866001

FINAL REPORT

RECONNAISSANCE EXPLORATION

FOR

SILICA SAND

TASMANIA

MONIER LIMITED

87-2722

Longworth & McKenzie Pty. Limited
Date : September, 1987
Ref : YGT0358/RH/CD/d2

AMG REFERENCE POINTS ADDED

L&M

EXECUTIVE SUMMARY

This brief investigation of the sand deposits in Tasmania which are suitable for glass manufacture and in a location from where they can be economically exported has necessarily only considered large aeolian sand deposits.

Once an area has been selected as the most appropriate for further study, detailed reserve quantities need to be determined by further fieldwork and processing in a pilot plant. Trials have to be carried out in order to determine the plant layout, the processing plant cost and to establish the finished product specifications that can be achieved. It is expected from previous trials that final product specifications would be better than achieved in a simple laboratory procedure.

It appears at this stage that the best option would be to initially mine the deposits on the North Coast in sequence and ship through the port of Burnie, then develop one of the major deposits either at Strahan or on King Island, after the markets were established and the necessary facilities for the major deposit had been constructed. Each of these major deposits would require the construction of port facilities which would take some considerable time. It would also appear best to pay for the cost of any port construction from profits obtained from the export of silica sand through Burnie.

There are good indications that sufficient reserves of the necessary quality are present for a 50 year operation at an extraction rate of 500,000 tonnes per annum.

001

866003

TABLE OF CONTENTS

LM

TABLE OF CONTENTS (cont'd)

LIST OF FIGURES

1.0 INTRODUCTION

At the request of Monier Limited (Monier), Longworth and McKenzie Pty. Limited (LM) have carried out an initial geological reconnaissance for high grade silica sand within designated regions in the state of Tasmania. (Fig. 1.1)

The designated areas were the North East Coast near Bridport, King Island and the West Coast near Strahan. In addition to these broad geographical areas, specific sites in the North Coast District were also examined in somewhat greater detail.

The purpose of the work was two-fold:-

- firstly, to locate by reconnaissance mapping and sampling an area with sufficient potential to warrant a more major investigation to prove reserves of 20-25 million tonnes of glass-making sand for supply over a 50 year period, and

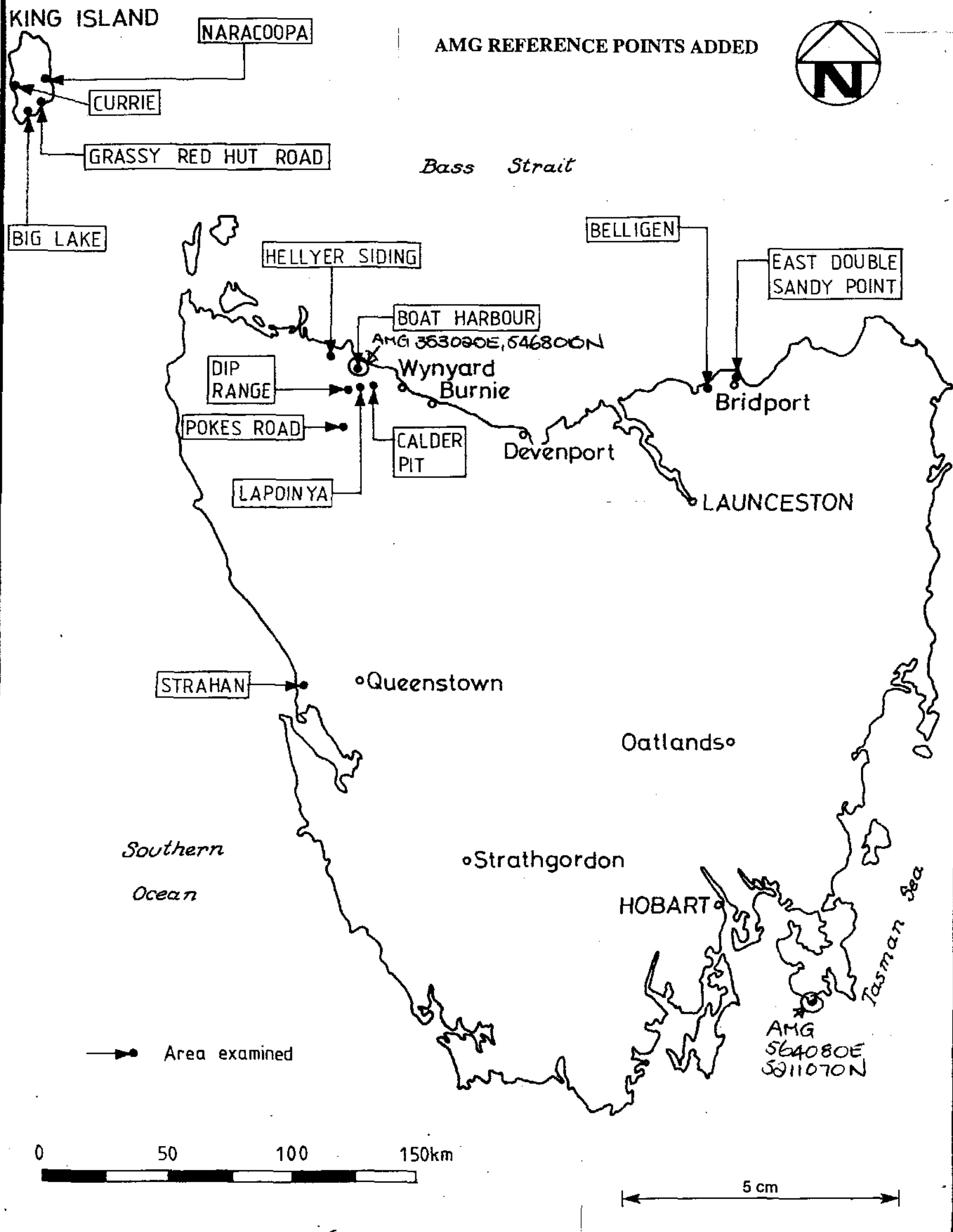
- secondly, to assess the potential for six specific sites in the North Coast region to supply a similar quality material - at a similar rate (i.e about 500,000 t/a) - for up to five years whilst the more major investigations of larger deposits are carried out and the plant and infrastructure constructed.

866006

084

RECONNAISSANCE EXPLORATION FOR SILICA SAND
GENERAL LOCATIONS

FIGURE Nº 1.1



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

2.0 FIELDWORK

2.1 Previous Studies

General geological studies have been made relating to the history of formation of the various sand deposits on King Island and the North East Coast of Tasmania. Whilst of background interest, they are insufficiently specific for the present purposes.

The 1:50,000 Geological Maps (Tasmania Department of Mines) differentiate between older fixed dune deposits and more recent mobile dunes. This division between older and younger dunes was used as a basis to define areas of potential interest, since the younger dunes were found to be calcareous and therefore of limited value due to possible higher iron contamination.

Various individual areas have been examined in the past as sources of very high grade silica for manufacture of elemental silicon. These include an area west of Strahan (C.R.A. Limited), Lapoinya (by B.H.P.) and several sites near Wynyard by Kaiser Aluminum Australia. Where available, reports on these works held by the Tasmanian Department of Mines have been perused.

More recently, Monier has commissioned fieldwork in the Lapoinya and Boat Harbour areas by Zetetic Consulting Economic Geologists, which was followed up by percussion drilling and backhoe work at these two and other areas in the North Coast district. The results of these studies have been accounted for in Section 4 of this report.

2.2 Present Studies

Fieldwork was carried out between 27th July and 6th August, 1987 in areas outlined in Figure 1.1.

The Bridport area (N.E. Coast) was reconnoitred on 28th July, with six locations being sampled either by hand auger or channel sample.

The hand auger holes penetrated to a depth of 5 m, unless groundwater was encountered or auger refusal occurred at higher levels. Samples were taken at metre intervals, and returned to Sydney for testing.

King Island was visited between 29th and 31st July. Four areas were sampled:-

- Big Lake - 3 sample locations
- Currie - 8 sample locations
- Red Hut Road (Grassy Area) - 1 sample location
- Naracoopa - 3 sample locations

Once again, hand auger methods were used, with sampling at one metre intervals.

Similarly, the Strahan area, on the West Coast, was sampled at 11 locations on 1st and 2nd August.

In the North Coast Area (3rd - 6th August) three existing quarries were sampled,

- Pokes Road Pit - 1 sample
- Calder Pit - 2 samples
- Hellyer Siding - 1 sample

whilst two other previously sampled areas (see section 2.1)

- Lapoinya, and
- Boat Harbour,

were tested with shallow seismic traverses.

The samples from all locations were visually assessed, and selected samples assigned for laboratory testing as per the schedule in Section 3 of this report.

All auger logs are contained within Appendix A1, whilst seismic data and laboratory results are within Appendices A2-A4.

3.0 LABORATORY TESTING

The work carried out comprised analysis of raw material, at sample intervals of no more than one metre, for Iron and Titanium content. For these tests, samples were hand ground in a previously un-used agate pestle and mortar, to minimise Iron contamination.

In addition, the samples were graded to -75 micron, in accordance with A.S. 1141.11, as is shown on the attached test schedule sheets.

Once these results were available, a selected 10 samples were acid washed in an agitated state for 12-16 hours, prior to removal of heavy minerals. The light product was then re-analysed for Iron and Titanium. This was done to simulate the effect of attritioning, screening, pumping, washing and heavy particle removal.

From previous work it has been established that a full scale washing plant would achieve higher purities than simple acid washing in a laboratory followed by heavy liquid separation. Generally, the resultant impurity from a full scale plant is half that achieved in simple laboratory cleaning.

Previous laboratory results which are available will be discussed in the relevant part of Section 4 of this report.

008

LABORATORY TESTING SCHEDULE

SHEET: 1

TRIAL HOLE Nº	AH1	AH1	AH1	AH1	AH1	AH2	AH2	AH2	AH3	AH1	AH1	AH1	AH1	AH1	AH2	AH3	UNIT RATE	COST
DEPTH (m)	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-2½	0-1.5	0-1	1-2	2-3	0-1	1-1½	0-1	0-0.8		
SAMPLE Nº	11671	11672	11673	11674	11675	11676	11679	11677	11678	11680	11681	11682	11712	11713	11714	11719		
SAMPLE TYPE D/U	← KING ISLAND — BIG LAKE AREA →									K. Is. RED HUT →			K. Is NARACOOPA →					
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75µ	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
DIGEST; Fe + Ti	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
ACID WASH	/										/				/			
FLOAT LIGHTS	/										/				/			
Fe + Ti ON LIGHTS	/										/				/			

TOTAL COST

Date received: ______
Date required: ______
Eng. in charge: ______
Priority: ______
(at date received)

Remarks:

STARTED

FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client:
Project:
Location:

JOB Nº

866010

LABORATORY TESTING SCHEDULE

SHEET 2

TRIAL HOLE Nº	AH1	AH1	AH2	AH2	AH3	AH3	AH4	AH5	AH5	AH5	AH6	AH6	AH6	AH7	AH7	AH7	UNIT RATE	COST
DEPTH (m)	0-1	1-2	0-1	1-1½	0-1	1-2	0-1.2	0-1	1-2	2-2½	0-1	1-1½	1½-2	0-1	1-2	2-3		
SAMPLE Nº	11715	11716	11717	11718	11720	11721	11722	11723	11724	11725	11726	11727	11728	11729	11730	11731		
SAMPLE TYPE D/U	← KING ISLAND – CURRIE →																	
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75µ	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
DIGEST; Fe + Ti	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
ACID WASH																		
FLOAT LIGHTS																		
Fe + Ti ON LIGHTS																		
TOTAL COST																		

Date received: ______
Date required: ______
Eng. in charge: ______
Priority: ______
(at date received)

Remarks: ______

STARTED
FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client: ______
Project: ______
Location: ______

JOB Nº

009

860011

LABORATORY TESTING SCHEDULE

SHEET 3

TRIAL HOLE Nº	AH7	AH7	AH8	AH1	AH1	AH1	AH1	AH1	AH2	AH2	AH2	AH2	AH2	AH3	AH3	AH3	UNIT RATE	COST
DEPTH (m)	3-4	4-5	0-1.2	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3		
SAMPLE Nº	11732	11733	11734	11697	11698	11699	11700	11701	11702	11703	11704	11705	11706	11707	11708	11709		
SAMPLE TYPE D/U	← K.Is. – CURRIE →		← BRIDPORT													→		
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75μ	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
DIGEST; Fe + Ti	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/		
ACID WASH			/					/										
FLOAT LIGHTS			/					/										
Fe+Ti ON LIGHTS			/					/										
																	TOTAL COST	

Date received: ______
Date required: ______
Eng. in charge: ______
Priority: ______
(at date received)

Remarks: ______

STARTED
FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client: ______
Project: ______
Location: ______

JOB Nº

010

- 7 -

866012

LABORATORY TESTING SCHEDULE

SHEET 4

TRIAL HOLE Nº	AH3	AH3	AH4	AH4	AH4	CS2	CS2	CS2	CS2	CS2	CS3	CS3	CS3	CS3	CS3		UNIT RATE	COST
DEPTH (m)	3-4	4-5	0-1	1-2	2-2.2	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5			
SAMPLE Nº	11710	11711	11695	11696	N/A	11684	11683	11685	11686	11687	11688	11689	11690	11693	11694			
SAMPLE TYPE D/U	← BRIDPORT →																	
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75µ	/	/	/	/	N/A	/	/	/	/	/	/	/	/	/	/			
DIGEST; Fe + Ti	/	/	/	/	N/A	/	/	/	/	/	/	/	/	/	/			
ACID WASH																		
FLOAT LIGHTS																		
Fe + Ti ON LIGHTS																		
TOTAL COST																		

Date received: ______
Date required: ______
Eng. in charge: ______
Priority: ______
(at date received)

Remarks: ______

STARTED
FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client: ______
Project: ______
Location: ______

JOB Nº

011

- 8 -

860013

012

LABORATORY TESTING SCHEDULE

SHEET 5

TRIAL HOLE №	AH1	AH1	AH1	AH1	AH1	AH2	AH2	AH2	AH2	AH2	AH3	AH3	AH3	AH3	AH4	AH4	UNIT RATE	COST
DEPTH (m)	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	0-1	1-2		
SAMPLE №	← NOT	TESTED →				11788	11787	11786	11785	11784	11783	11782	11781	11780	11779	11778		
SAMPLE TYPE D/U	←					STRAHAN →												
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75μ	←	N/A →				/	/	/	/	/	/	/	/	/	/	/		
DIGEST: Fe + Ti	←	N/A →				/	/	/	/	/	/	/	/	/	/	/		
ACID WASH																		
FLOAT LIGHTS																		
Fe + Ti ON LIGHTS																		
TOTAL COST																		

- 6 -

Date received: ____
Date required: ____
Eng. in charge: ____
Priority: ____
(at date received)

Remarks: ____

STARTED

FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client: ____
Project: ____
Location: ____

JOB №

866014

LABORATORY TESTING SCHEDULE

SHEET 6

013

																	UNIT RATE	COST
TRIAL HOLE Nº	AH4	AH4	AH4	AH5	AH5	AH5	AH5	AH5	AH6	AH6	AH6	AH6	AH6	AH7	AH7			
DEPTH (m)	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5	0-1	1-1½			
SAMPLE Nº	11777	11776	11775	← NOT TESTED →														
SAMPLE TYPE D/U	← STRAHAN →																	
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75µ	/	/	/	← N/A →														
DIGEST: Fe + Ti.	/	/	/	← N/A →														
ACID WASH																		
FLOAT LIGHTS																		
Fe + Ti ON LIGHTS																		
																	TOTAL COST	

- 10 -

Date received: ______
Date required: ______
Eng. in charge: ______
Priority: ______
(at date received)

Remarks:

STARTED

FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client:
Project:
Location:

JOB Nº

866015

LABORATORY TESTING SCHEDULE

SHEET 7

014

TRIAL HOLE Nº	AH8	AH8	AH8	AH8	AH8	AH9	AH9A	AH9A	AH9A	AH9A	AH9A	AH10	AH10	AH10	AH10	AH10	UNIT RATE	COST
DEPTH (m)	0-1	1-2	2-3	3-4	4-5	0-1	0-1	1-2	2-3	3-4	4-5	0-1	1-2	2-3	3-4	4-5		
SAMPLE Nº	←	NOT	TESTED			→	11774	11773	11772	11771	11770	11767	11766	11765	11764	11763		
SAMPLE TYPE D/U	←					STRAHAN										→		
DESCRIPTION																		
DENSITY																		
MOISTURE CONTENT																		
ATTERBURG LIMITS																		
LINEAR SHRINKAGE																		
SIEVE ANALYSIS																		
HYDROMETER																		
COMPACTION ST./MOD.																		
CBR SOAKED / UNSOAKED																		
OTHER REQUIREMENTS: GRADING TO 75µ	←	N/A				→	/	/	/	/	/	/	/	/	/	/		
DIGEST; Fe + Ti	←	N/A				→	/	/	/	/	/	/	/	/	/	/		
ACID WASH								/										
FLOAT LIGHTS								/										
Fe+Ti ON LIGHTS								/										

TOTAL COST

Date received: ______

Date required: ______

Eng. in charge: ______

Priority: ______

(at date received)

Remarks: ______

STARTED

FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122

MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA

LONGWORTH & McKENZIE PTY. LIMITED

Client: ______

Project: ______

Location: ______

JOB Nº

- 11 -

866016

LABORATORY TESTING SCHEDULE

SHEET 8

015

TRIAL HOLE Nº	AH 11	AH 11	PFA	PFB	PFA	PFB	AH1	AH1	AH1	A	B					UNIT RATE	COST
DEPTH (m)	0-1	1-1½	0	0	0	0	0-1	1-2	2-3	0	0						
SAMPLE Nº	11769	11768	11790	11789	11792	11791	← N/A →			11737	11740						
SAMPLE TYPE D/U	← STRAHAN →		← POKES Rd →		← CALDAR →		← HELLYER →										
DESCRIPTION																	
DENSITY																	
MOISTURE CONTENT																	
ATTERBURG LIMITS																	
LINEAR SHRINKAGE																	
SIEVE ANALYSIS																	
HYDROMETER																	
COMPACTION ST./MOD.																	
CBR SOAKED / UNSOAKED																	
OTHER REQUIREMENTS: GRADING TO 75µ	/	/	/	/	/	/	← N/A →			/	/						
DIGEST; Fe + Ti	/	/	/	/	/	/	← N/A →			/	/						
ACID WASH		/			/	/				/							
FLOAT LIGHTS		/			/	/				/							
Fe + Ti on LIGHTS		/			/	/				/							

TOTAL COST

Date received:
Date required:
Eng. in charge:
Priority:
(at date received)

Remarks:

STARTED

FINISHED

Consulting Engineers: 3 Eden St, Crows Nest 2065 Tele: 929 0122
MEMBER OF THE ASSOCIATION OF CONSULTING ENGINEERS, AUSTRALIA
LONGWORTH & McKENZIE PTY. LIMITED

Client:
Project:
Location:

JOB Nº

- 12 -

866017

4.0 ANALYSIS OF RESULTS - QUANTITY AND QUALITY

4.1 North East Coast

Two areas were sampled in the vicinity of Bridport, namely East Double Sandy Point (AH1 to AH3) on St. Albans Bay and Belligen (AH4, CS2 & CS3) near Weymouth on Noland Bay. (See Figures 1.1, 4.1 and 4.2)

A further area (Adams Beach) near Bridport was assessed as being of potentially high quality, but with only small reserves (less than 250,000 m^3).

Of the two areas sampled, the East Double Sandy Point Area appears the most (visually) prospective, in regards to sand quality and ease of access. The Belligen deposit appeared more organic and calcareous.

A moderately large area of fixed dune is present at East Double Sandy Point (about 200 ha), which was sampled to a depth of 4-5 m, thus, inferring reserves of about 20 million tonnes (m.t.).

The analytical data (Appendix A3) shows that, for raw material, iron values are very high (1400 - 6600 ppm Fe_2O_3 at Double Sandy Point, and 1800 - 7250 ppm Fe_2O_3 at Noland Bay), although after acid washing and removal of heavy minerals from one sample, the Fe_2O_3 content was reduced from 1380 to 110 ppm.

Although this reduction is encouraging, the initial high and variable Fe contents are seen as causing this whole area to be given a lower ranking of importance.

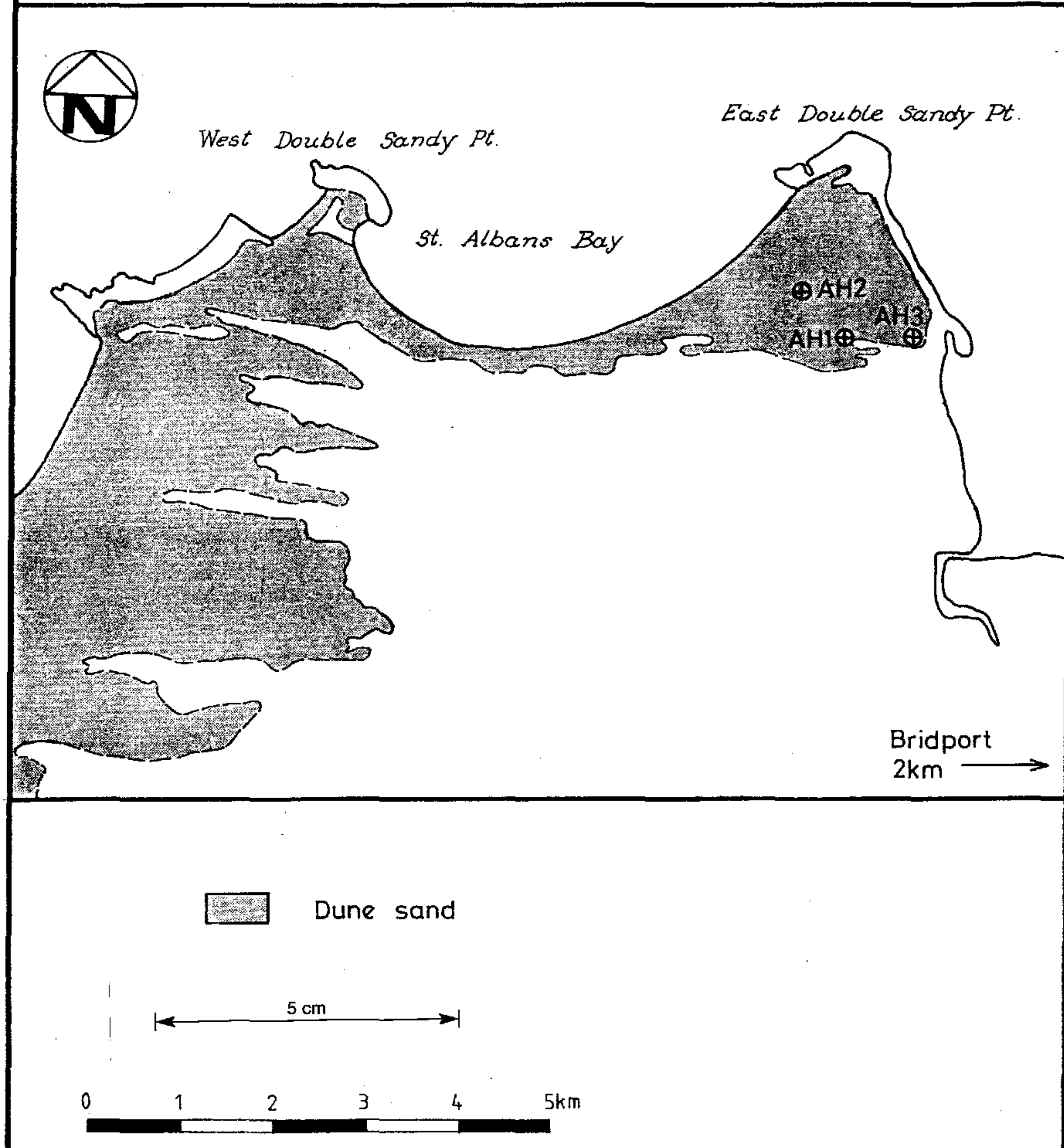
It is noted that a much larger area of similar material is present near West Double Sandy Point, but access was not available for sampling during the course of this study.

