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produce a -10 μ m fraction**

Introduction

The licence area of 7 km² is located in northwestern Tasmania 3 km from the Bass Highway by way of Montumana and Newhaven Roads: it surrounds mineral lease 8M/89 held by the same company for the production of metallurgical silica and glass sand.

Exploration within the licence is directed towards the search for reserves of these commodities additional to those which are known to occur within the lease.

Previous reports relevant to the geology and exploration are:

Report on Stage 2 EL 43/70 by Longworth and McKenzie (1981)

Annual Report EL 25/88 by Vic Threader (1989)

Exploration

The quartzite ridge was hammer drilled during the 1981 exploration (in EL 43/70) and more recently within the lease area (ML 8M/89). The drilled sequence in both cases consists of orthoquartzite which has been selectively silicified resulting in alternating hard and soft beds (referred to as quartzite and sandstone).

Where it outcrops, the sandstone weathers to form a mantle of sand and useful colluvial accumulations were anticipated on the slopes of the ridge.

During 1989 excavator pits were dug in the northern portion of the licence to test for sand resources on the slopes. In the current year this programme was extended to cover the southwesterly extension of the quartzite ridge.

The greatest thickness of colluvial sand so far encountered in these programmes was 1½m before bottoming on sandstone and it is apparent that a sand resource would only exist as a by-product of quartzite mining and not as a minable resource in itself.

Current Programme

Locations of pits are shown on Figure 2. Test pit data is given in Table 1, sizing analyses in Table 2, chemical analyses in Table 3 and size frequency curves in Figure 3 (no.4 sizing is a quartz schist from pit no.14 and no.5 was taken from a road cutting in the lease area at 372480mE, 5462880mN).

Comparable results were obtained by M.K. Silica from samples which that company collected recently from within the lease area, Table 4 and Figure 4. The sand sizing is now well documented and is apparently very uniform when comparing the M.K. Silica and exploration results and also excavator pit samples in previous exploration (Ann.Rept 1988-89). Comparison with the fine glass sand specification (Table 4 and Figure 4) indicates that Dip Range sand is slightly deficient in the medium to fine sand range (425 to 212 μ m) and slightly excessive in the very fine sand range (<150 μ m) for a perfect match with the specification. Monier Sands have, however, run tests on the material and found it of acceptable quality as a fine glass sand.

Dip Range Excavator Pits

<u>Pit no.</u>	<u>AMG</u> mE	<u>Reference</u> mN	<u>Sand Sample No.</u>	<u>Soil</u>	<u>Table 1</u>		
					<u>Sand(th)</u>	<u>Log</u> <u>Bedrock</u>	<u>Rock Type</u>
1	372050	5462080	1	250	650	at 900	SS
2	372020	5462060	2	700	800	at 1500	SS
3	372020	5462090	-	400	600	at 1000	SS
4	371980	5462100	3	400	1450	at 1850	SS
5	371960	5462120	-	500	900	at 1400	SS
6	371950	5462140	-	400	900	at 1300	SS
7	371920	5462160	-	250	250	500-800	SS
8	371980	5462200	-	300	-	300-500	SS
9	372020	5462170	-	300	-	300-500	SS
10	372060	5462130	-	300	-	300-500	SS
11	372130	5462070	-	300	-	300-500	SS
12	372200	5462080	-	300	-	300-500	SS
13	372270	5462110	-	300	-	300-500	SS
14	371910	5462260	4	400	-	500-1300	Sch
15	371820	5462320	-	300	-	400-1000	SS
16	371760	5462470	-	300	-	300-600	SS, Sch
						300-600	Sch

In production, the run of mine material would be processed to produce a +30mm fraction of metallurgical silica and a -425 μ m fraction would be recovered from the undersize to produce glass sand.

Future exploration would be directed to determining whether the south westerly extension of the quartzite ridge contains an economic resource of metallurgical quality quartzite.

For this purpose, two hammer drill holes will be sited on the northwest face of the ridge and directed towards the southeast at an angle of 45°.

A series of tests was carried out by the Division of Mines laboratory to determine the -10 μ m fraction of Champion Road and Dip Range sand and whether this fraction could be economically increased. The results are given in the appendix to this report.

