk



EL 2188.
 Pimex Pty. Ltd.
 (Granted 1988)

Silica sand deposits

LEGEND

 ML. 17M/79



5 cm

Scale 1:100,000

0 1 2 3 4 5

KING ISLAND SCHEELITE

LOCATION PLAN

ML 17M/79

HOOKER RESOURCES

READINGS ID	1	2	3	4
HOOKER ID	KI 10	KI 9	KI 9	KI 8
INTERVAL	1.0 - 1.85M	3.3 - 4.7M	0.3 - 3.3M	0.75 - 1.35M
% +1.0mm	0.22	0.68	0.36	0.34
% FINES	3.39	4.52	1.61	1.15
% SAND	96.39	94.80	98.03	98.51
% HEAVY MINERALS	0.52	0.40	0.69	0.41
SIZING:				
% +850	0.1	1.3	0.1	0.3
% +600	1.0	9.0	1.7	3.7
% +500	3.5	11.5	3.7	7.5
% +420	9.3	15.5	9.8	14.3
% +300	35.6	31.0	35.9	38.4
% +212	32.4	23.8	32.9	25.0
% +150	14.3	2.8	12.3	6.2
% +106	3.5	4.7	3.1	4.4
% -106	0.3	0.4	0.5	0.2
TOTAL	100.00	100.00	100.00	100.00
READINGS ID	5	6	7	8
HOOKER ID	KI 7	KI 6	KI 7	KI 5
INTERVAL	2.75 - 3.5M	0.3 - 1.6M	0.55 - 2.25M	0.3 - 2.1M
% +1.0mm	0.05	0.04	0.03	1.97
% FINES	1.27	1.17	1.16	1.57
% SAND	98.68	98.79	98.81	96.46
% HEAVY MINERALS	0.82	0.83	0.67	0.48
SIZING:				
% +850	0.0	0.1	0.0	0.2
% +600	1.0	1.0	0.8	1.2
% +500	3.5	3.4	2.9	2.7
% +420	8.9	7.5	9.7	7.9
% +300	30.9	26.0	33.7	29.6
% +212	30.2	30.6	31.4	36.0
% +150	21.6	27.9	18.1	18.2
% +106	3.6	3.1	3.2	3.1
% -106	0.3	0.4	0.2	1.1
TOTAL	100.00	100.00	100.00	100.00

HOOKER RESOURCES

READINGS ID	9	10	11	12
HOOKER ID	KI 4	KI 4	KI 3	KI 1
INTERVAL	0.2 - 3.0M	3.0 - 3.6M	1.0 - 3.0M	0.25 - 1.5M
% +1.0mm	0.20	0.01	0.22	0.08
% FINES	1.14	1.37	0.83	2.98
% SAND	98.66	98.62	98.95	96.94
% HEAVY MINERALS	1.62	1.29	0.63	0.34
SIZING:				
%+850	0.0	-	0.4	2.2
%+600	0.3	-	5.3	0.1
%+500	0.9	0.2	10.5	6.1
%+420	2.9	1.9	20.8	13.7
%+300	21.8	33.4	40.2	37.2
%+212	38.2	45.9	18.2	26.2
%+150	31.3	15.3	2.2	10.6
%+106	3.8	3.1	2.2	3.5
%-106	0.8	0.2	0.2	0.4
TOTAL	100.00	100.00	100.00	100.00
READINGS ID	13	14	15	16
HOOKER ID	KI 2	KI 15	KI 14	KI 15
INTERVAL	0.25 - 0.8M	0.65 - 2.3M	2.3 - 3.35M	2.3 - 3.0M
% +1.0mm	0.05	2.90	0.42	1.61
% FINES	0.36	1.27	1.17	2.88
% SAND	99.59	95.83	98.41	95.51
% HEAVY MINERALS	0.27	0.87	0.40	1.20
SIZING:				
%+850	0.1	1.2	0.3	0.5
%+600	1.9	5.4	2.2	3.3
%+500	4.3	6.3	4.2	4.9
%+420	9.6	11.1	8.8	10.1
%+300	35.3	29.7	36.7	30.0
%+212	32.9	27.1	33.9	29.6
%+150	12.9	15.2	11.7	17.5
%+106	2.9	3.6	2.1	3.8
%-106	0.1	0.4	0.1	0.3
TOTAL	100.00	100.00	100.00	100.00

HOOKER RESOURCES

READINGS ID	17	18	19	20
HOOKER ID	KI 14	KI 13	KI 11	KI 12
INTERVAL	0.5 - 2.3M	0.5 - 1.05M	0.6 - 2.0M	0.5 - 1.6M
% +1.0mm	0.53	7.18	0.03	0.60
% FINES	0.08	0.89	1.11	1.72
% SAND	98.59	91.93	98.86	97.68
% HEAVY MINERALS	0.49	0.14	0.53	0.54
SIZING:				
%+850	0.4	2.4	-	0.7
%+600	2.8	13.6	0.3	7.2
%+500	4.3	16.1	1.0	10.6
%+420	9.3	19.9	4.9	15.9
%+300	29.7	29.5	33.6	36.1
%+212	31.7	12.9	40.0	17.5
%+150	19.3	1.1	17.3	9.8
%+106	2.3	4.3	2.8	2.0
%-106	0.2	0.2	0.1	0.2
TOTAL	100.00	100.00	100.00	100.00
READINGS ID				
HOOKER ID				
INTERVAL				
% +1.0mm				
% FINES				
% SAND				
% HEAVY MINERALS				
SIZING:				
%+850				
%+600				
%+500				
%+420				
%+300				
%+212				
%+150				
%+106				
%-106				
TOTAL				

089044

HOOKER RESOURCES

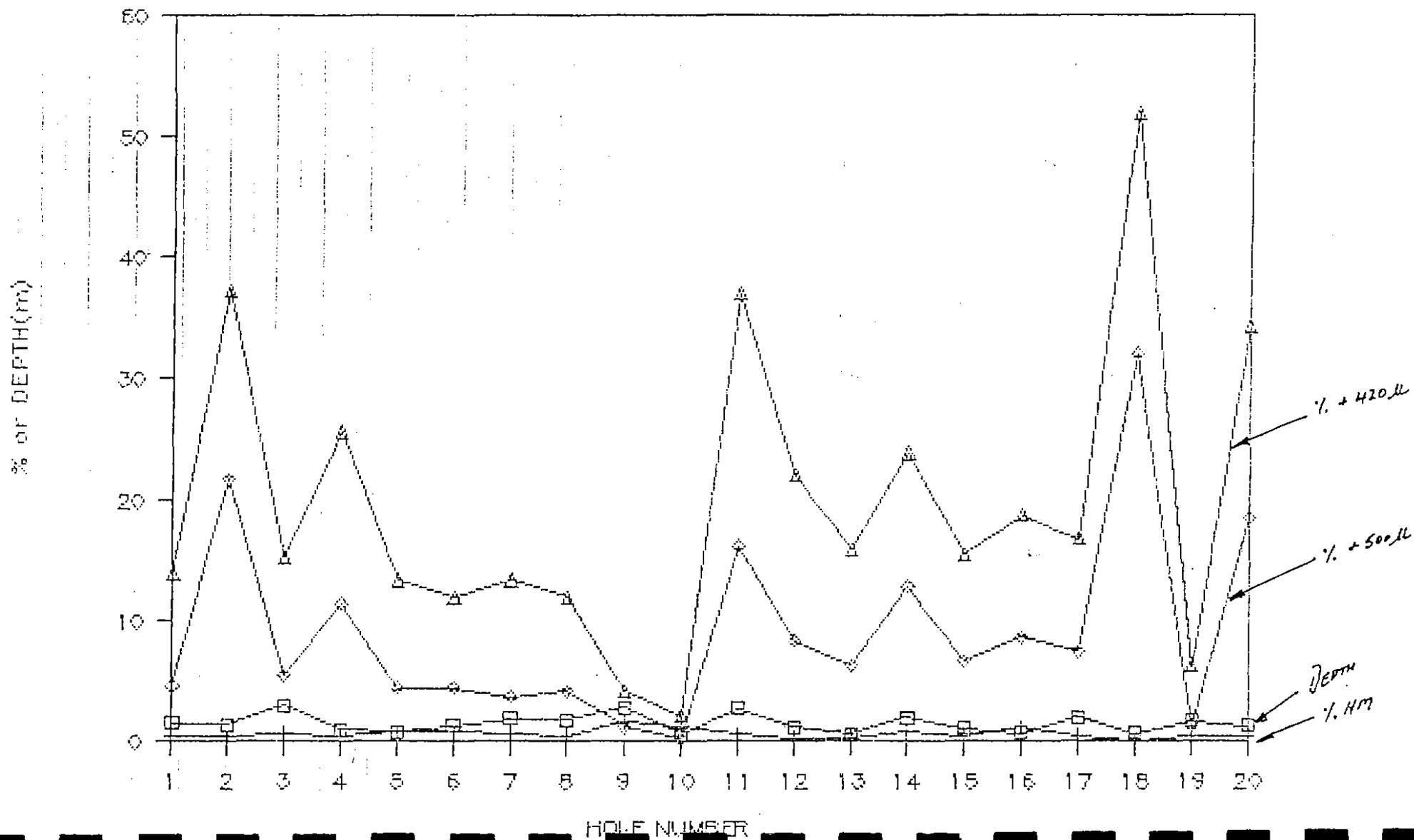
KING ISLAND JV SAMPLING

HOLE NO.	DEPTH m	+ 1mm %	FINES %	+ 500u %	+420u %	HM %
1	1.5	0.2	3.4	4.6	13.9	0.52
2	1.4	0.7	4.5	21.8	37.3	0.40
3	3.0	0.4	1.6	5.5	15.3	0.69
4	1.0	0.3	1.2	11.5	25.8	0.41
5	0.8	0.1	1.3	4.5	13.4	0.82
6	1.3	0.0	1.2	4.5	12.0	0.83
7	1.9	0.0	1.2	3.7	13.4	0.67
8	1.8	2.0	1.6	4.1	12.0	0.48
9	2.8	0.2	1.1	1.2	4.1	1.62
10	0.6	0.0	1.4	0.2	2.1	1.29
11	2.7	0.2	0.8	16.2	37.0	0.63
12	1.2	0.1	3.0	8.4	22.1	0.34
13	0.6	0.1	0.4	6.3	15.9	0.27
14	2.0	2.9	1.3	12.9	24.0	0.87
15	1.1	0.4	1.2	6.7	15.5	0.40
16	0.7	1.6	2.9	8.7	18.8	1.20
17	2.0	0.5	0.9	7.5	16.8	0.49
18	0.7	7.2	0.9	32.1	52.0	0.14
19	1.7	0.0	1.1	1.3	6.2	0.53
20	1.3	0.6	1.7	18.5	34.4	0.54

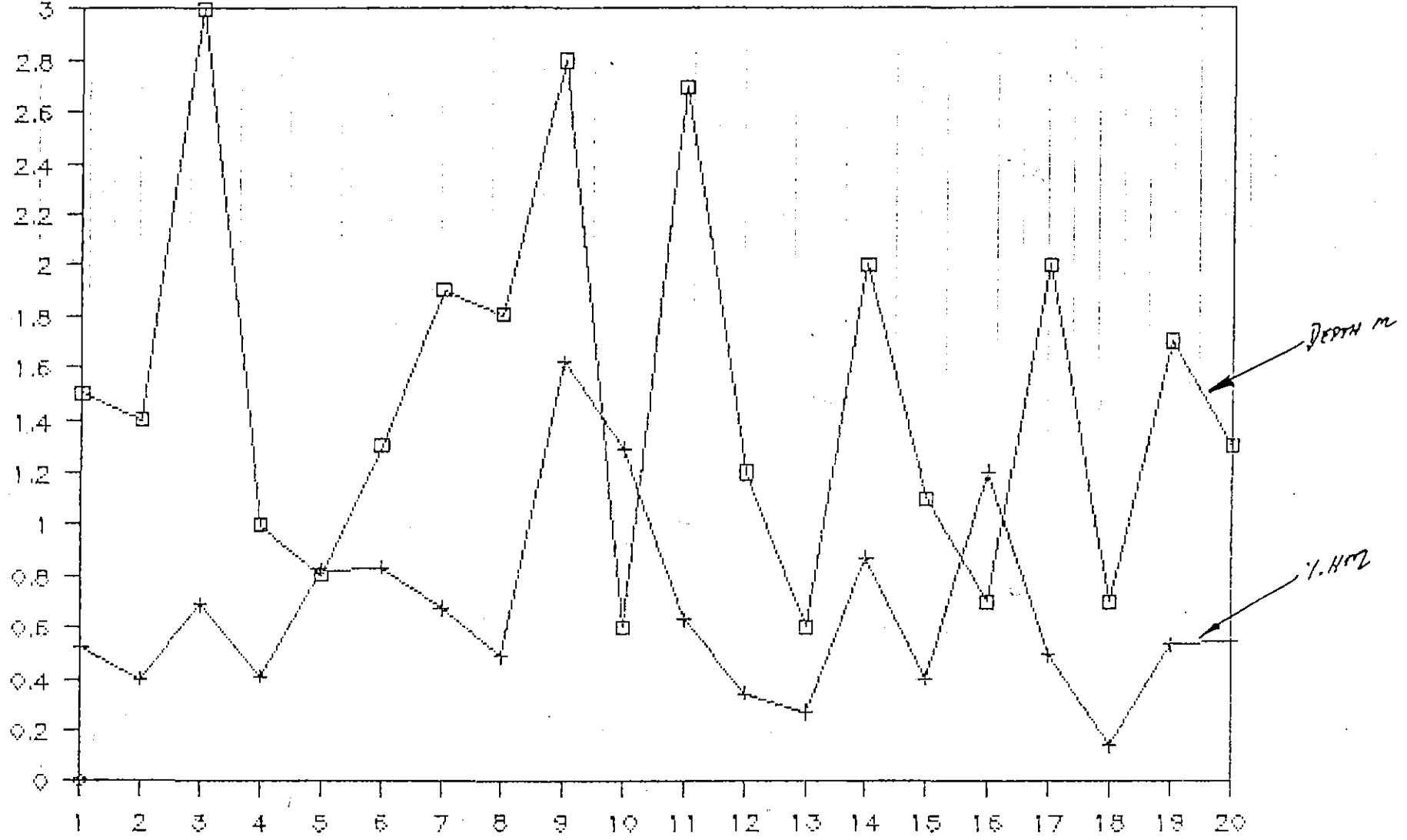
AVERAGE	1.5	0.9	1.6	9.0	19.6	0.7
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0-89045

KING ISLAND



089046



XRF ANALYSIS OF BROMOFORM FLOAT FROM GLASS SANDS

089047

ME NO	% Fe ₂ O ₃	% Al ₂ O ₃	% TiO ₂	% Cr ₂ O ₃
1	<0.01 (0.003)	0.029	<0.01 (0.008)	<0.001
2	<0.01 (0.008)	0.037	0.017	<0.001
3	<0.01 (0.005)	0.031	0.011	<0.001
4	<0.01 (0.005)	0.031	<0.01 (0.005)	<0.001
5	<0.01 (0.006)	0.034	<0.01 (0.008)	<0.001
6	<0.01 (0.007)	0.037	<0.01 (0.009)	<0.001
7	<0.01 (0.007)	0.032	<0.01 (0.007)	<0.001
8	<0.01 (0.004)	0.028	0.010	<0.001
9	<0.01 (0.006)	0.036	0.010	<0.001
10	<0.01 (0.008)	0.072	0.011	<0.001
11	<0.01 (0.005)	0.041	<0.01 (0.008)	<0.001
12	<0.01 (0.006)	0.034	0.012	<0.001
13	<0.01 (0.005)	0.029	<0.01 (0.008)	<0.001
14	<0.01 (0.006)	0.047	0.012	<0.001
15	<0.01 (0.008)	0.060	0.011	<0.001
16	<0.01 (0.006)	0.048	0.015	<0.001
17	<0.01 (0.007)	0.041	<0.01 (0.008)	<0.001
18	<0.01 (0.005)	0.043	<0.01 (0.009)	<0.001
19	<0.01 (0.006)	0.040	0.013	<0.001
20	<0.01 (0.007)	0.040	0.010	<0.001

PEKO - WALLSEND LTD.