017

866019

EAST DOUBLE SANDY POINT

FIGURE Nº 4.1



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

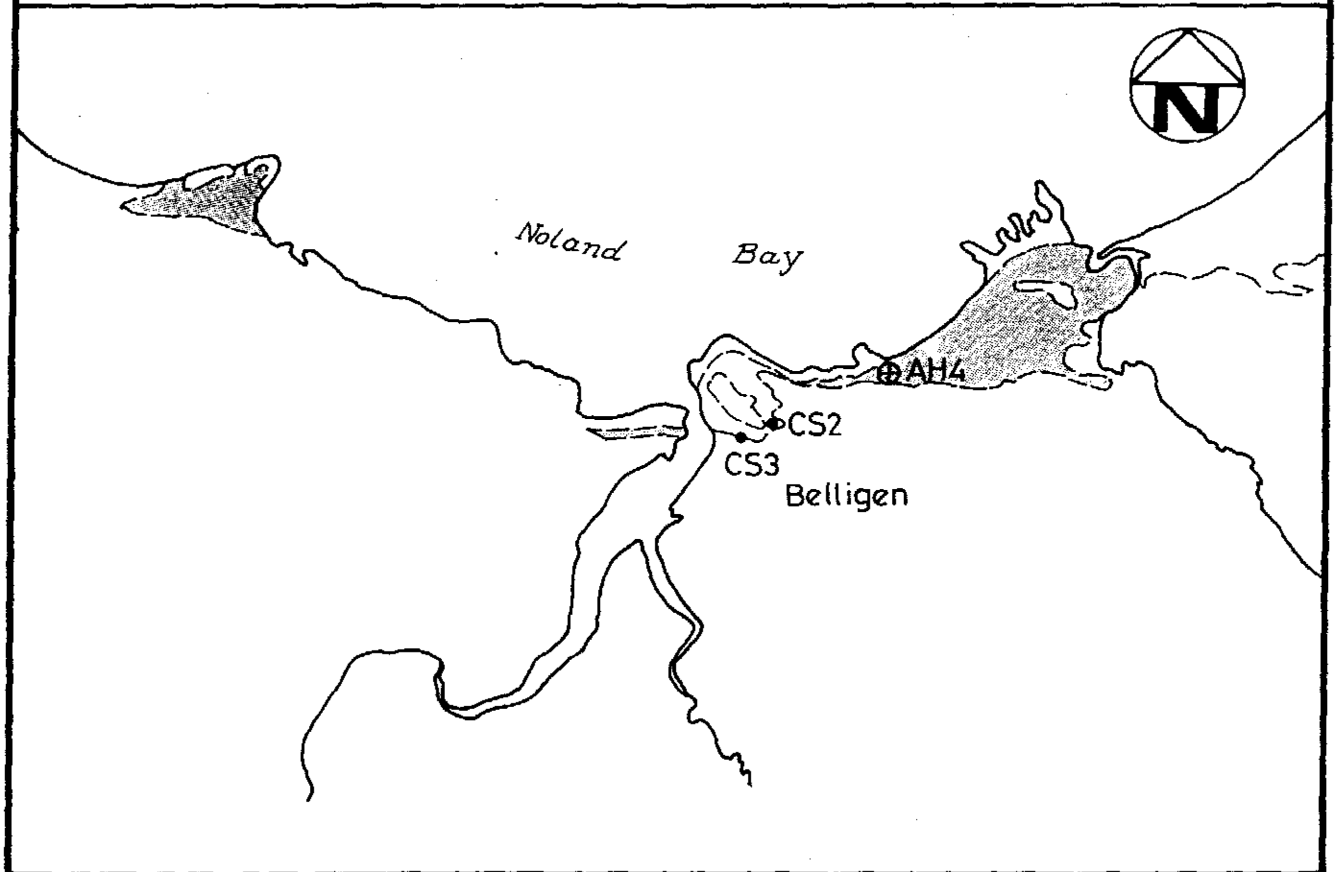
Job Nº YGT0358

018

866020

BELLIGEN

FIGURE Nº 4.2



5 cm

Dune sand

0 1 2 3 4 5km

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

4.2 King Island

Four areas were inspected:

- Big Lake
- Currie
- Red Hut Road (Grassy)
- Naracoopa

All are within the older stabilised sand dune formation. (See Figure 4.3)

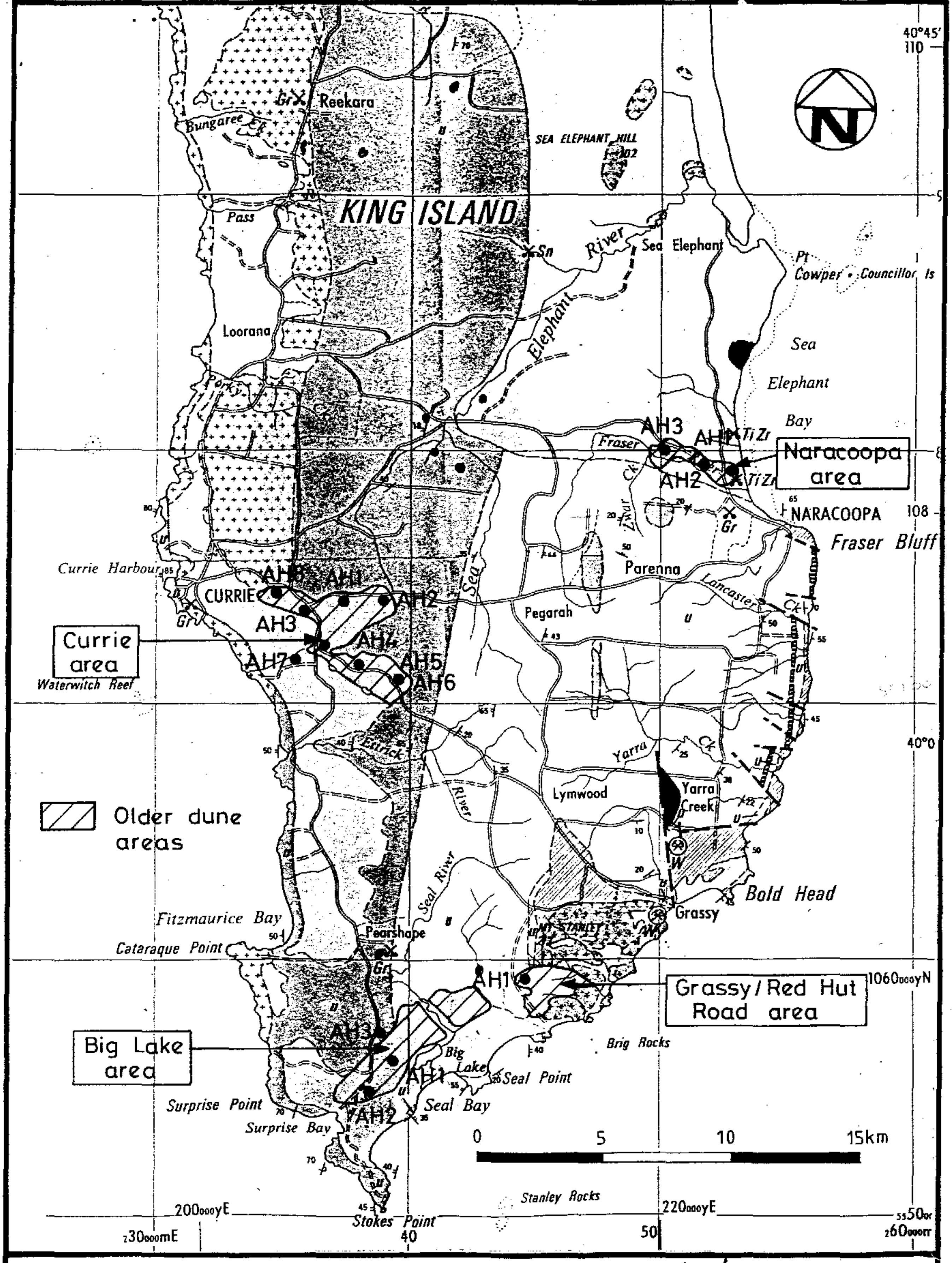
Although of a high quality (Fe_2O_3 700 to 1700 ppm as mined, 60 ppm after washing), the Naracoopa area was found to be small (about 800,000 m^2), with auger refusal or ground water intersections at depths of 0.8 to 1.5 metres. On this basis, no further work is warranted in this area.

Near the township of Currie, a large expanse of older dunes is present (about 700 ha). Auger holes penetrated a thickness of about 2 m, generally refusing on residual chocolate coloured clayey sands. Iron contents were variable (Fe_2O_3 385 to 6050 ppm as mined) but after acid washing and heavy mineral separation the Fe_2O_3 value was reduced from 385 to 105 ppm. This area therefore represents a large resource worthy of further attention, provided environmental constraints do not preclude a method of extraction which requires shallow workings over a large area.

The Big Lake area comprises some 450 ha of older dunes, in which auger holes penetrated from 2 to 5 metres of non calcareous silica sands. The analytical results were not encouraging, with Fe_2O_3 (raw) ranging from 550 to 4000 ppm, but reducing from 550 to only 260 ppm after acid washing and removal of heavy minerals. This area does not appear to be worth further consideration.

020 KING ISLAND 866022

FIGURE Nº 4.3



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

5 cm

Another area of sand nearby (Red Hut Road) covering some 200 ha also had quartz rich non-calcareous sands sampled to a depth of 3 metres, with more encouraging analytical results. Raw sand Fe_2O_3 levels had a range of 1170 to 1960 ppm, whilst acid washing and removal of heavy minerals reduced Fe_2O_3 from 1170 to 85 ppm. Additonal testing could prove some 5-10 m.t. of reserves in this region.

4.3 Strahan

A very large expanse of older dunes is exposed west of Strahan. Although part of the area is covered by younger calcareous sand, and part is swampy, the remainder covers an area some 20 km long by 1½ to 4 km wide. (Figure 4.4)

Eleven hand auger holes were spread over this area, none of which encountered refusal, although four holes were abandoned at the groundwater table (1.5 to 4 m) due to caving.

Five of the holes sampled (AH1, 5, 6, 7, 8) were not programmed for initial testing - see Section 3.0 Test Schedule - as they visually appeared more clayey than the remainder.

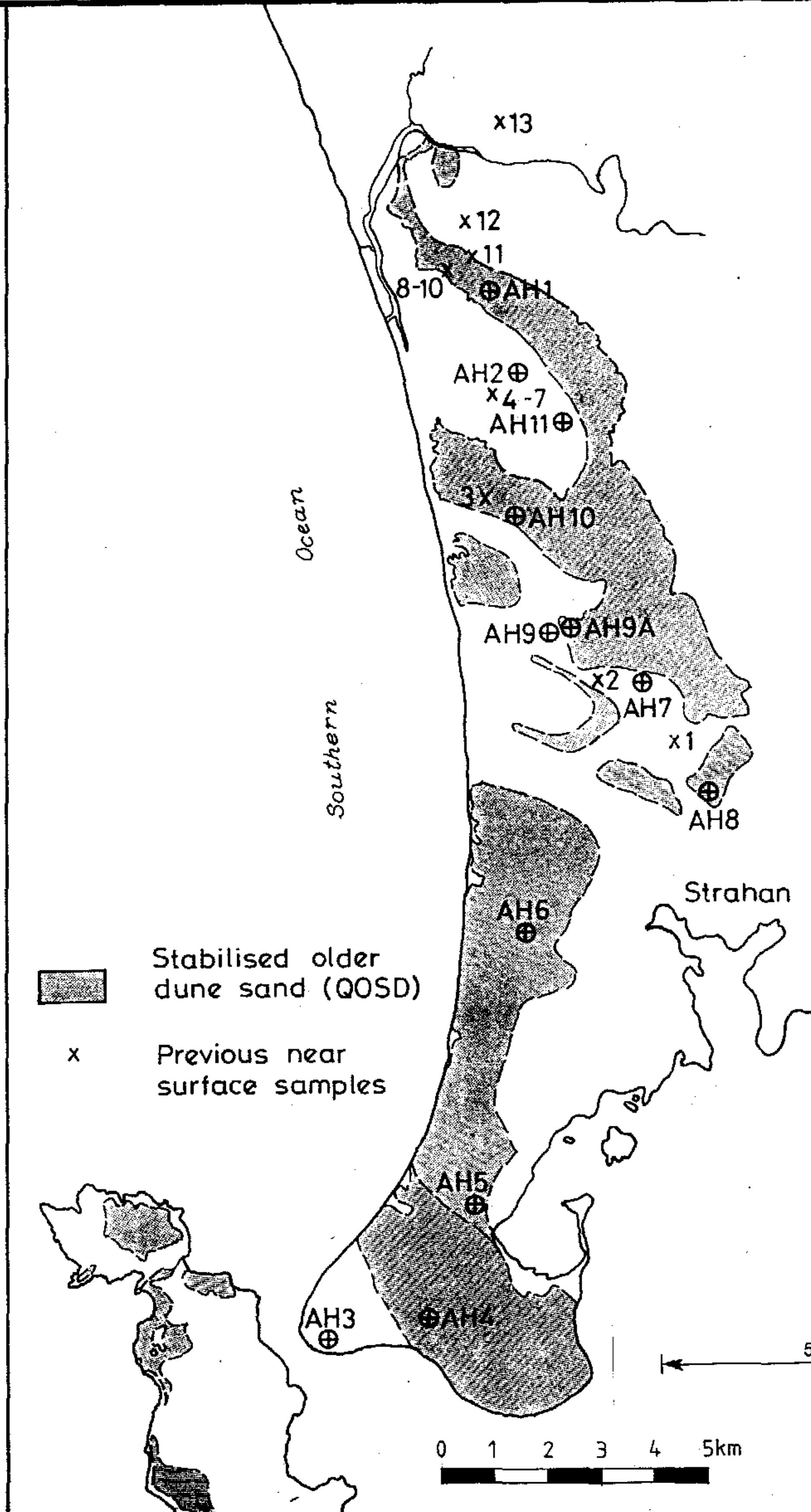
Some previously obtained near-surface raw sample results (from random locations marked on Figure 4.4) are shown below:-

(The Fe_2O_3 values are for the raw sand)

Location	Fe_2O_3 (ppm)	+600	+425	+300	+212	+150	+106	+75	-75 (u)
1	135	0.8	1.9	6.8	27.2	55.3	7.3	0.2	0.5
2	185	-	-	4.2	27.3	61.5	6.5	0.1	0.4
3	265	-	-	1.9	23.8	67.6	5.5	0.3	0.9
4	290	-	1.8	10.0	34.7	48.6	4.7	0.1	0.1
5	310	0.6	4.7	14.3	40.7	37.9	1.7	-	-
6	295	2.9	11.1	23.4	35.3	25.9	1.2	0.1	0.1
7	245	0.9	3.5	11.8	32.7	45.7	5.2	0.1	0.1
8	270	1.1	5.7	18.1	41.1	32.5	1.3	-	-
9	275	1.0	6.9	22.4	36.8	30.2	2.5	0.1	0.1
10	240	4.0	12.7	26.1	30.7	23.9	2.1	0.1	0.4
11	240	4.3	10.3	21.3	36.2	25.8	1.9	0.1	0.1
12	190	0.4	4.5	19.4	45.0	28.2	2.1	0.1	0.3
13	52	1.1	9.3	27.7	33.7	18.9	3.3	1.6	4.4

STRAHAN

FIGURE Nº 4.4



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

It is noted here that of the older dune areas, two categories can be outlined. These are referred to as "Older sand dunes" (QOS), and "Stabilised older sand dunes" (QOSD). The QOS areas are generally topograhically lower and swampy, and auger holes intersected ground water at depths of about 1.5 metres.

Conversely, all QOSD areas are topgraphically higher (up to 100 m ASL), with auger holes penetrating 5 m without encountering refusal or groundwater.

Of the large area mentioned above (20 km by 1.5 to 4 km), about half is covered by QOSD deposits.

Analysis of samples taken during the current work showed a range of Fe_2O_3 values for the raw sand from 440 to 3350 ppm with reductions from 500 to 215, and 450 to 235 ppm, after acid washing and removal of heavy minerals from the raw sand.

Based on the analytical results in hand, this material represents a potential multi-million tonne deposit of fine, moderately high grade silica sand.

As was noted earlier, CRA has carried out exploration for high grade silica nearby, on an isolated peninsula to the west of the major deposit described above. Although results were encouraging, based on reports obtained from the Tasmanian Mines Department, the prospect was abandoned due to access difficulties which were out of all proportion to the then - required production tonnages.

4.4 Boat Harbour

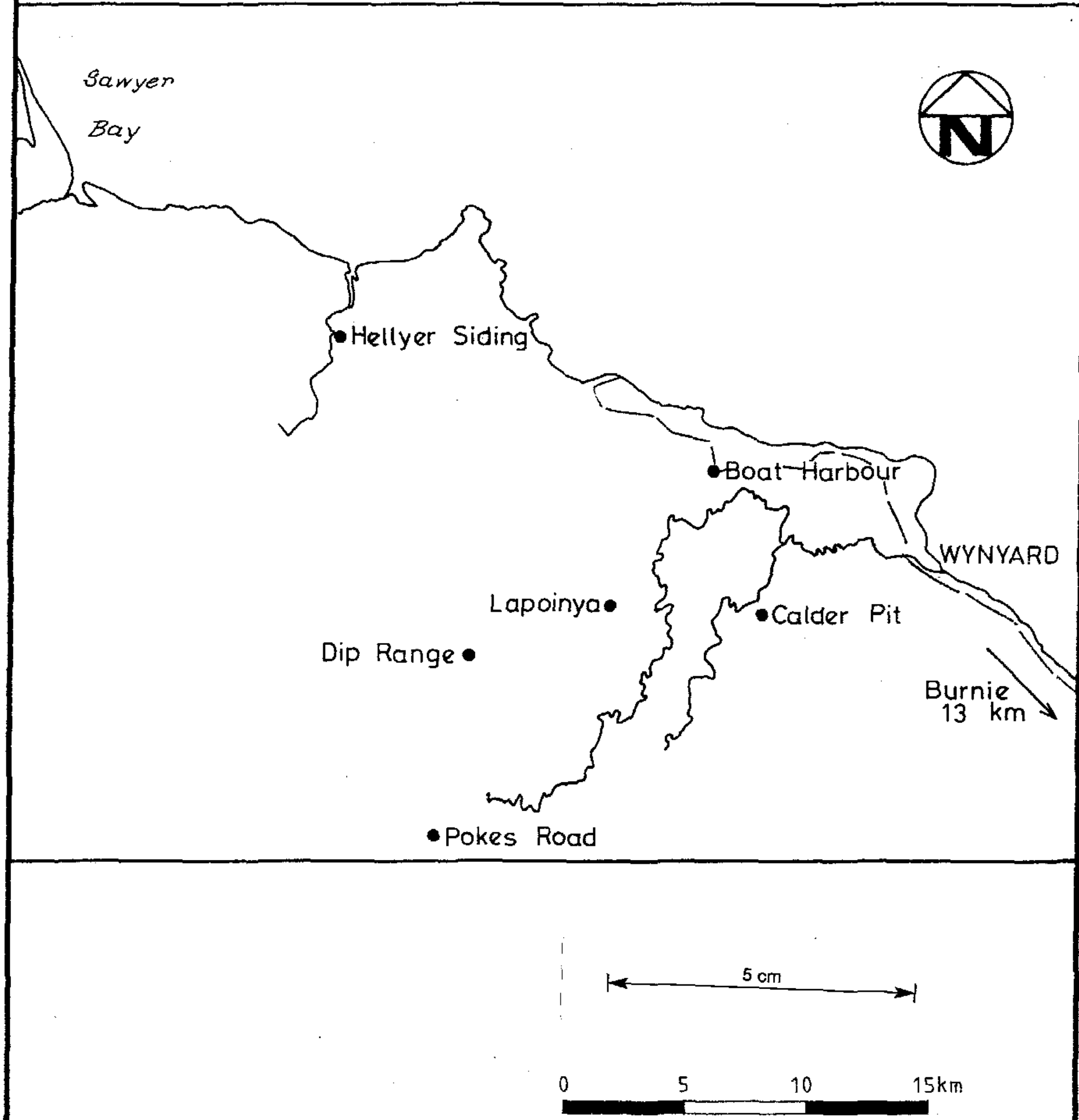
This area (Figure 4.5, 4.6 and 4.6(a)) has previously been auger drilled and test pitted by Zetetic Consulting Economic Geologists, with some analytical work carried out on samples recovered.

The area of interest has good access with two existing small quarries within the surface layers of decomposed quartzite.

NORTH COAST LOCATION PLAN

FIGURE Nº 4.5

866026



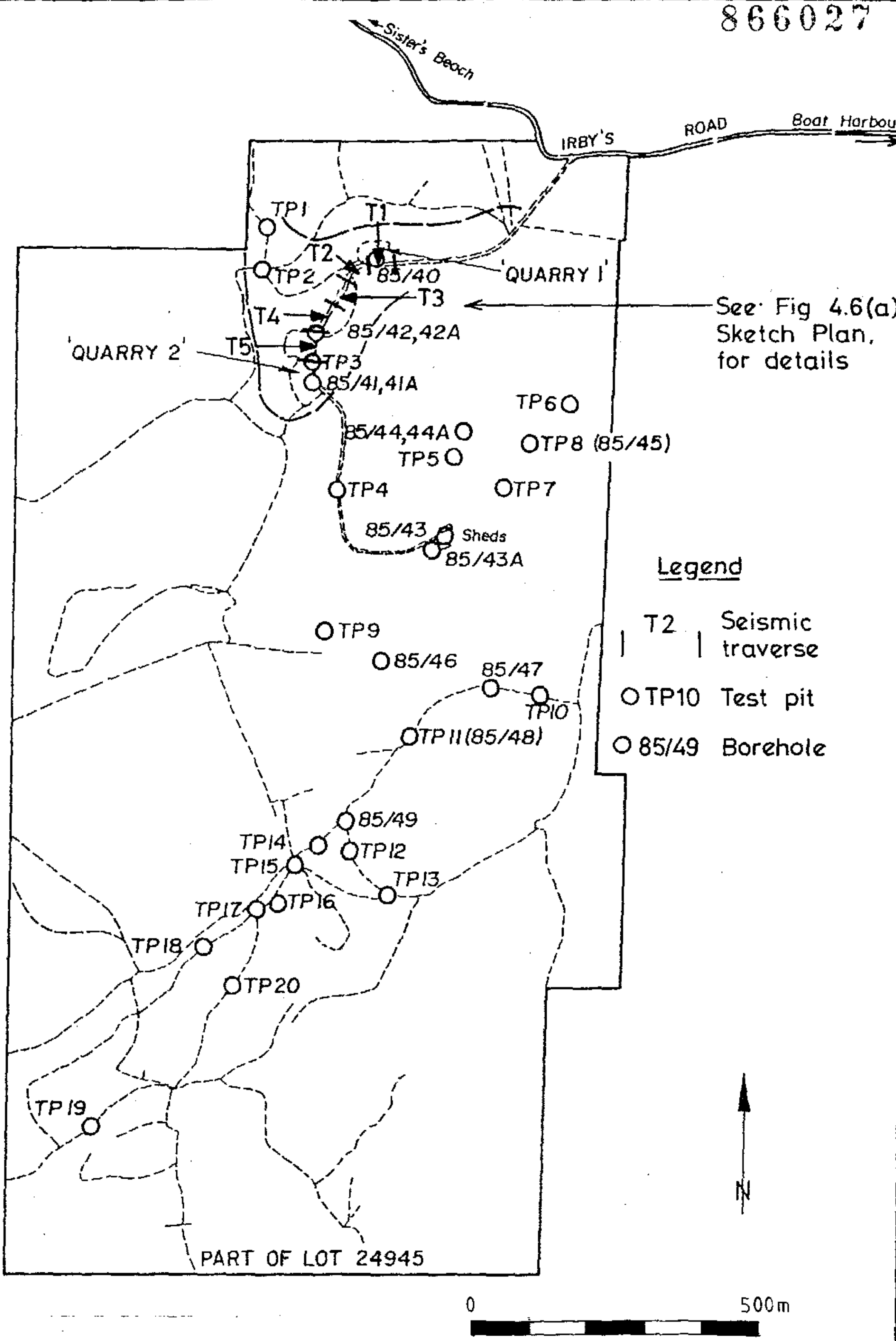
Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