904170 1

Sieve Size	Mass	Mass Cum.
+4.75mm	1.30	1.30
+2.36mm	0.07	1.38
+1.18mm	0.29	1.67
+600um	3.44	5.11
+425um	15.57	20.68
+300um	23.22	43.90
+212um	24.77	68.67
+150um	13.44	82.11
+75um	10.32	92.43
+38um	2.35	94.78
-38um	5.22	100.00

904171 2

Sieve Size	Mass	Mass Cum.
+4.75mm	2.01	2.01
+2.36mm	0.73	2.73
+1.18mm	0.19	2.93
+600um	0.85	3.77
+425um	14.27	18.05
+300um	25.52	43.57
+212um	24.33	67.90
+150um	11.37	79.27
+75um	7.98	87.25
+38um	3.02	90.28
-38um	9.72	100.00

904172 3

Sieve Size	Mass	Mass Cum.
+2.36mm	0.12	0.12
+1.18mm	0.15	0.28
+600um	8.99	9.27
+425um	17.71	26.98
+300um	19.06	46.04
+212um	20.79	66.83
+150um	15.61	82.45
+75um	11.43	93.87
+38um	1.91	95.78
-38um	4.22	100.00

904173 4

Sieve Size	Mass	Mass Cum.
+19.05mm	2.92	2.92
+9.53mm	18.05	20.97
+4.75mm	13.50	34.47
+2.36mm	7.17	41.64
+1.18mm	9.17	50.81
+600um	4.49	55.31
+300um	3.05	58.36
+150um	3.15	61.51
+75um	7.02	68.52
+38um	11.11	79.64
-38um	20.36	100.00

904174 5

Sieve Size	Mass	Mass Cum.
+4.75mm	0.63	0.63
+2.36mm	0.51	1.14
+1.18mm	0.57	1.71
+600um	2.43	4.14
+425um	14.48	18.62
+300um	21.67	40.29
+212um	21.73	62.02
+150um	16.70	78.72
+75um	15.29	94.00
+38um	3.30	97.30
-25um	2.70	100.00

904175 6

Sieve Size	Mass	Mass Cum.
+38um	0.05	0.05
C/S1 + 49um	0.00	0.05
C/S2 + 38um	0.00	0.05
C/S3 + 26um	0.65	0.70
C/S4 + 17um	4.56	5.27
C/S5 + 13um	5.65	10.92
C/S O/F -13um	89.08	100.00

The second decimal place in these results is not significant, but has been included in the computer print-out to reduce errors due to rounding off.


Senior metallurgist.....

Mineral Holdings Reg. nos 904170-75

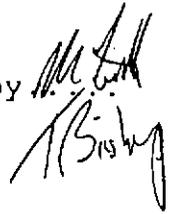
Dip Range %

3.10.90

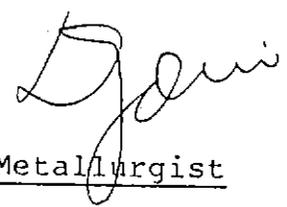
007

<u>Reg. Nos</u>	<u>Desc</u>	<u>SiO₂</u>	<u>TiO₂</u>	<u>Al₂O₃</u>	<u>Fe₂O₃</u>	<u>MnO</u>	<u>CaO</u>	<u>Na₂O</u>	<u>K₂O</u>	<u>P₂O₅</u>	<u>SO₃</u>	<u>L.O.I.</u>	<u>MgO</u>
904170	1	99.42	0.05	0.02	0.05	0.02	<0.01	0.06	<0.01	0.01	0.08	0.24	0.03
904171	2	99.10	0.15	0.05	0.03	0.01	<0.01	0.27	0.01	0.01	0.08	0.26	0.03
904172	3	99.42	0.07	0.01	0.05	0.01	<0.01	<0.01	<0.01	0.01	0.08	0.19	0.02
904173	4	92.43	0.49	2.89	0.45	0.01	<0.01	<0.01	0.96	0.01	0.07	0.72	0.19
904174	5	99.53	0.09	0.04	0.03	0.02	<0.01	0.04	<0.01	0.01	0.07	0.37	0.03
904175	6	44.05	3.69	36.77	0.52	0.01	<0.01	0.77	0.11	0.02	0.09	13.73	0.19

Analyses by



(D. Zani)