(INCORPORATED IN NEW SOUTH WALES)

METALLIFEROUS MINING DIVISION

25 MERRIWA STREET, GORDON, N.S.W., 2072, AUSTRALIA.

TELEPHONE 498 4566

27th June 1988

→ PRS

Mr. J. Hann,
Divisional Manager - Exploration & Development,
Hooker Resources,
GPO Box 2724,
SYDNEY. NSW 2001.

I suspect, we will need to consider an offshore loading facilities based on a single point mooring and a slurry line.

Dear John,

SILICA SANDS - KING ISLAND

How critical is moisture content of product? Ok

During a visit to King Island last week, I discussed the silica sands project with Michael Crow, Manager of Operations at King Island Scheelite Ltd. Michael pointed out several operational limitations related to the wharf at Grassy, of which you should be aware.

The wharf was designed in the early 1970's and was intended to handle the 900-1000 tonne (200 ft) capacity ships then in use. Allowance was also made for a 4000 tonne (400 ft) ship to berth at the breakwater, however, because of the presence of shallow areas within Little Grassy Bay, anything larger would have great difficulty in manoeuvring within the Bay, and would have to stand off-shore. The 'Straitsman' (1200 tonnes) is the only vessel which regularly uses the Grassy Wharf. The 'Mobil Australis' (26,000 tonnes) which brings in the island's oil supplies, stands off the wharf at Naracoopa, and discharges via a pipeline.

If an operation based on a 4000 tonne vessel was envisaged, transport and loading facilities would need to be constructed along the breakwater. Allowance would also have to be made for bad weather as, while the 'Straitsman' is normally able to enter the harbour under most conditions, a larger ship would be adversely affected more frequently.

Yours sincerely,

P.R. Stephenson,
Chief Geologist,
Metalliferous Mining Division.

c.c. R. Knight, MMD
M. Crow, KIS.

PEKO-WALLSEND LTD.
METALLIFEROUS MINING DIVISION

089049

INTER OFFICE MEMO

From:

PAUL BALIND

25 Merriwa Street,
Gordon, 2072.

To:

PAT STEPHENSON

Date:

16th June 1988

SUBJECT: SAMPLING OF "OLD" DUNE SANDS - SILICA SANDS PROJECT -
KING ISLAND.

Attached to this memo are brief geological logs and sampling details for a limited hand auger sampling programme undertaken from 6th-11th June 1988 as a first past effort to evaluate the potential of silica sands within King Island Scheelite's mining lease.

Observations suggest that the three areas outlined in red on the aerial photo (King Island Run 9S 1085-91) are probably joined (i.e. continuous) with the western boundary extending to the granite outcrop. Mapping in greater detail than time allowed for this exercise would define this boundary quite accurately. Overlap of new dunes on old dunes to the east were particularly noted in the area of sample KI:13.

The overlying humus layer generally averaged 25 to 30cm in thickness with leaching effects occurring down to one metre depth. The base of the white, typically fine grained quartz rich sands averaged 2.2m and ranged from 0.8 to 3.7m. Underlying the white sand is a variable thickness of grey-stained wet sand followed by brown to chocolate coloured clayish sand. The sample holes were generally terminated in this zone due mainly to poor and very difficult auger penetration rate.



for PAUL BALIND

HOLE DESCRIPTION

<u>Sample No.</u>	<u>Location Co-ordinates</u>	<u>Depth(m)</u>	<u>Description</u>
KI:1	218800E/563900N	0-0.25	Humic layer: degraded leaves, bracken, etc.
		0.25-1.5	White fine grained quartz rich sand; well sorted, equigranular
		1.5-1.87	Very dark blackish brown clayish fine grained sand, very slow penetration with hand auger
		1.87	End of Hole (E.O.H.)
KI:2	218930E/563810N	0-0.25	Humic layer
		0.25-0.80	Very pale pink to white fine grained well sorted equigranular quartz rich sand
		0.80-1.00	Dark brown to very dark brown clayish fine grained sand. Very slow penetration with auger
		1.00	E.O.H.
KI:3	218970E/563690N	0-0.25	Humic layer
		0.25-1.00	Pale grey fine grained quartz rich sand with common plant fragments, roots, etc.
		1.00-2.20	White, fine grained, well sorted, equigranular quartz rich sand. A 15cm wide clayish humic layer is found at 1.50m
		2.20-2.30	10cm wide humic clayish zone
		2.30-2.60	Grey to brown grey fine grained sand; some plant matter noted, weakly clayish
		2.60	E.O.H.

HOLE DESCRIPTION

<u>Sample No.</u>	<u>Location Co-ordinates</u>	<u>Depth(m)</u>	<u>Description</u>
KI:4	219010E/563580N	0-0.25	Humic layer
		0.25-3.60	White fine grained, well sorted equigranul or quartz rich sand. Colour changes to slightly greyish after 2m
		3.60-3.90	Dark brown clayish humic looking fine grained sand
		3.90	E.O.H.
KI:5	218480E/563660N	0-0.30	Humic layer
		0.30-2.10	White to very pale grey quartz rich sand, fine grained well sorted, etc.
		2.10-2.20	Impervious ? rock; no sample return. Very hard, well indurated
		2.20	Hole abandoned
KI:6	218700E/563520N	0-0.30	Humic layer
		0.30-1.30	White fine grained well sorted quartz rich sand
		1.30-1.45	Clayish humic layer, dark brown and abundant plant matter
		1.45-1.60	White to often grey fine grained quartzose sand; some plant fragments. Greyness possibly due to leaching
		1.60-1.75	Very dark brown clayish humic looking quartzose sand; partially consolidated (lumpy). Poor penetration with auger
		1.75	E.O.H.

HOLE DESCRIPTION

<u>Sample No.</u>	<u>Location Co-ordinates</u>	<u>Depth(m)</u>	<u>Description</u>
KI:7	218650E/563440N	0-0.56	Humic layer
		0.56-3.50	White fine grained, well sorted quartz rich sand
		3.50-3.70	Very pale brownish grey fine grained sand; wet
		3.70-4.00	Wet very dark brown to coffee coloured weakly clayish quartzose sand. Poor auger penetration
		4.00	E.O.H.
KI:8	218540E/563120N	0-0.75	Humic layer
		0.75-1.35	White fine grained well sorted quartz rich sand
		1.35-2.00	Pale grey brown to chocolate brown quartzose, slightly clayish fine grained sand
		2.00	E.O.H.
KI:9	218410E/563110N	0-0.40	Humic layer
		0.40-0.75	Pale yellowish grey fine grained quartzose sand
		0.75-2.65	White fine grained well sorted equigranular quartz rich sand
		2.65-2.75	Very pale yellowish brown quartzose sand
		2.75-4.70	Predominantly white quartz rich sand, occasionally very slightly grey or brown. The sand is fine grained down to 3.75m and medium grained thereafter. The sand is wet at 3.75m and very wet by 4.0m. Auger penetration is slow after 3.0m and very poor after 4.5m with sand washing in at depth
4.70	Hole abandoned		

HOLE DESCRIPTION

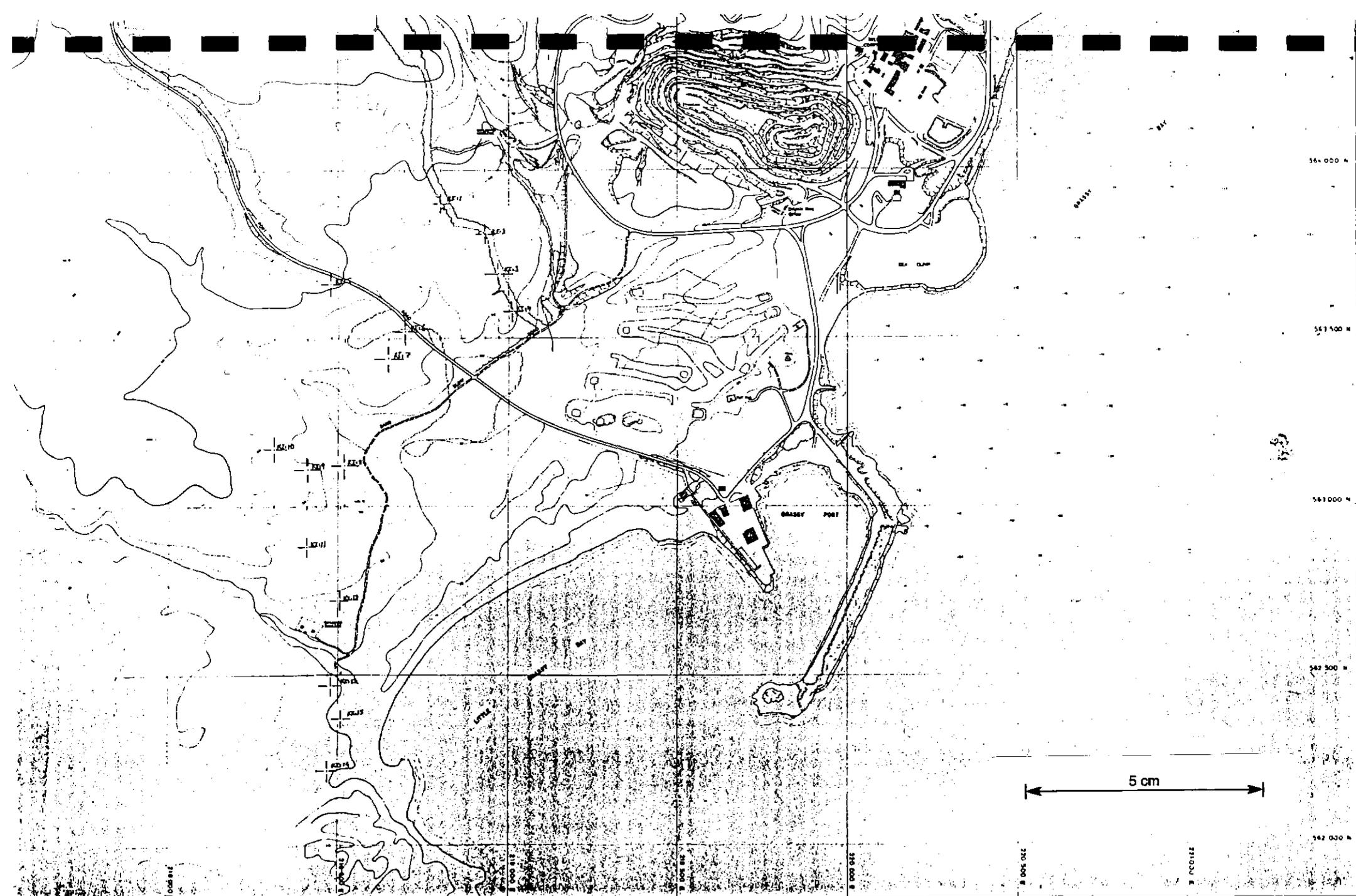
<u>Sample No.</u>	<u>Location Co-ordinates</u>	<u>Depth(m)</u>	<u>Description</u>
KI:10	218310E/563110N	0-0.40	Humic layer
		0.40-1.00	Pale grey to pale greyish brown to white fine grained sand with common plant fragments
		1.00-1.85	White fine grained well sorted equigranular quartz rich sand with patches of very pale grey coloration. The sand is moist at 1.75m and very wet by 1.85m
		1.85-1.95	Very wet pale brownish-grey white fine grained quartzose sand
		1.95	Hole abandoned. An impervious layer was struck at this depth and there was no sample return
KI:11	218410E/562880N	0-0.30	Humic layer
		0.30-0.60	Grey-brown stained white fine grained sand with common plant fragments
		0.60-2.00	White fine grained equigranular well sorted quartz rich sand
		2.00-2.80	Chocolate coloured fine grained moderately clayish fine grained quartzose sand
		2.80	E.O.H.
KI:12	218510E/562270N	0-0.25	Humic layer
		0.25-0.50	Grey stained white fine grained quartzose sand with common plant fragments
		0.50-1.60	White fine grained well sorted quartz rich sand. Wet at 1.50m
		1.60-1.90	Grey fine grained quartzose sand; weakly clayish and wet
		1.90-2.00	Chocolate coloured clayish very wet fine grained sand
		2.00	E.O.H.