025 BOAT HARBOUR

FIGURE Nº 4.6

866027



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

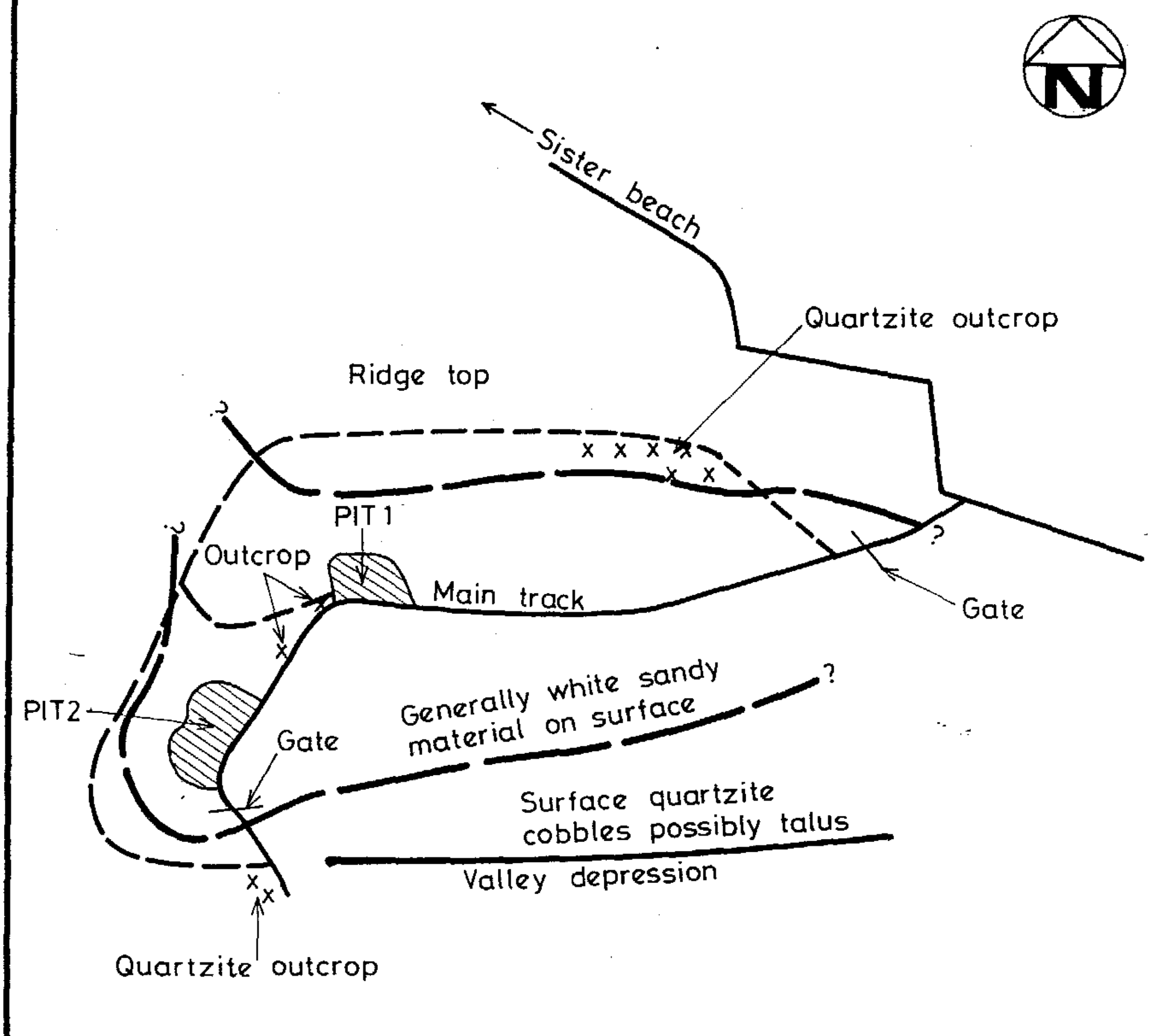
Job Nº YGT0358

5 cm

026 SKETCH PLAN BOAT HARBOUR

FIGURE Nº 4.6(a)

866028



Not to scale

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

Present indications of quality are:

	Sample A (Raw)	Sample B (Raw)	Sample B (Acid washed and heavy minerals separated)	
Al_2O_3	250	240	129	(ppm)
Fe_2O_3	210	190	81	(ppm)
TiO_2	550	600	200	(ppm)

Typical gradings are:-

+600 u	2.5%
+425 u	7.4%
+300 u	24.0%
+212 u	45.6%
+150 u	12.4%
+106 u	5.0%
+75 u	2.0%
-75 u	1.1%

The extent of the deposit was difficult to map due to poor surface expression. The inferred extent, however, is some 6 ha, subject to checking by further backhoe excavation.

At shallow depths, the deposit was found to be too compacted and competent for penetration by backhoe, although an auger drill was able to penetrate to depths of up to 22 m.

Hole	Depth (m)
85/40	22
85/41	6
85/42	1
85/43	17
85/44	0.5
85/45	16

In order to resolve these variations in depth, six seismic traverses were located in the area of interest between the two small existing quarries.

As shown in Figure A.2.1 (a), in Appendix A2 the interpreted depth of recoverable material ranges from about 15 to 20 metres, with an average depth of about 17 metres.

Provided these depths are maintained over the whole of the deposit, a reserve of about 2 million tonnes is inferred.

4.5 Lapoinya

This area (Figure 4.5, 4.7 and 4.7(a)) has previously been sampled and tested. During the current fieldwork, several shallow seismic traverses were carried out, to confirm average depths of easily extractable silica sand.

The previous work consisted of rotary boreholes and dozer pits by Zetetic Consulting Economic Geologists, supplemented by a further 8 percussion holes.

Analysis of raw product shows, typically:

Al_2O_3	550 (ppm)
Fe_2O_3	120 (ppm)
TiO_2	230 (ppm)

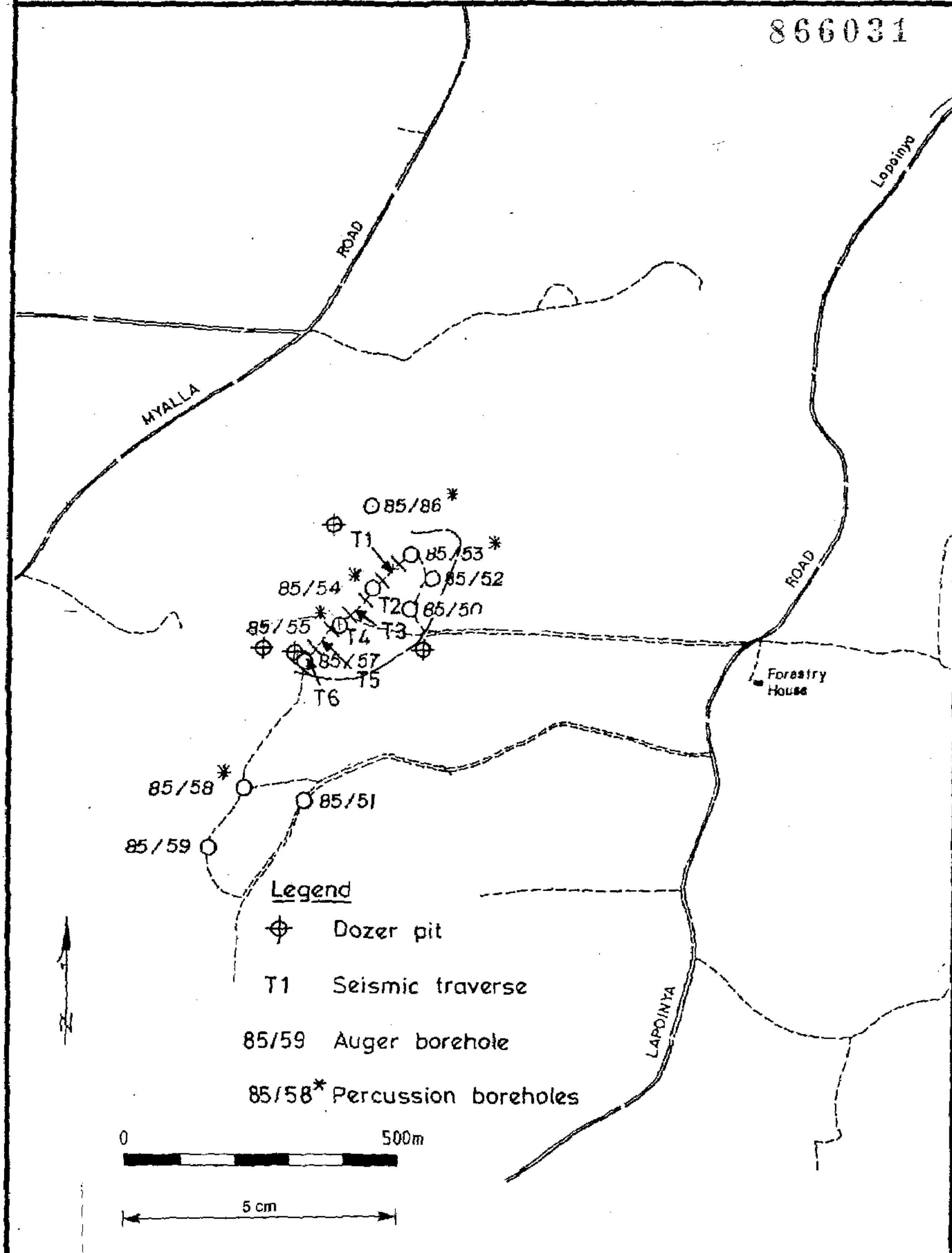
The deposit abuts a ridge of quartzite, the flanks of which are covered by significant depths of silica sand.

Other analytical data from the percussion holes shows that:-

029 LAPOINYA

FIGURE Nº 4.7

866031



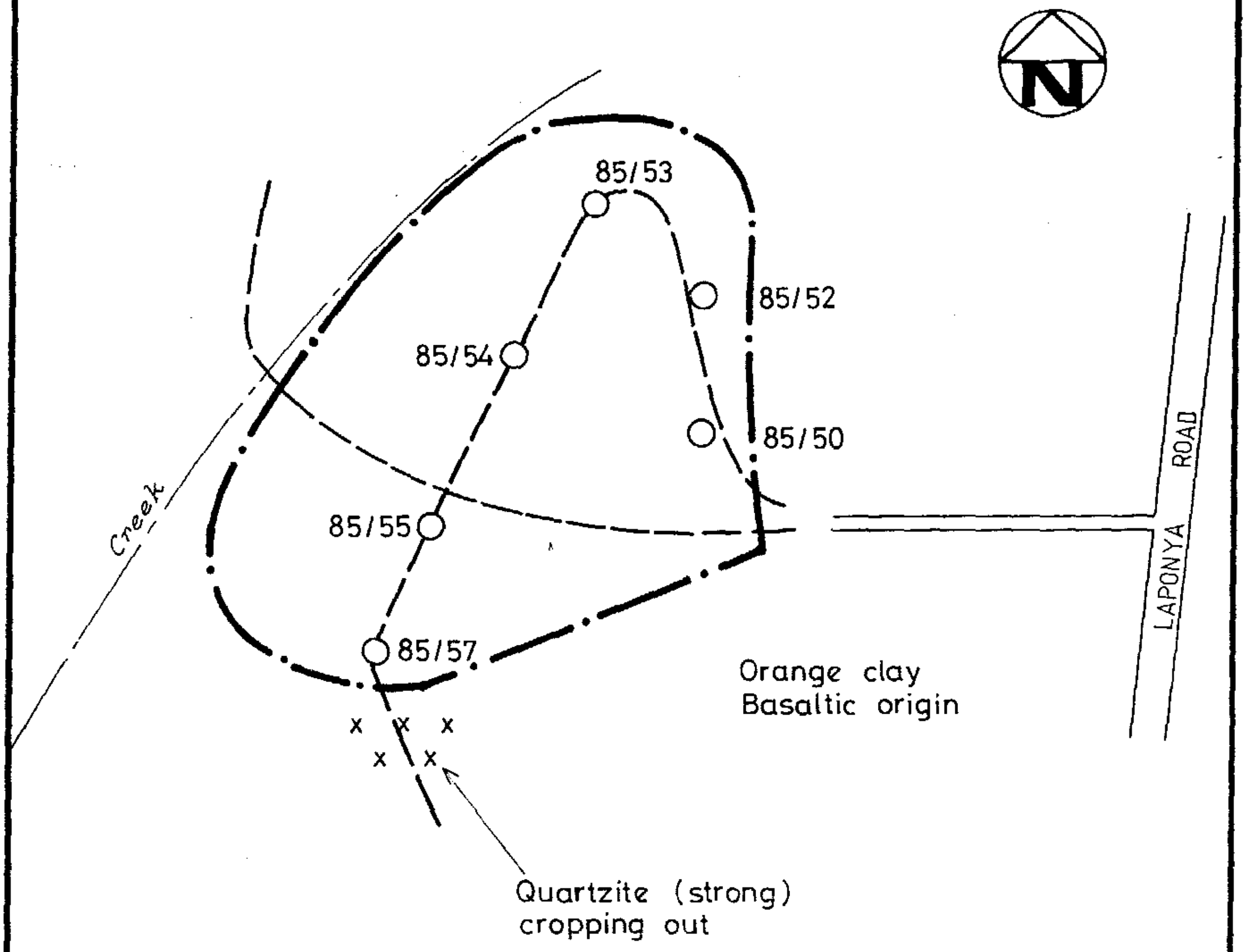
Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

030 SKETCH PLAN LAPOINYA

FIGURE Nº 4.7(a)

866032



Of no use whatever.

Not to scale

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

Hole	Depth (m)	Raw Fe_2O_3 (ppm)
85/52	3	164
85/52	6	106
85/53	3	768
85/53	6	369
85/53	9	721
85/53	12	944
85/55	3	215
85/55	6	265
85/55	9	283
85/55	12	784
85/56	3	227
85/56	6	3,289
85/56	9	878
85/56	12	712

From these previous data, it is accepted that the most prospective area is in the Northern part of the deposit (covered by rotary holes 50 and 52 to 57 and percussion holes 52 to 56), whilst the Southern portion (rotary holes 51, 58 and 59) has only very shallow sand.

It is over the Northern Area - some 500 m long by 300 m wide - that the seismic traverses were carried out to correlate depths indicated by the percussion boreholes. The extent of the deposit, however, may be greater to the west, as this boundary has not yet been mapped.

Borehole	Refusal Depth for Rotary Drill	Percussion Depth
85/50	7 m	-
85/52	4 m	+12 m
85/53	4½ m	+12 m
85/54	3/4 m	+12 m
85/55	2½ m	+12 m
85/56	1/3 m	+12 m
85/57	7 m	-

The seismic traverses (T1 to T6) started near borehole 53 and ended at borehole 57 over a distance of 240 metres.

It is evident from the seismic results (Figure A.2.1(b) of Appendix A2) that the Gemco auger drill has penetrated only very low velocity material (less than 500 m/s) whereas the percussion Airtrak rig has penetrated somewhat more consolidated strata (up to 1500 m/s) which is, however, relatively easy to excavate. The depth to hard bedrock ranged from about 6 to 22 metres, with an average depth of about 16 metres. Provided these depths are maintained over the whole of the deposit, the area has potential reserves of about 4 million tonnes of silica sand.

4.6 Calder Pit

This existing sand and gravel pit (See Figure 4.5) was sampled. Analytical results for two samples showed raw Fe_2O_3 values of 500 and 390 ppm, reducing to 145 and 135 ppm respectively, after acid washing and removal of heavy minerals. Although large reserves are known to be present, they have not been quantified.

Visually, the material is more coarse grained than that sampled from other areas, but is silica rich. Due to the nature of the deposit (Alluvial) it should be expected, however, that variation in quality will occur throughout. Thus, the proving of the area would most probably require a more intensive investigation than would normally be implemented for, say, a stable dune deposit.

4.7 Hellyer Siding

A brief inspection was made of this site (Figure 4.5) and a single auger hole bored to a depth of 3 m, at which depth the hole was abandoned due to groundwater. The material is of high quality (Raw Fe_2O_3 about 265 ppm, reducing to 125 ppm after acid washing and removal of heavy minerals).

In summary the deposit covers about 100 ha, to a depth of up to 2-3 metres, thus inferring reserves of about 4 million tonnes.

Since access to the area is good, further attention may well be warranted.

4.8 Pokes Road

This area (Figure 4.5) has previously been quarried for sand and road gravel. Hard veins of quartzite are present, although there are pockets of mineable sand. Current analytical data shows the material is not of high quality, with raw Fe_2O_3 ranging from 720 to 1140 ppm, although some earlier data was a little more encouraging, e.g. :-

	Raw	Acid Washed and Heavy Minerals Removed
Al_2O_3 (ppm)	340	151
Fe_2O_3 (ppm)	270	76
$Ti\ O_2$ (ppm)	440	80

with a grading of:-

+600	3.8 %
+425	14.1 %
+300	25.1 %
+212	33.3 %
+150	13.1 %
+106	7.4 %
+75	2.2 %
-75	1.0 %

Backhoe excavations have shown that clean friable sand is present to a depth of more than 5 metres, although its extent is limited to a strike length of about 150 metres, over a width of 20-30 metres.

The small quantities, and greater relative distance from the port of Burnie, probably make this area unworthy of further attention.

4.9 Dip Range

Little further work has been carried out on this area (Figure 4.5) during this phase of the investigation. Previous work by other parties has been comprehensive, and the data registered with the Mines Department has been perused to obtain the assessment outlined below. In addition, however, four percussion boreholes have been drilled, and their results incorporated herein (see Figure 4.8).

The area of interest lies adjacent to, and north of, Hogarth Creek. Here, weathered quartzites are present to depths of two to at least twelve metres (generally, an average of about 6-8 m).

The quality of weathered quartzite is high, e.g.:-

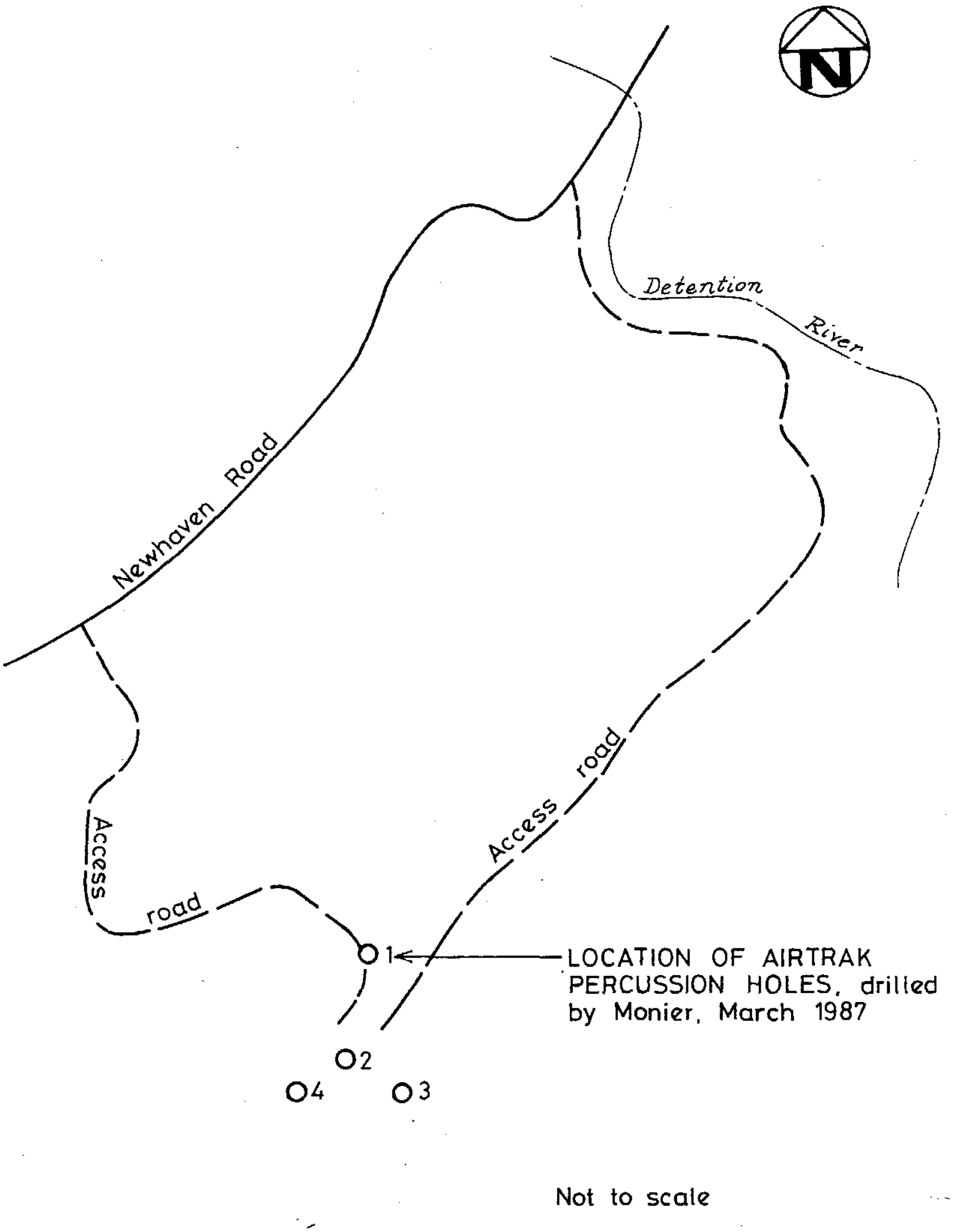
Hole	Depth (m)	Fe_2O_3 (Raw)
2	3	159
2	6	133
2	9	136
2	12	273
3	3	134
3	6	152
3	9	143
4	6	126
4	9	249

Typically raw Al_2O_3 and TiO_2 contents are about 300 and 380 ppm, respectively, whilst after heavy mineral separation and acid washing the corresponding values and gradings are:

866037

SKETCH PLAN
035 DIP RANGE

FIGURE Nº 4.8



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº
YGT0358

036

Al_2O_3	=	134 ppm
Fe_2O_3	=	96 ppm
TiO_2	=	105 ppm

+600	u	18.6%
+475	u	19.2%
+300	u	22.2%
+212	u	20.6%
+150	u	11.6%
+106	u	3.1%
+75	u	2.7%
-75	u	2.2%

In terms of quantity, the area investigated extends some 100 m x 70 m, inferring reserves of about 110,000 tonnes. There is potential for increasing this figure by at least a factor of two, but the area is relatively inaccessible and mining large quantities would require extraction of several larger "pockets" of deeper suitable material.

For these reasons, no further work is recommended at Dip Range, for the current purposes.

5.0 INFRASTRUCTURE

5.1 Surface Facilities

By Australian standards Tasmania is closely settled and well developed so that labour, housing, port facilities, electricity etc. are generally nearby.

(a) North East

Any sand mine in the North East would draw its labour from the surrounding farming areas at Scottsdale through to Launceston or from the fishing village of Bridport or from the heavy industrial area in the Tamar Valley around Bell Bay and George Town. There is adequate housing available in Bridport, Scottsdale and other nearby villages and towns.

All of the towns, villages and farms in the North East are connected to the state power grid so that power could easily be extended to a sand processing plant.

Engineering services (e.g. fitters, boilermakers, electricians) for maintenance of the plant would come from the surrounding towns or from Launceston.

(b) King Island

The island is a fairly closely settled dairy farming community with Scheelite mining at Grassy in the South East. There used to be mineral sands mining on the East coast but that is now closed. With the downturn in Scheelite mining there is adequate skilled labour and accommodation available in the towns and villages.

There is an electricity grid on the island serving the towns and farms. However, the electricity is produced from diesel fuel making it more expensive than hydro power on the main island of Tasmania.

Engineering support would come from the towns of Currie and Grassy which service the Scheelite mine, and the dairy product factories.

(c) **Strahan**

The town of Strahan used to be the port for concentrates from Mt. Lyell at Queenstown but it now services the Macquarie Harbour tourist trade, local forestry and nearby Hydro Electricity construction.

There is adequate labour and housing available and engineering support would come from Queenstown or from Burnie on the North West Coast. In this area the electricity grid is fairly restricted and if the processing plant is not within say 1-2 kilometres of existing power transmission lines it may be cheaper to generate electricity on site from diesel fuel.

(d) **North West Coast**

There are numerous towns and villages on the North West coast from which to draw the necessary labour and to provide the necessary housing. The area is closely settled and none of the areas looked at are more than a few kilometres from a town.