Chief Chemist & Metallurgist

008

Sieve Analysis of Samples collected by M.K. Silica

	<u>Sample 1</u>		<u>Sample 2</u>		<u>Sample 3</u>		<u>Specification*</u> <u>for fine glass sand</u>	
	<u>Mass%</u>	<u>Cum.Mass%</u>	<u>Mass%</u>	<u>Cum.Mass%</u>	<u>Mass%</u>	<u>Cum.Mass%</u>	<u>Mass%</u>	<u>Cum.Mass%</u>
+425 μ m	23.4	23.4	33.5	33.5	36.6	36.6	17	17
300	16.0	39.4	18.7	52.2	21.7	58.3	38	55
250	10.7	50.1	11.9	64.1	9.7	68.0		
212	7.3	57.4	7.5	71.6	5.3	73.3	30	85
150	16.6	74.0	14.8	86.4	10.0	83.3	12	97
106	10.9	84.9	6.5	92.9	6.7	90.0	2.6	99.6
75	4.1	89.0	2.0	94.9	3.6	93.6	0.3	99.9
-75	11.0	100	5.1	100	6.6	100	0.1	100
<hr/>								
% Fe ₂ O ₃	0.025		0.015		0.018		0.012	

* Specification supplied by Monfer

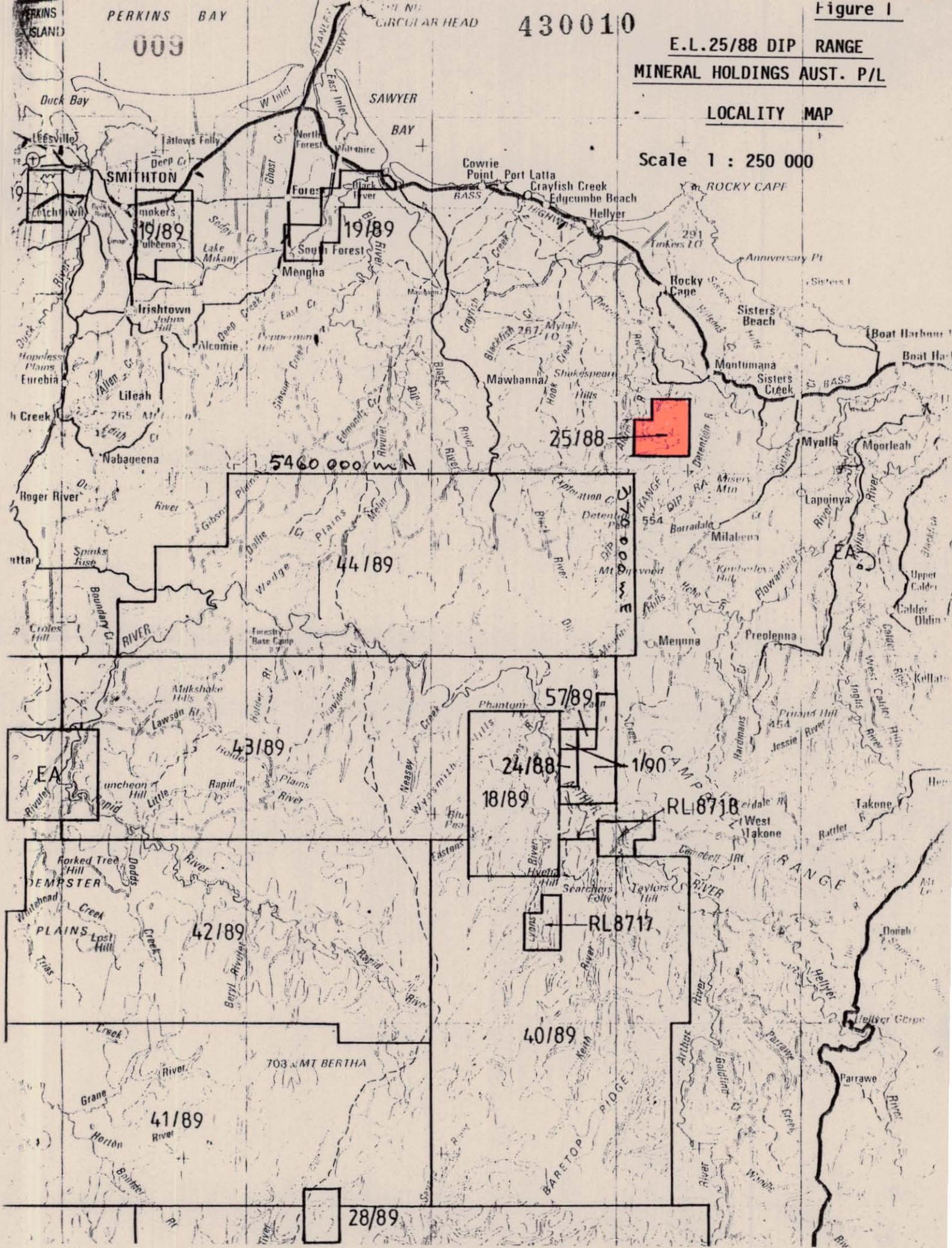
Figure 1

430010

E.L.25/88 DIP RANGE
MINERAL HOLDINGS AUST. P/L

LOCALITY MAP

Scale 1 : 250 000



5 cm

Vic Threder and Associates Pty. Ltd.