HOLE DESCRIPTION

<u>Sample No.</u>	<u>Location Co-ordinates</u>	<u>Depth(m)</u>	<u>Description</u>
KI:13	218480E/562470N	0-0.30	Humic layer
		0.30-0.50	Grey stained sand with plant matter
		0.50-1.05	Greyish white fine to occasionally medium grained well sorted quartz rich sand, moist towards the base
		1.05-1.40	Chocolate brown to very dark grey (almost black) very clayish fine grained quartzose sand, generally wet
		1.40	Hole abandoned. Impervious layer at 1.4m; no sample return
KI:14	218470E/562220N	0-0.30	Humic layer
		0.30-0.50	White to grey fine grained quartzose sand with plant matter
		0.50-3.35	White fine grained well sorted quartz rich sand. Moist at depth. Occasionally slightly greyish
		3.35-3.45	Grey to brown stained fine grained quartzose sand
		3.45-3.85	Very clayish brown fine to medium grained moist sand
		3.85	E.O.H.
KI:15	218510E/562370N	0-0.45	Humic layer
		0.45-0.65	Grey stained white quartzose sand with plant fragments
		0.65-3.00	White fine grained well sorted equigranular quartz rich sand
		3.00-3.20	Wet greyish white quartz rich fine grained sand
		3.20-3.65	Very wet greyish white quartz rich sand
		3.65	Hole abandoned due to a) loss of sample from auger b)washing in of sand at depth

SAMPLING DETAILS

<u>Sample No</u>	<u>Interval Sampled</u>
KI:1	0.25-1.5m
KI:2	0.25-0.80m
KI:3	1.00-2.20m
KI:4	0.25-3.60m
KI:5	0.30-2.10m
KI:6	0.30-1.60m
KI:7	0.56-3.70m
KI:8	0.75-1.35m
KI:9	0.75-2.65m
KI:10	1.00-1.85m
KI:11	0.60-2.00m
KI:12	0.50-1.60m
KI:13	0.50-1.05m
KI:15	0.50-3.35m
KI:16	0.65-3.00m



080056

Topographic map of King Island, Schellite, showing the Grassy area and environs. The map is based on aerial photography and is accurate to 1:25,000. It is a reproduction of the original map and is not to be used for navigation purposes. The map is based on the datum of the Australian Geodetic Datum (AGD) 1984. The map is based on the datum of the Australian Geodetic Datum (AGD) 1984. The map is based on the datum of the Australian Geodetic Datum (AGD) 1984.



GRASSY AND ENVIRONS

KING ISLAND SCHELLITE
 04KI06 - 0012

PEKO-WALLSEND LTD.
METALLIFEROUS MINING DIVISION

INTER OFFICE MEMO

From: P. R. Stephenson

25 Merriwa Street,
Gordon, 2072.

To: R. Knight *RK*

Date: 24.5.88

Copy: M. Crow *→ PRS/EC*

SILICA SAND PROJECT - KING ISLAND

A meeting was held on the 18th May between myself and John Hann, Divisional Manager - Exploration and Development for Hooker Resources, to discuss preliminary assessment of the sand deposits on King Island Scheelite's mining lease.

Hooker has identified 3 main types of sand dune deposits in the Grassy area:-

1. Recent deposits forming the present-day beach and occurring inland for a short distance.
2. Older recent deposits, occurring immediately inland from type 1 deposits.
3. Old deposits, occurring further inland again.

In terms of potential sources of high quality silica sand (<0.02% Fe), type 1 deposits are the least attractive and type 3 deposits the most attractive, since the older the deposit, the more likely are the impurities to have been leached from it.

From aerial photography work and reference to old reports (report by J. Jennings, 1958 attached), Hooker has identified areas within the Grassy portion of the KIS mining lease apparently underlain by type 1 deposits (under and east of the golf course), type 2 deposits (under the golf course) and type 3 deposits (west and south of the golf course). (See attached aerial photograph and overlay). Extensive dune deposits of all types have also been identified on the adjoining exploration license held by Pimex.

It has been estimated that in order to establish a viable silica sand mining operation in this area, a minimum of 5 million tonnes of high quality sand would be required, i.e. capable of producing 0.5 million tonnes per year for 10 years. Hooker believes that there may be approximately 2.5 million tonnes of type 3 deposits within the Grassy portion of the mining lease (although this figure is very tentative), and at least 10-20 million tonnes within Pimex's ground. Hooker wishes to evaluate the quality of the sand on the mining lease and, if appropriate, to establish a working relationship with Peko before entering into discussions with Pimex.

Approximately 10-12 carefully taken samples from type 3 deposits on the mining lease are required for analysis, together with observations as to visual contaminants, thicknesses and surface extent. A request to carry out this work has been sent to Michael Crow. In the meantime, Hooker will commence preparatory economic modelling and will approach us again when the results of the sampling programme are known.

P. R. Stephenson

P. R. Stephenson.

P. R. Stephenson

H. Crow

24.5.88

SAMPLING PROGRAMME - SILICA SAND PROJECT - KING ISLAND

(Refer to the attached memo to R. Knight on this subject).

In order to obtain an indicative measure of the quality of sand deposits on King Island Scheelite's mining lease, Hooker has requested that we undertake the following programme:-

- Collect a total of 10-12 1 kg samples from the areas of type 3 (old) sand deposits which are marked in red on the photograph overlay. Each sample should be representative of the full thickness of sand at each sampling locality. Overlying organic material and underlying "coffee rock" (if present) should not be included. The plots on the photograph overlay are tentative, and it is likely that the deposits are more extensive than shown.
- Collect using a stainless steel soil auger or an untarnished spade. It is important that no contamination, particularly rust, gets into the samples. Hooker can assist with sampling equipment if necessary.
- Log the colour, grain size and visual contaminants of the samples. Measure thicknesses and attempt to establish surface extent.
- Seal samples in plastic bags and despatch to:-

Mr. M. Davies
Laboratory,
Hooker Sands,
Captain Cook Drive,
CRONULLA. N.S.W. 2230

I would be grateful if you could arrange for this programme to be carried out, if possible by Paul Balind. When the samples are despatched, could you ask him to forward me a map and details of the samples (and to return the aerial photograph).

If yourself or Paul have any questions on this, please do not hesitate to ring.

Regards.

PC8

P. R. Stephenson.

Encl.

AGC
089059

KING ISLAND
PRE-FEASIBILITY STUDY FOR
EXPORT OF MINERAL SANDS

DRAFT

February 1989

Macknight Pty Ltd
49 Cardigan Place
ALBERT PARK VIC 3205

Tel: (03) 690 7366
Fax: (03) 690 9902
Telex: AA 10720792 NCPT

Macknight Pty Ltd
457 Upper Edward Street
BRISBANE QLD 4000

Tel: (07) 831 9033
Fax: (07) 832 1140
Telex: AA 10720792

Macknight

KING ISLAND

PRE-FEASIBILITY STUDY FOR
EXPORT OF MINERAL SANDS

- 1.0 INTRODUCTION ✓
- 2.0 SUMMARY
- 2.1 NARACOOPA JOINT VENTURE X
- 2.2 GRASSY JOINT VENTURE ✓
- 3.0 NARACOOPA JOINT VENTURE X
- 3.1 RUTILE AND ZIRCON
- 3.1.1 Export Through Grassy
- 3.1.2 Export Direct
- 3.2 ILMENITE
- 3.2.1 Export Direct
- 3.3 COMBINED OPERATION
- 3.4 COST ESTIMATES
- 3.4.1 General
- 3.4.2 Labour Costs
- 3.4.3 Export Through Grassy
- 3.4.4 Export Direct - Rutile and
Zircon in Bulk
- 3.4.5 Export Direct - Rutile,
Zircon and Ilmenite in Bulk
- 3.4.6 Combined Operation
- 3.4.7 Cost Summaries
- 4.0 GRASSY JOINT VENTURE ✓

- 4.1 EXPORT OF DRY BULK SILICA SAND ✓
 - 4.1.1 Sandblow Point
 - 4.1.2 Jetty Point
- 4.2 EXPORT OF MOIST SILICA SAND ✓
 - 4.2.1 SPM offshore Sandblow Point
 - 4.2.2 SPM offshore Jetty Point
- 4.3 COST ESTIMATES ✓
 - 4.3.1 General
 - 4.3.2 Dry Bulk Export
 - 4.3.3 SPM/Slurry Export
 - 4.3.4 Cost Summaries

5.0 SHIPPING

- 5.1 NARACOOPA JOINT VENTURE X
 - 5.1.1 Rutile/Zircon in Containers ex Grassy
 - 5.1.2 Rutile/Zircon in Bulk
 - 5.1.3 Ilmenite
 - 5.1.4 Combined Container/Bulk
- 5.2 GRASSY JOINT VENTURE ✓
 - 5.2.1 Bulk Silica Sand to Japan

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- 3.2
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- 4.4
- 4.5

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	3.4.3
	3.4.4
	3.4.5.
	3.4.6
	4.3.1
	4.3.2
	4.3.3
	4.3.4
	4.3.5
	4.3.6
	4.3.7
	4.3.8
	4.3.9
	4.3.10

1.0 INTRODUCTION

In November 1988 Peko-Wallsend Ltd (PWL) commissioned Macknight Pty Ltd (MPL) to carry out a pre-feasibility study for exporting mineral sands from King Island in Bass Strait.

The study included the technical and economic prefeasibility of the marine loading and shipping for the following two separate projects:

- o Naracoopa Joint Venture
 - Export of 15,000t/a of rutile and 20,000t/a of zircon from near Naracoopa to the West Coast of USA (WCNA).
 - Export of 70,000t/a of ilmenite from near Naracoopa to Burnie in Tasmania.
- o Grassy Joint Venture
 - Export of 250,000t/a to 1,000,000t/a of silica sand from near Grassy to Japan.

Figure 1.0 shows the proposed location of the developments.

Summaries of the results of the study and the cost estimates are given in Section 2.0. The various options for exporting rutile, zircon and ilmenite both as separate and combined operations are discussed in Section 3.0 together with details of the cost estimates.

Section 4.0 discusses the alternative methods of loading the silica sand at two potential sites near Grassy and presents the associated cost estimates.

The shipping freight rates for each of the options for both projects are developed in Section 5.0.

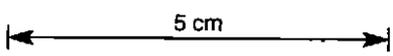
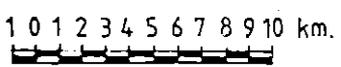


FIGURE 1-0

will be by the export ship,s grabs.

This operation is slow and hampered by weather - a three day loading duration (turnaround time) has been allowed to cover these aspects.

2.2 GRASSY JOINT VENTURE

The prefeasibility study for the export of between 250,000 t/a and 1,000,000 t/a of silica sand from the Grassy area has been carried out for two systems of loading at two potential port sites which include dry bulk by conventional conveyor and a slurry system to a Single Point Mooring (SPM) offshore.

Apneumatic loading system was also considered but at this stage it was found to be unpractical and too expensive over the distances to either the export berth or SPM. This system is further discussed in section 4.

The existing harbour at Grassy restricts vessel size and a new facility is therefore required to load the export vessels necessary to maintain the specified throughputs. Two potential sites have been identified.

- Sandblow Point which is in close proximity to the centre of the mining operations.
- Jetty Point where the required water depths are closer to shore.

The options for direct export of silica sand to Japan include:

- 5 (a) Sandblow Point Dry Bulk - 250,000 t/a - 35,000 dwt vessels.
- 5 (b) Sandblow Point Dry Bulk - 1,000,000 t/a - Panamax vessels.

- 6 (a) Jetty Point Dry Bulk - 250,000 t/a - 35,000 dwt vessels.
- 6 (b) Jetty Point Dry Bulk - 1,000,000 t/a - Panamax vessels.
- 7 (a) Sandblow Point SPM/Slurry 250,000 t/a - 35,000 dwt vessels.
- 7 (b) Sandblow Point SPM/Slurry 1,000,000 t/a - Panamax vessels.
- 8 (a) Jetty Point SPM/Slurry 250,000 t/a - 35,000 dwt vessels.
- 8 (b) Jetty Point SPM/Slurry 1,000,000 t/a - Panamax vessels.

The operating systems are based on dry average loading/unloading rates of 1000t/h and 600t/h respectively. For the slurry systems an extra day in the loading port has been allowed and the freight rate is based on 20% moisture contents to allow for cost of further on ship dewatering in order to deliver at 5% moisture content. The slurry concentration would be 50% by wt.

One fully utilized 35000 dwt vessel can transport the lower annual throughput (dry) but two 65000 dwt vessels are required for 1.0 Mt/a. The marine facilities have been located in water depths suitable for the 65000 dwt at the outset.

Conceptual layouts for the port facility at each of the sites have been prepared for both systems. Capital and Operating costs have been estimated in section 4.3 and summaries presented as cash flows over the 10 year life of the mine with a NPV are given in Tables 2.2 and 2.3 for Dry Bulk and Slurry systems.

It will be seen that the dry bulk alternative is more economical both in capital and operating costs with minor differences for sites - which can only be resolved in detail.

The layout of the dry bulk facilities is based on the concept of a berth with stand-off moorings to minimize down time, and to utilize navigation procedures which do not involve tugs.

Whilst these procedures have performed satisfactorily in other places it is not possible to confirm their suitability without further data and it is therefore recommended that wave, wind and tide measurements are taken as a first step in further studies should the project appear potentially viable. This data would also be necessary for the SPM options.

In addition to the options studied the alternative of a floating structure is always possible. However in the context of short approach trestles for dry bulk loading this option is usually more expensive and has been discounted.

KING ISLAND EXPORT STUDY

TABLE 2.2

SUMMARY OF OPTIONS

ALL AMOUNTS A\$'000

OPTION / YEAR	-2	-1	1	2	3	4	5	6	7	8	9	10	11	NPV
GRASSY JOINT VENTURE														
DRY BULK - SANDBLOW POINT														
5a SILICA SANDS - 250,000T/A DRY BULK - 35,000DWT														
CAPITAL COSTS	14,305	14,305												
OPERATING COSTS			6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	
SALVAGE @ 25%														-7,153
CASH COST	14,305	14,305	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	48,251
5b SILICA SANDS - 1,000,000T/A DRY BULK - PANAMAX														
CAPITAL COSTS	17,268	17,268												
OPERATING COSTS			18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	
SALVAGE @ 25%														-8,634
CASH COST	17,268	17,268	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	96,235
DRY BULK - JETTY POINT														
6a SILICA SANDS - 250,000T/A DRY BULK - 35,000DWT														
CAPITAL COSTS	12,724	12,724												
OPERATING COSTS			6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	
SALVAGE @ 25%														-6,362
CASH COST	12,724	12,724	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	45,307
6b SILICA SANDS - 1,000,000T/A DRY BULK - PANAMAX														
CAPITAL COSTS	17,973	17,973												
OPERATING COSTS			18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	
SALVAGE @ 25%														-8,986
CASH COST	17,973	17,973	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	97,547

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KING ISLAND EXPORT STUDY

TABLE 2.3

SUMMARY OF OPTIONS

ALL AMOUNTS AS '000

OPTION / YEAR	-2	-1	1	2	3	4	5	6	7	8	9	10	11	NPV
GRASSY JOINT VENTURE														
SPM/SLURRY - SANDBLOW POINT														
7a SILICA SANDS - 250,000T/A SPM/SLURRY - 35,000DWT														
CAPITAL COSTS	16,704	16,704												
OPERATING COSTS			8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	9,506	
SALVAGE														-8,352
CASH COST	16,704	16,704	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	9,506	-8,352 58,079
7b SILICA SANDS - 1,000,000T/A SPM/SLURRY - PANAMAX														
CAPITAL COSTS	22,647	22,647												
OPERATING COSTS			22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	
SALVAGE														-11,324
CASH COST	22,647	22,647	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	-11,324 122,240
SPM/SLURRY JETTY POINT														
8a SILICA SANDS - 250,000T/A SPM/SLURRY - 35,000DWT														
CAPITAL COSTS	17,070	17,070												
OPERATING COSTS			8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	9,506	
SALVAGE														-8,535
CASH COST	17,070	17,070	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	9,506	-8,535 58,644
8b SILICA SANDS - 1,000,000T/A SPM/SLURRY - PANAMAX														
CAPITAL COSTS	22,464	22,464												
OPERATING COSTS			22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	
SALVAGE														-11,232
CASH COST	22,464	22,464	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	-11,232 121,903

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4.0 GRASSY JOINT VENTURE

Grassy is a small town on the south east coast of King Island. The township serves the scheelite mine operated by King Island Scheelite.