Electricity is readily available if not already connected at the sites investigated from the State grid. Engineering support would come from Burnie the major port and industrial town in the area.

5.2 Ports

(a) **North East**

The only existing harbour in the North East is Bridport, a small fishing harbour. Bell Bay at the mouth of the Tamar valley is too far away. The port of Bridport would need

039

dredging and the construction of a dedicated jetty. There should be no environmental constraints against the construction of a new jetty.

(b) **King Island**

There are three ports on King Island, all administered by the King Island Marine Board.

(i) Grassy - a small shallow artificial harbour handles small ships carrying containerised cargo. To enable larger ships to use the port the breakwater would need to be extended and the harbour dredged.

(ii) Currie - mainly a fishing harbour with minimal commercial facilities and on the exposed westerly side of the island. It is doubtful that a large jetty would be built there when Grassy offers a sheltered if shallow harbour.

(iii) Naracoopa - originally constructed as a port for shipping mineral sands. It is now used for bulk fuel discharge but ships have to tie up to a buoy because the jetty is in shallow water. Recent studies have shown that expansion of the Grassy facility would be preferable to any upgrading at Naracoopa.

(c) **Strahan**

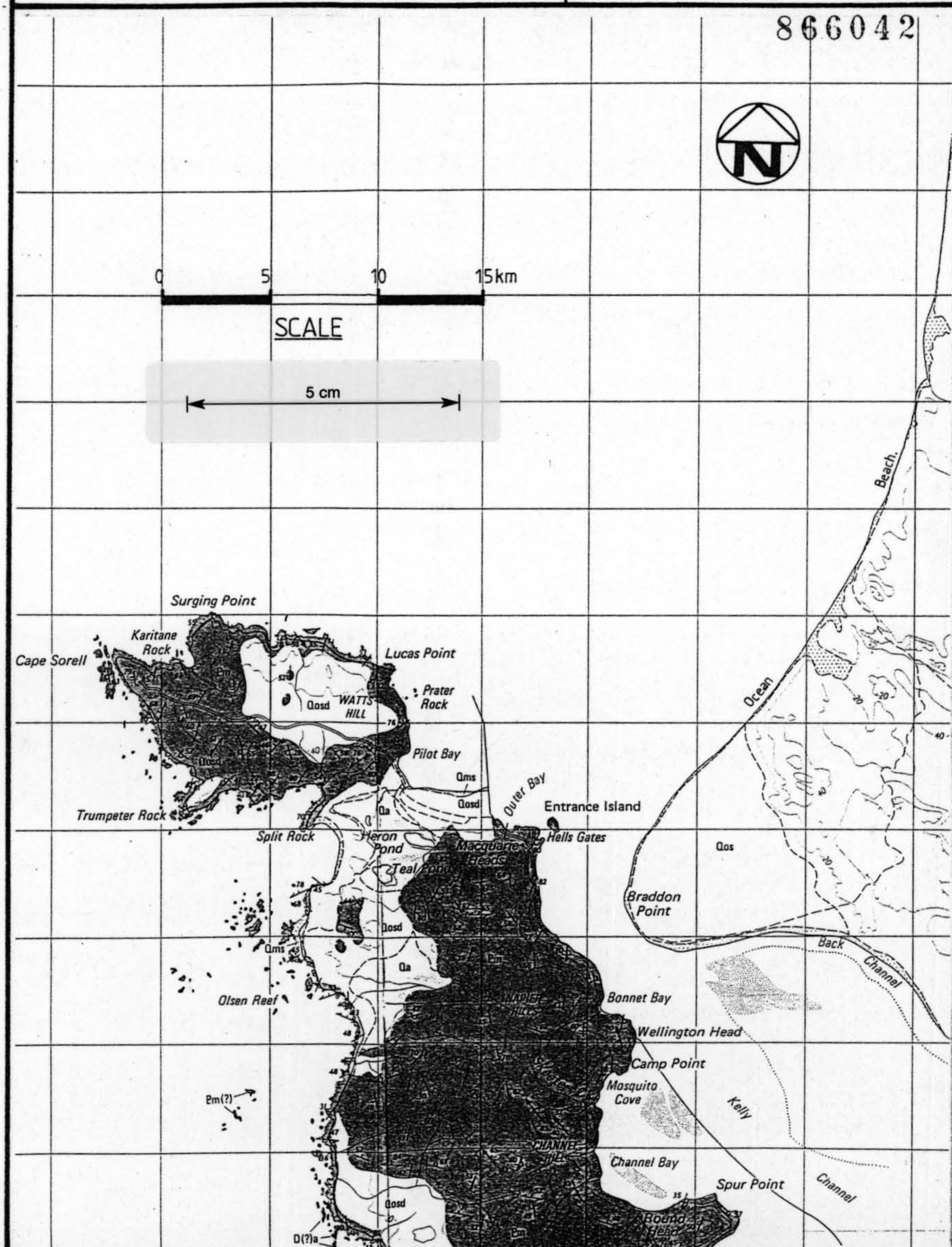
Whilst Strahan is in Macquarie Harbour, a deep natural harbour and the second largest in Australia, it has extremely limited access to the sea because of the large sand bar near the entrance (see Figure 5.1). To clear a channel would require six kilometres of dredging for a depth of 6-10 metres and over the necessary channel width. Also, a small island (Entrance Island) in the mouth of the harbour would need to be removed to allow for a straight run through the widened channel.

040

HARBOUR ENTRANCE STRAHAN

FIGURE Nº 5.1

866042



Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

Job Nº YGT0358

L & M - FS: Jan. 1981

An alternative proposal developed by CRA/Comalco is to construct an 800 m long causeway to Entrance Island in the mouth of the harbour (the base of the causeway is currently at sea level), then build a bridge from the island, across the waters of Hell's Gates, to the western peninsula which is adjacent to the 60 metre channel. The existing breakwater at Pilot Bay on the Western Peninsula would need to be extended and a jetty constructed but the capital cost would be far less than the alternative of dredging some 6 km in the main channel.

(d) **North West Coast**

There are three ports on the North West Coast.

(i) Stanley - a fishing and small bulk cargo port which may close in the near future. It is used to import bulk clay for Associated Pulp and Paper Mills in Burnie. Some dredging would be required to accommodate 25,000 tonne ships and most of the facilities required are available. However, it is further from most of the likely sand deposits on the North West Coast than is Burnie.

(ii) Port Latta - the closest port to most of the sand deposits and it can accommodate vessels up to 100,000 tonnes. It is owned by Savage River mines and access would be granted. However, great care would have to be exercised to ensure that there was no contamination from the iron ore pelletising facility or shiploading operation. It would however, be an ideal facility when the iron ore mine is depeleted.

(iii) Burnie - a major port administered by the Burnie Marine Board. The largest vessel received so far has been 44,000 tonnes. There is already a bulk material shiploader for copper and lead-zinc concentrates. A separate facility for silica sand would have to be constructed but using the existing wharves. There is land available to build a wharf stockpile facility.

5.3 Plant & Processing

Irrespective of the location of the sand deposit to be mined, the processing plant would be almost identical. Any difference would be due to the need for inclusion of attrition cells to liberate clay particles from the sand grains should this prove necessary. A conceptual plant flow chart is shown in Figure 5.2.

Transport of the raw sand to the processing plant and removal of the final product to the shiploading area would be different in each case because of the relationship between the plant and the deposit and the plant and the wharf to be used.

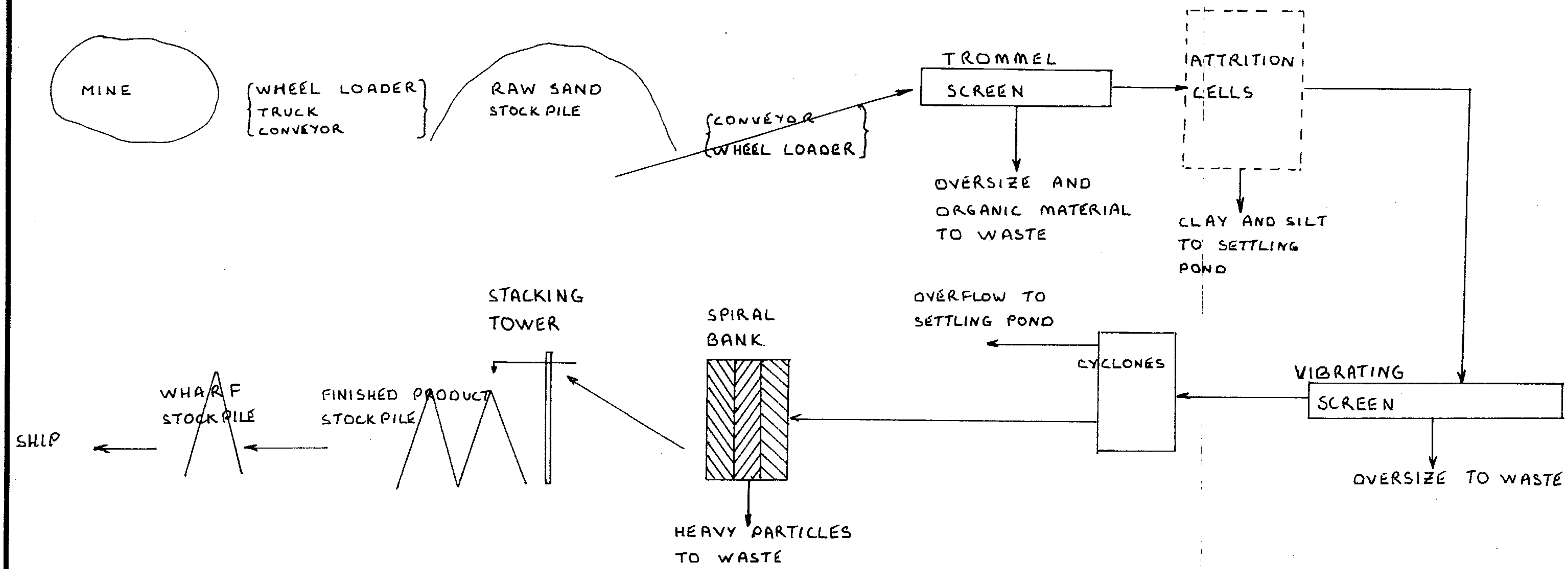
It is assumed that there will be adequate water on site for processing the sand by collection in dams and supplemented by bores if necessary. Any areas mined will be landscaped after mining and rehabilitated with pasture, native trees and shrubs etc. as required by the landowner.

Plant Location Considerations

The biggest operating constraint is in loading ships as quickly as possible which means having a large stockpile of sand adjacent to the wharf area. This can be done either by having the processing plant adjacent to the wharf or by having a stockpile area adjacent to the wharf and the plant near to the sand deposit.

Whilst having the processing plant adjacent to the wharf reduces the handling costs it is probably impractical at this stage because of the need for settling ponds, water supply, and sufficient area. It will be assumed that the plant will be located near the sand deposit and in a semi mobile form so that it can be moved as the deposit is mined.

866045



MONIER LIMITED

6-8 THOMAS ST., CHATSWOOD, N.S.W. 2067

FIGURE Nº 5.2

CONCEPTUAL PLANT FLOW CHART

No.	DATE	DESCRIPTION	CH'D.

REVISIONS

DRAWN:	B.R.H.	CHECKED:		SCALE:
DESIGNED:		CHECKED:		N.T.S.
DATE:	13. 8. 87	APPROVED:		

DRAWING No.:

SHEET No.:

Mining of the Sand

Overburden material including scrub, trees and soil will be removed by bulldozer and stockpiled for future rehabilitation. This work would be done by a contractor when required. Mining of the sand horizon to be processed would be done by front end loader and transported to the processing plant by front end loader, field conveyor or dump truck depending on the distance and terrain.

Primary Surge Stockpile

To enable the processing plant to be fed efficiently, a surge stockpile will be necessary. This would be built by the transport system used to take raw sand from the mined area to the plant.

Ideally the reclaim system would use a gullet conveyor with vibrating feeders to take sand from the stockpile to the plant but to save capital cost or to retain the mobility of the plant it may be necessary to use a front end loader.

Sizing

A rotating trommel screen would be used to removal gravel, large particles, and organic material prior to the sand entering the plant. Vibrating polyurethane screens would be used to achieve an accurate upper cut point of 600, 500 or 425 microns. The removal of clay particles, silt and fine sand would be done with cyclones.

If additional screening is necessary to produce a particular grading curve for a customer, that would be done with additional vibrating screens followed by blending of the separated fractions in the appropriate ratio.

Cleaning

It is probable that the screening, cycloning, pumping etc. will liberate any clay or other coating on the grains from the sand but it may be necessary in some instances to use attrition cells to physically scrub the sand grains whilst in a dense pulp.

A spiral bank would be used to remove any heavy particles from the sand e.g. magnetite, ilmenite, rutile, monazite, zircon and chromite. The heavy mineral product from the spirals would be waste.

Stockpiling

After leaving the spirals the sand would be dewatered by screening, then stockpiled for further drying. The stockpile area would be sized to accommodate 50,000 tonnes

Mobile Plant

Overburden removal and truck transport of both raw sand and finished product would be done using contractors at least initially.

Front end loaders will be needed at the mining face and at the primary surge stockpile unless a reclaim conveyor is used and at the finished product stockpile. One of three front end loaders at the plant would be necessary at the wharf stockpile during shiploading.

Shiploader

If export shipments go through the port of Burnie a mobile ship loder will be necessary which will sit on one of the existing wharfs with trucks discharging directly into a hopper attached to it.

For export shipments from any other area a dedicated jetty would have to be constructed. The jetty would carry a transfer conveyor and transverse shiploading conveyor with discharge chute.

Plant Capacity

Assumptions	(a)	Annual capacity	500,000 t/year
	(b)	Working days	250/ year
	(c)	Working hours	10/ day

Therefore the plant size needs to be 200t/hour with downtime made up on a second shift or at weekends. It is probably best to plan for a plant capacity of 250t/hour.

Capital Cost (budget only)

(a)	Plant : The plant without attrition cells and gullet reclaim conveyor but including structural steel, concrete and electrics should cost in the order of	$600,000
	Attrition cells would be around	$100,000
	Gullet reclaim conveyor	$150,000
(b)	Mobile :	
	Mining front end loader	$300,000
	Plant loading front end loader	$200,000
	Finished product front end loader	$200,000
(c)	Mobile Ship loader : Two units would be necessary so that two holds can be filled simultaneously $150,000 each (rough estimate)	$300,000
(d)	Dedicated Jetty : The cost for this item would be dependent on many things such as existing facilities, water depth etc. but obviously it will be some millions of dollars.	

Operating Costs

The operating cost estimate has been taken from Monier's existing export silica sand operation in Perth Western Australia. Actual operating cash costs including fuel, labour, electricity, maintenance and supervision but excluding depreciation and transport is $3.00/tonne.

Depreciation costs will depend on the actual capital invested and the rate of depreciation chosen for each item.

Transport will depend on the distance from the mining area to the plant and from the plant to the port. Ship loading costs should be around $3.00/tonne depending on the distance between the wharf stockpile and the shiploader and the facilities available.

6.0 CONCLUSIONS

Results from several areas have proved encouraging:-

- **North East Coast**
  The East Double Sandy Point area has potential to supply large quantities of moderate to high grade sand, but major works would be required to upgrade the port facilities of Bridport, which currently serves a minor fishing fleet with vessels having up to 600 mm draft.

- **King Island**
  The two southern deposits (Big Lake and Red Hut Road) are close to each other, and would provide a source of large volumes of high to medium grade sand, exported through the port of Grassy. It is noted that the Red Hut Road deposits are of a higher quality than are the Big Lake deposits. Facilities and capacity of the port of Grassy would need upgrading.

- **West Coast**
  The Strahan deposits are very large and subject to a full feasibility study, could justify installation of a major export facility. Further work is required on the variability of sand quality, and methods of improving quality, but the very large volumes available enhance the attractiveness of this region.

- **North Coast**
  Several moderately sized deposits are present, which, if mined consecutively, would provide 500,000 t/a for over 10 years and probably up to 20 years.

  All are within reasonable distance of the port of Burnie, which has the capacity to handle moderately large shipments.

  It is not anticipated that these smaller deposits would provide a long term supply, but rather would act as an initial source until a major deposit could be brought into production.

  In any event, once a target area is chosen, further work will be necessary to definitely prove the quality and quantity of recoverable reserves.

APPENDIX A1

Hand Auger and Surface Sample Logs

•	East Double Sandy Point.	AH1 to AH3
•	Belligen/Noland Bay.	AH4, CS2, CS3
•	King Island - Currie.	AH1 to AH8
	Narracoopa.	AH1 to AH3
	Big Lake.	AH1 to AH3
	Red Hut/Grassy.	AH1
•	Strahan.	AH1 to AH11; AH9A
•	Pokes Road.	Pit floor sample descriptions (A & B)
•	Caldar Pit.	Pit floor sample descriptions (A & B)
•	Hellyer Siding.	AH1

050

866052

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE Nº AH.1

Location: DOUBLE SANDY POINT - ST ALBANS BAY - BRDPORT

SHEET 1 OF 1

Position: See Geol map

Surface Elevation: 1

Date Started: 28.7.87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0m	1	mod. to strong		yellow brown	medium	quartz rich, minor shells, orange minerals
	1	2	weak to mod.		yellow brown	medium	" " " "
	2	3	strong		"	"	" " " "
	3	3.9	weak		"	"	" " " "
	3.9	5	NIL		light grey to black	fine to medium	organic smell- swamp environment
							AH becoming slightly moist
							below 4m.
							No groundwater observed
							No refusal
							N.B. : Acid test conc.
							hydrochloric acid

051

866053

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE Nº AH.2.

Location: DOUBLE SANDY PT, ST ALBANS BAY, BRIDPORT

SHEET 1 OF 1

Position: SEE GEOL MAP

Surface Elevation: ?

Date Started: 28/7/87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0m	1	weak to mod.		yellow brown	medium	quartz rich, minor orange minerals, trace shells
	1	2	very weak		yellow brown	medium	quartz rich, minor orange minerals
	2	3	very weak		"	"	" " " "
	3	4	very weak		"	"	" " " "
	4	5	very weak		"	"	" " " "
							No groundwater
							No refusal
							NB: Acid test with conc.
							hydrochloric acid

052

866054

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

HOLE No A.H.3

Location: SOUBLE SANDY PT - BRIDPORT

SHEET 1 OF 1

Position: See Geol.Map

Surface Elevation: ?

Date Started: 28/7/87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL.	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1m	weak to mod.		light yellow to light brown	medium	minor shells and orange minerals (quartz-rich)
	1	2	"		"	"	" " " "
	2	3	"		"	"	" " " "
	3	4	weak		"	"	" " " "
	4	5	"		black	clayey SAND	organic smell, root fibres
							No refusal
							No Groundwater observed
							NB: Acid test with conc.
							hydrochloric acid

866055

053

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

HOLE No AH.4.

Location: NOLAND BAY - WEST OF BRIDPORT

SHEET 1 OF 1

Position: SEE GEOL. MAP

Surface Elevation: -

Date Started: 20/7/87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	mod.		yellow brown	medium	minor shell and trace orange minerals, quartz rich
	1	2	mod.		yellow brown to black	medium	" " " "
	2	2.2	mod.		black	medium	organic
							Auger Hole terminated @ 2.2.m.
							(organic clayey sand)
							No groundwater observed.
							NB: Acid test with 1:4 conc.
							hydrochloric : H_2O

054

866056

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE NO CS.2.

Location: NOLAND BAY - WEST OF BRIDPORT

SHEET OF

Position: See Pipers River Geol.map

Surface Elevation: -

Date Started: 28/7/87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): channel sample from cut in sand dune

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	mod. to strong		yellow brown	medium	quartz rich, with trace of black minerals and some Fe stained minerals (calcareous)
	1	2	mod.		yellow brown	medium	quartz rich and some shell fragments and trace of black mineral
	2	3	mod.		yellow brown	"	" " " "
	3	4	weak to mod.		"	"	" " " "
	4	5	"		"	"	" " " "
							No groundwater

055

866057

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION TASMANIA

Location: NOLAND BAY - WEST OF BRIDPORT

HOLE NO CS.3

SHEET 1 OF 1

Position: See Pipers River Geol.map

Surface Elevation: -

Date Started: 28/7/87 Date Completed: 28/7/87 Logged By: P.M.

Rig Type (Mounting): channel sample down sand (dune

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)				
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	weak to mod.		yellow brown	fine to medium	quartz rich, some shells, minor dark minerals
	1	2	mod.		"	"	" " " "
	2	3	"		"	"	" " " "
	3	4	"		"	"	" " " "
	4	5	"		"	"	" " " "

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

056

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION (TAS)

Location: CURRIE, KING ISLAND

HOLE NO AH.1.

SHEET 1 OF 1

Position: See Base Map

Surface Elevation: –

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		grey	fine - medium	quartz rich
	1	2	NIL		grey	"	" "
							Becoming very moist at 2m.,
							refusal on chocolate brown
							residual clayey sand at 2 metres

057

BOREHOLE LOG SHEET

866059

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

Location: CURRIE, KING ISLAND

HOLE No AH.2.

SHEET 1 OF 1

Position: See Base Map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)				
	Depth		Acid	Colour		Sand	Remarks	
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level	
	0	1	NIL	grey	grey	medium	quartz rich - grey sand	
	1	1.5	NIL	grey	grey	medium	" " " (moist sand)	
							Refusal at 1.5 metres on chocolate brown residual clayey sand.	

866060

058

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION TASMANIA

HOLE NO AH.3.

Location: CURRIE - KING ISLAND

SHEET 1 OF 1

Position: See Base Map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		grey	fine _ medium	quartz-rich (moist)
	1	2	NIL		grey	"	" "
							Refusal at 2.2 metres on
							chocolate brown residual clayey
							sand

059

866061

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE Nº AH4

Location: CURRIE - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1.2	NIL		grey	fine-med	quartz-rich (v. moist-wet)
							Hole abandoned at 1.2m, groundwater intersected, hole caving.

060

BOREHOLE LOG SHEET

866062

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE No AH5

Location: CURRIE-KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: –

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)				
	Depth		Acid	Colour		Sand	Remarks	
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level	
	0	1	NIL		grey	fine-med	quartz-rich (slightly moist)	
	1	2	"		"	"	" (moist)	
	2	2.5	"		"	"	" (wet)	
							Hole abandoned, hole caving due to groundwater intersection at 2.5 metres.	

866063

061

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE No AH6

Location: CURRIE-KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: –

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		light grey	fine to med	quartz-rich
	1	1.5	"		grey	"	" " minor carbonaceous
	1.5	2.0	"		grey to dk grey	"	quartz-rich with some carbonaceous material.
							Refusal at 2.0 metres

866064

062

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE NO. AH7

Location CURRIE - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: _

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: _

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	vig-orous		yellow brown	fine to med	quartz-rich, calcareous
	1	2	"		"	"	" "
	2	3	"		"	"	" "
	3	4	"		"	"	" "
	4	5	"		"	"	" "
							No refusal
							No groundwater intersected

866065

n63

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA SAND EXPLORATION

HOLE No. AH8

Location: CURRIE - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1.2	NIL		light grey	Fine	quartz-rich (v. moist)
							Hole abandoned 1.2m hole
							caving, groundwater intersected.

064

866066

LONGWORTH & McKENZIE

BOREHOLE LOG SHEET

Client: MONIER LIMITED

Project: SILICA EXPLORATION

HOLE Nº AH1

Location: NARACOOPA - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		grey	fine-med	quartz-rich (v. moist)
	1	1.5	"		"	"	" (wet)
							Hole abandoned at 1.5 metres due
							to groundwater intersection
							and caving.

866067

065

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

HOLE No. AH2

Location: NARACOOPA - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		grey	fine-med	quartz rich (moist to wet)
							Refusal & groundwater
							intersection at 1 metre.

066

866068

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

HOLE No AH3

Location: NARACOOPA - KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 30/7/87 Date Completed: 30/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	0.8	NIL		grey	fine-med	quartz-rich - minor clayey SAND
							Refusal at 0.8 metres

067

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: TASMANIA SILICA EXPLORATION

HOLE Nº AH1

Location: BIG LAKE – KING ISLAND

SHEET 1 OF 1

Position: See base map

Surface Elevation: –

Date Started: 31/7/87 Date Completed: 31/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		grey	fine-med	quartz-rich, minor organic matter
	1	2	NIL		grey	fine-med	quartz-rich,
	2	3	NIL		grey	fine-med	" " minor contamination
							from above, moist
	3	4	NIL		grey	fine-med	as for 2-3 metres
	4	5	NIL		grey	fine-med	quartz-rich, moist
							No refusal
							No groundwater although becoming
							moist.