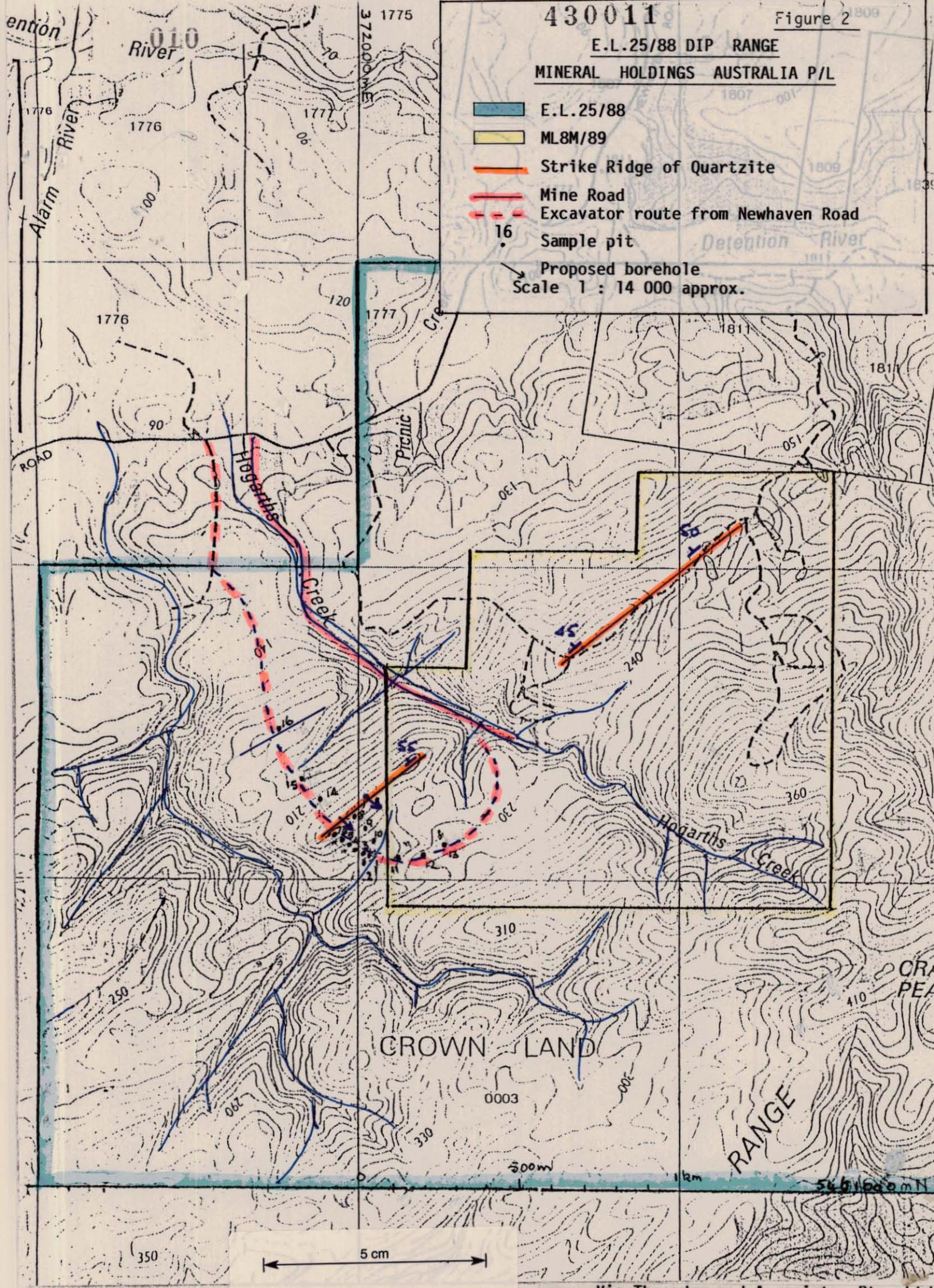
430011

Figure 2

E.L.25/88 DIP RANGE

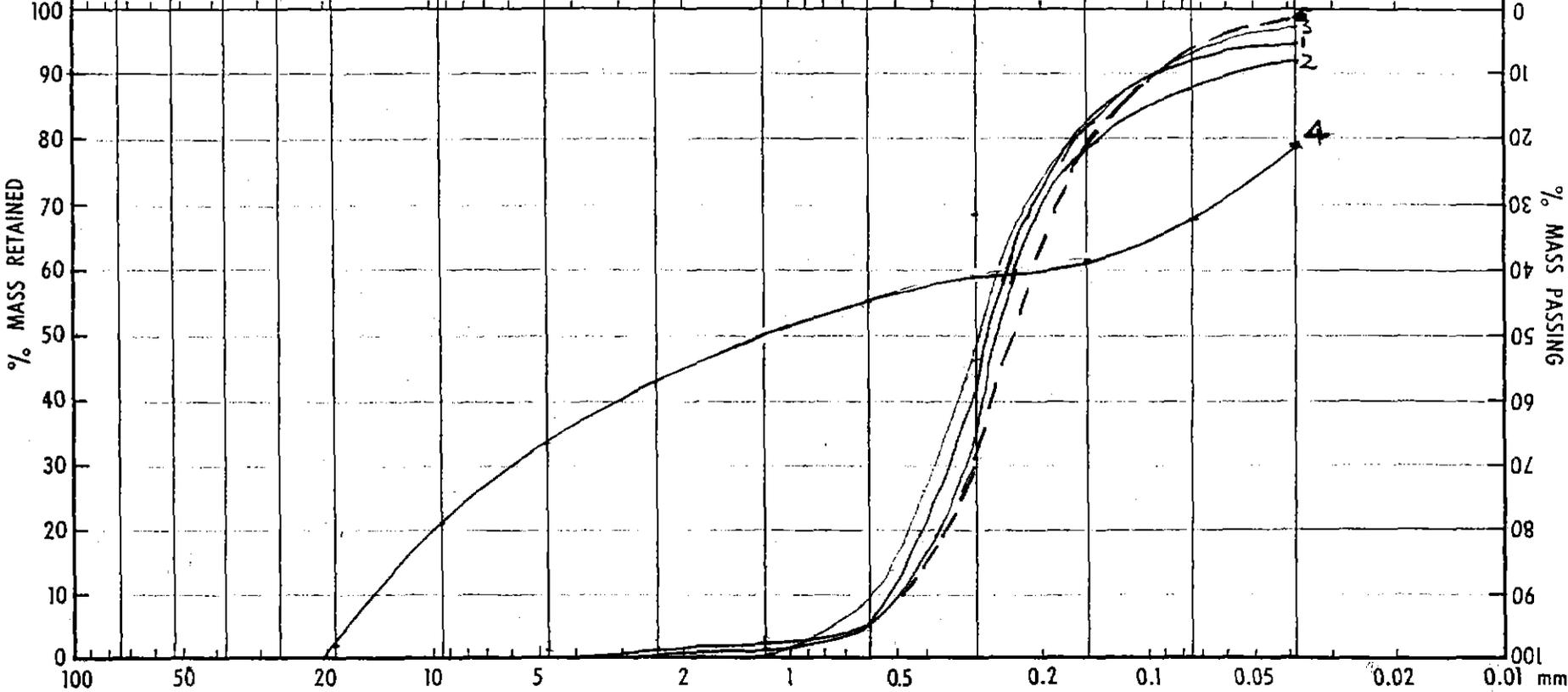
MINERAL HOLDINGS AUSTRALIA P/L

-  E.L.25/88
 -  ML8M/89
 -  Strike Ridge of Quartzite
 -  Mine Road
 -  Excavator route from Newhaven Road
 -  16 Sample pit
 -  Proposed borehole
- Scale 1 : 14 000 approx.