A port consisting of an outer breakwater constructed from the spoil of the scheelite mine was constructed in 1971. The port provides an all weather harbour for fishing vessels and the M.V. Straitsman which currently services King Island on a weekly basis.

The wharf facilities consist of a Ro-Ro ramp, 85m of concrete deck wharf and a fixed leg derrick. Depth and turning constraints restrict the size of vessel able to berth at the wharf facilities.

The seas offshore at times could be described as severe with numerous reefs that restrict navigation.

The brief requires investigation of the facilities necessary for the export of between 250,000t and 1,000,000t of silica sand per annum.

Two methods for loading the sand have been included in the investigation as follows:

- Dry Bulk Silica Sand using conventional conveyors with a fixed head loader.
- Moist Silica Sand using a slurry system piped to a single Point Mooring (SPM) offshore.

The throughputs and the size of the associated vessels are such as to require the construction of a new export facility.

The cost of breakwaters and extending Grassy to provide an all weather loading port would be prohibitive and therefore an exposed facility has been considered.

The following two potential port sites have been included in the investigation:

- Sand Blow Point which is closer to the centre of mining operations and
- Jetty Point which is seaward of the existing breakwater where deepwater is relatively close to shore.

The various options are discussed in the following sections. The associated cost estimates are presented in Section 4.3 and the shipping aspects with freight rates are given in Section 5.0.

Figure 4.1 following provides a similar representation of the operations considered.

A third option of pneumatic loading of dry sand via a SPM was also briefly considered. The minimum required loading rate for a reasonable turnaround of the export vessel together with the excessive pumping lengths results in systems that are outside the levels of present technology. For example systems with installed horsepower greater than 4 kW/tonne of product conveyed and air consumption in excess of 2000 m.m per min. lead to very high operating costs due to the air consumption of the system when compared with power requirements for the slurry system at about 1 kW/t and much less for the conveyor system.

Maintenance, particularly if a breakage occurred in the sub sea pipe, could be expensive and at this stage the option of a pneumatic system has not been given any

further consideration.

While our costing systems have been based on conventional deep trough conveying design, there may well be some significant savings to be achieved in the use of the emerging pipe conveyor technology. While these systems share approximately the same installed costs as conventional conveyors, they have the potential for cost savings in the areas of the approach trestle and supporting structure.

4.1 EXPORT OF DRY BULK SILICA SAND

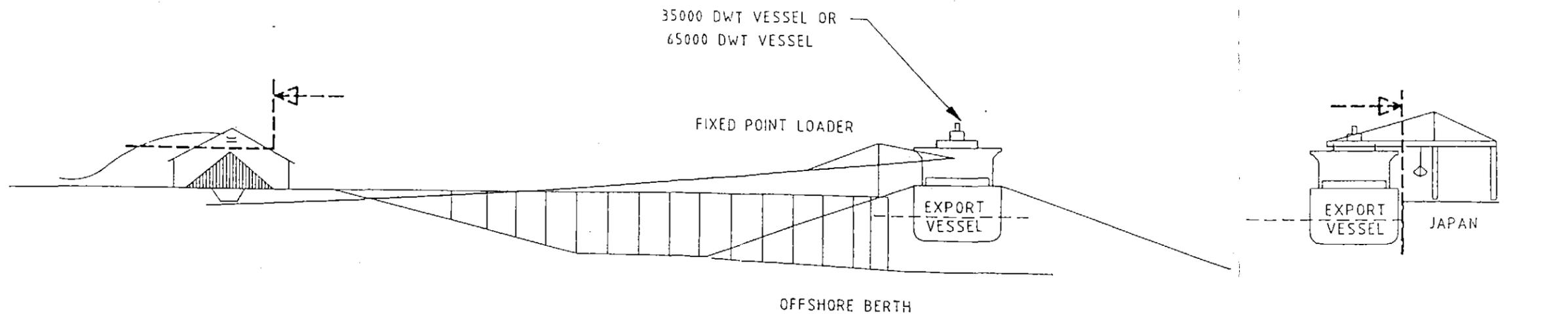
This option considers conventional loading by conveyor of dry silica sand. Two vessel sizes have been considered to accommodate the range of throughputs specified in the brief.

Shipping cycle times have been calculated for the loading, travelling to Japan, discharge and returning to King Island for the range of throughputs defined. A significant allowance has been made for the potential downtime that could be experienced at both port sites. Loading/unloading rates have been taken at averages of 1000t/h and 600t/h.

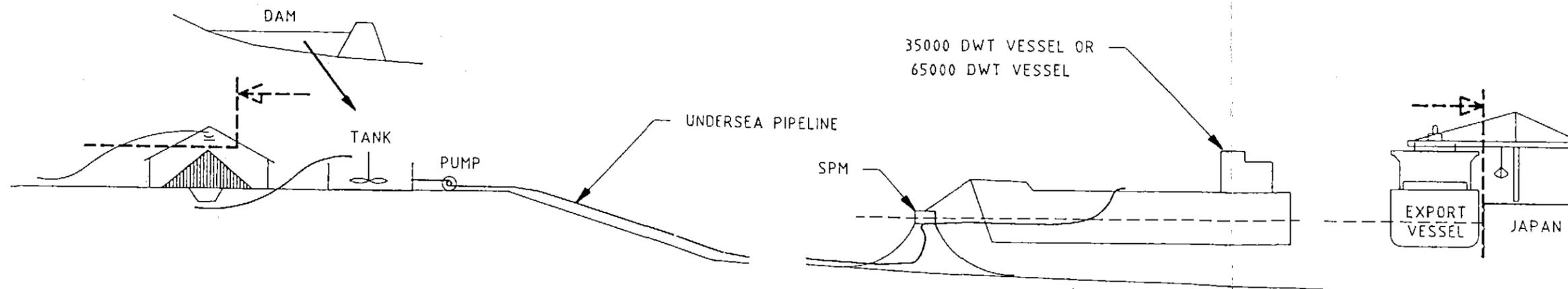
Taking all these criteria into consideration the lowest throughput of 250,000 t/a would require a dedicated vessel of a minimum size of 35,000 dwt. The higher throughput of 1,000,000 t/a would require two Panamax vessels of 65,000 dwt.

Because of availability and cost advantage of using Panamax bulkers, the proposed facilities have been located in water depths to suit the draft of loaded 65,000 dwt vessels.

At both port sites the export facility for dry bulk



DRY BULK SILICA SAND SANDBLOW POINT OR JETTY POINT



MOIST SILICA SAND SANDBLOW POINT OR JETTY POINT

LEGEND



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MARINE PROJECTS
49 Cardigan Place, Albert Park VICTORIA Tel 6907366 Fax 6909902

GRASSY JOINT VENTURE
SILICA EXPORT STUDY
OPTIONS

FIGURE 4.1

loading will consist of an access trestle carrying the conveyor and road, and a jetty head supporting the fixed head loader.

The sea conditions require that the vessel moor off the berth and that the moorings are capable of allowing loading to continue in seas of up to 2.5m.

The berth will include two berthing fender dolphins and 4 mooring buoys. Spring lines are attached to the dolphins and bow and stern breast lines to the mooring buoys. The spring lines will be used to move the vessel along the berth under the fixed loader whilst the mooring buoys maintain transverse position.

The loader although fixed will have slewing capacity so that a number of holds can be accessed therefore minimising movements.

Although the predominant swell direction is from the south the alignment of the berth will be to the southeast to reduce roll of the vessel to a minimum and allow reasonable navigation access.

4.1.1. Sand Blow Point

Sand Blow Point is the southern headland of Grassy Bay. (Refer to Figure 1.0). It is more central to the operation of the mine but is some 10-15m above sea level and hence the route of the trestle will have to be carefully located.

The 65,000 dwt Panamax bulk carrier draws 12.6m fully laden and with a head sea with wave heights up to 3m and a wave periods of 13 seconds could increase the draft by 2m. Allowing in addition an underkeel clearance (UKC) of 15%, the minimum required water depth at chart datum is 16.8m.

The hydrographic information available is limited to the chart AUS 789 which indicates adequate water depth some 600m from the shore. The extent of the reef on the shore is unknown and it could be an advantage for the trestle to come ashore further south on an east-west alignment.

Omagh Reef directly east of Sand Blow Point presents a navigation hazard and adequate distance must be allowed for emergency departures.

4.1.2 Jetty Point

Jetty Point is at the main root of the existing breakwater joining Grassy Island to form the harbour. The water offshore drops quickly to 20m depth and the associated trestle lengths to the location of the export berth are about 50% of those necessary for the equivalent facility off Sand Blow Point.

This significant advantage must be offset against the distance to the centre of the mining activity and associated conveyor lengths. The location of the export port off Jetty Point will also cause some inconveniences to the operation of the Port of Grassy.

4.2 EXPORT OF MOIST SILICA SAND

The option of loading the silica sand as a slurry has been investigated for throughputs of 250,000 t/a and 1000,000 t/a with the port or SPM located off Sandblow Point or Jetty Point.

It has been assumed that the slurry will be 50% solids and 50% water. Once loaded onto the ship, excess water will be decanted until the mixture is approximately 80% solids and 20% water. The remaining water will be removed during the voyage and the final product will be

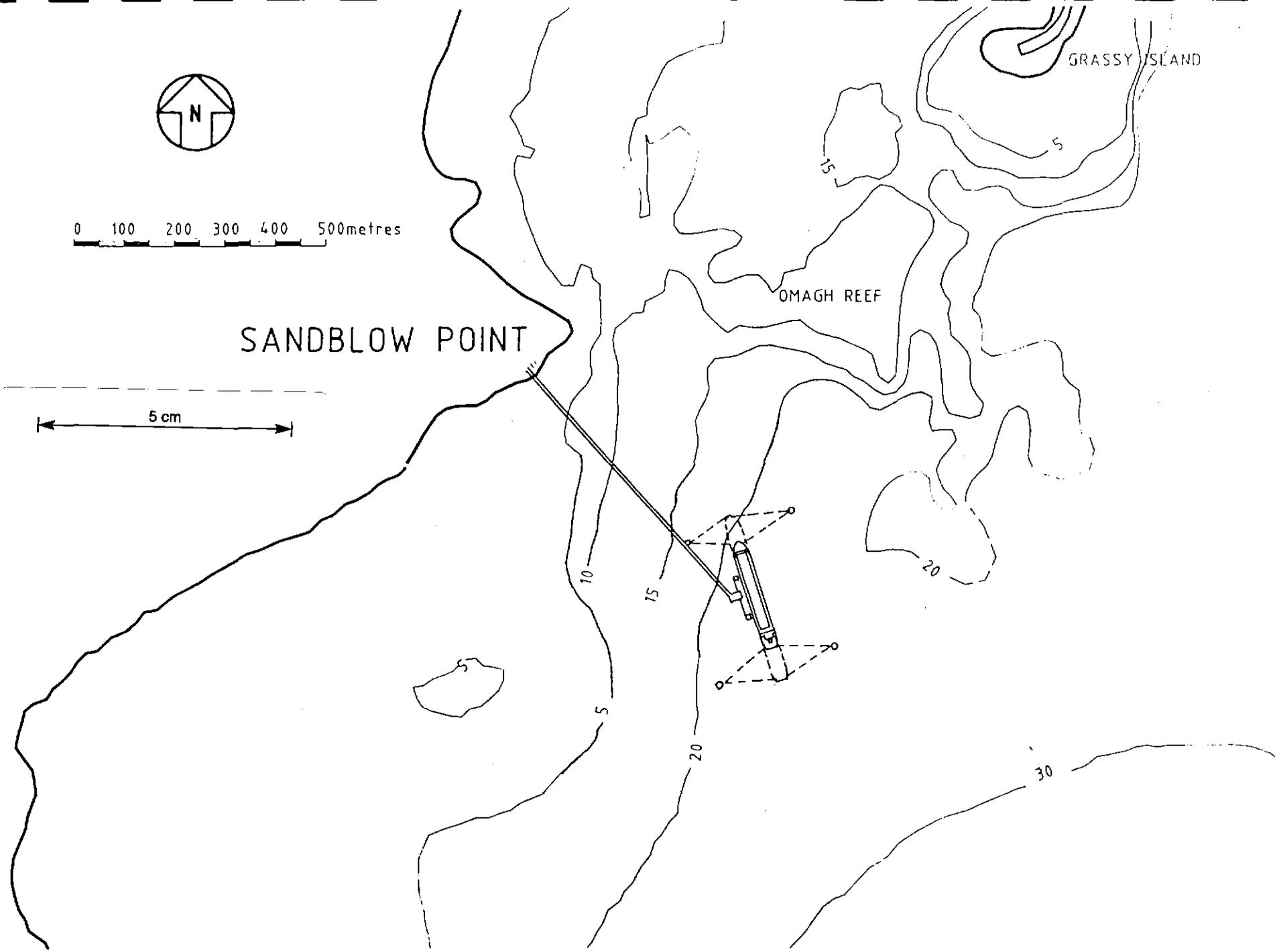


FIGURE 4.2

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equivalent to the dry bulk option ie 95% solids and 5% water.

The slurry would be loaded at 2000t/h.

Sand is fed by conveyor from beneath a storage shed to a mixing tank where the slurry is prepared. Mixing of the slurry only occurs when a ship is in port and ready to receive its cargo.

Preliminary calculation show that the slurry would be pumped to the vessel in a 600m.m dia pipe at approximately 2m/s. The line connects with a manifold on the seabed. From the manifold flexible hoses carry the slurry to a floating buoy which is anchored to the seabed with heavy chains.

The export vessel moors to the buoy and can swing around to continuously point into the predominant sea.

Floating hoses pass the slurry from the buoy to the side of vessel.

Once the slurry is on board it is envisaged that the silica sand will settle and excess water will be pumped ashore through a second pipeline.

We have assumed that the moisture content will reduce from 50% to 20% before the vessel sails for Japan. During the voyage further dewatering will take place using special equipment and it is intended that the vessel will arrive in Japan with only 5% moisture.

Although these assumptions are reasonable further investigation will be necessary if the slurry option is to be considered further.

4.2.1 SPM off Sandblow Point

A preliminary position for an SPM off Sandblow Point is shown in Figure 4.4 following.

