1983/63. Sand resources on P.L. Burns lease, Tebrakunna Road, near Pioneer.

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Abstract

A sand resource of about 90 000 m³ occurs within the lease area.

Some 10 000 m³ of this material and 10 000 m³ of underlying sandy clay was removed in error by A.P.P.M.

The sand is suitable but not ideal for the manufacture of concrete blocks but its distance from the plant would make its use only marginally economic.

The offer of A.P.P.M. to replace this sand from its own neighbouring sand pit would seem a satisfactory solution.

If a cash settlement is preferred it should be on the basis of 10 000 m³ at 70¢/m³, *i.e.* $7000.

INTRODUCTION

A resource survey of P.L. Burns stone lease 53M/77 (25 ha) on Tebrakunna Road, 12 km east of Pioneer, was made on 15-17 November 1983.

The co-ordinates of the north-east corner peg of the lease are 588650 mE, 5450820 mN (fig. 1).

The lease was issued on 1 March 1978 but subsequently the location was moved to incorporate the initial workings which were to the south and outside the lease boundary (see attached lease plan).

The Associated Pulp and Paper Manufacturers (A.P.P.M.) were granted a Forestry Commission permit to extract road materials from the same area.

The purpose of this investigation is to form a basis for a negotiated settlement of Burn's claim for compensation.

This situation would not have arisen had:

(1) The Department of Mines advised the Forestry Commission of the changed lease boundaries, or

(2) The A.P.P.M. had applied for a lease from the Department of Mines, or

(3) Burns had renewed his Department of the Environment licence to operate scheduled premises which had, in fact, expired when A.P.P.M. commenced operations.

GEOLOGY

The lease area is situated on an interfluvial ridge capped by a remnant of granite-derived Tertiary sediments lying between Musselroe Creek and the Great Musselroe River.

A thin layer of lag quartz gravel occurs over much of the ridge and is underlain by about 300 mm black sandy soil and one metre of quartz sand