M 1324

REFERENCE	LAB. SERIAL No.	LOCALITY				SEDIMENT ANALYSIS PARAMETERS								
D.O.M.	904170-4	DIP RANGE		EL25/88		M =	V =	Sk =	K =					
COARSE AGGREGATE			FINE AGGREGATE				A77-1957 (concrete)							
COARSE AGGREGATE		FINE AGGREGATE		BINDER		N.A.A.S.R.A. (road materials)								
COBBLE	PEBBLE		GRANULE	SAND					SILT					
				V. COARSE	COARSE	MEDIUM	FINE	V. FINE						
-6	-5	-4	-3	-2	-1	0	2	3	4	5	6 φ			
75	53	37.5	26.5	19	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075	0.038	Aust. Stand. Sieve



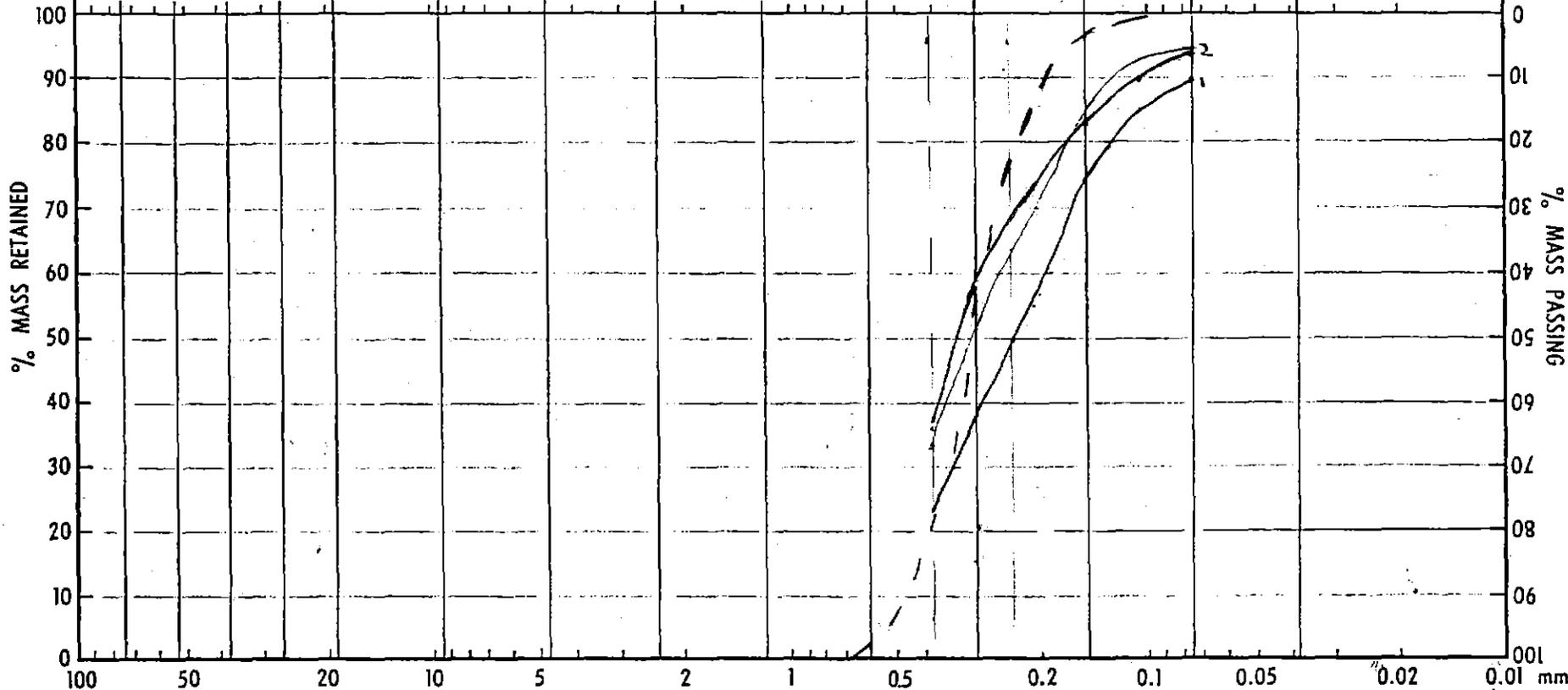
CSA CS5
 (-022) (016) (012)

430012

Figure 3

M 1324

REFERENCE	LAB. SERIAL No.	LOCALITY				SEDIMENT ANALYSIS PARAMETERS								
MK Silica		DIP	RANGE	EL	25/88	M =	V =	Sk =	K =					
COARSE AGGREGATE			FINE AGGREGATE				A77-1957 (concrete)							
COARSE AGGREGATE		FINE AGGREGATE		BINDER		N.A.A.S.R.A. (road materials)								
COBBLE	PEBBLE		GRANULE	SAND					SILT					
				V. COARSE	COARSE	MEDIUM	FINE	V. FINE						
-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	Ø	
75	53	37.5	26.5	19	9.5	4.75	2.36	1.18	0.6	0.3	0.15	0.075	0.038	Aust. Stand. Sieve