The mooring buoy has been located to allow the vessel to come around in the weather with the bow into the predominant seas.

The location of the SPM must be selected to be a safe distance from the dangerous contour line in all weather.

The dangerous contour line is determined by the laden draft of the vessel plus the increase due to heave in operating seas plus an underkeel clearance.

For the 65,000 dwt vessel with a jetty laden draft of 12.6 m the dangerous contour would 17 m below Chart Datum.

4.2.2 SPM off Jetty Point

A preliminary arrangement for an SPM located off Jetty Point is shown in Figure 4.5. The dangerous seabed contour is closer to the shore at this site and hence pipe costs operating costs etc.. will be less than for the facility located at Sandblow Point.

4.3 COST ESTIMATES

4.3.1 General

Capital and operating costs have been estimated at "order of magnitude" level of accuracy for the export of silica sand from a mine at Sandblow Point near Grassy on King Island. Two options have been costed; dry bulk and SPM/slurry. Each of these options has been costed for marine facilities at Jetty Point and Sandblow Point.

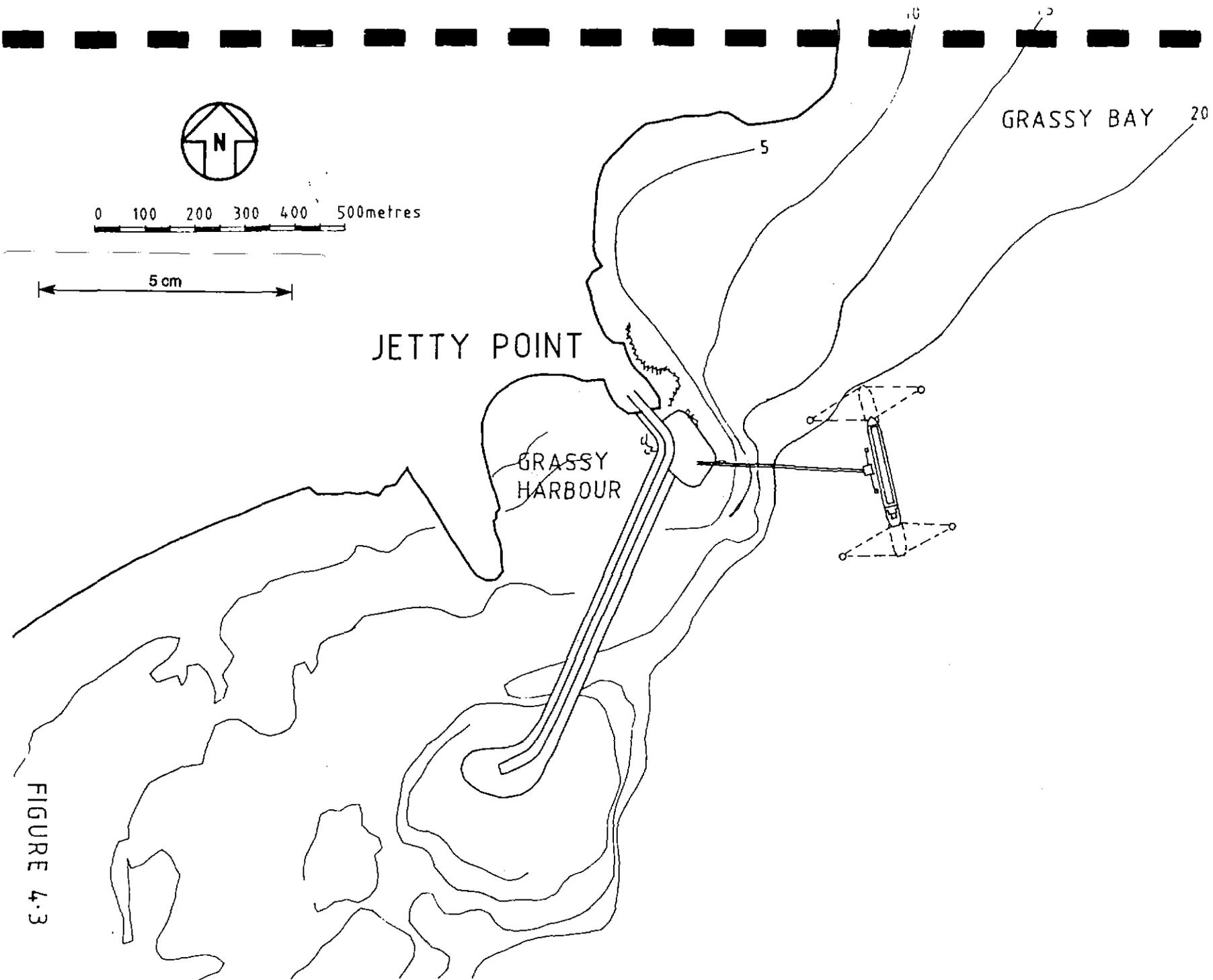


FIGURE 4.3

Costs have also been estimated for the export of 250,000t and 1,000,000t per year.

The costs have been presented in cash flow form and a Net Present Value calculated at a discount rate of 15%. The results are set out in Table 2.2 and 2.3 in section 2.0 of this report.

Costs are developed in similar manner to those for the Naracoopa Joint Venture and reference should be made to Section 3.4.1 of this report for details of:

- Interfaces between mining and marine export
- Spares allowance
- Engineering allowance
- Contingency allowance
- Operating cost categories

The basis of operating labour costs are described in Section 3.4.2.

4.3.2 Dry Bulk Export

Costs have been estimated for a dry bulk export port at Sandblow Point and also at Jetty Point. Each installation consists of:

- an A frame storage shed to hold one shipment of sand.
- a reclaim system and conveyors to transport sand to the ship loader.
- an approach trestle and berth with fender dolphins
- a fixed point loader on the berth
- buildings and accomodation
- line boat
- mooring buoys
- nav aids

- an access road between the mine and Grassy Harbour

The installations at each site are the same except at Grassy where there is an additional conveyor between the storage shed and the shiploader.

At Grassy the receival, storage, dispatch system will impinge on the existing port area. It has been assumed that the receival system and storage shed will be located south-west of this port and adjacent to the port access road. This could affect the golf course. The dispatch conveyor will cross under the port access road and be located on the seaward side of the road as far as Jetty Point. The sand will pass through a transfer tower located on Jetty Point and then onto the trestle conveyor to be loaded onto the ship.

At each site, options were costed for throughputs at 250,000t and 1,000,000t per year. The capital costs are equivalent except for the size of the storage shed. Operating costs reflect the differences in quantity.

For each option, it has been assumed that the mining operation will deliver sand to the storage shed, probably by a roof mounted conveyor and tripper.

4.3.3 SPM/Slurry Export

Capital cost have been estimated at "order of magnitude" accuracy for a Single Point Mooring/Slurry silica sand export facility. Costs have been developed for two sites; Sandblow Point and Jetty Point. For both sites, two annual tonnage rates have been costed; 250,000t/a and 1,000,000t/a.

It has been assumed that the slurry will be 50% solids and 50% water. Once loaded onto the ship, excess water

will be returned until the mixture is approximately 80% solids and 20% water. The remaining water will be removed during the voyage and the final product will be equivalent to the dry bulk option ie 95% solids and 5% water.

The estimates assume that the sand will be delivered to the storage shed as part of the mining operation. This estimate includes the storage shed, reclaim system, mixing tank and mixer, pump, undersea pipeline, flexible delivery hoses and the SPM for the export vessel.

The storage shed is sized to contain one shipment of sand. The reclaim system consists of an underfloor tunnel in which there is a conveyor. Sand is fed onto the conveyor through openings in the floor of the shed and delivered to the mixing tank at approximately 1,000t per hour.

Mixing of slurry takes place when a ship is in port and ready to receive product. A tank of 2000t capacity has been allowed so as to provide 1 to 2 hours of slurry in case of breakdowns in the system supplying sand and slurry.

The slurry pump is 1,000 kw capacity and a standby has been allowed. It is assumed to be electrically driven using power from the existing generating capacity on King Island.

The single point mooring will be anchored to the sea bed with at least four marine anchors with heavy chains connecting them the body of the mooring. Spare chains and anchors are allowed.

A dam and water supply line have been allowed. This will provide the water for slurry production.

Buildings, amenities, workshop, services and accommodation are provided in similar amounts as for the dry bulk option.

A line boat has been provided to assist with mooring and to change snotters on the floating delivery hose just before the export vessel arrives and also after it leaves.

Contingency on capital costs has been increased to 33% for the slurry option.

Operating costs include labour for the reclaim system and the preparation and pumping of slurry. Tradesmen have been allowed for repair and maintenance work.

The sea freight to Japan takes into account the water content of the cargo by increasing the freight rate for the equivalent dry bulk sand by 26%. An additional day has been allowed in the shipping cycle to take into account the lower production rate when slurry is being loaded.

4.3.4 Cost Summaries

Cost estimate sheets for the eight options for the Grassy Joint Venture are set out in this section. The tables are as follows:

Table 4.3.1 Summary of Options for Dry Bulk Export

Table 4.3.2 250,000t/a dry bulk from Sandblow Point

Table 4.3.3 1,000,000t/a dry bulk from Sandblow Point

Table 4.3.4 250,000t/a dry bulk from Jetty Point

Table 4.3.5 1,000,000t/a dry bulk from Jetty Point

Table 4.3.6 Summary of Options for SPM/Slurry

Table 4.3.7 250,000t/a SPM/Slurry from Sandblow Point

Table 4.3.8 1,000,000t/a SPM/Slurry from Sandblow Point

Table 4.3.9 250,000t/a SPM/Slurry from Jetty Point

Table 4.3.10 1,000,000t/a SPM/Slurry from Jetty Point

The Summary of Options includes the Net Present Value of each option. The discount rate is 15% and represents the cost of borrowed funds, or the opportunity cost of owners funds if used in the project.

The NPV has been calculated over a period including the life of the mine (10 years) and the construction period (2 years).



0 100 200 300 400 500metres

5 cm

SANDBLOW POINT

CMAGH REEF

GRASSY ISLAND

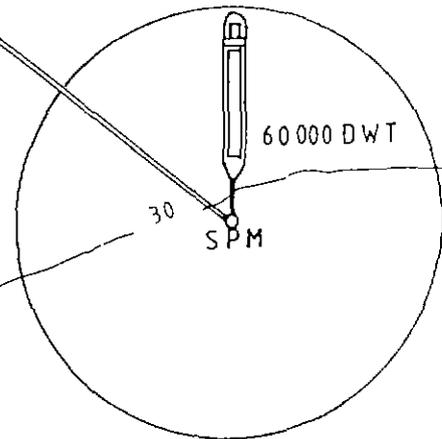


FIGURE 4.4

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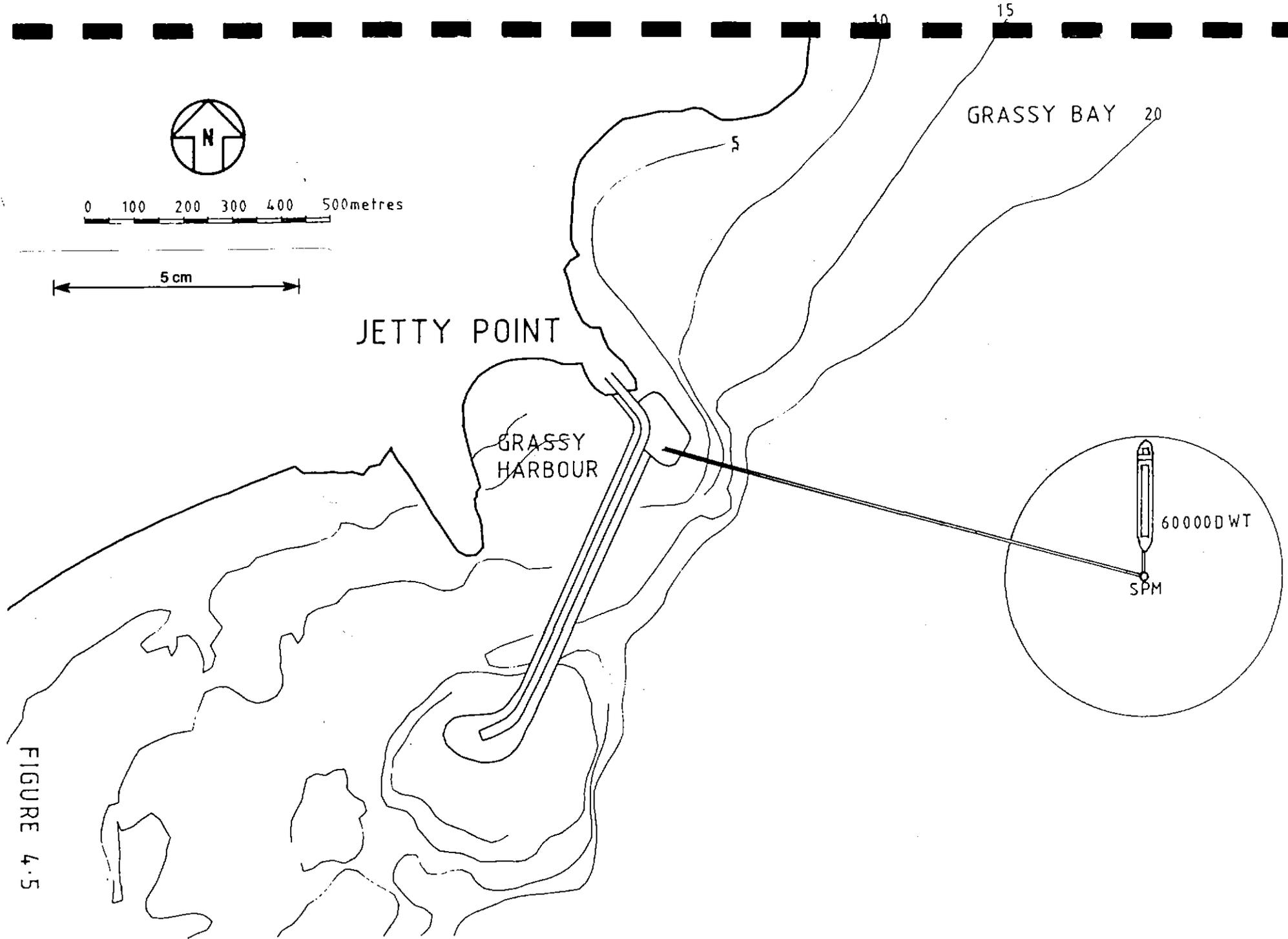