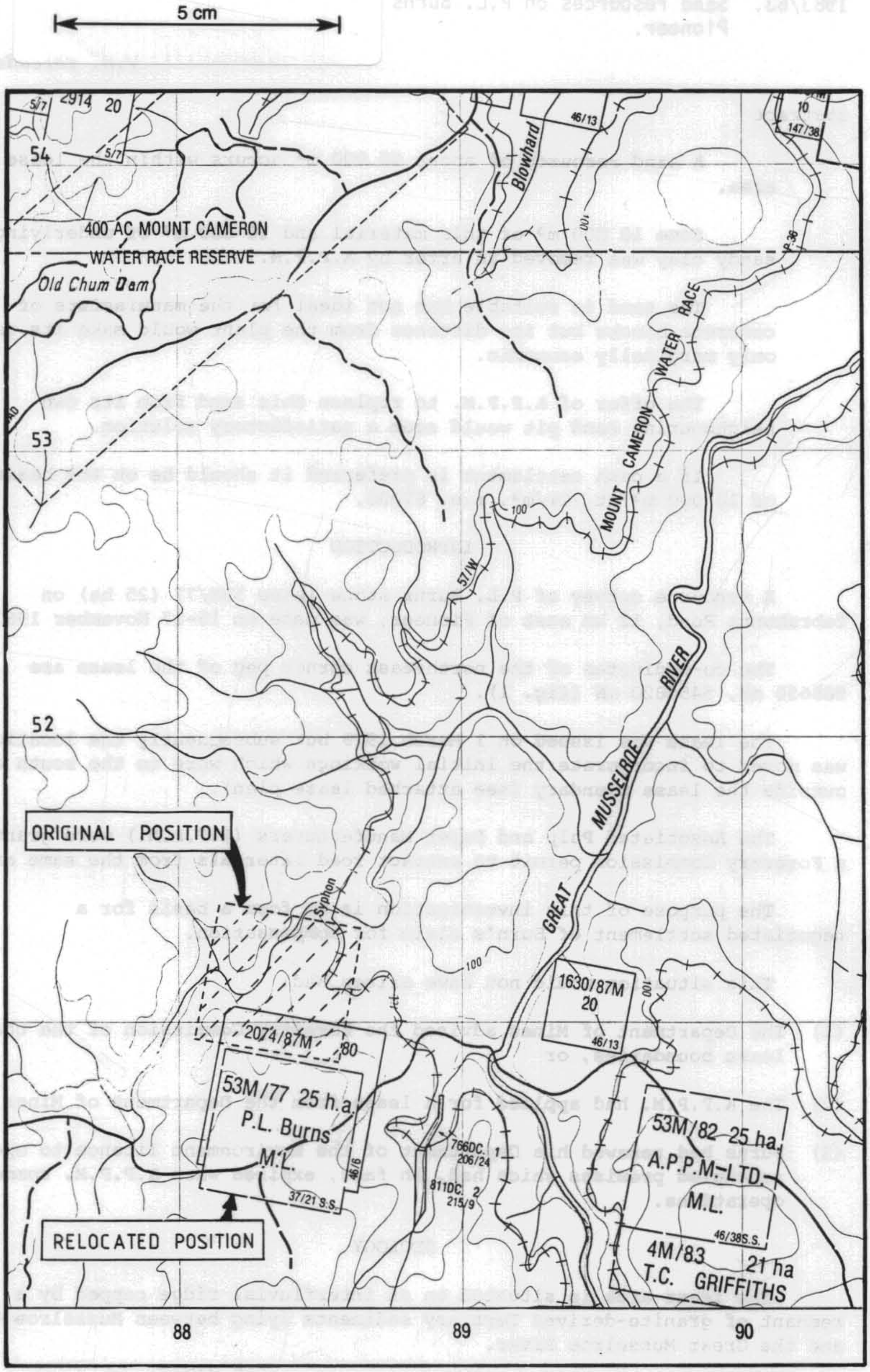


Figure 1. *Location map.*

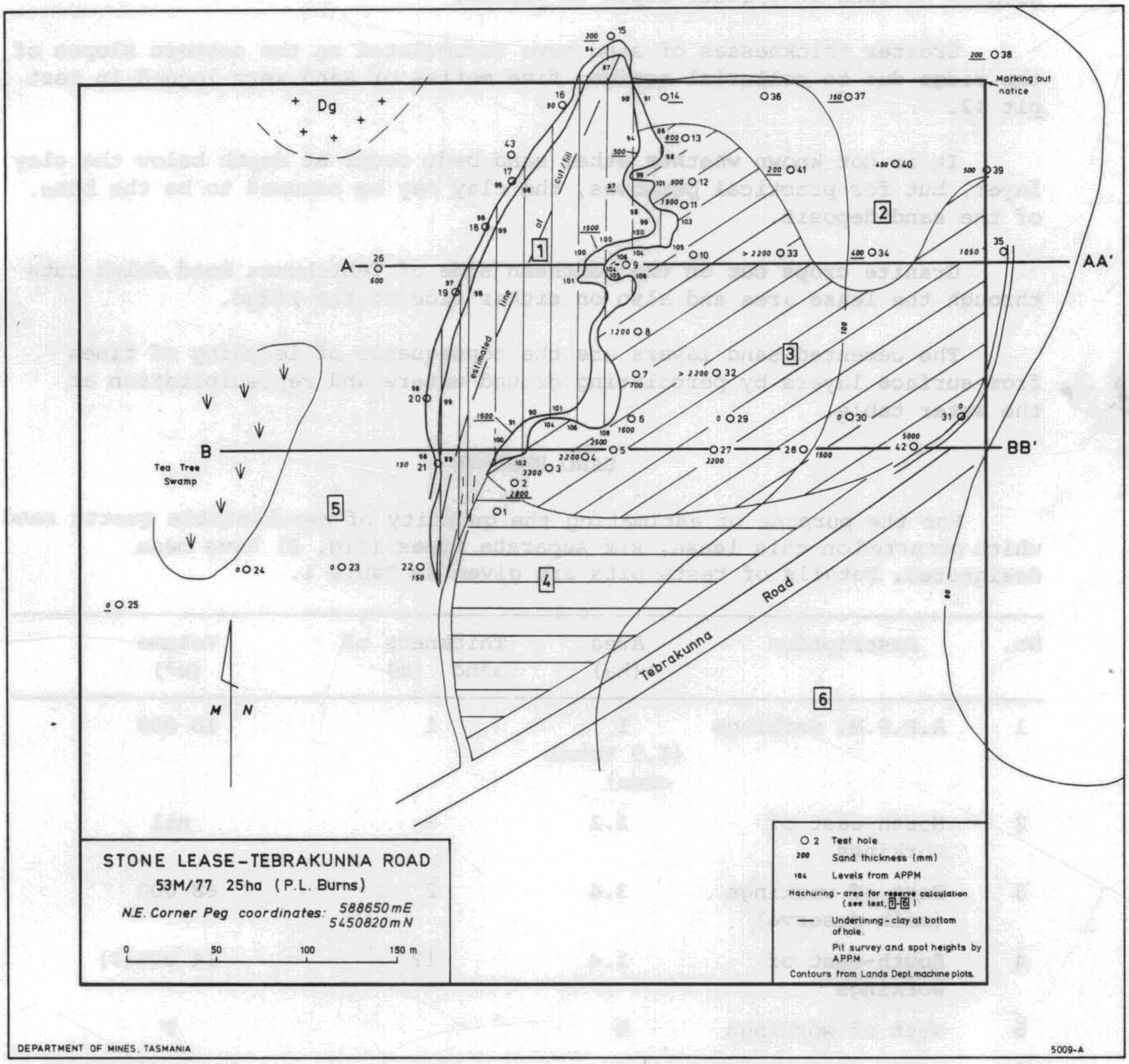


Figure 2. *See Figure 3 for sections.*

5 cm

with cemented layers (hardpan) occurring at 300 mm depth and at the base. This is underlain by a variable thickness of sandy clay and clay.

The sequence is probably of fluvial origin and quite variable with pockets of sand at greater depth in places.

Greater thicknesses of sand have accumulated on the eastern slopes of the ridge due to colluvial action, five metres of sand were logged in test pit 42.

It is not known whether other sand beds occur at depth below the clay layer, but for practical purposes, the clay may be assumed to be the base of the sand deposit.

Granite crops out on the southern side of Tebrakunna Road which cuts through the lease area and also on either side of the ridge.

The cemented sand layers are the consequence of leaching of fines from surface layers by percolating ground waters and reprecipitation at the water table.

SAND RESERVE

For the purpose of estimating the quantity of merchantable quartz sand which occurred on this lease, six separate areas (fig. 2) have been designated. Details of tests pits are given in Table 1.