— — — Fine glass sand specification

CS3 CS4 CS5
(.02) (.01) (.012)

430013

Figure 4

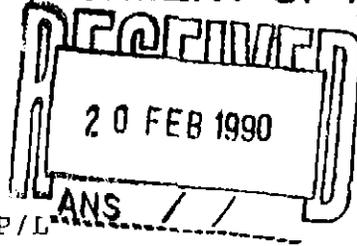
A P P E N D I X

Beneficiation Test to produce -10 μ m Sand

(D.O.M. Laboratory)



TASMANIA



Launceston Office:

Chemical and Metallurgical
Laboratory,
287 Wellington Street,
LAUNCESTON 7249

Enquiries: Mineral Holdings P/L
Phone: 2nd Floor
Your ref.: 100 Collins Street
Our file: Melbourne 3000

15.2.90

R904 Part 11Production of -10 μ m Material from Silica Flour.1. Introduction

Two samples of silica were submitted by Mr. N. Thomas of Mineral Holdings for the production of -10 μ m silica. The samples are identified as follows:-

<u>Reg. No</u>	<u>Description</u>
900282	Sample A Champions Road Silica Flour.
900283	Sample B Thomas Mountain Silica Sand, with some fines.

2. Method

co-ords sample A:

2.1. Sample A Reg. No 900282

367620mE 5443750mN

The sample was crushed by rolling with a 2.5 litre glass acid bottle on a rubber mat. It was noted that some of the lumps when broken down contained dark material, probably organic.

The sample of mass 2010g was mixed with water and agitated for some time before being allowed to settle in a four litre beaker. 10 μ m silica will settle 160 mm in 30 minutes. So the suspension in the beaker above the 160 mm mark was taken to be -10 μ m in size.

After this initial agitation, the material still suspended was quite grey in colour. This grey material was decanted by siphoning and discarded. The remainder in the beaker had fresh water added to it to the zero mark on the beaker and it was again agitated and then allowed to settle and after 30 minutes the top 160 mm of suspension was again siphoned off and discarded. This was repeated several times until virtually no material remained in suspension. The remainder in the beaker was wet screened on a 500 μ m screen and about 5g of organic material was removed in the screen oversize.

The silica was transferred to a flotation cell and with the addition of a few drops of fuel oil and a few drops of Teric 400 as frother, the remaining organic matter was floated off and amounted to 41g.

The silica was again agitated with water in the four litre beaker and allowed to settle and from the rate of settling it was determined that the silica was substantially greater than 20 μ m.

The silica was dried and weighed and 1850g remained. This indicated that about 114g was lost in the decantation to remove the grey material.

A mass balance of what was done to this stage is as follows:-

Product	% Mass
+500 μ m organic material	0.3
Flotation concentrate	2.0
Loss by decantation	5.7
Remaining silica	92.0
Initial Feed	100.0

A sample of the dried silica of mass 110g was taken and was subjected to a screen analysis and a cyclosizing with the following result.

<u>Size Fraction</u>	<u>% Mass</u>	<u>% Mass Cum</u>
+ 300 μ m	4.3	4.3
-300 μ m + 212 μ m	2.9	7.2
-212 μ m + 150 μ m	4.2	11.4
-150 μ m + 106 μ m	9.1	20.5
-106 μ m + 75 μ m	11.7	32.2
- 75 μ m + 53 μ m	17.5	49.7
- 53 μ m + 38 μ m	23.8	73.5
C/S 1 + 41 μ m	0.4	73.9
C/S 2 + 31 μ m	7.4	81.3
C/S 3 + 21 μ m	12.7	94.0
C/S 4 + 14 μ m	0.5	94.5
C/S 5 + 11 μ m	4.9	99.4
C/S O/F - 11 μ m	0.6	100.0

This sizing analysis confirmed the finding by settling rate that the silica was substantially greater than 20 μ m. The sizing analysis shows 94% grater than 21 μ m.

The remaining silica sample was divided into two parts. One part was ground in the 180 mm dia x 180 mm long ceramic ball mill with a ball charge of 3.12 kg of ceramic balls, for three successive periods of two hours. After each two hours the ground silica was transferred to a four litre beaker water added to the zero mark on the beaker, stirred and then allowed to settle. The -10 μ m material was siphoned off. The adding of water, stirring, and settling was repeated twice

more and the -10 μm fraction was drawn off on each occasion.