FIGURE 4.5

KING ISLAND EXPORT STUDY

TABLE J.J.1

SUMMARY OF OPTIONS

ALL AMOUNTS AS '000

OPTION / YEAR	-2	-1	1	2	3	4	5	6	7	8	9	10	11	NPV
GRASSY JOINT VENTURE														
DRY BULK - SANDBLOW POINT														
5a SILICA SANDS - 250,000T/A DRY BULK - 35,000DWT														
CAPITAL COSTS	14,305	14,305												
OPERATING COSTS			6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	
SALVAGE @ 25%														-7,153
CASH COST	14,305	14,305	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	6,893	48,251
DRY BULK - JETTY POINT														
6a SILICA SANDS - 250,000T/A DRY BULK - 35,000DWT														
CAPITAL COSTS	17,268	17,268												
OPERATING COSTS			18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	
SALVAGE @ 25%														-8,634
CASH COST	17,268	17,268	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	18,331	96,235
DRY BULK - JETTY POINT														
6a SILICA SANDS - 250,000T/A DRY BULK - 35,000DWT														
CAPITAL COSTS	12,724	12,724												
OPERATING COSTS			6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	
SALVAGE @ 25%														-6,362
CASH COST	12,724	12,724	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	6,760	45,307
DRY BULK - JETTY POINT														
6b SILICA SANDS - 1,000,000T/A DRY BULK - PANAMAX														
CAPITAL COSTS	17,973	17,973												
OPERATING COSTS			18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	
SALVAGE @ 25%														-8,986
CASH COST	17,973	17,973	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	18,390	97,547

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KING ISLAND EXPORT STUDY

TABLE 4.3.2

GRASSY JOINT VENTURE - OPTION 5(a)

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
250,000 T/A DRY BULK - 35,000DWT- SANDBLOW POINT - SILICA SAND						
CAPITAL COSTS						
ACCESS ROAD	GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
SITWORKS			ITEM		500,000	
STORAGE SHED		5,000	M2	750.00	3,750,000	
RECLAIM TUNNEL		300	M	5,000.00	1,500,000	
RECLAIM CONVEYOR		350	M	2,500.00	875,000	
TRANSFER TOWER		1	NO	150,000.00	150,000	
TRESTLE CONVEYOR		750	M	2,500.00	1,875,000	
FIXED PT LOADER 2000T/HR			ITEM		1,500,000	
APPROACH TRESTLE		600	M	10,000.00	6,000,000	
BERTH		100	M2	3,000.00	300,000	
WALKWAYS		60	M	1,500.00	90,000	
FENDER DOLPHINS		2	NO	280,000.00	560,000	
BOUYS		4	NO	300,000.00	1,200,000	
BUILDINGS		150	M2	750.00	112,500	
AMENITIES		50	M2	1,000.00	50,000	
WORKSHOP		200	M2	500.00	100,000	
SERVICES			ITEM		450,000	
ACCOMMODATION		7	NO	150,000.00	1,050,000	
NAVAIDS			ITEM		150,000	
LINE BOAT		1	NO	250,000.00	250,000	20,657,500
SPARES			5% ITEM		120,000	
ENGINEERING			10% ITEM		2,080,750	
CONTINGENCY			25% ITEM		5,722,063	7,922,813
TOTAL CAPITAL COSTS						28,610,313
ANNUAL OPERATING COSTS						
LABOUR						
CONVEYOR/LOADER		1	NO	39,000.00	39,000	
GENERAL LABOUR		2	NO	36,000.00	72,000	
TRADESMAN		4	NO	44,000.00	176,000	287,000
ENERGY						
CONVEYOR/LOADER		500,000	KWHR	0.13	62,500	
MISC POWER & LIGHT		50,000	KWHR	0.13	6,250	
LINE BOAT		1,000	L	0.60	600	69,350
REPAIRS & MAINTENANCE						
STRUCTURES			5% ITEM		516,125	
PLANT & EQUIPMENT			7.50% ITEM		213,750	
ROADS			2% ITEM		4,500	1,034,375
OTHER						
SEA FREIGHT TO JAPAN		250,000	T	18.37	4,592,500	
LINE BOAT MOORING		52	WKS	200.00	10,400	4,602,900
CONTINGENCY			15% ITEM		899,014	899,014
TOTAL ANNUAL OPERATING COSTS						6,592,609

KING ISLAND EXPORT STUDY

TABLE 4.3.3

GRASSY JOINT VENTURE - OPTION 5(b)

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
1,000,000 T/A DRY BULK - PAMAMAX - SANDBLOW POINT - SILICA SAND						
CAPITAL COSTS						
ACCESS ROAD GRASSY-SANDBLOW PT		2.50	KM	90,000.00	225,000	
SITWORKS			ITEM		500,000	
STORAGE SHED		8,500	M2	750.00	6,375,000	
RECLAIM TUNNEL		500	M	5,000.00	2,500,000	
RECLAIM CONVEYOR		550	M	2,500.00	1,375,000	
TRANSFER TOWER		1	NO	150,000.00	150,000	
TRESTLE CONVEYOR		750	M	2,500.00	1,875,000	
FIXED PT LOADER 2000T/HR			ITEM		1,500,000	
APPROACH TRESTLE		600	M	10,000.00	6,000,000	
BERTH		100	M2	3,000.00	300,000	
WALKWAYS		60	M	1,500.00	90,000	
FENDER DOLPHINS		2	NO	280,000.00	560,000	
BOUYS		4	NO	300,000.00	1,200,000	
BUILDINGS		150	M2	750.00	112,500	
AMENITIES		50	M2	1,000.00	50,000	
WORKSHOP		200	M2	500.00	100,000	
SERVICES			ITEM		450,000	
ACCOMMODATION		8	NO	150,000.00	1,200,000	
NAVAIDS			ITEM		150,000	
LINE BOAT		1	NO	250,000.00	250,000	24,962,500
SPARES			5% ITEM		155,000	
ENGINEERING			10% ITEM		2,511,750	
CONTINGENCY			25% ITEM		6,907,313	9,574,063
TOTAL CAPITAL COSTS					34,536,563	
ANNUAL OPERATING COSTS						
LABOUR						
CONVEYOR/LOADER		2	NO	39,000.00	78,000	
GENERAL LABOUR		2	NO	36,000.00	72,000	
TRADESMAN		4	NO	44,000.00	176,000	326,000
ENERGY						
CONVEYOR/LOADER		2,000,000	KWHR	0.13	250,000	
MISC POWER & LIGHT		200,000	KWHR	0.13	25,000	
LINE BOAT		1,000	L	0.60	600	275,600
REPAIRS & MAINTENANCE						
STRUCTURES			5% ITEM		936,125	
PLANT & EQUIPMENT			7.50% ITEM		307,500	
ROADS			2% ITEM		4,500	1,245,125
OTHER						
SEA FREIGHT TO JAPAN		1,000,000	T	14.08	14,080,000	
LINE BOAT MOORING		52	WKS	200.00	10,400	14,090,400
CONTINGENCY			15% ITEM		2,391,019	2,391,019
TOTAL ANNUAL OPERATING COSTS					18,331,144	

KING ISLAND EXPORT STUDY

TABLE 4.3.4

GRASSY JOINT VENTURE - OPTION 6(a)

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
250,000 T/A DRY BULK - 35,000DWT- JETTY POINT - SILICA SAND						
CAPITAL COSTS						
	ACCESS ROAD GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
	SITWORKS		ITEM		500,000	
	STORAGE SHED	5,000	M2	750.00	3,750,000	
	RECLAIM TUNNEL	300	M	5,000.00	1,500,000	
	RECLAIM CONVEYOR	350	M	2,500.00	875,000	
	RECLAIM CONVEYOR	350	M	3,000.00	1,050,000	
	TRANSFER TOWER	2	NO	150,000.00	300,000	
	TRESTLE CONVEYOR	350	M	2,500.00	875,000	
	FIXED PT LOADER 2000T/HR		ITEM		1,500,000	
	APPROACH TRESTLE	350	M	10,000.00	3,500,000	
	BERTH	100	M2	3,000.00	300,000	
	WALKWAYS	60	M	1,500.00	90,000	
	FENDER DOLPHINS	2	NO	250,000.00	500,000	
	BOUYS	4	NO	300,000.00	1,200,000	
	BUILDINGS	150	M2	750.00	112,500	
	AMENITIES	50	M2	1,000.00	50,000	
	WORKSHOP	200	M2	500.00	100,000	
	SERVICES		ITEM		450,000	
	ACCOMMODATION	7	NO	150,000.00	1,050,000	
	NAVAIDS		ITEM		150,000	
	LINE BOAT	1	NO	250,000.00	250,000	18,387,500
	SPARES		5% ITEM		120,000	
	ENGINEERING		10% ITEM		1,850,750	
	CONTINGENCY		25% ITEM		5,089,563	7,060,313
	TOTAL CAPITAL COSTS					25,447,813
ANNUAL OPERATING COSTS						
LABOUR						
	CONVEYOR/LOADER	1	NO	39,000.00	39,000	
	GENERAL LABOUR	2	NO	36,000.00	72,000	
	TRADESMAN	4	NO	44,000.00	176,000	287,000
ENERGY						
	CONVEYOR/LOADER	500,000	KWHR	0.13	62,500	
	MISC POWER & LIGHT	50,000	KWHR	0.13	6,250	
	LINE BOAT	1,000	L	0.60	600	69,350
REPAIRS & MAINTENANCE						
	STRUCTURES		5% ITEM		701,125	
	PLANT & EQUIPMENT		7.50% ITEM		213,750	
	ROADS		2% ITEM		4,500	919,375
OTHER						
	SEA FREIGHT TO JAPAN	250,000	T	18.37	4,592,500	
	LINE BOAT MOORING	52	WKS	200.00	10,400	4,602,900
	CONTINGENCY		15% ITEM		681,794	881,794
	TOTAL ANNUAL OPERATING COSTS					6,760,419

KING ISLAND EXPORT STUDY
GRASSY JOINT VENTURE - OPTION 6(b)

TABLE 4.3.5

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
1,000,000 T/A DRY BULK - PAMAMAX - JETTY POINT - SILICA SAND						
CAPITAL COSTS						
	ACCESS ROAD GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
	SITWORKS		ITEM		500,000	
	STORAGE SHED	8,500	M2	750.00	6,375,000	
	RECLAIM TUNNEL	500	M	5,000.00	2,500,000	
	RECLAIM CONVEYOR	550	M	2,500.00	1,375,000	
	RECLAIM CONVEYOR	350	M	2,500.00	575,000	
	TRANSFER TOWER	2	NO	150,000.00	300,000	
	TRESTLE CONVEYOR	750	M	2,500.00	1,575,000	
	FIXED PT LOADER 2000T/HR		ITEM		1,500,000	
	APPROACH TRESTLE	600	M	10,000.00	6,000,000	
	BERTH	100	M2	3,000.00	300,000	
	WALKWAYS	60	M	1,500.00	90,000	
	FENDER DOLPHINS	2	NO	250,000.00	560,000	
	BOUYS	4	NO	300,000.00	1,200,000	
	BUILDINGS	150	M2	750.00	112,500	
	AMENITIES	50	M2	1,000.00	50,000	
	WORKSHOP	200	M2	500.00	100,000	
	SERVICES		ITEM		450,000	
	ACCOMMODATION	8	NO	150,000.00	1,200,000	
	NAVALDS		ITEM		150,000	
	LINE BOAT	1	NO	250,000.00	250,000	25,957,500
	SPARES	5%	ITEM		155,000	
	ENGINEERING	10%	ITEM		2,614,250	
	CONTINGENCY	25%	ITEM		7,159,155	9,958,438
TOTAL CAPITAL COSTS					35,945,933	
ANNUAL OPERATING COSTS						
LABOUR						
	CONVEYOR/LOADER	2	NO	39,000.00	78,000	
	GENERAL LABOUR	2	NO	36,000.00	72,000	
	TRADESMAN	4	NO	44,000.00	176,000	326,000
ENERGY						
	CONVEYOR/LOADER	2,000,000	KWHR	0.13	250,000	
	MISC POWER & LIGHT	200,000	KWHR	0.13	25,000	
	LINE BOAT	1,000	L	0.60	600	275,600
REPAIRS & MAINTENANCE						
	STRUCTURES		5% ITEM		957,375	
	PLANT & EQUIPMENT		7.50% ITEM		307,500	
	ROADS		2% ITEM		4,500	1,299,375
OTHER						
	SEA FREIGHT TO JAPAN	1,000,000	T	14.05	14,050,000	
	LINE BOAT MOORING	52	WKS	200.00	10,400	14,090,400
	CONTINGENCY		15% ITEM		2,399,706	2,399,706
TOTAL ANNUAL OPERATING COSTS					18,390,091	

KING ISLAND EXPORT STUDY

TABLE 4.3.6

SUMMARY OF OPTIONS

ALL AMOUNTS A\$'000

OPTION / YEAR	-2	-1	1	2	3	4	5	6	7	8	9	10	11	NPV
GRASSY JOINT VENTURE														
SPM/SLURRY - SANDBLOW POINT														
7a SILICA SANDS - 250,000T/A SPM/SLURRY - 35,000DWT														
CAPITAL COSTS	16,704	16,704												
OPERATING COSTS			8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	
SALVAGE														-8,352
CASH COST	16,704	16,704	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	-8,352 58,079
7b SILICA SANDS - 1,000,000T/A SPM/SLURRY - PANAMAX														
CAPITAL COSTS	22,647	22,647												
OPERATING COSTS			22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	
SALVAGE														-11,324
CASH COST	22,647	22,647	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	22,995	-11,324 122,240
SPM/SLURRY JETTY POINT														
8a SILICA SANDS - 250,000T/A SPM/SLURRY - 35,000DWT														
CAPITAL COSTS	17,070	17,070												
OPERATING COSTS			8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	
SALVAGE														-5,535
CASH COST	17,070	17,070	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	8,506	-5,535 58,614
8b SILICA SANDS - 1,000,000T/A SPM/SLURRY - PANAMAX														
CAPITAL COSTS	22,464	22,464												
OPERATING COSTS			22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	
SALVAGE														-11,232
CASH COST	22,464	22,464	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	22,980	-11,232 121,903

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KING ISLAND EXPORT STUDY

TABLE 4.3.7

GRASSY JOINT VENTURE - OPTION 7(a)