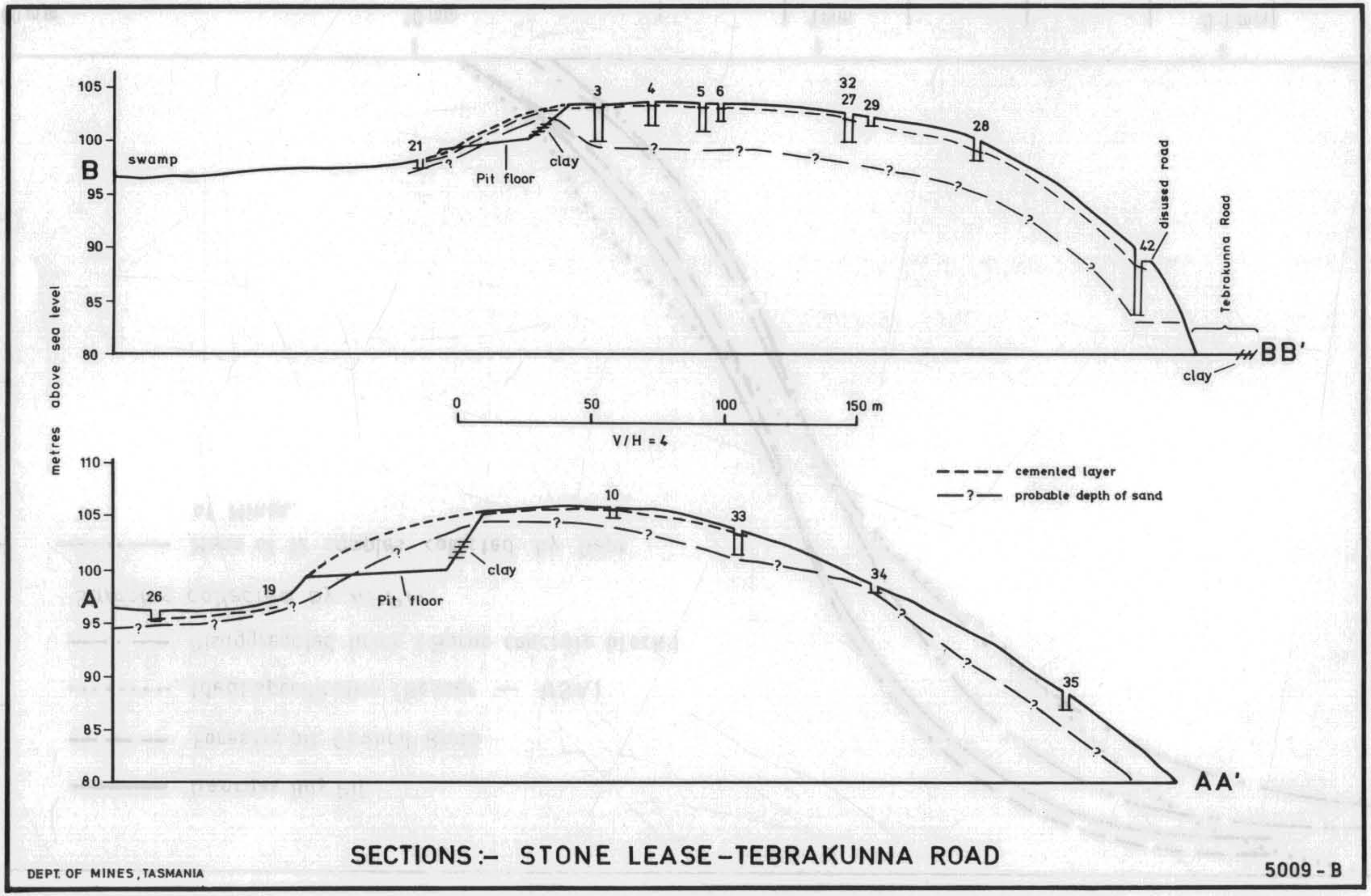
No.	Description	Area (ha)	Thickness of sand (m)	Volume (m^3)
1	A.P.P.M. workings	1 (1.9 total area)	1	10 000
2	North-east of workings	1.2	-	nil
3	East of workings (main reserve)	3.4	2	68 000
4	South-east of workings	1.4	1?	14 000(?)
5	West of workings	9		?
6	South of Tebrakunna Road	8	-	-
		25		

The basis for this estimate is:

(1) A series of 21 backhoe pits which was dug by A.P.P.M. - these were re-excavated in the present survey.

(2) An additional 22 backhoe pits excavated in the present survey.

Areas 4 and 5 require additional testing to estimate their potential but were found too difficult to penetrate with a backhoe and so may be impractical for economic sand mining.



B
swamp
21
Pit floor
clay
3
4
5
6
32
27
29
28
disused road
42
Tebrakunna Road
clay
BB'
105
100
95
90
85
80
metres above sea level
0
50
100
150 m
V/H = 4
cemented layer
probable depth of sand
A
26
19
Pit floor
clay
10
33
34
35
AA'
110
SECTIONS:– STONE LEASE–TEBRAKUNNA ROAD
DEPT. OF MINES, TASMANIA
5009 - B

Figure 3.