866070

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

HOLE No AH2

Location: KING ISLAND - BIG LAKE AREA

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 31/7/87 Date Completed: 31/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks: obvious shells, organic matter, water level
	0	1	NIL		light grey	fine-med	quartz-rich, minor organic matter
	1	2	"		dk grey	"	" " some drty clayey material
	2	2.5	NIL		dk grey to brown	"	quartz-rich, increasing brown clayey sand.
							Refusal of 2.5 metres on clayey sand.

069

866071

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

HOLE No AH3

Location: KING ISLAND - BIG LAKE AREA

SHEET 1 OF 1

Position: See base map

Surface Elevation: -

Date Started: 31/7/87 Date Completed: 31/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1.5	NIL		grey	fine-med	quartz-rich - some organic matter
							groundwater intersected at 1.5m,
							hole abandoned.

070

866072

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

HOLE Nº AH.1.

Location: KING ISLAND, RED HUT ROAD - GRASSY

SHEET 1 OF 1

Position: See Base Map

Surface Elevation: -

Date Started: 31/7/87 Date Completed: 31/7/87 Logged By: P.M.

Rig Type (Mounting): HAND AIUGER Contractor: -

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL.	Depth		Acid	Colour		Sand	Remarks
	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		grey	fine-med	quartz rich-trace organic
	1	2	NIL		light grey	" "	quartz rich
	2	3	NIL		"	" "	"
							Refusal on brown clayey sand
							at 3 metres

866073

071

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

HOLE Nº AH.1.

Location: STRAHAN - WEST TASMANIA

SHEET 1 OF 1

Position: See geol. map

Surface Elevation: -

Date Started: 1/8/87 Date Completed: Logged By: P.M.

Rig Type (Mounting): Contractor:

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		light grey	fine - med	quartz rich,minor orange black grains
	1	2	NIL		yellow brown	medium	" " orange staining clay
	2	3	NIL		"	"	" " "
	3	4	NIL		"	"	" " "
	4	5	NIL		"	"	" " "
							No refusal
							No Groundwater

072

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

Location: STRAHAN - WEST TASMANIA

HOLE No AH.2.

SHEET 1 OF 1

Position: See Geol.Map

Surface Elevation: –

Date Started: 1/8/87 Date Completed: 1/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	weak		yellow brown	medium	quartz-rich
	1	2	"		"	"	" "
	2	3	"		"	"	" "
	3	4	"		"	"	" "
	4	5	"		"	"	" "

866075

073 BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

HOLE Nº AH.3

Location: STRAHAN - WEST TASMANIA

SHEET 1 OF 1

Position: See Geol.Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	mod.		yellow brown	fine	quartz-rich - calcareous
	1	2	"		"	"	" " "
	2	3	"		"	"	" " "
	3	4	weak		"	"	" " slightly calcareous
							(wet)
							hole abandoned at 4m.

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

HOLE No AH.4.

Location: STRAHAN - WEST TASMANIA

SHEET OF

Position: See Geol. Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	weak		yellow brown	fine	quartz - rich
	1	2	"		"	"	" "
	2	3	"		"	"	" "
	3	4	"		"	"	" "
	4	5	"		"	"	" "
							No refusal

866077

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION TASMANIA

Location: STRAHAN TASMANIA

HOLE Nº AH.5

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: –

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL.	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		yellow brown	fine	quartz- rich
	1	2	"		brown	"	" "
	2	3	"		"	"	" "
	3	4	"		"	"	" "
	4	5	"		"	"	" "
							No refusal

076

866078

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION - TASMANIA

HOLE No AH.6.

Location: STRAHAN - WEST TASMANIA

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER

Contractor: -

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		yellow brown	fine	quartz - rich
	1	2	"		"	"	" "
	2	3			brown	"	" some clay (slightly moist)
	3	4	"		"	"	" " (moist)
	4	5			"	"	" " (wet)
							Hole caving at 5m.

866079

077 BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

HOLE Nº AH.7

Location: STRAHAN

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		grey	fine	quartz - rich (moist)
	1	1.5	NIL		grey	fine	quartz - rich, (wet)
							Hole caving at 1.5m.

078

866080

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION

Location: STRAHAN - WEST TASMANIA

HOLE NO. AH.8

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: -

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		light grey	fine	quartz - rich - trace clay
	1	2	NIL		"	"	quartz - rich
	2	3	NIL		dark brown	"	quartz-rich with clay (moist)
	3	4	NIL		"	"	" " " " "
	4	5	"		"	"	" " " " "

866081

079

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

Location: STRAHAN - WEST TASMANIA

HOLE No AH.9.

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: -

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting):

Contractor:

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)				
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL	light grey			quartz - rich
							Groundwater intersected @ 1m.
							hole abandoned

866082

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client:	MONIER LIMITED
Project:	SILICA EXPLORATION (TASMANIA)
Location:	STRAHAN

HOLE No AH.9A

SHEET 1 OF 1

Position: See Geol. Map   Surface Elevation: –

Date Started: 2/8/87   Date Completed: 2/8/87   Logged By: P.M.

Rig Type (Mounting): HAND AUGER   Contractor: –

Progress | Sample or Test | Depth (RL) metres | Strata | Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks: obvious shells, organic matter, water level
	0	1	NIL		light grey	fine	quartz-rich
	1	2	"		light grey to grey	"	quartz - rich (slightly moist)
	2	3	"		"	"	" " " "
	3	4	"		yellow brown	"	" " " " "
	4	5	"		"	"	" " " " "

081

866083

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

HOLE No AH.10

Location: STRAHAN

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: –

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
	Depth		Acid	Colour		Sand	Remarks
RL	from	to	Log	wet	dry	grain size	obvious shells, organic matter, water level
	0	1	NIL		light grey	fine	quartz-rich, minor clayey material
	1	2	NIL		"	"	quartz-rich c̄ brown clay
	2	3	"		yellow brown	"	quartz-rich c̄ clay (moist)
	3	4	"		yellow brown		
					to brown	"	" " " " "
	4	5	"		"	"	" " " " "

082

866084

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

Location: STRAHAN

HOLE No AH.11

SHEET 1 OF 1

Position: See Geol. Map

Surface Elevation: –

Date Started: 2/8/87 Date Completed: 2/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		light grey to		
					grey	fine	quartz-rich
	1	1.5	"		grey	fine	quartz-rich (very moist)
							hole caving at 1.5m.

083

866085

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED	HOLE No PIT FLOOR SAMPLE
Project: SILICA SAND EXPLORATION	
Location: POKES ROAD QUARRY FLOOR	SHEET 1 OF1
Position: POKES ROAD QUARRY FLOOR	Surface Elevation: –
Date Started: 3/8/87 Date Completed: 3/8/87	Logged By: P.M.
Rig Type (Mounting): surface samples	Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
		A	NIL		light grey	medium	quartz-rich c̄ quartzite pebbles
		B	NIL		"	"	" " c̄ " "

084

866086

BOREHOLE LOG SHEET

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

HOLE No PIT FLOOR SAMPLES

Location: CALDER PIT FLOOR SAMPLE

SHEET 1 OF 1

Position: BURNIE 1:250,000 6.R.E:3870 N:5460   Surface Elevation: -

Date Started: 3/8/87   Date Completed: 3/8/87   Logged By: P.M.

Rig Type (Mounting): HAND AUGER   Contractor: -

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)			
RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
		A	NIL		grey	medium - coarse	quartz-rich c̄ quartzite fragments
		B	NIL		grey	" "	" " c̄ " "

085 BOREHOLE LOG SHEET

866087

LONGWORTH & McKENZIE

Client: MONIER LIMITED

Project: SILICA EXPLORATION (TASMANIA)

HOLE No AH.1.

Location: HELLYER SIDING

SHEET OF

Position: BURNIE 1:63,000 E:3680 N:5472 Surface Elevation: –

Date Started: 5/8/87 Date Completed: 5/8/87 Logged By: P.M.

Rig Type (Mounting): HAND AUGER Contractor: –

Progress	Sample or Test	Depth (RL) metres	Strata	Description (moisture, colour, consistency, structure, SOIL TYPE, origin)

RL	Depth from	Depth to	Acid Log	Colour wet	Colour dry	Sand grain size	Remarks obvious shells, organic matter, water level
	0	1	NIL		dark grey	fine	quartz-rich c̄ clay
	1	2	NIL		"	"	" " "
	2	3	NIL		brown	"	" " clay (wet)
							abandoned (wet) at 3 metres.

866088

0857A

MINES
File Ref. E.L.15/85
23 JUL 1990
Doc. Ref. 3023
Action Officer KM. | Initials

16

Department of Resources and Energy
P.O. Box 56
Rosney Park 7018
Tasmania

52 Hamilton St
Lane Cove
NSW 2066
10/7/90

Attention K. McClymont

Your ref. KMCC3.90:KAC
Exploration Licence 15/85

Dear Sir/Madam,

The co-ordinates that you requestedin your letter of July4th 1990 are as follows.

Strahan	AH1	3,56.90 east	53,43.40 North
	AH2	3,57.45 east	53,41.90 North
	AH3	3,53.85 east	53,24.10 North
	AH4	3,55.80 east	53,24.45 North
	AH5	3,56.60 east	53,26.60 North
	AH6	3,57.55 east	53,31.65 North
	AH7	3,59.70 east	53,36.20 North
	AH8	3,61.00 east	53,34.10 North
	AH9	3,57.90 east	53,37.10 North
	AH9A	3,58.35 east	53,37.25 North
	AH10	3,57.30 east	53,39.30 North
	AH11	3,58.15 east	53,41.00 North
Hellyer Siding	AH1	3,68.70 east	54,71.20 North
East Double Sandy Point			
	AH1	5,28.70 east	54,65.70 North
	AH2	5,28.20 east	54,65.70 North
	AH3	5,29.40 east	54,66.20 North
Belligen/Noland Bay			
	AH4	5,15.10 east	54,60.10 North
	CS2	5,14.20 east	54,59.40 North
	CS3	5,14.00 east	54,59.30 North

Yours faithfully,

B. R. Harrison

C.C. J.Carr
General Manager
Construction Materials Division
Amatek Limited
P.O.Box 295
Chatswood
N.S.W

APPENDIX A2

Seismic Travel Time Curves

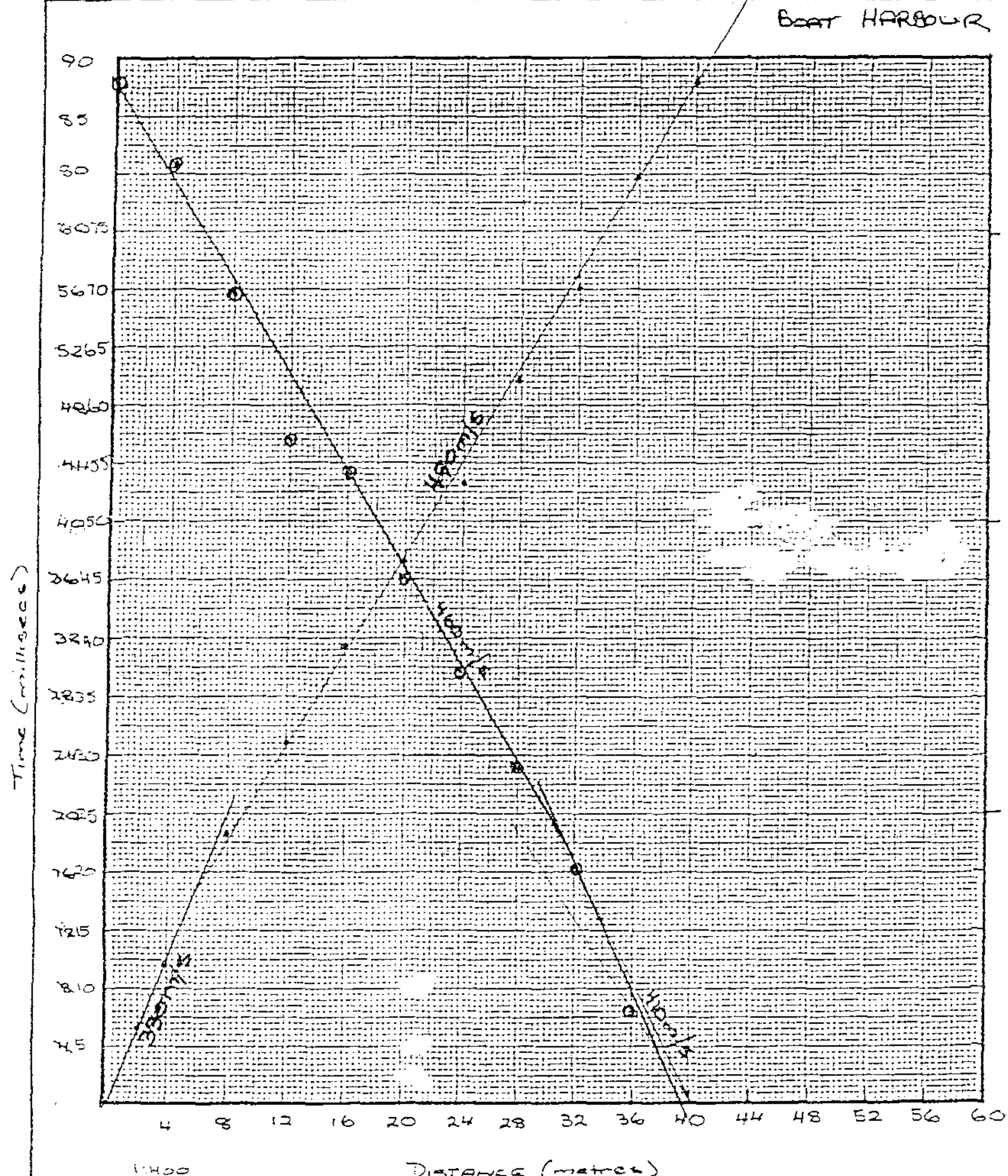
- Boat Harbour, Traverses T1 to T6
- Lapoinya, Traverses T1 to T6

087

866090

Seismic 50m Spread. (Sisters Hill MT) NE	BOREHOLE No. 4/8/87
	DEPTH: T1
	SAMPLE No. SW

	0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
	–	–	6.6	12.2	23.2	31.1	39.3	46.5	53.3	62.0	70.2	79.4	88				
	88			81	69.6	57.2	54.2	45.1	37.1	29	20.3	8.1	–				



TESTED: P.M	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED		
DATE			
CHECKED:			
CERTIFIED BY:	NATA — THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA. THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION	JOB No.	DWG No.

866091

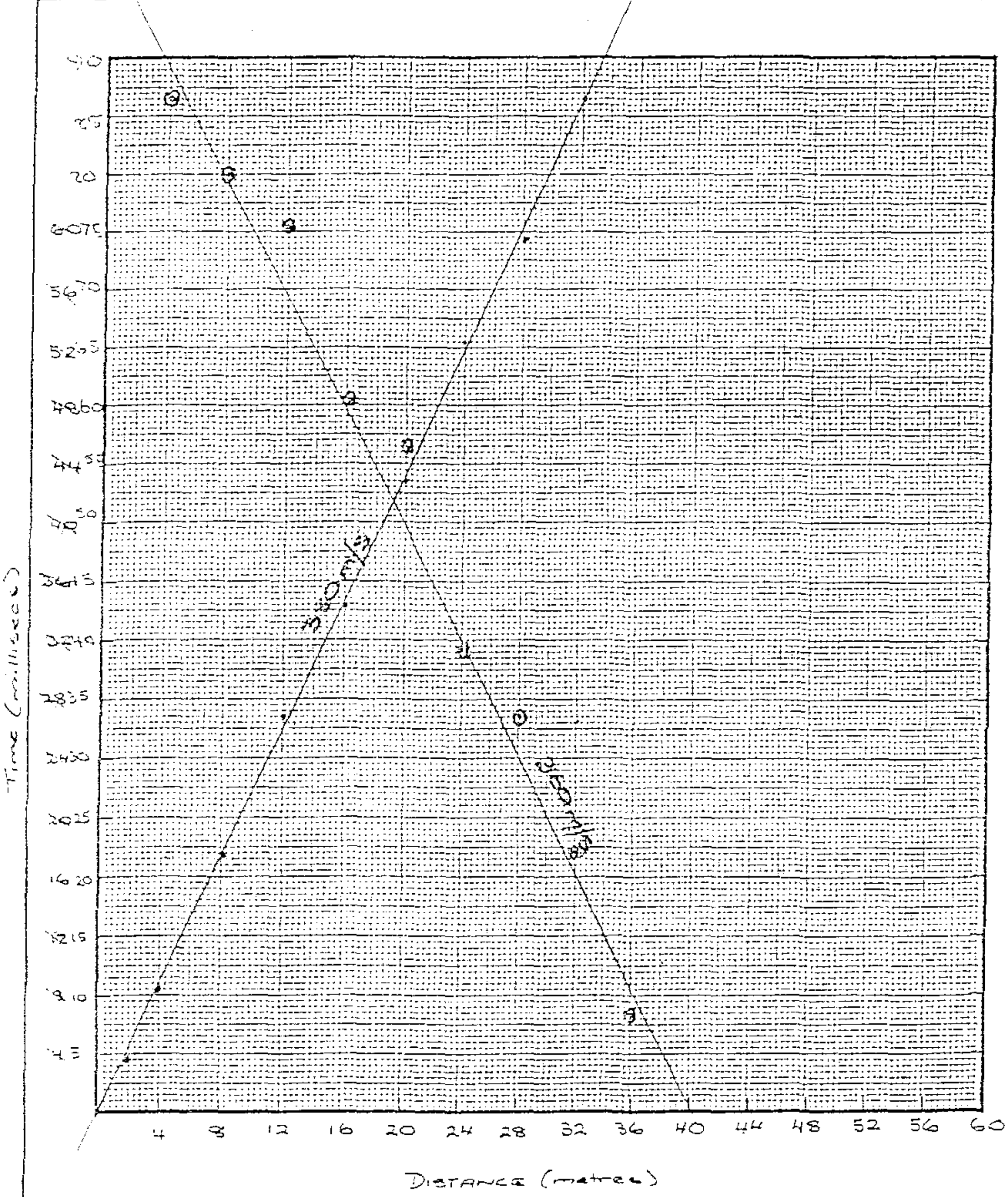
BOAT HARBOUR

088

Seismic 50m Spread.

BOREHOLE No.	4/8/85
DEPTH:	T2
SAMPLE No.	Sisters H

0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
–	–	4.5	10.7	22.1	33.6	43	53.5	65.9	74.5	86.6	95.2	101.7				
101.2	–	–	86.5	80.0	75.3	60.4	56.3	39.2	33.6	22.3	8.4	–				



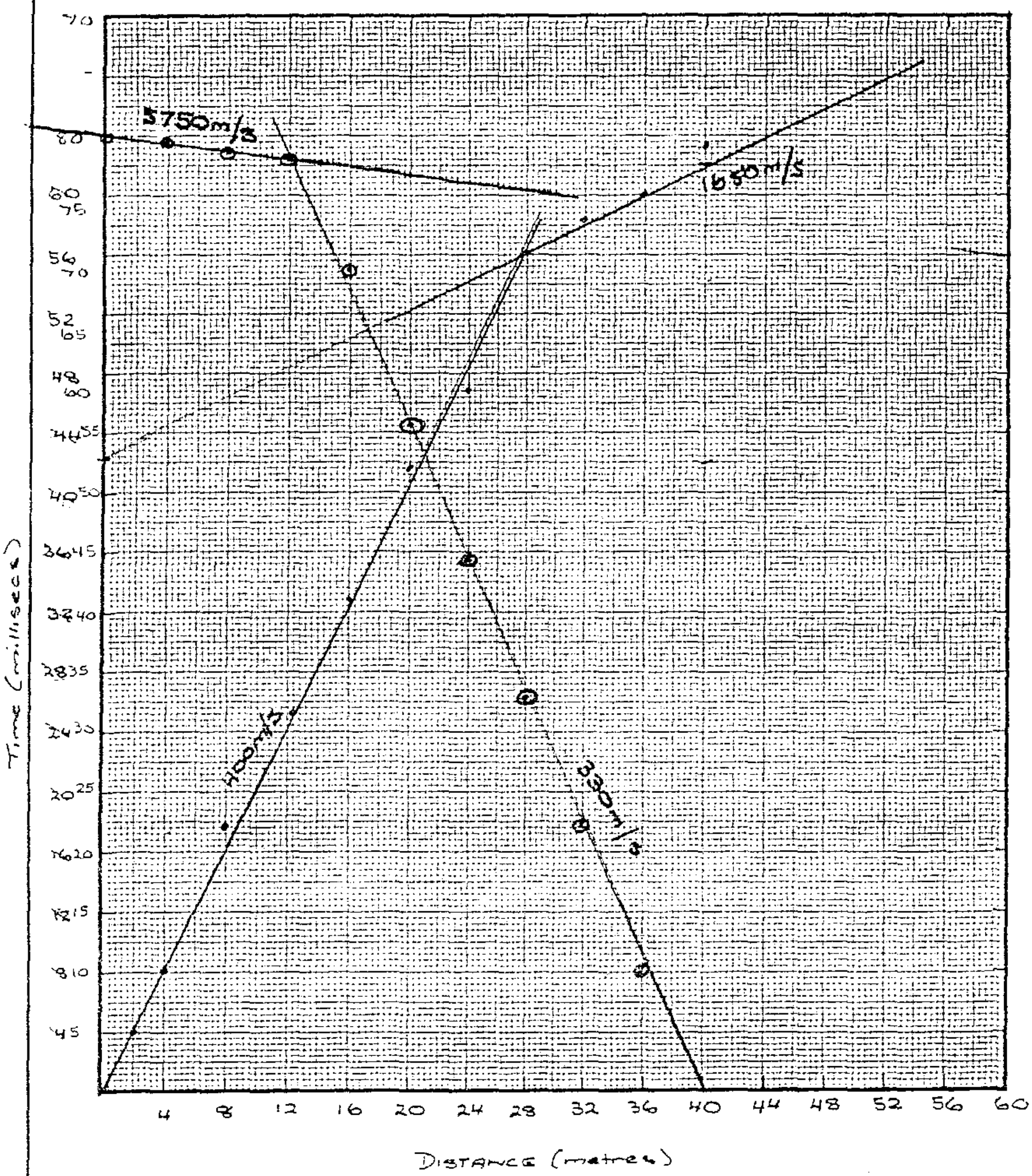
TESTED: P.M.	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST. 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED	
DATE		
CHECKED:		
CERTIFIED BY:	THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION	JOB No. / DWG No

866092

BOAT HARBOUR

089 Seismic 50m Spread.	
	BOREHOLE No.
	DEPTH: T3
	SAMPLE No. SISTERS HILL

	0	1	2	4	8	12	16	20	24	28	32	36	40				
	–	–	5.1	10.3	22.2	33.4	41.3	52.3	58.6	70	73	75	79.4				
	80	–	–	79.6	79.3	78.3	68.8	55.6	44.4	32.9	22.3	10.4	–				



TESTED: P.M.	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED		
DATE			
CHECKED:			
CERTIFIED BY:	NATA — THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA. THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION	JOB No.	DWG No

866093

Boat Harbour

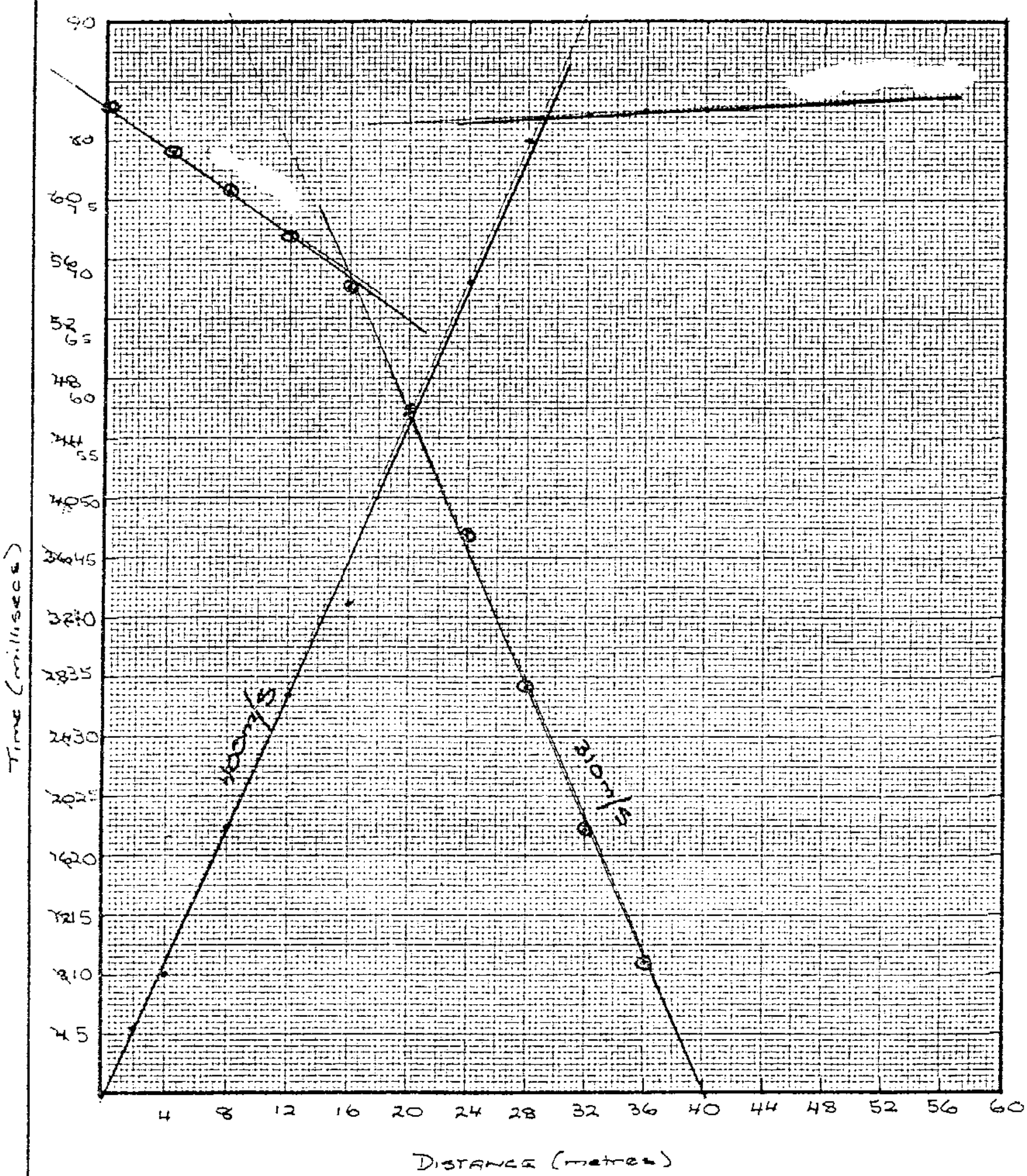
090 Seismic 50m Spread.