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
250,000 T/A SLURRY - 35,000DWT- SANDBLOW POINT - SILICA SAND						
CAPITAL COSTS						
ACCESS ROAD	GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
SITWORKS			ITEM		500,000	
DAM		50,000	M3	5.00	250,000	
WATER PIPELINE		1,000	M	50.00	50,000	
STORAGE SHED		5,000	M2	750.00	3,750,000	
RECLAIM TUNNEL		300	M	5,000.00	1,500,000	
RECLAIM CONVEYOR		350	M	2,500.00	875,000	
MIXING TANK			ITEM		400,000	
MIXER			ITEM		150,000	
DELIVERY PUMP & STANDBY		2,000	KW	500.00	1,000,000	
DELIVERY PIPELINE ONSHORE		200	M	500.00	100,000	
DELIVERY PIPELINE OFFSHORE		1,100	M	2,500.00	2,750,000	
MANIFOLD & FLEXIBLE PIPELINE		50	M	10,000.00	500,000	
SINGLE POINT MOORING		1	NO	7,500,000.00	7,500,000	
FLOATING DELIVERY HOSE		150	M	5,000.00	750,000	
BUILDINGS		300	M2	750.00	225,000	
AMENITIES		50	M2	1,000.00	50,000	
WORKSHOP		200	M2	500.00	100,000	
SERVICES			ITEM		450,000	
ACCOMMODATION		8	NO	150,000.00	1,200,000	
NAVAIDS			ITEM		150,000	
LINE BOAT		1	NO	250,000.00	250,000	22,725,000
SPARES		5%	ITEM		110,000	
ENGINEERING		10%	ITEM		2,283,500	
CONTINGENCY		33%	ITEM		8,289,105	10,682,605
TOTAL CAPITAL COSTS						33,407,605
ANNUAL OPERATING COSTS						
LABOUR						
GENERAL LABOUR		2	NO	36,000.00	72,000	
OPERATORS		2	NO	39,000.00	75,000	
TRADESMEN		4	NO	44,000.00	176,000	326,000
ENERGY						
FUEL		1,000	L	0.60	600	
POWER		375,000	KWH	0.13	46,375	
MISC POWER & LIGHT		37,500	KWH	0.13	4,655	52,163
REPAIRS & MAINTENANCE						
STRUCTURES		5%	ITEM		991,250	
PLANT & EQUIPMENT		7.50%	ITEM		165,000	
ROADS		2%	ITEM		4,500	1,160,750
OTHER						
SEA FREIGHT TO JAPAN		250,000	T	23.39	5,847,500	
LINE BOAT MOORING		52	WKS	200.00	10,400	5,557,900
CONTINGENCY		15%	ITEM		1,109,522	1,109,522
TOTAL ANNUAL OPERATING COSTS						5,506,334

KING ISLAND EXPORT STUDY
 GRASSY JOINT VENTURE - OPTION 7(b)

TABLE 4.3.8

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
1,000,000 T/A SLURRY - PANAMAX- SANDBLOW POINT - SILICA SAND						
CAPITAL COSTS						
ACCESS ROAD GRASSY-SANDBLOW PT		2.50	KM	90,000.00	225,000	
SITWORKS			ITEM		1,000,000	
DAM		100,000	M3	5.00	500,000	
WATER PIPELINE		1,000	M	50.00	50,000	
STORAGE SHED		8.500	M2	750.00	6,375,000	
RECLAIM TUNNEL		500	M	5,000.00	2,500,000	
RECLAIM CONVEYOR		550	M	2,500.00	1,375,000	
MIXING TANK			ITEM		400,000	
MIXER			ITEM		150,000	
DELIVERY PUMP & STANDBY		2,000	KW	500.00	1,000,000	
DELIVERY PIPELINE ONSHORE		200	M	500.00	100,000	
DELIVERY PIPELINE OFFSHORE		1,400	M	2,500.00	3,500,000	
MANIFOLD & FLEXIBLE PIPELINE		50	M	10,000.00	500,000	
SINGLE POINT MOORING		1	NO	10,000,000.00	10,000,000	
FLOATING DELIVERY HOSE		150	M	5,000.00	750,000	
BUILDINGS		300	M2	750.00	225,000	
AMENITIES		50	M2	1,000.00	50,000	
WORKSHOP		200	M2	500.00	100,000	
SERVICES			ITEM		450,000	
ACCOMMODATION		8	NO	150,000.00	1,200,000	
NAVAIDS			ITEM		150,000	
LINE BOAT		1	NO	250,000.00	250,000	30,550,000
SPARES		5%	ITEM		110,000	
ENGINEERING		10%	ITEM		3,096,000	
CONTINGENCY		33%	ITEM		11,238,450	14,444,450
TOTAL CAPITAL COSTS						45,294,480
ANNUAL OPERATING COSTS						
LABOUR						
GENERAL LABOUR		2	NO	36,000.00	72,000	
OPERATORS		2	NO	39,000.00	78,000	
TRADESMEN		4	NO	44,000.00	176,000	326,000
ENERGY						
FUEL		1,000	L	0.60	600	
POWER		1,500,000	KWH	0.13	157,500	
MISC POWER & LIGHT		150,000	KWH	0.13	15,750	206,850
REPAIRS & MAINTENANCE						
STRUCTURES		5%	ITEM		1,372,500	
PLANT & EQUIPMENT		7.50%	ITEM		165,000	
ROADS		2%	ITEM		4,500	1,542,000
OTHER						
SEA FREIGHT TO JAPAN		1,000,000	T	17.91	17,910,000	
LINE BOAT MOORING		52	WKS	200.00	10,400	17,920,400
CONTINGENCY		15%	ITEM		2,999,258	2,999,258
TOTAL ANNUAL OPERATING COSTS						22,994,535

KING ISLAND EXPORT STUDY
GRASSY JOINT VENTURE - OPTION 6(a)

TABLE 4.3.9

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
250,000 T/A SLURRY - 35,000DWT- JETTY POINT - SILICA SAND						
CAPITAL COSTS						
	ACCESS ROAD GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
	SITWORKS		ITEM		750,000	
	DAM	50,000	M3	5.00	250,000	
	WATER PIPELINE	3,000	M	50.00	150,000	
	STORAGE SHED	5,000	M2	750.00	3,750,000	
	RECLAIM TUNNEL	300	M	5,000.00	1,500,000	
	RECLAIM CONVEYOR	350	M	2,500.00	875,000	
	MIXING TANK		ITEM		400,000	
	MINER		ITEM		150,000	
	DELIVERY PUMP & STANDBY	3,000	KW	500.00	1,500,000	
	DELIVERY PIPELINE ONSHORE	500	M	500.00	250,000	
	DELIVERY PIPELINE OFFSHORE	900	M	2,500.00	2,250,000	
	MANIFOLD & FLEXIBLE PIPELINE	50	M	10,000.00	500,000	
	SINGLE POINT MOORING	1	NO	7,500,000.00	7,500,000	
	FLOATING DELIVERY HOSE	150	M	5,000.00	750,000	
	BUILDINGS	300	M2	750.00	225,000	
	AMENITIES	50	M2	1,000.00	50,000	
	WORKSHOP	200	M2	500.00	100,000	
	SERVICES		ITEM		450,000	
	ACCOMMODATION	8	NO	150,000.00	1,200,000	
	NAVAIDS		ITEM		150,000	
	LINE BOAT	1	NO	250,000.00	250,000	23,225,000
	SPARES		5% ITEM		110,000	
	ENGINEERING		10% ITEM		2,333,500	
	CONTINGENCY		33% ITEM		8,470,605	10,914,105
	TOTAL CAPITAL COSTS					34,139,105
ANNUAL OPERATING COSTS						
LABOUR						
	GENERAL LABOUR	2	NO	36,000.00	72,000	
	OPERATORS	2	NO	39,000.00	78,000	
	TRADESMEN	4	NO	44,000.00	176,000	326,000
ENERGY						
	FUEL	1,000	L	0.60	600	
	POWER	375,000	KWH	0.13	46,875	
	MISC POWER & LIGHT	37,500	KWH	0.13	4,658	52,163
REPAIRS & MAINTENANCE						
	STRUCTURES		5% ITEM		991,250	
	PLANT & EQUIPMENT		7.50% ITEM		165,000	
	ROADS		2% ITEM		4,500	1,160,750
OTHER						
	SEA FREIGHT TO JAPAN	250,000	T	23.39	5,847,500	
	LINE BOAT MOORING	52	WKS	200.00	10,400	5,857,900
	CONTINGENCY		15% ITEM		1,109,522	1,109,522
	TOTAL ANNUAL OPERATING COSTS					8,506,334

KING ISLAND EXPORT STUDY
GRASSY JOINT VENTURE - OPTION S(b)

TABLE 4.3.10

ITEM	DESCRIPTION	QTY	UNIT	RATE	AMOUNT	AMOUNT
1,000,000 T/A SLURRY - PANAMAX- JETTY POINT - SILICA SAND						
CAPITAL COSTS						
	ACCESS ROAD GRASSY-SANDBLOW PT	2.50	KM	90,000.00	225,000	
	SITWORKS		ITEM		1,500,000	
	DAM	100,000	M3	5.00	500,000	
	WATER PIPELINE	3,000	M	50.00	150,000	
	STORAGE SHED	8,500	M2	750.00	6,375,000	
	RECLAIM TUNNEL	500	M	5,000.00	2,500,000	
	RECLAIM CONVEYOR	550	M	2,500.00	1,375,000	
	MIXING TANK		ITEM		400,000	
	MIXER		ITEM		150,000	
	DELIVERY PUMP & STANDBY	2,000	KW	500.00	1,000,000	
	DELIVERY PIPELINE ONSHORE	500	M	500.00	250,000	
	DELIVERY PIPELINE OFFSHORE	1,000	M	2,500.00	2,500,000	
	MANIFOLD & FLEXIBLE PIPELINE	50	M	10,000.00	500,000	
	SINGLE POINT MOORING	1	NO	10,000,000.00	10,000,000	
	FLOATING DELIVERY HOSE	150	M	5,000.00	750,000	
	BUILDINGS	300	M2	750.00	225,000	
	AMENITIES	50	M2	1,000.00	50,000	
	WORKSHOP	200	M2	500.00	100,000	
	SERVICES		ITEM		450,000	
	ACCOMMODATION	8	NO	150,000.00	1,200,000	
	NAVAIDS		ITEM		150,000	
	LINE BOAT	1	NO	250,000.00	250,000	30,600,000
	SPARES	5%	ITEM		110,000	
	ENGINEERING	10%	ITEM		3,071,000	
	CONTINGENCY	33%	ITEM		11,147,730	14,328,730
TOTAL CAPITAL COSTS						44,925,730
ANNUAL OPERATING COSTS						
LABOUR						
	GENERAL LABOUR	2	NO	36,000.00	72,000	
	OPERATORS	2	NO	39,000.00	78,000	
	TRADESMEN	4	NO	44,000.00	176,000	326,000
ENERGY						
	FUEL	1,000	L	0.60	600	
	POWER	1,500,000	KWH	0.13	197,500	
	MISC POWER & LIGHT	150,000	KWH	0.13	19,750	206,350
REPAIRS & MAINTENANCE						
	STRUCTURES	5%	ITEM		1,360,000	
	PLANT & EQUIPMENT	7.50%	ITEM		165,000	
	ROADS	2%	ITEM		1,500	1,529,500
OTHER						
	SEA FREIGHT TO JAPAN	1,000,000	T	17.91	17,910,000	
	LINE BOAT MOORING	52	WKS	200.00	10,400	17,920,400
	CONTINGENCY	15%	ITEM		2,997,413	2,997,413
TOTAL ANNUAL OPERATING COSTS						22,950,163

5.2 GRASSY JOINT VENTURE

5.2.1 Bulk Silica Sand to Japan

Voyage cycle times have been prepared for two vessel sizes 35,000 dwt and 65,000 dwt.

Downtime preventing loading at the offshore facility at Grassy has been assessed as the time when wave heights exceed 2m. This together with an allowances for maintenance docking etc. have been included in the assessment.

One dedicated 35,000 dwt vessel is required to achieve the lower throughput of 250,000 t/a. Two 65,000 dwt dedicated vessels are necessary for the 1,000,000 t/a throughput.

The following freight rates shown in Tables 5.2.1 and 5.2.2 have been developed for the 35,000 dwt and 65,000 dwt vessels respectively.

TABLE 5.2.1

BULK SILICA SAND GRASSY/JAPAN

35,000 dwt bulk carrier				DRY
				<u>BULK</u>
Current market T/C rate US	\$8,500	per day		
Vessel T/C costs:				<u>US\$</u>
38 days @ \$8,500			323,000	
Fuel costs:				
33 days @ \$2,395	79,322			
5 days @ \$210	1050	80,372		
Port costs:				
Grassy	10,000			
Japan	40,000	50,000		
Cargo costs:				
Cleaning		10,000		
Misc costs:			5,000	
<u>TOTAL COSTS</u>			468,392	
Cost per tonne			US\$ <u>15.61</u>	
			A\$ <u>18.37</u>	

TABLE 5.2.2

BULK SILICA SAND GRASSY/JAPAN

65,000 dwt bulk carrier			DRY
			<u>BULK</u>
Current market T/C rate US	\$8,500	per day	
Vessel T/C costs:			<u>US\$</u>
40 days @ \$12,000			480,000
Fuel costs:			
33 days @ \$3,545	117,410		
7 days @ \$115	805	118,215	
Port costs:			
Grassy	20,000		
Japan	75,000	95,000	
Cargo costs:			
Cleaning		16,000	
Misc costs:		<u>10,000</u>	
TOTAL COSTS		<u>718,215</u>	
Cost per tonne FIOST			US\$ <u>11.97</u>
			A\$ <u>14.08/t</u>

In both cases we have selected average current market time charter rates for the vessels, but such rates are subject to variance in the same way and to the same extent as international bulk freight rates. Between 1980 and 1989 time charter rates for handy-sized (25-35,000 dwt) bulk carriers have fluctuated between a high of about US\$12,500/day and a low of about US\$4,000/day; and for Panamax bulkers (50-80,000 dwt) between US\$16,000/day and US\$6,000/day. Our view of the market is that it will remain relatively stable for the shorter term but it is still very sensitive to world trade trends and other factors.

5.2.2 Moist Silica Sand to Japan

The freight rates shown in Tables 5.2.3 and 5.2.4 following for a 35,000 dwt and 65,000 dwt bulk carriers are based on the previous freight rates with an allowance for an increase in port time due to dewatering the slurry and a reduction in the actual product that is shipped.

TABLE 5.2.3

MOIST SILICA SAND GRASSY/JAPAN

35,000 dwt bulk carrier

SLURRY

Current market T/C rate US \$8,500 per day

Vessel T/C costs:

US

39 days @ \$8,500 331,500

Fuel costs:

33 days @ \$2,395 79,322

6 days @ \$210 1050 80,582

Port costs:

Grassy 10,000

Japan 40,000 50,000

Cargo costs:

Cleaning 10,000

Misc costs:

5,000

TOTAL COSTS

477,082/0.80

Cost per tonne

596,353US\$ 19.88A\$ 23.39/t of sand

TABLE 5.2.4

MOIST SILICA SAND GRASSY/JAPAN

65,000 dwt bulk carrier

	<u>SLURRY</u>
Current market T/C rate US	\$8,500 per day
Vessel T/C costs:	<u>US\$</u>
41 days @ \$12,000	492,000
Fuel costs:	
33 days @ \$3,545	117,410
8 days @ \$115	805
	118,892
Port costs:	
Grassy	20,000
Japan	75,000
	96,000
Cargo costs:	
Cleaning	18,000
Misc costs:	<u>10,000</u>
TOTAL COSTS	<u>730,092/0.80</u>
	<u>913,615</u>
Cost per tonne FJOST	US\$ <u>15.23</u>
	A\$ <u>17.91/t</u> of sand

B. Williams

089103

PEKO-WALLSEND LTD
METALLIFEROUS MINING DIVISION

INTER-OFFICE MEMO

From: R F Scotford 25 Merriwa Street
Gordon NSW 2072

To: Mr W B Willis - Melbourne Date: 2 August, 1991

Subject: KING ISLAND SILICA SAND PROJECT

My comments on the strategic and marketing aspects of the potential silica sands resource on King Island follow, with a strategic overview attached (Table 1).