63-5

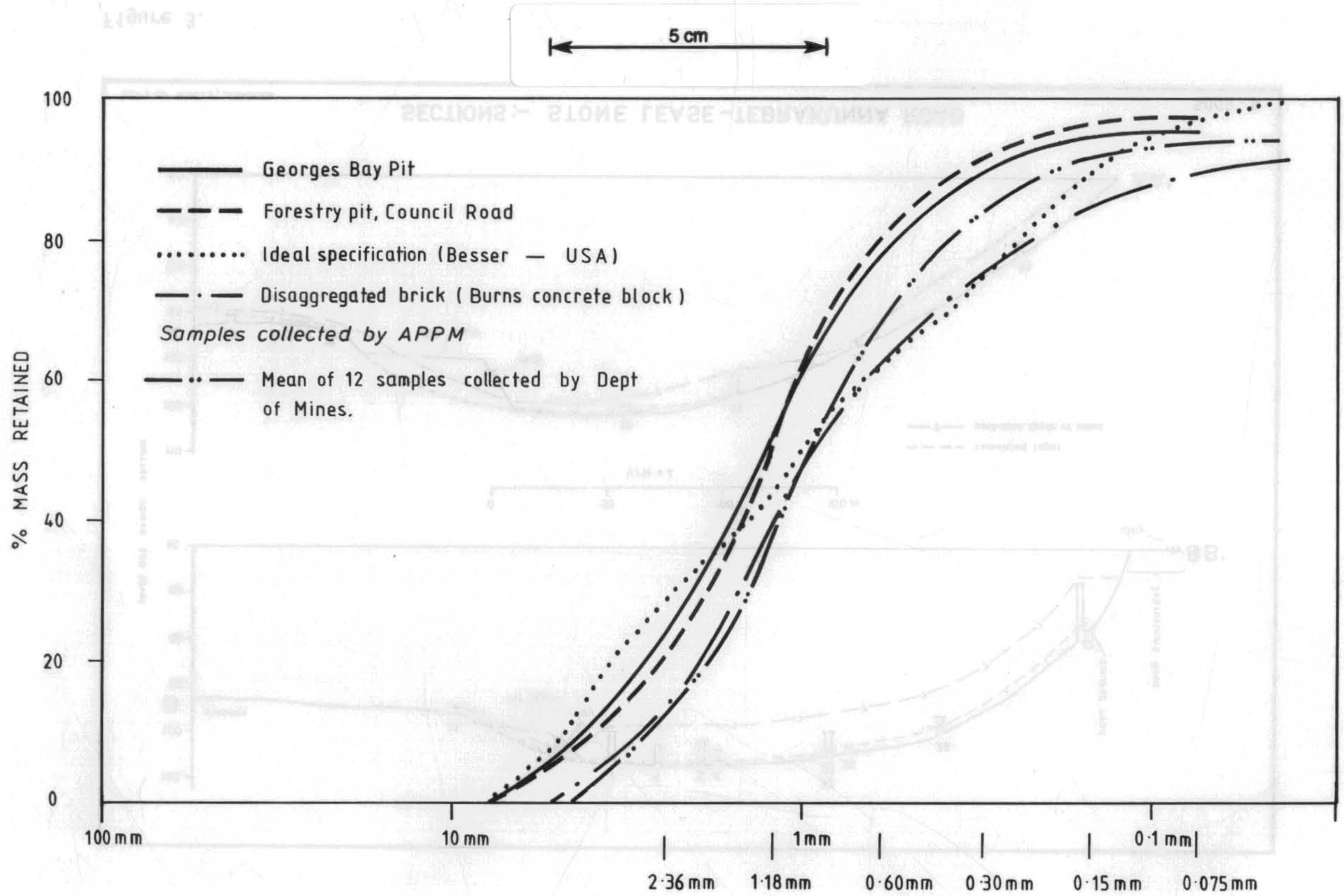


Figure 4. *Size distribution analyses.*

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Of the two, area 4 is the more likely to contain an economically extractable sand resource.

SAND QUALITY

Twelve channel samples were collected during the test pit programme and these have been analysed for particle size distribution and the results are given in Table 2 and Figure 4.

Three samples were collected by A.P.P.M. (fig. 4):

A sample of Burn's concrete block which had been disaggregated and two raw materials, one from the lease area under discussion and one from a sand pit on Georges Bay.

The disaggregated brick shows a deficiency in fines due probably to the original fines being locked into the concrete mix. This is not a significant test for that reason.