BOREHOLE No.

DEPTH: TW

SAMPLE No. Sisters Hill

	0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
	—	—	5.5	10.2	22.4	33.5	44.1	57.2	68.2	80.1	82.3	82.5	82.6				
	83			79.1	76		67.9		47		22.3	11.1	—				



TESTED: P.M.

DATE

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.

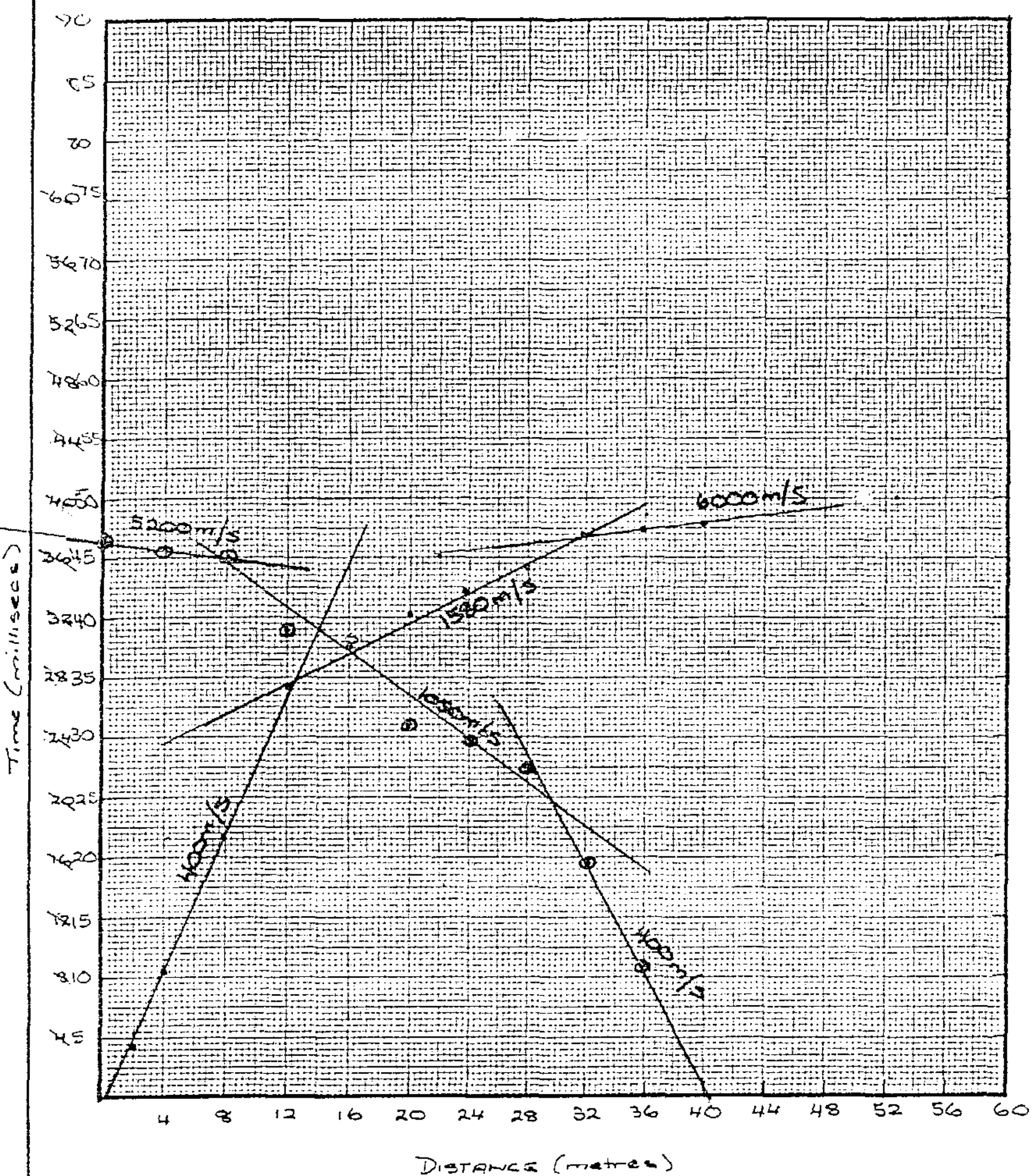
DWG No.

866094

BOAT HARBOUR

091 Seismic 50m Spread.	BOREHOLE No. T5
	DEPTH: SISTERS HILL
	SAMPLE No.

0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
–	–	4.3	10.6	21.6	34.3	37.5	40.1	42	44.2	47	47.5	47.8				
46	–	–	45.5	45	39	37.5	31.2	29.7	27.5	19.6	11	–				



TESTED: P.M.	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST. 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED	LM
DATE		
CHECKED:		

CERTIFIED BY:	NATA — THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA. THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION	JOB No.	DWG No.

866095

BOAT HARBOUR

092 SEISMIC 50m Spread.

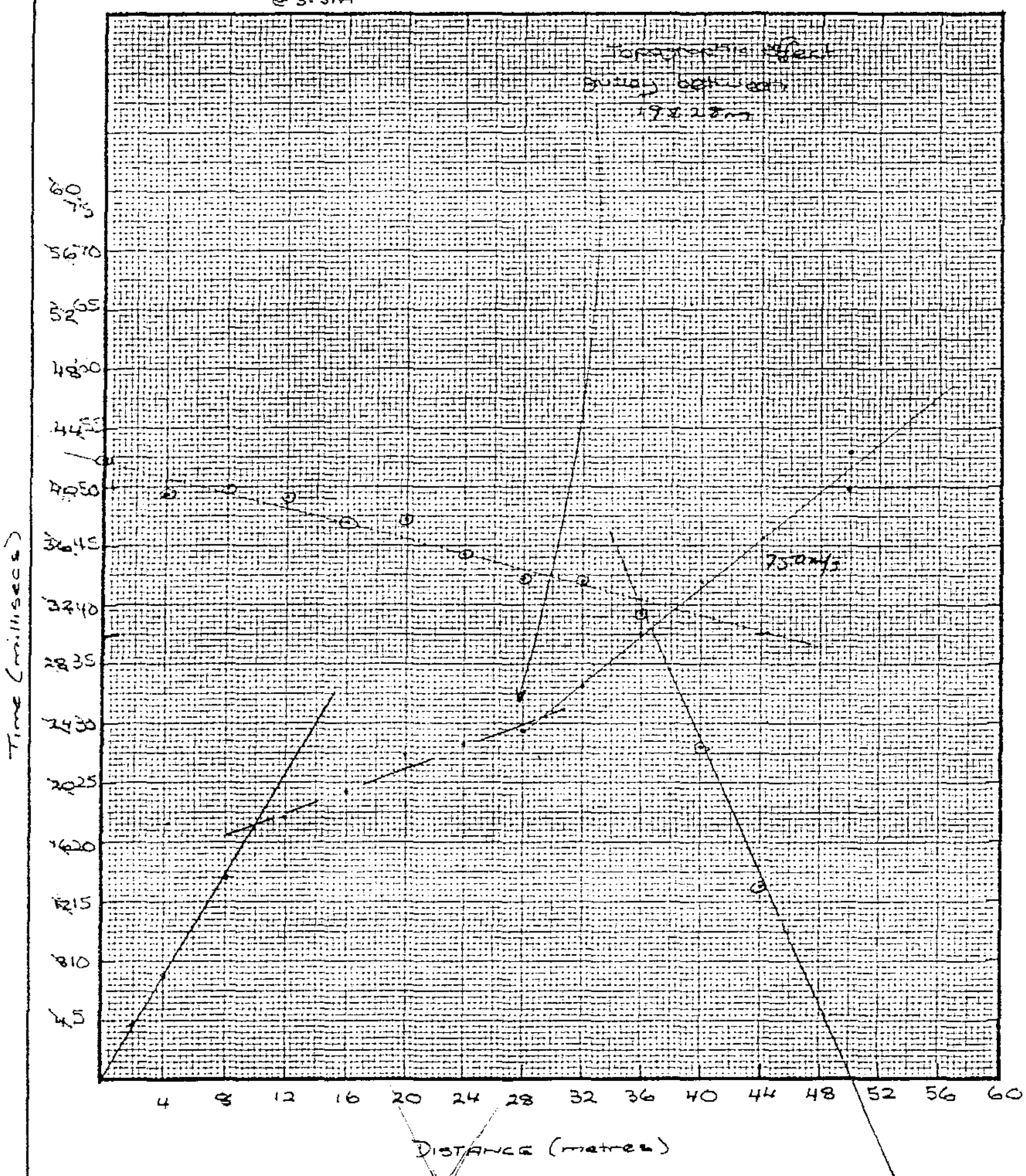
BOREHOLE No.	
DEPTH:	T6
SAMPLE No.	SISTERS HILL

0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
—	—	4.7	8.8	17.1	22.1	24.3	27.4	28.2	29.4	33.1	37.6	42	45.6	—	—	49.7
52.3	—	—	49.4	49.6	49.2	47.1	47.2	44.3	42.2	42	39.4	28	16.4	—	—	—

85/42 @ 3.5m

SISTERS HILL PIT.

test pit or borehole (unmarked) @ 50m



TESTED:	P.M.
DATE	
CHECKED:	
CERTIFIED BY:	

MATERIALS LABORATORY
3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.	DWG No.

866096

LUCOINYA 5/8/87

093

30m to 85/53

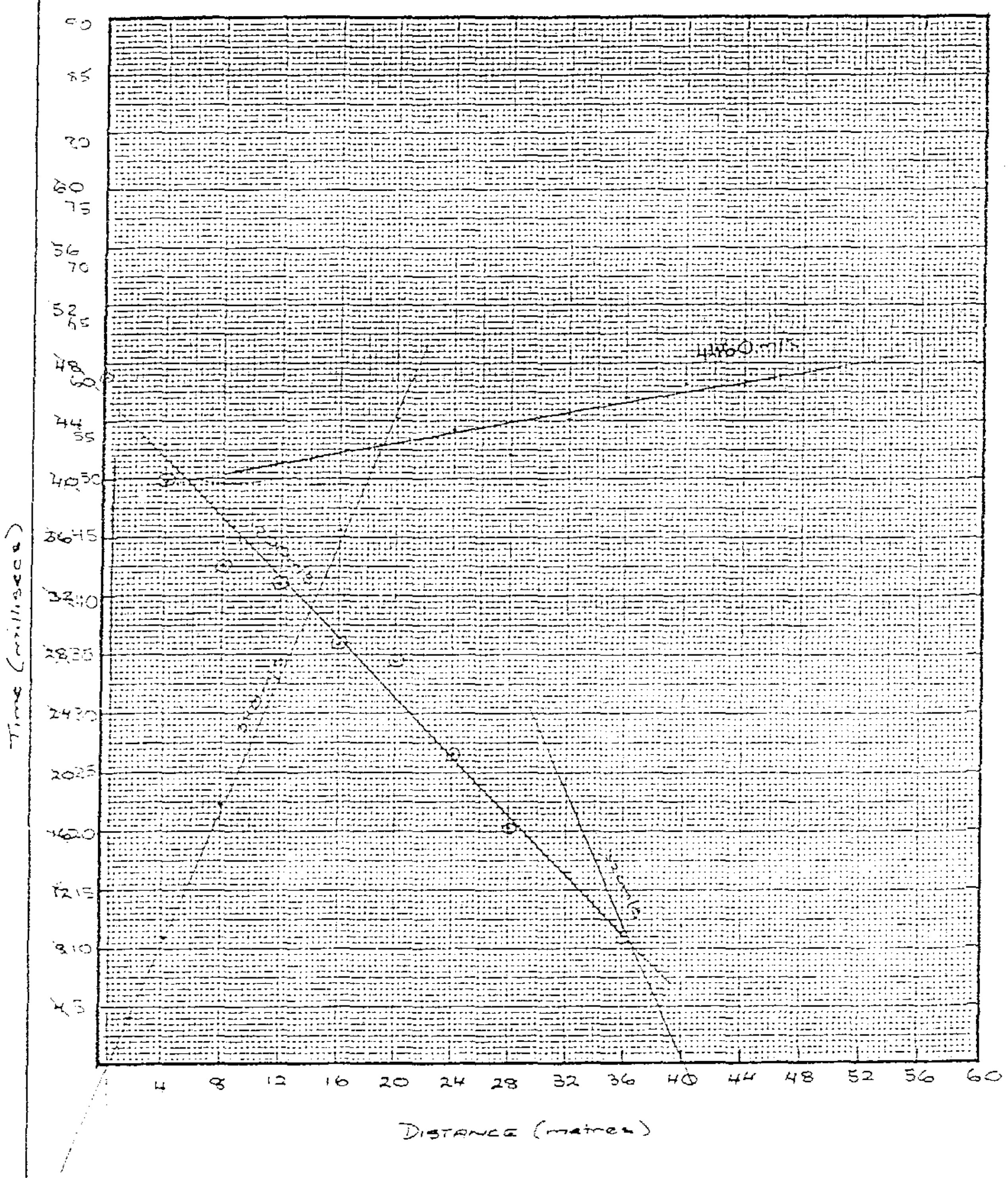
Seismic 50m Spread.

BOREHOLE No.

DEPTH: T1

SAMPLE No.

	0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
	–	–	4.1	11.0	22.4		45.6	55.4	54.2	52	55	57	58.3				
		–	—	50	42.5	41	35.8	34.6	26.5	20.2		11	–				



TESTED: P.M.

DATE

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY

3 EDEN STREET., CROWS NEST. 2065 TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

NATA

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.

DWG No

094

866097

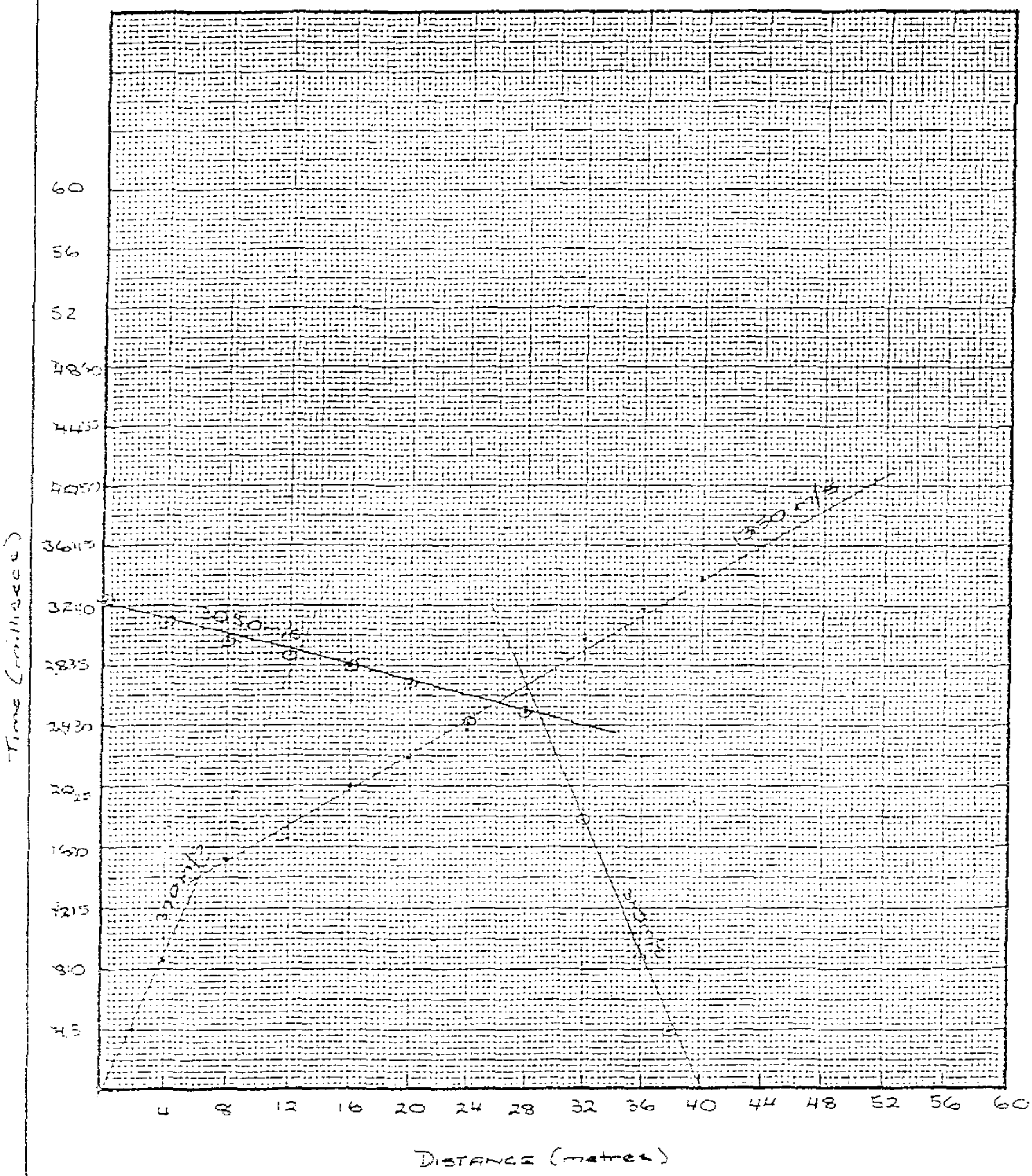
LAPOINYA

BOREHOLE No.	
DEPTH:	T2
SAMPLE No.	

Seismic 50m Spread.

3H 35/34 @ 6m. ([illegible] to hole)

0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	5
–	–	5	10.2	19	20.7	25.1	27.4	29.6	32.5	37.3	39.7	42				
40.5	–	–	38.5	37	35.8	34.9	33.5	30.2	31.2	22.2	5 / 11.1	–				



TESTED: PCT	MATERIALS LABORATORY
DATE	3 EDEN STREET., CROWS NEST. 2065 TELEPHONE: 929 0122
CHECKED:	LONGWORTH & McKENZIE PTY. LIMITED
CERTIFIED BY:	THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA. THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No. | DWG

866098

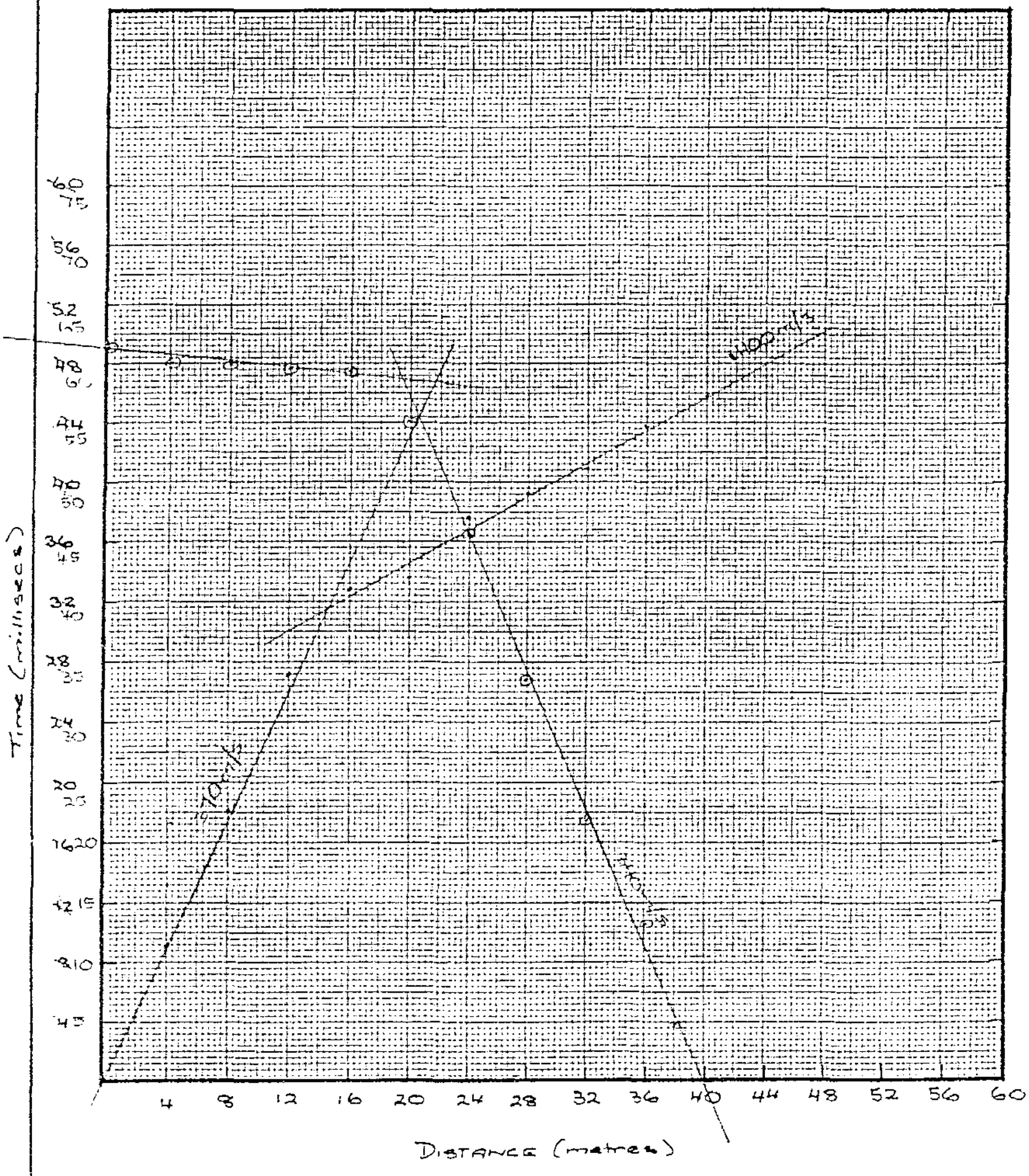
HARDINYUQ

095

Seismic 50m Spread.