The oversize material remaining in the beaker was transferred to the ceramic ball mill and was subjected to a further two hours grinding. The procedure was repeated for a total grinding time of six hours.

The other part of the silica sample was ground continuously for six hours and the same decantation procedure was used to remove the -10 μm silica.

The coarse settled silica from each grinding procedure was sampled and subjected to a screen analysis and cyclosizing with the following result.

6 Hours Intermittent Grinding

<u>Size Fraction</u>	<u>% Mass</u>	<u>% Mass Cum</u>
+ 38 μm	1.3	1.3
C/S 1 + 42 μm	0.0	1.3
C/S 2 + 32 μm	1.7	3.0
C/S 3 + 22 μm	19.7	22.7
C/S 4 + 14 μm	42.1	64.8
C/S 5 + 12 μm	26.6	91.4
C/S O/F - 12 μm	8.6	100.0

6 Hours Continuous Grinding

<u>Size Fraction</u>	<u>% Mass</u>	<u>% Mass Cum</u>
+ 38 μm	3.8	3.8
C/S 1 + 41 μm	0.0	3.8
C/S 2 + 32 μm	1.7	5.5
C/S 3 + 22 μm	20.2	25.7
C/S 4 + 14 μm	37.4	63.1
C/S 5 + 11 μm	23.2	86.3
C/S O/F - 11 μm	13.7	100.0

The mass balance from grinding was as follows:-

<u>Size Fraction</u>	<u>Intermittent Grinding</u>	<u>Continuous Grinding</u>
	<u>% Mass</u>	<u>% Mass</u>
+ 10 μm	56.0	66.6
- 10 μm	47.0	35.8
Total	103.0	102.4
Mass gain	3.0	2.4

The -10 μm products from both grinds were combined and mixed and sampled by riffing and was disposed of as follows:-

- $\frac{1}{2}$ (About 350g) to Australian Newsprint Mills
- 100 to A.P.P.M. Burnie
- About 1/8 to Mr. N. Thomas
- $\frac{1}{4}$ retained by Department of Mines

A.P.P.M. at Burnie have since requested a further 100g which was taken from the portion retained by the Department of Mines.

A portion of the +10 μm fraction from intermittent grinding was also sent to Mr. N. Thomas.

The remainder of the +10 μm fraction from intermittent grinding was combined with the +10 μm fraction from continuous grinding, amounting to 765g, and was ground in the ceramic ball mill for four hours. The -10 μm product was separated by beaker decantation and the +10 μm remainder was further ground for another six hours in the ceramic ball mill. The -10 μm product was again separated by beaker decantation, and appeared to look greyer in colour. The +10 μm fraction was again ground for a further six hours, followed by collection of -10 μm material by decantation.

Discussion

Ideally, grinding of silica to produce such a fine product should be done by a Vibro-Energy Mill using small diameter grinding media. This technique was successfully used to produce ultra-fine strontium carbonate for E.Z. Co (see R875).

The desired product would be produced more quickly using less energy and with less wear of the grinding media and lining. Grinding for six hours in the ceramic mill has resulted in a mass gain of 2.4% to 3.0% and illustrates the inadequacy of a conventional type ball mill to give the desired result.

Some pages copied from the brochure entitled "Sweco Vibro-Energy Grinding Mills" are attached for information.

2.2 Sample B Reg. No 900283 co-ords sample B 372500mE

The sample was subjected to rolling with a 2.5 litre glass acid bottle on a rubber mat. The sample was mixed with water and agitated for some time and the -10 μm fraction was separated by beaker decantation.

The mass balance was as follows:-

<u>Product</u>	<u>% Mass</u>
+10 μm	96.2
-10 μm	3.8
Feed	100.0

3. Conclusions

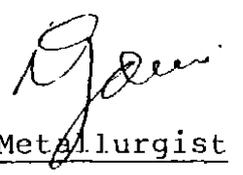
The Champions Road silica contained lumps which when bottle roll crushed, contributed greatly to the contamination by dark particles of organic source. An initial screening at an appropriate size may greatly reduce the amount of this contaminating material.

Both the Champions Road silica and the Dip Range silica contained little naturally occurring silica of -10 μ m size.

Metallurgist.



(D. Zani)
Chief Chemist & Metallurgist



Fee \$512.00