Silica sand is a high bulk, low-priced commodity and hence the key elements of cost competitive sand mining are:

- . proximity to market
- . low infrastructure and transport costs
- . scale of operations.

The world is generally well endowed with good sand resources for construction, glass making, foundries etc. Europe and the USA in particular have adequate reserves of sand resources and sand is rarely transported further than a few hundred kilometres.

Australia is self-sufficient in silica sand and is already an exporter to Japan, South Korea and the Philippines. ACI has five sand mining operations for its local glass manufacturing operations. Both Western Australia and Queensland are exporters of silica sand. Japan imports around 1.4 million tpa of silica sand, with over 1.0 million tpa coming from Australia.

Australia's major export project is Mitsubishi's Cape Flattery Silica Mines in northern Queensland which has been operating for over 20 years. High quality sand is produced with minimum processing. The mine has direct bulk loading facilities (2,000 tph loader; up to 60,000 DWT vessels) and is located closer to Asian markets than either Western Australia or Tasmania. Cape Flattery has a capacity of 2 million tonne per annum and currently produces around 1.3 million tonne per annum of sand. Proven reserves of 200 million tonnes are sufficient for over 100 years production at present capacity. Indicated reserves are ten times greater and the mine has consistently expanded to meet any increase in market demand. The mine services the glass, abrasive, chemical and foundry industries in Japan and has also sold into the growing sand market for artificial beaches and golf courses in Japan. The glass industry accounts for 80% of sales and Japan accounts for 78% of shipments from Cape Flattery.

In considering any new export sand mining operation in Australia, one must take a hard look at the project's cost competitiveness compared with Cape Flattery Silica Mines. Export sand prices have appeared to rise very little in the 1980's and this has given rise to accusations of transfer pricing. Average export price for Cape Flattery sand in 1987 was around A\$12 per tonne.

The glass sand market has shown little growth in the 1970's and 1980's as container glass faces strong competition from cans, plastics and paper cartons. With adequate glass sand resources worldwide, the industry has therefore been very competitive and has traditionally shown low profit margins. Clearly, high quality sand resources will be in demand, but location and transport costs will dominate project economics.

Silica sand prices depend largely on location, but an export price of around \$15 per tonne ex-King Island as estimated by Hooker Resources, could be appropriate. With market size of say 250,000-500,000 tonne per annum, this gives annual revenues of between \$4 million and \$8 million. The higher revenues would most likely depend on a diversified market spread which could take some years to establish.

Total capital costs for this project should not exceed \$10 million to have any chance of economic viability. Mine and processing facilities could account for around \$5 million capital cost. Macknight's estimates for a new offshore loading facility on King Island were of the order of \$12 to \$25 million and hence this alone makes the project highly uncompetitive. Macknight also looked at minimum facilities only for modifying the Grassy wharf to handle 20-25,000 DWT vessels (maximum size for existing wharf). The capital cost in this case could be around \$5 million for such loading facilities. Operating costs were estimated to be around \$30 per tonne for loading and shipping to Japan. A comparison with the Cape Flattery facilities is shown in Table 2 attached. It is seen that shipping cost disadvantages from King Island could be at least \$5 per tonne. This is for a product which might only be worth \$10-\$15 per tonne on a fob basis. Transport, loading and shipping costs therefore dominate any consideration of low value bulk commodity projects.

From a strategic viewpoint, for a business that is new to NBHP, the size and growth prospects of the export silica sand market do not appear attractive to justify development expenditure. NBHP has no experience in the silica sand business and no marketing experience which is critical in assessing a project's cost competitiveness. Peko's experience in mineral sands mining means that the technology risk is low, but it should be noted that the level of sophistication of the technology involved in producing silica sands to meet the chemical and physical demands of customers is relatively high considering the low value of this commodity.

The preliminary evaluation of the quality of the sand on King Island suggests that it would meet silica sand glass specification (at least with respect to those four elements analysed). Even if the sand were to meet the specification for specialty glass applications (ophthalmic glass etc), the market for such applications is small and diverse and the product would need to meet very strict quality and size specifications. It would be normal in such circumstances to separate out a specialty glass product and sell the remainder to the container and flat glass markets. Average prices for silica sand in the USA for container glass are around US\$12.30 per ton compared with US\$15.80 per ton for specialty glass applications. Further notes on silica sand specifications are attached. However, unless the basic economics of the proposed operation can be greatly improved, there seems little point in doing further work on resource-quality.

For a preliminary evaluation of such a business, we have to rely initially on an assessment of what is in the literature on this subject. I have made a brief review of recent publications covering developments in the world's silica sand industry and find little encouragement for such a project. There is no evidence for example, that there is any substantial shortage of quality sand resources likely to occur in the foreseeable future. In particular, the conclusions made in a review of silica sand export opportunities from Western Australia (Ind. Minerals, Oct 86) appear relevant:

"Known reserves of high quality silica sand in Western Australia are substantial, and numerous additional, as yet untested, deposits exist. Successful exploitation of resources is dependent, therefore, on the cost of extraction, processing and transportation both to port facilities and to ultimate point of consumption. Competition from alternative Australian and overseas sources is fierce and prices obtained are consequently low resulting in, at best, narrow profit margins."

An editorial article from Industrial Minerals (June 85) is also attached which addresses the issue of "the frustration of possessing a good quality easily mineable silica sand deposit at a distance from a large potential market" and concludes that "glass sand will likely remain one of the cheapest industrial mineral products at the mercy of transportation distance and alternative packaging materials".

The isolation of King Island and the absence of shipping facilities for bulk commodities makes any sand deposit on the island of questionable interest to NBHP. The strategic fit and profit prospects appear poor.

I recommend no further expenditure on the project.



R F Scotford

RFS:sk

TABLE 1
KING ISLAND SILICA SANDS PROJECT
STRATEGIC OVERVIEW

FACTOR	COMMENT	ASSESSMENT
Resource quality	Preliminary assays show low Fe	Excellent
Resource size	3-20 million tonnes	Fair
Infrastructure	Isolated location results in high consumable costs	Poor
	No bulk shipping facilities in place. High cost new loader. Bad weather conditions	Very Poor (critical)
Strategic Fit with NBHP:		
. with current businesses	No similar operations at present	Poor
. with future operations	Some synergy with mineral sands	Fair
. size of operations (profit potential)	Too small for NBHP	Poor
. technology fit	Warmans has technology if processing required	Good
. downstream potential	Low value bulk commodity only	Poor
Competitiveness:		
. cost competitiveness	high local costs and shipping costs are unfavourable for such a low value bulk commodity	Poor
. product quality	Potentially good, but yet to be proven	(Good)
. with other producers	Existing suppliers have excellent reserves and low costs. Market is very competitive.	Poor

Continued over

TABLE 1 (cont'd)

FACTOR	COMMENT	ASSESSMENT
Marketing:		
. local markets	Australian markets already provided for. Shipping costs preclude penetration of local markets	Poor
. overseas markets	Potential in Japan and other Asian markets, but no apparent shortages of good quality sands	Fair
. product distinction	Superior quality product could help market access but market size reduced.	Fair
Environmental:		
	Sand mining is environmentally sensitive.	Poor
Nature of Business:		
	Low valued product in highly competitive business with traditionally low profit margins. Competition from cans, plastics and paper cartons for glass silica sand.	Poor
OVERVIEW		
	Any advantages of the potential size and quality of the resource are completely negated by the poor strategic fit, absence of infrastructure, poor competitiveness and lack of growth markets.	Recommend no further expenditure

TABLE 2
SHIPPING COST COMPARISON
Basis: Japanese Market

MINE: LOCATION:		CAPE FLATTERY SILICA MINES NORTH QUEENSLAND	KING ISLAND GRASSY, TAS*
Export capacity	'000 tpa	1 300 - 2 000	250 - 500
Max. vessel size	DWT	60 000	25 000
Loading rate	tph	2 000	500
Shipping time to Japan	days	12 - 13	16
Round trip time	days	30	36.5
Trips per year		12	10
Annual capacity/ vessel	tpa	720 000	250 000
Estimated Shipping Costs			
Loading	A\$/t	1.00	1.70
Sea freight	A\$/t	<u>23.00</u>	<u>28.40</u>
	Total	24.00	30.10
		_____	_____

* based on King Island Preliminary Technical Study for a Ship Loading Facility at Grassy Harbour, Macknight, July 1989.

SILICA SAND - TYPICAL GLASS SPECIFICATIONS

Optical Glass	min 99.5% SiO ₂ max 0.008% Fe ₂ O ₃
Colourless Glass	min 99.5% SiO ₂ max 0.013% Fe ₂ O ₃
Container/flat	min 98.5% SiO ₂ max 0.03% Fe ₂ O ₃
General:	0.1-0.5% Al ₂ O ₃ max 0.0006% Cr ₂ O ₃ (6ppm) max 0.0002% Co (2 ppm) 0.01-0.05% TiO ₂ consistent grain size and purity, with preferred grain size 0.1-0.5 mm

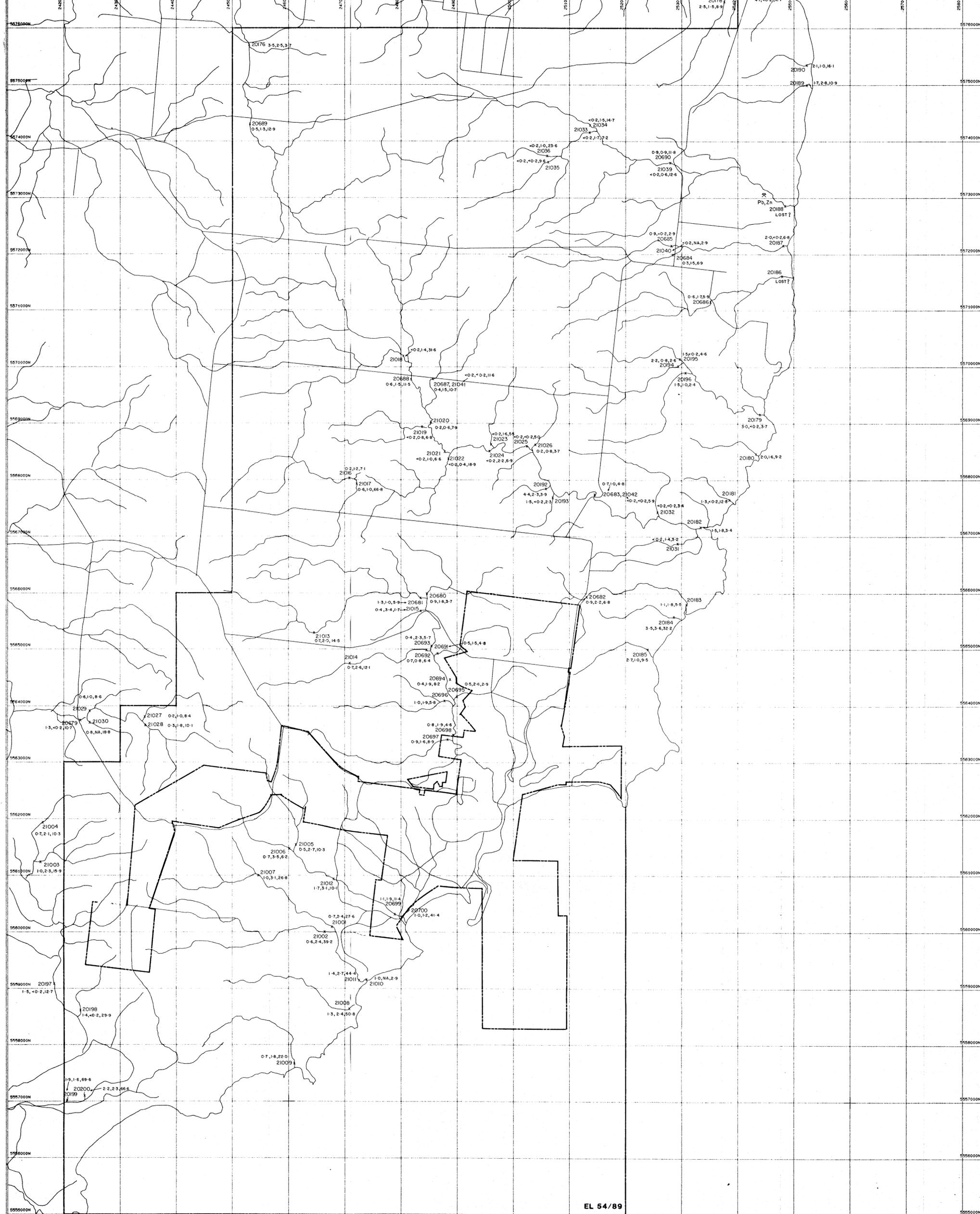
Grade of King Island Sand

XRF analysis of bromoform float:

0.003 - 0.008%	Fe ₂ O ₃
0.03 - 0.07%	Al ₂ O ₃
0.005 - 0.017%	TiO ₂
less than 0.001%	Cr ₂ O ₃

TYPICAL SILICA SAND GRADES

Source		% SiO ₂	% Fe ₂ O ₃	% Al ₂ O ₃	% TiO ₂
Belgium	Mol area	-	0.025	-	-
	Maasmechelen	-	0.012	-	-
Germany	A	99.7	0.012	0.08	-
	B	99.6	0.011	0.22	-
	C	99.46	0.02-0.04	0.20	-
Malaysia	Sarawak	99.7	0.01	-	0.03
Australia	Cape Flattery	98.8	0.012	-	-
USA	NJ	99.66	0.025	0.143	-
	IL	99.88	0.011	0.050	-
	OK	99.75	0.020	0.100	-
	CA	92.76	0.127	3.78	-
	WA	99.6	0.039	0.26	-



EL 54/89

5 cm

x21014 Sample Location and Number
 0.7, 1.8, 22.0 Au, As, TOC (organic carbon)

PLATE I

92-3351
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 Scale 1: 25000
 089111

TASMANIA
 Ser. _____
 Checked _____
 Date 19-JUL-90

**EL 54/89 GRASSY
 WATER GEOCHEMISTRY
 SAMPLE LOCATIONS**

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