BOREHOLE No.	
DEPTH:	
SAMPLE No.	T3

	0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
	—	—	5.3	11.4	22.6	34	41	42	47	49	51.1	55.7	57.4				
	61.5	—	—	60	59.7	59.5	59.5	55.2	45.7	34.2	21.8	13.6 / 11.6	—				



TESTED: P.M.	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED
DATE	
CHECKED:	

CERTIFIED BY:	THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION	JOB No.	DWG N

096 866099

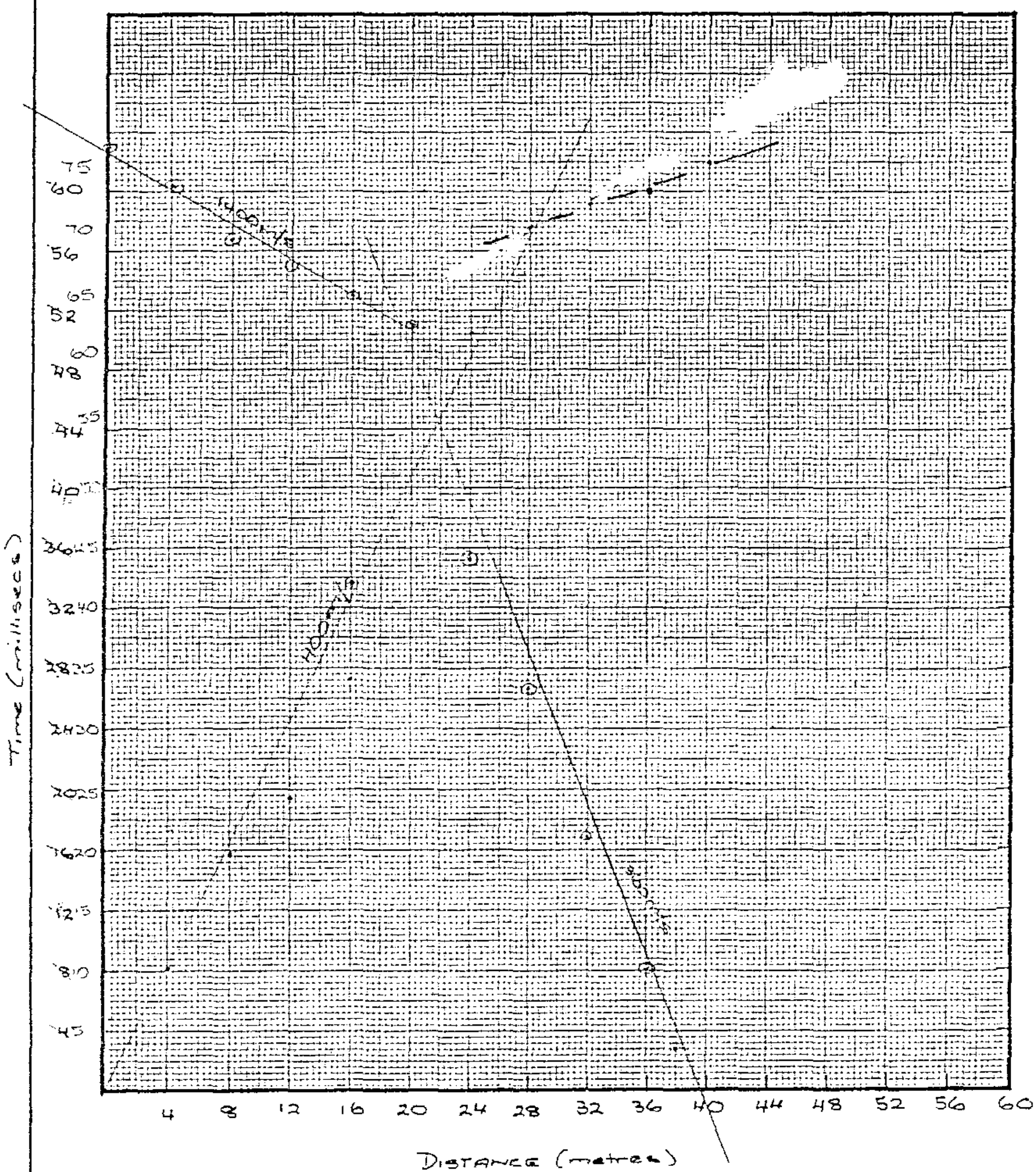
LAPOINYUA

Seismic 50m Spread.

PH 35/55 @ 21...

BOREHOLE No.	
DEPTH:	T4
SAMPLE No.	

	0	1	2	4	8	12	16	20	24	28	32	36	40	44	48	49	50
	–	–	5.3	10.1	19.7	24.2	34.1	?	63	72	74	75	77.5				
	76.3	—	—	75.6	71	68.7	66.4	64	44.4	33.4	21.4	102 3.5	—				



TESTED: P.M?	MATERIALS LABORATORY 3 EDEN STREET., CROWS NEST, 2065 TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED
DATE	
CHECKED:	
CERTIFIED BY:	THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION
JOB No.	DWG N

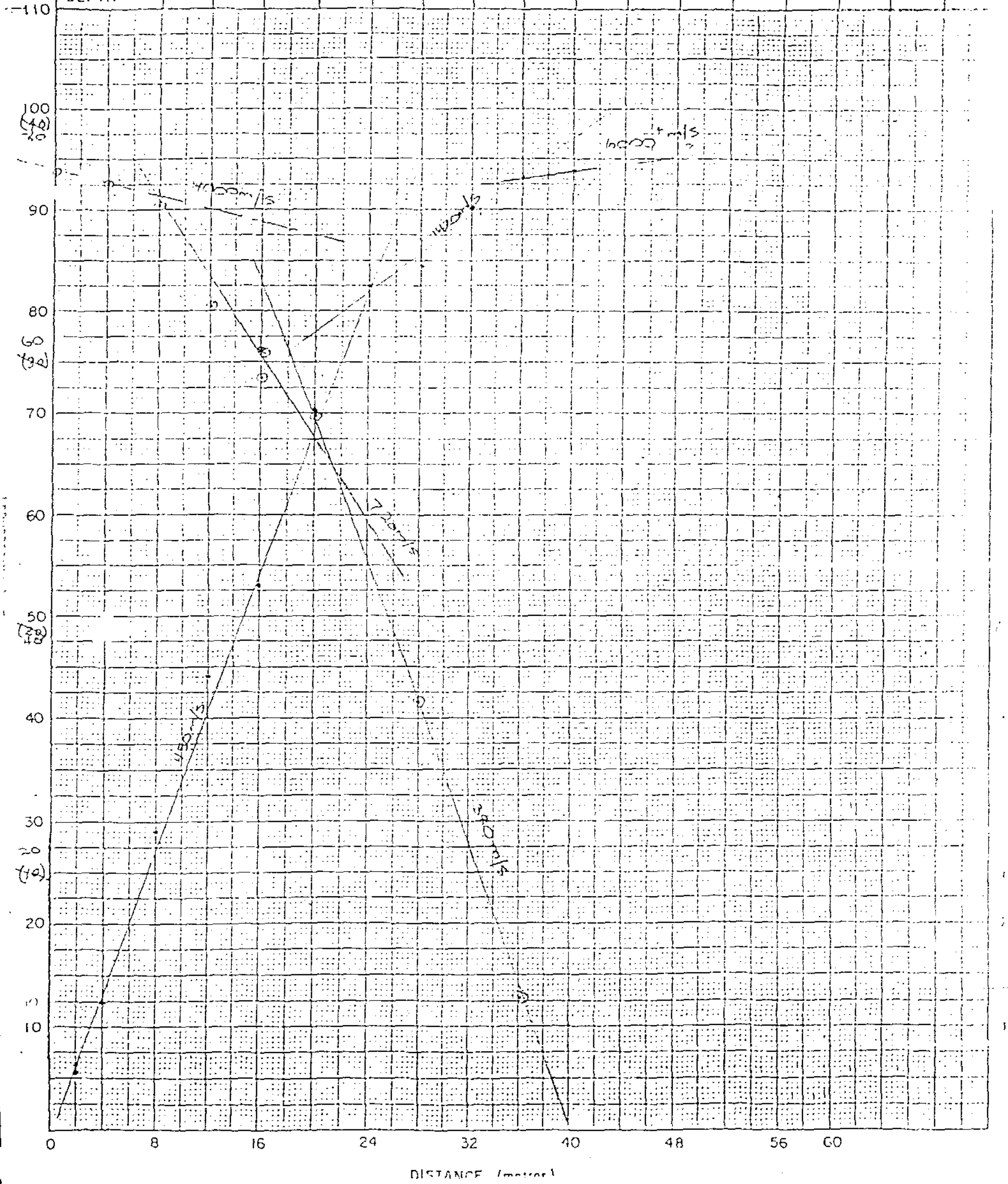
866100

SEISMIC SPREAD

Job No. [illegible]
Traverse No. T5
Date
Operator

097

DISTANCE	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	[illegible]
TIME	–	4.5/10	21.3	33.3	44.3	56.2	64	67.6	70.2	74.4	75					
	75	74	72.4	64.4	[illegible]	55.8	–	33.2	–	10.2	–					
TIME-DEPTH																
HAWKIN'S TIMES																
DEPTH																

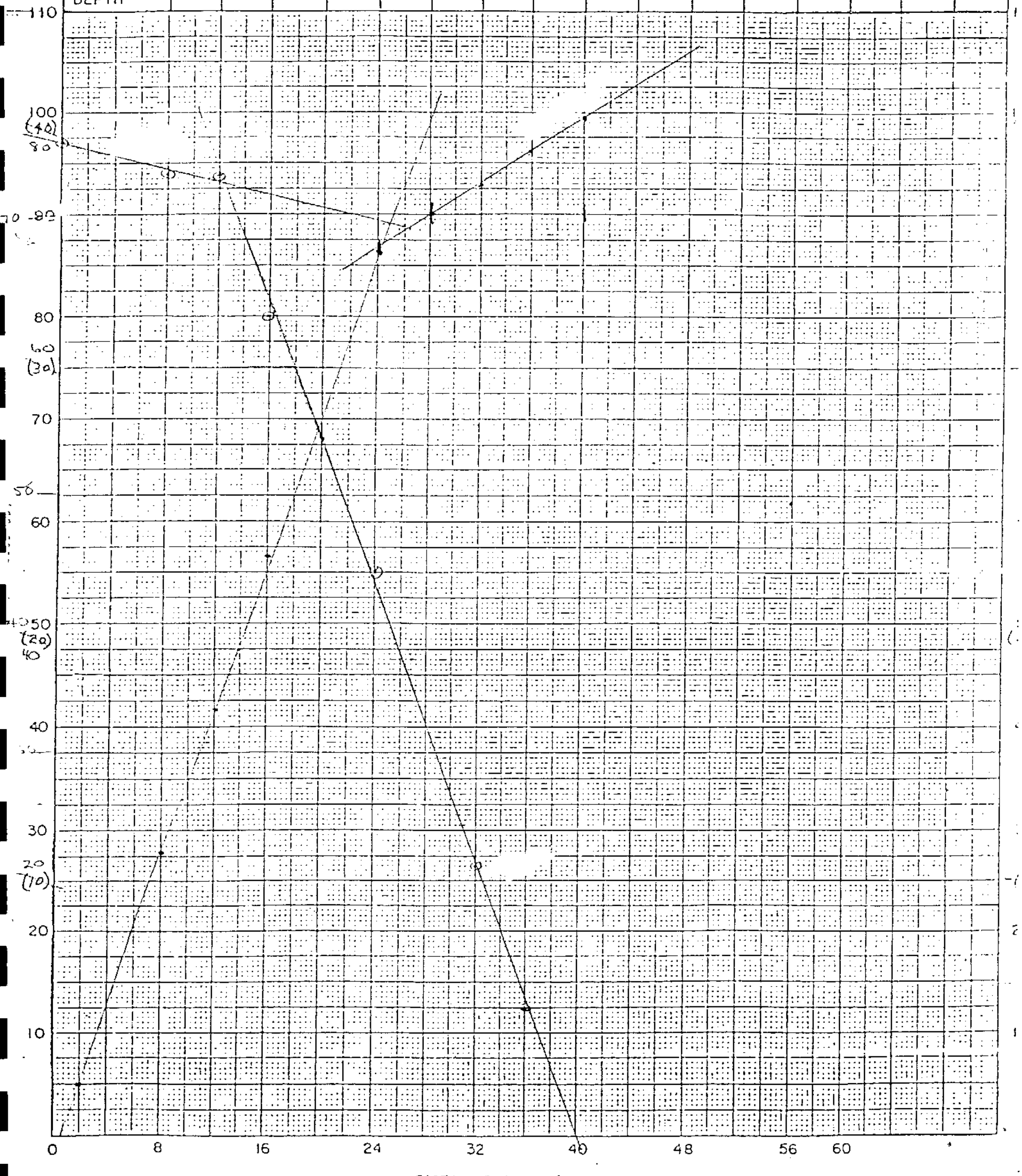


866101 SEISMIC SPREAD

85/57 @ 30m

Job No
Traverse No. T6
Date
Operator
LAPSINSA

DISTANCE	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
TIME	–	3.9/–	22.2	33.3	45.3	54.5	67	70	72.2	74.8	77.4					
098	77.7	–	75.1	75	64	–	44	–	21.4	9.9	–					
TIME-DEPTH																
HAWKIN'S TIMES																
DEPTH																



866102

FIGURE A.2.1 : DIAGRAMMATIC SECTIONS FROM INTERPRETATION OF SEISMIC RESULTS

APPENDIX A3

Chemical Test Results

CHEMICAL TESTING	TRIAL HOLE No.:
	DEPTH:
101	SAMPLE No.:

866104

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 28.7.87

LOCATION : Double Sandy Point Bridport

TEST RESULTS :

					HC1/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
1	1.0	11697	6600	1790		
1	2.0	11698	4200	1280		
1	3.0	11699	4300	1230		
1	4.0	11700	4150	1220		
1	5.0	11701	1410	1230		
*1	5.0	11701	1380	1230	110	130
2	1.0	11702	3100	640		
2	2.0	11703	2300	510		
2	3.0	11704	2450	400		
2	4.0	11705	2850	570		
2	5.0	11706	2450	500		
3	1.0	11707	3450	890		
3	2.0	11708	3100	700		
3	3.0	11709	3350	770		
3	4.0	11710	2800	540		
3	5.0	11711	3250	800		

* NOTE: REPEATED TEST

RJ. [signature]

TESTED: J.S.	MATERIALS LABORATORY
DATE: 27.8.87	3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
CHECKED: [initials]	LONGWORTH & McKENZIE PTY. LIMITED
CERTIFIED BY:	JOB No.: YLT0358 — DWG No.:

CHEMICAL TESTING

102

TRIAL HOLE No.:	
DEPTH:	
SAMPLE No.:	

866105

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 $HF/HClO_4$ AAS
TiO_2 $HF/HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 28.7.87

LOCATION : Noland Bay west of Bridport

TEST RESULTS :

CHANNEL SAMPLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm
2	1.0	11684	4850	1700
2	2.0	11683	6000	1670
2	3.0	11685	7250	700
2	4.0	11686	4750	1180
2	5.0	11687	4050	760
3	1.0	11688	4900	1170
3	2.0	11689	2550	650
3	3.0	11690	3550	910
3	4.0	11693	5000	1170
3	5.0	11694	4750	1080
AUGER HOLE				
4	1.0	11695	1780	340
4	2.0	11696	3950	1020

R.J. Smith

TESTED:	J.S.
DATE:	27.8.87
CHECKED:	JS
CERTIFIED BY:	

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.:	DWG No.:
YLT0358	

CHEMICAL TESTING	TRIAL HOLE No.:
103	DEPTH:
	SAMPLE No.:

866106

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 30.7.87

LOCATION : Naracoopa - King Island

TEST RESULTS :

					HCl/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
1	1.0	11712	820	2900		
1	1.5	11713	1210	1450		
2	1.0	11714	700	4300	60	210
3	0.8	11719	1690	2700		

R.J. Smith

TESTED: J.S.	**MATERIALS LABORATORY**	
DATE: 27.8.87	3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122	
CHECKED: JS	LONGWORTH & McKENZIE PTY. LIMITED	
CERTIFIED BY:	JOB No.: YLT0358	DWG No.:

CHEMICAL TESTING

104

TRIAL HOLE No.:
DEPTH:
SAMPLE No.:

866107

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 30.7.87

LOCATION : Currie - King Island

TEST RESULTS :

					HCl/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
1	1.0	11715	1230	1910		
1	2.0	11716	1080	1060		
2	1.0	11717	3000	4500		
2	1.5	11718	2800	3950		
3	1.0	11720	1290	1960		
3	2.0	11721	1610	2000		
4	1.2	11722	1820	2200		
5	1.0	11723	1710	2000		
5	2.0	11724	1090	1400		
5	2.5	11725	1090	1380		
6	1.0	11726	1210	1800		
6	1.5	11727	1380	1940		
6	2.0	11728	1300	1880		
7	1.0	11729	6050	860		
7	2.0	11730	5850	810		
7	3.0	11731	5300	790		
7	4.0	11732	5150	800		
7	5.0	11733	5150	790		
8	1.2	11734	385	970	105	170

R. [signature]

TESTED: J.S.
DATE: 27.8.87
CHECKED: [initials]
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358

DWG No.:

CHEMICAL TESTING	TRIAL HOLE No.:
105	DEPTH:
	SAMPLE No.:

866108

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 31.7.87

LOCATION : King Island Big Lake Area

TEST RESULTS :

					HCl/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
1	1.0	11671	550	970	260	270
1	2.0	11672	1010	1240		
1	3.0	11673	1000	1800		
1	4.0	11674	840	1400		
1	5.0	11675	1040	1400		
2	1.0	11676	970	1300		
2	2.5	11677	4000	2600		
3	1.5	11678	620	2800		

TESTED: J.S.
DATE: 27.8.87
CHECKED: [signature]
CERTIFIED BY: [signature]

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358
DWG No.:

CHEMICAL TESTING

TRIAL HOLE No.:	
DEPTH:	
SAMPLE No.:	

866109

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 31.7.87

LOCATION : King Island Red Hut Road

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	HC1/TBE Treatment Fe_2O_3 ppm	HC1/TBE Treatment TiO_2 ppm
1	1.0	11680	1200	2100		
1	2.0	11681	1170	1900	85	130
1	3.0	11682	1960	1880		

R J Lth

TESTED: J.S.
DATE: 27.8.87
CHECKED: gs
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358
DWG No.:

101

CHEMICAL TESTING	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

866110

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 2.8.87

LOCATION : Strahan - West Tasmania

TEST RESULTS :

					HC1/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
2	1.0	11788	1470	160		
2	2.0	11787	1360	160		
2	3.0	11786	1220	190		
2	4.0	11785	1220	190		
2	5.0	11784	1220	190		
3	1.0	11783	2920	380		
3	2.0	11782	3130	430		
3	3.0	11781	3350	420		
3	4.0	11780	3350	430		
4	1.0	11779	2950	400		
4	2.0	11778	2220	470		
4	3.0	11777	2950	410		
4	4.0	11776	3150	400		
4	5.0	11775	3300	440		
9A	1.0	11774	730	360		
9A	2.0	11773	500	380	215	160
9A	3.0	11772	1480	510		
9A	4.0	11771	1920	380		
9A	5.0	11770	2370	390		
11	1.0	11769	440	200		
11	1.5	11768	450	220	235	150

R J [signature]

TESTED: J.S.	MATERIALS LABORATORY	
DATE: 27.8.87	3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122	
CHECKED: JS	LONGWORTH & McKENZIE PTY. LIMITED	
CERTIFIED BY:	JOB No.: YLT0358	DWG No.:

108

CHEMICAL TESTING

TRIAL HOLE No.:

DEPTH:

SAMPLE No.:

866111

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 3.8.87

LOCATION : Calder Pit Floor Sample

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	HCl/TBE Treatment Fe_2O_3 ppm	HCl/TBE Treatment TiO_2 ppm
A	-	11792	500	880	145	200
B	-	11791	390	850	135	260

TESTED: I.S.
DATE: 27.8.87
CHECKED: [signature]
CERTIFIED BY: [signature]

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358

DWG No.:

109

CHEMICAL TESTING	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

866112

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 5.8.87

LOCATION : Hellyer Siding

TEST RESULTS :

					HCl/TBE Treatment	
AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	Fe_2O_3 ppm	TiO_2 ppm	Fe_2O_3 ppm	TiO_2 ppm
A	-	11737	265	800	125	290
B	-	11740	270	690		

R J. [signature]

TESTED: J.S.	MATERIALS LABORATORY 3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122 LONGWORTH & McKENZIE PTY. LIMITED		
DATE: 27.8.87			
CHECKED: [initials]			
CERTIFIED BY:		JOB No.: YLT0358	DWG No.:

110

CHEMICAL TESTING	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

866113

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : Fe_2O_3 HF/$HClO_4$ AAS
TiO_2 HF/$HClO_4$ Colourmetric

SAMPLE INFORMATION :

DATE OF SAMPLING : 3.8.87

LOCATION : Pokes Road

TEST RESULTS :

AUGER HOLE	Fe_2O_3 ppm	TiO_2 ppm
A	720	310
B	1140	470

NOTE: AUGER HOLE A LABORATORY SAMPLE NO. 11790
AUGER HOLE B LABORATORY SAMPLE NO. 11789

R. J. Smith

TESTED: J.S.	**MATERIALS LABORATORY**
DATE: 27.8.87	3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
CHECKED: JS	LONGWORTH & McKENZIE PTY. LIMITED
CERTIFIED BY:	JOB No.: YLT0358 — DWG No.:

APPENDIX A4

Gradings

112

PARTICLE SIZE DISTRIBUTION TEST REPORT	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

866115

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 28.7.87

LOCATION : Noland Bay west of Bridport

TEST RESULTS :

CHANNEL SAMPLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE						
			2.36	1.18	0.600	0.425	0.300	0.150	0.075
2	1.0	11684	100	100	99	89	47	1	0
2	2.0	11683	100	100	99	88	41	2	1
2	3.0	11685	100	100	97	84	50	3	1
2	4.0	11686	100	100	99	88	51	2	0
2	5.0	11687	100	100	100	92	63	2	0
3	1.0	11688	100	100	99	87	46	1	0
3	2.0	11689	100	100	97	81	42	1	0
3	3.0	11690	100	100	99	86	47	1	0
3	4.0	11693	100	100	98	87	48	2	0
3	5.0	11694	100	100	98	86	44	0	0
AUGER HOLE									
4	1.0	11695	100	100	96	77	40	1	0
4	2.0	11696	100	99	98	91	75	12	2

TESTED: F.W.

DATE: 13.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

113

866116

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:

DEPTH:

SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 31.7.87

LOCATION : King Island Red Hut Road

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE						
			2.36	1.18	0.600	0.425	0.300	0.150	0.075
1	1.0	11680	100	100	100	97	70	7	4
1	2.0	11681	100	100	100	95	59	3	1
1	3.0	11682	100	100	100	97	67	3	1

TESTED: F.W.

DATE: 11.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358

DWG No.:

114

866117

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:
DEPTH:
SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 3/8/87

LOCATION : POKES ROAD

TEST RESULTS :

AUGER	% PASSING mm SIZE SIEVE										
HOLE	19.0	9.5	6.7	4.75	2.36	1.18	0.600	0.425	0.300	0.150	0.075
A	96	95	94	93	91	90	87	78	60	24	9
B	100	97	96	95	93	92	88	79	62	26	10

NOTE: AUGER HOLE A LABORATORY SAMPLE NO. 11790
AUGER HOLE B LABORATORY SAMPLE NO. 11789

TESTED: F.W.
DATE: 19.8.87
CHECKED:
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

115

866118

PARTICLE SIZE DISTRIBUTION TEST REPORT	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 28/7/87

LOCATION : DOUBLE SANDY POINT BRIDPORT

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE 2.36	1.18	0.600	0.425	0.300	0.150	0.075
1	1.0	11697	100	100	97	76	41	4	0
1	2.0	11698	100	100	97	79	44	3	0
1	3.0	11699	100	100	99	89	46	2	0
1	4.0	11700	100	100	97	81	51	3	0
1	5.0	11701	100	100	98	90	74	25	7
*1	5.0	11701	100	100	98	90	74	25	8
2	1.0	11702	100	100	98	85	49	1	0
2	2.0	11703	100	100	98	56	22	0	0
2	3.0	11704	100	100	98	68	29	3	3
2	4.0	11705	100	100	97	69	29	1	0
2	5.0	11706	100	100	97	66	26	1	0
3	1.0	11707	100	100	97	80	52	2	0
3	2.0	11708	100	100	98	87	60	2	0
3	3.0	11709	100	100	100	85	59	3	1
3	4.0	11710	100	100	97	80	48	1	0
3	5.0	11711	100	99	96	83	56	10	5

* NOTE: REPEATED TEST

TESTED: F.W.
DATE: 19.8.87
CHECKED:
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

JOB No.: YLT0358

DWG No.:

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:
DEPTH:
SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 5/8/87

LOCATION : HELLYER SIDING

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE						
			2.36	1.18	0.600	0.425	0.300	0.150	0.075
A	-	11737	100	100	100	100	97	33	1
B	-	11740	100	100	100	100	99	43	2

TESTED: F.W.
DATE: 19.8.87
CHECKED:
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

NATA
THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No

866120

117 PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:
DEPTH:
SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 31/7/87

LOCATION : KING ISLAND BIG LAKE AREA

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE 2.36	1.18	0.600	0.425	0.300	0.150	0.075
1	1.0	11671	100	100	99	97	90	9	1
1	2.0	11672	100	100	99	95	87	6	1
1	3.0	11673	100	100	100	98	92	10	3
1	4.0	11674	100	100	99	97	91	12	3
1	5.0	11675	100	100	100	97	89	10	3
2	1.0	11676	100	100	100	98	92	7	1
2	2.0	11679	100	100	99	97	91	16	7
2	2.5	11677	100	100	99	98	92	6	3
3	1.5	11678	100	100	99	97	87	19	7

TESTED: F.W.
DATE: 19.8.87
CHECKED:
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

866121

118 PARTICLE SIZE DISTRIBUTION TEST REPORT	TRIAL HOLE No.: DEPTH: SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 30/7/87

LOCATION : NARACOOPA - KING ISLAND

TEST RESULTS :

AUGER	DEPTH	LABORATORY	% PASSING mm SIZE SIEVE						
HOLE	M	SAMPLE NO.	2.36	1.18	0.600	0.425	0.300	0.150	0.075
1	1.0	11712	100	100	100	97	73	7	4
1	1.5	11713	100	100	100	97	68	5	2
2	1.0	11714	100	100	98	94	78	37	22
3	0.8	11719	100	99	92	79	64	30	13

TESTED: F.W.
DATE: 19.8.87
CHECKED:
CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No

866122

119

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:

DEPTH:

SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 30/7/87

LOCATION : CURRIE - KING ISLAND

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE 2.36	1.18	0.600	0.425	0.300	0.150	0.075
1	1.0	11715	100	100	96	90	83	24	4
1	2.0	11716	100	100	99	95	89	20	4
2	1.0	11717	100	100	91	81	72	18	5
2	1.5	11718	100	100	91	82	72	17	5
3	1.0	11720	100	100	98	96	90	23	5
3	2.0	11721	100	100	99	96	91	27	7
4	1.2	11722	100	100	97	90	82	18	4
5	1.0	11723	100	100	89	75	62	7	2
5	2.0	11724	100	100	96	88	78	16	3
5	2.5	11725	100	100	97	88	77	20	2
6	1.0	11726	100	100	72	47	35	9	2
6	1.5	11727	100	99	73	50	38	8	2
6	2.0	11728	100	99	76	51	38	8	3
7	1.0	11729	100	100	83	54	31	5	1
7	2.0	11730	100	100	80	47	27	4	1
7	3.0	11731	100	100	80	52	32	6	1
7	4.0	11732	100	99	77	47	29	4	1
7	5.0	11733	100	99	79	49	30	6	1
8	1.2	11734	100	100	97	94	91	37	2

TESTED: F.W.

DATE: 19.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

NATA

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

120

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:

DEPTH:

SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 2/8/87

LOCATION : STRAHAM - WEST TASMANIA

TEST RESULTS :

AUGER	DEPTH	LABORATORY	% PASSING mm SIZE SIEVE						
HOLE	M	SAMPLE NO.	2.36	1.18	0.600	0.425	0.300	0.150	0.075
2	1.0	11788	100	100	92	59	27	0	0
2	2.0	11787	100	100	92	50	7	0	0
2	3.0	11786	100	100	100	67	32	0	0
2	4.0	11785	100	100	92	56	17	0	0
2	5.0	11784	100	100	95	71	35	0	0
3	1.0	11783	100	100	100	100	100	45	1
3	2.0	11782	100	100	100	100	100	32	4
3	3.0	11781	100	100	100	100	100	42	5
3	4.0	11780	100	100	100	100	100	35	1
4	1.0	11779	100	100	100	100	100	31	3
4	2.0	11778	100	100	100	100	100	33	3
4	3.0	11777	100	100	100	100	100	31	2
4	4.0	11776	100	100	100	100	100	39	3
4	5.0	11775	100	100	100	100	100	36	2
9A	1.0	11774	100	100	100	99	96	8	1
9A	2.0	11773	100	100	100	100	100	7	1
9A	3.0	11772	100	100	100	100	98	9	1
9A	4.0	11771	100	100	100	99	96	7	2
9A	5.0	11770	100	100	100	99	95	5	1
11	1.0	11769	100	100	99	96	85	6	3
11	1.5	11768	100	100	100	98	91	4	1

TESTED: F.W.

DATE: 19.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY

3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122

LONGWORTH & McKENZIE PTY. LIMITED

NATA

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

PARTICLE SIZE DISTRIBUTION TEST REPORT

TRIAL HOLE No.:

DEPTH:

SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING : 3/8/87

LOCATION : CALDER PIT FLOOR SAMPLE

TEST RESULTS :

AUGER HOLE	DEPTH M	LABORATORY SAMPLE NO.	% PASSING mm SIZE SIEVE						
			2.36	1.18	0.600	0.425	0.300	0.150	0.075
A	-	11792	97	93	72	42	21	13	10
B	-	11791	97	92	69	36	15	8	6

TESTED: F.W.

DATE: 19.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY

3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122

LONGWORTH & McKENZIE PTY. LIMITED

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

122

866125

PARTICLE SIZE DISTRIBUTION TEST REPORT	TRIAL HOLE No.:
	DEPTH:
	SAMPLE No.:

PROJECT : Tasmania - Glass Sands

CLIENT : Monier Limited

TEST METHOD : AS1289 C6.1.4.4 1977 (Washed Sieve)

SAMPLE INFORMATION :

DATE OF SAMPLING :

LOCATION : 00 22 00

TEST RESULTS :

AUGER	DEPTH	LABORATORY	% PASSING mm SIZE SIEVE						
HOLE	M	SAMPLE NO.	2.36	1.18	0.600	0.425	0.300	0.150	0.075
-	-	11741	100	100	100	97	72	1	0

TESTED: F.W.

DATE: 19.8.87

CHECKED:

CERTIFIED BY:

MATERIALS LABORATORY
3 EDEN STREET, CROWS NEST, 2065. TELEPHONE: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

NATA

THIS LABORATORY IS REGISTERED BY THE NATIONAL ASSOCIATION OF TESTING AUTHORITIES AUSTRALIA
THE TESTS REPORTED HEREIN HAVE BEEN PERFORMED IN ACCORDANCE WITH ITS TERMS OF REGISTRATION

JOB No.: YLT0358

DWG No.:

APPENDIX A5

General Notes

124

866127

GENERAL NOTES

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

GENERAL

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the introduction section(s) of the document. The report should not be used by other parties or for other purposes as it may not contain adequate or appropriate information.

TEST HOLE LOGGING

The information on the Test Hole Logs (Boreholes, Backhoe Pits, Exposures etc.) has been based on a visual and tactile assessment except at the discrete locations where test information is availble (field and/or laboratory results).

Reference should be made to our standard sheets for the definition of our logging procedures (Soil and Rock Descriptions).

GROUNDWATER

Unless otherwise indicated the water levels given on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities. Further variations of this level could occur with time due to such effects as seasonal and tidal fluctuations or construction activities. Final confirmation of levels can only be made by appropriate instrumentation techniques.

INTERPRETATION OF RESULTS

The discussion and any recommendations contained within this report are normally based on a site evaluation from discrete test hole data. Generalised or idealised subsurface conditions (including any cross-sections contained in the report) have been assumed or prepared by interpolation/extrapolation of these data. As such these conditions are an interpretation and must be considerd as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in the generalised ground conditions used for this report can occur, particularly between discrete test hole locations. Furthermore, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site.

Any change in conditions in design/construction, or in ground conditions as noted during construction, from those assumed in this report should be referred to this firm for appropriate assessment and comment.

FOUNDATION DEPTH

Where referred to in the report, the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate of the depth to which they should be constructed. The estimate is limited by the field work method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The depth remains, however, an 'estimate' and therefore liable to variation. Foundation drawings, designs and specifications based upon this report should provide for variations in the final depth depending upon the ground conditions at each point of support.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in this report for the inclusion in the contract documents or engineering specification of the subject development, such reproductions should include at least all of the relevant trial hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature.

866128

125

CORE LOG SHEET NOTES

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

GENERAL

The intention of Core Log Sheets is to present factual information measured from the core or as recorded in the field. Some interpretative information is inevitable in the location of core loss, description of weathering and identification of drilling induced fractures. This should be noted in the use of Core Log Sheets and remembered in their utilisation.

PROGRESS

Drilling and Casing

The types of drilling used to advance the drill hole are recorded for relevant intervals. The types of drilling may include : NMLC coring, NQTT (NQ triple tube wire line), HW, HX, NW & NX casing, wash boring (tri-cone roller bit, TC drag bit, TC blade bit), or auger drilling (V-bit, TC drag bit).

The relevant progress is shown by abbreviated dates in the column.

WATER

Water lost or water made during drilling is recorded and subsequent readings of water levels in the borehole or piezometers are recorded here with dates of observation.

DRILL DEPTH (CORE LOSS)

Drilling intervals are shown by depth increments and full horizontal marker lines. Core loss is shown in brackets and is measured as a percentage of the drill run. If the location of the core loss is known or strongly suspected, it is shown in a region of the column bounded by dashed horizontal lines. If unknown, core loss is assigned to the bottom of a coring run.

SAMPLES & FIELD TESTS

The location of samples taken for testing or the location of field tests are indicated by the appropriate symbol from the GLOSSARY OF SYMBOLS Standard Sheet (or as applicable for the project) and are shown at the relevant location or over the relevant depth interval.

DEPTH (RL)

Changes in rock types or the locations of piezometer tips, samples, test intervals or other depths are shown as appropriate.

STRATA

Rock types are presented graphically using the symbols shown on the GLOSSARY OF SYMBOLS Standard Sheet or as assigned for the project.

DESCRIPTION

The rock type is described in accordance with the ROCK DESCRIPTION Standard Sheet.

WEATHERING

Weathering is described, by code letters, in accordance with the ROCK DESCRIPTION Standard Sheet. A weathering term or range of terms is usually assigned to various strata.

It is noted, however, that the assignment of a term of weathering is subjective and is normally used for identification and does not imply engineering behaviour (such behaviour being controlled principally by rock substance strength and defect frequency - collectively, rock mass strength). Consequently, boundaries are often not shown and weathering may even not be reported where potentially misleading.

ESTIMATED STRENGTH

The strength of the rock substance is estimated by a combination of Point Load testing and tactile appraisal in accordance with the ROCK DESCRIPTION Standard Sheet. The estimated strength is presented in a histogram form. Both axial and diametric point load test results can be presented using the symbols on the GLOSSARY OF SYMBOLS Standard Sheet and the variation between axial and diametric is indicative of anisotropy or fissility of the rock unit.

NATURAL FRACTURES

The identification of natural fractures requires an endeavour to exclude drilling induced breaks in the core and, as such, can be somewhat subjective. Natural fractures exist prior to coring the rock, whereas artificial fractures occur either during coring, during placing core in the core boxes, or during examination of core after being boxed.

The log of Natural Fractures is presented as a combination of Fracture Spacing, Visual and Description. The spacing excludes bedding partings (unless there is evidence that separation of the partings was present prior to drilling) and is presented as a histogram. The creation of the histogram is also somewhat subjective. The visual log is presented with some artistic license and the additional data is presented using coding for brevity. The coding is presented on the GLOSSARY OF SYMBOLS Standard Sheet. Where fractures are suspected to be drilling induced, but this is not conclusive, the fracture is shown dashed in the visual log and noted accordingly.

LABORATORY TESTING

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

126

GENERAL

Samples extracted during the fieldwork stage of a site investigation may be 'disturbed' or 'undisturbed' (as generally indicated on the trial hole logs) depending upon the nature and purpose of the sample as well as the method of extraction. Nominally 'undisturbed' samples may suffer a varying degree of disturbance during extraction, transportation, extrusion and testing. This aspect should be taken into account when assessing test results which must of necessity reflect the effects of such disturbance.

All soil properties (as measured by laboratory testing) exhibit inherent variability and thus a certain statistical number of tests is required in order to predict an average property with any degree of confidence. The site variability of soil strata, future changes in moisture and other conditions and the discrete sampling positions must also be considered when assessing the representative nature of the laboratory programme.

Certain laboratory test results provide interpreted soil properties as derived by conventional mathematical procedures. The applicability of such properties to engineeering design must be assessed with due regard to the site, sample condition, procedure and project in hand.

TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 (1977) as amended, or DMR Standards when specified. The routine Australian Standard tests are as follows :

Sample Preparation	Test A2	
Moisture Content	Test B1.1	
Liquid Limit	Test C1.1)	
Plastic Limit	Test C2.1)	collectively known as Atterberg Limits
Plasticity Index	Test C3.1)	
Linear Shrinkage	Test C4.1	
Particle Density	Test C5.1	
Particle Size Distribution	Tests C6.1, C6.2 & C6.3	
Emerson Class Number	Test C8.1)	
Percent Dispersion	Test C8.2)	collectively, Dispersive Classification
Pinhole Dispersion Classification	Test C8.3)	
Organic Matter	Test D1.1	
Sulphate Content	Test D2.1	
pH Value	Test D3.1	
Resistivity	Test D4.1	
Standard Compaction	Test E1.1	
Modified Compaction	Test E2.1	
Dry Density Ratio	Test E4.1	
Minimum Density	Test E5.1	
Density Index	Test E6.1	
California Bearing Ratio	Tests F1.1, F1.2	
Undrained Triaxial Shear	Test F4.1	
One Dimensional Consolidation	Test F6.1	
Constant Head Permeability	Test F7.1	

Where tests are used which are not covered by appropriate standard procedures, details are given in the report.

LABORATORY

Our laboratory is a Registered Laboratory in the terms of registration with the National Association of Testing Authorities (NATA) for the listed tests.

The oedometer, triaxial and shear box equipment are fully automated for continuous operation using computer controlled data acquisition, processing and plotting systems.

127

866130

ROCK DESCRIPTION

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

This method is based on AS1726 Appendix D and is orientated to the field logging of diamond drill core but may be used for the profiling of natural exposures and cuttings as applicable. The procedure involves a visual and tactile assessment of the rock mass and the nature of defects in order to facilitate a prediction of engineering behaviour.

DESCRIPTION: Rock Type is described on the basis of origin (sedimentary, pyroclastic, metamorphic and igneous) with the common types listed below:

Sedimentary			Pyroclastic	Metamorphic	Igneous				
clastic	non clastic (chemical)	non clastic (organic)				Acid	Intermediate		Basic
			tuff	slate					
			agglomerate	phyllite	Extrusive	Rhyolite	Trachyte	Andesite	Basalt
			volcanic breccia	schist					
conglomerate	limestone	coal		quartzite	Intrusive	Quartz			
sandstone	chert	some limestone		gneiss	(med. grained)	porphyry	Porphyry	Porphyrite	Dolerite
siltstone	gypsum								
claystone	salt				(coarse grained)	Granite	Syenite	Diorite	Gabbro
shale									

Colour is given to assist in rock identification and the interpolation of field data. Colour is usually described at as-received moisture condition, though both wet and dry colours may also be appropriate.

Texture refers to the degree of crystallinity and granularity (grain size) and the fabric relationship between the constituents of a rock. Often only grain size is given for simplified descriptions of certain sedimentary rocks.

Structure and texture are commonly used synonymously in describing rocks since there is no clear delineation between terms. In general, structure refers to large scale features recognisable in the field (banding, lineation, massive, porphyritic, schistose etc.). For sedimentary rocks in particular, the thickness of sedimentary layering (bedding) is described as:

thinly laminated	- 6 mm	very thinly bedded	20 - 60 mm	medium bedded	0.2 - 0.6 m	very thickly bedded	+ 2 m
laminated	6 - 20 mm	thinly bedded	60 - 0.2 m	thickly bedded	0.6 - 2 m		

In addition, mineral composition, hardness, alteration, cementation is given as applicable.

WEATHERING The assignment of weathering is somewhat subjective. Weathering assists identification and does not imply engineering behaviour. No distinction is drawn between chemical weathering and alteration for most engineering purposes. These procedures are collectively described as 'weathering' using the following terms which do not describe the related strength change. Carbonate rocks generally do not conform to this classification.

Term	Symbol	Definition
Completely Weathered	CW	Residual soil with rock fabric not visible.
Extremely Weathered	EW	The rock exhibits soil-like properties though the texture of the original rock is still evident.
Highly Weathered	HW	Limonite staining or colour change affects the whole of the rock mass and other signs of chemical or physical decomposition are evident.
Moderately Weathered	MW	Staining extends throughout the whole of the rock mass and the original colour is not longer recognisable.
Slightly Weathered	SW	Partial staining or discolouration of the rock mass, usually by limonite, has taken place.
Fresh	F	Rock mass unaffected by weathering.

ESTIMATED STRENGTH This refers to the strength of the rock substance and not that of the rock mass. The strength of the rock substance is estimated by the Point Load Strength Index I_s (50) and refers to the strength measured in the direction normal to the bedding for sedimentary rocks. A field guide is given below:

Term	Symbol	I_s (50) MPa	Field Guide (The Core refers to a 150 mm long x 50 mm dia. sample)
Extremely Weak	EW		Remoulded by hand to a material with soil properties.
		0.03	
Very Weak	VW		May be crumbled in the hand. Sandstone is 'sugary' and friable.
		0.1	
Weak	W		The core may be broken by hand and easily scored with a knife. Sharp edges or core may be friable and break during handling.
		0.3	
Medium Strong	MS		The core may be broken by hand with considerable difficulty. Readily scored with knife.
		1.0	
Strong	S		The core cannot be broken by unaided hands, can be slightly scratched or scored with knife.
		3.0	
Very Strong	VS		The core may be broken readily with hand held hammer. Cannot be scratched with knife.
		10.0	
Extremely Strong	ES		The core is difficult to break with hand held hammer. Rings when struck with a hammer.

DEFECTS This important feature can control the overall engineering behaviour of a rock mass. All types of natural fractures across which the core is discontinuous are noted. These fractures include bedding plane partings, joints and other defects but exclude artificial fractures such as drilling breaks. The nature of the defects (joints, partings, seams, zones and veins) is also noted with description, orientation, infilling or coating, shape, roughness, thickness, etc. given generally in accordance with AS1726 Table D2. The spacing of natural fractures excludes bedding partings unless there is evidence that they were separated prior to drilling. This notwithstanding, bedding partings may be considered as points of weakness in an engineering assessment.

SOIL DESCRIPTION

Consulting Geotechnical Engineers
3 Eden Street, Crows Nest 2065 Telephone: 929 0122
LONGWORTH & McKENZIE PTY. LIMITED

This procedure involves the description of a soil in terms of its visual and tactile properties, and relates to both laboratory samples and field exposures as applicable. A detailed soil profile description, in associaton with local geology and experience, will facilitate the initial (and often complete) site assessment for engineering purposes.

The method involves an evaluation of each of the items listed below and is in general agreement with both the Site Investigation Code AS 1726 Appendix D and ASTM D2487-83 & D2488-83.

MOISTURE

The moisture condition of the soil is most applicable for cohesive soils as a precursor to the assessment of consistency and workability. The moisture condition is described as :

Dry (dusty, dry to the touch) Slightly Moist Moist (damp, no visible water) Very Moist or Wet (visible free water, saturated condition)

In addition, the presence of any seepage or free water is noted on all test hole logs.

COLOUR

Colour is important for correlation of data between test holes and for subsequent excavation operations. The prominent colour is noted, followed by (spotted, mottled, streaked etc.) secondary colours as applicable. Colour is usually described at as-received moisture condition, though both wet and dry colours may also be appropriate.

CONSISTENCY/RELATIVE DENSITY

This assessment is based on the effort required to penetrate and/or mould the soil, and is an indicator of the shear strength.

Granular soils are generally described in terms of relative density (density index) as listed in AS1726. These soils are inherently difficult to assess and normally a penetration test procedure (SPT, Scala or Dutch Cone) is used in conjunction with published correlations. Alternatively, in situ density tests can be conducted in association with minimum and maximum densities performed in the laboratory.

Cohesive soils can be assessed by direct measurement (shear vane), or estimated approximately by tactile means and/or the aid of a geological pick as given on the following table. It is emphasised that a 'design shear strength' must take cognisance of the insitu moisture content and the possible variations of moisture with time.

Term	Tactile Properties	Unconfined Compressive Strength q_u (kPa)
Very Soft	Extrudes from fingers when squeezed.	25
Soft	Easily penetrated by thumb about 30 - 40 mm. Pick head can be pushed in up to shaft. Moulded by light finger pressure.	25 - 50
Firm	Penetrated by thumb 20 - 30 mm with moderate effort. Sharp end of pick pushed in some 30 - 40 mm. Moulded by strong finger pressure.	50 - 100
Stiff	Indented by thumb about 5 mm with moderate effort. Pick pushed in up to 10 mm. Cannot be moulded in fingers.	100 - 200
Very Stiff	Readily Indented by thumb nail. Slight indentation produced by pushing pick into soil.	200 - 400
Hard	Difficult to indent with thumb nail. Requires power tools for excavation.	400

STRUCTURE/OTHER FEATURES

The soil structure is generally applicable to cohesive soils and refers to the presence (or absence) of joints and layering. Typical terms used are intact (no joints), fissured (closed joints), shattered (open joints), slickensided (polished joints indicative of movement), stratified/laminated.

For granular soils, an assessment of grading (well, uniform or poor), particle size (fine, medium etc.) angularity and shape may also be given.

In addition, the presence of other features (ferricrete nodules, timber inclusions) should also be noted as applicable.

SOIL TYPE

The soil is described in terms of its estimated grain size composition and the tactile behaviour (plasticity) of any fines (less than *0.06 mm). This system does not differentiate on grading below 0.06 mm, in accordance with the Unified Soil Classification (USC) procedure.

Furthermore, as most natural soils are part combinations of various constituents, the primary soil is described and modified by minor components. In brief, the system is as follows:

	Coarse Grained Soils		Fine Grained Soils
% Fines	Modifier	% Coarse	Modifier
5	omit, or use 'trace'	15	omit, or use 'trace'
5-12	describe as 'with clay/silt' as applicable	15-30	described as 'with sand/gravel' as applicable
12	prefix soil as 'silty/clayey' as applicable	30	prefix soil as 'sandy/gravelly' as applicable

Note: For soils containing both sand and gravel the minor coarse fraction is omitted if less than 15%, or described as 'with sand/gravel' as applicable when greater than 15%.

The appropriate USC symbol is also given after the soil type description in accordance with ASTM D2487-83 and D2488-83.

(* The 200# sieve (0.076 mm) is commonly used in practice to differentiate between fine and coarse grained soils).

ORIGIN

An attempt is made, where possible, to assess origin (transported, residual, pedogenic, or fill etc.) since this assists in the judgement of probable engineering behaviour. This assessment is generally restricted to field logging activities. An interpretation of landform is a useful guide to the origin of transported soils (e.g. talus, slide debris, slope wash, alluvial, lacustrine, esturine, aeolian and littoral deposits) while local geology and remnant fabric will assist identification of residual soils.