The two raw material tests indicate good sorting characteristics and therefore poor grading. In comparison with the ideal particle size distribution which is well graded, the raw materials exhibit excess material in the plus one millimetre size fraction and deficiency of fines.

This is likely to result in voids in bricks made from these aggregates and would require the addition of fines or additional cement to make a satisfactory product.

WORKING METHODS

Although most of the sand has not been removed, it has not been stockpiled. In fact, it has been mixed with topsoil and dumped along the western margin of the workings. Consequently the sand is not now merchantable and the soil is not now available for rehabilitation of mined areas.

The major resource on this lease is unaffected by the workings and if Burns wishes to extract it, an ideal starting point for operations would be on the disused road somewhere near test pit 35. The slope could be worked in a series of benches with soil from each bench being used to rehabilitate previously worked benches. This would allow concurrent mining and rehabilitation.

If more roadmaking material is required from these workings, care should be taken to ensure stockpiling of sand (for resale) and topsoil (for rehabilitation).

The clay and sandy clay which has been used by A.P.P.M. is of questionable quality for road-making except for sub-base. Extreme care in preparation would be necessary to avoid the inclusion of clay balls because of their capacity to swell and cause the pavement to break up.

The quantities so far removed are estimated to be 20 000 m^3 consisting of one metre of sand and one metre of clay over an area of one hectare.

FINANCIAL CONSIDERATIONS

Washed sand, delivered to the plant is valued at \$9.50/m^3 in Ulverstone and Launceston. This value includes the *in situ* value of the raw material; the cost of extraction, loading, washing and screening; and transport.

Transport costs are currently in the region of 10¢/tonne/km which converts to 12.8¢/m³/km. The 80 km trip from the lease to St Helens would therefore cost $10.24/m³. Additional costs associated with item 2 above would bring the unit price to $11/m³. This does not preclude the economic feasibility of using the sand from the Tebrakunna Road lease because it could still be cheaper to buy the product made in St Helens than to transport bricks from the nearest competitor which is in Launceston.

It does however indicate the relative importance of the unit cost of raw material. It could be said that the final value of the sand is almost entirely its acquired value due to extraction, treatment and transport.

In view of the foregoing it is considered that for the purposes of assessing compensation the sand and clay could be considered of equal value and the unit value of 70¢/m³, which is the Government royalty for such materials when it is charged, seems an appropriate figure.

CONCLUSION

The value of sand for concrete block making is dependent on market considerations. The sand on Burn's lease is suitable for the purpose but not ideal. It is difficult to see how it could have any present day value except as a back up supply when more conveniently placed supplies are exhausted.

In such a case the A.P.P.M. offer to supply similar material from their own lease on Tebrakunna Road would seem to be a satisfactory solution. If this is not acceptable to Mr Burns, it is recommended that A.P.P.M. pay a compensation of $7000 based on the removal of 10 000 m³ at 70¢/m³. It is not known whether or not a compensation for removal of the 10 000 m³ of underlying clayey material is demanded. As this material is of no use to Burns he may not wish to pursue this aspect.

The responsibility for rehabilitation of the disturbed area must naturally rest with the operator, A.P.P.M.

[29 November 1983]

Table 1. LOGS OF TEST PITS, BURN'S LEASE, TEBRAKUNNA ROAD.

Pit No.	Depth (mm)	Thickness (mm)	Log	Sand Thickness (A.P.P.M.)	Sample No.
1	300	300	mantle of rounded quartz pebbles on black sandy soil	300	
	>300		cemented sand, in part iron-stained.		
2	200	200	black sandy soil		
	3000	2800	clean sand	2700	
	>3000		iron-stained sandy clay		2
3				3300	
4	200	200	black sandy soil		
	>2000	1800	clean sand	2200	
	2100	100	cemented sand		
5					
				2500	
6	300	300	black sandy soil		
	>1700	>1400	clean sand	1600	6
7	300	300	black sandy soil		
	900	600	clean sand, cemented layer at 600-700 mm but not continuous.	700	7
8	300	300	black sandy soil		
	>1500	>1200	clean sand	1100	8
9	300	300	black sandy soil		
& 10	>300		cemented sand	nil	
11	300	300	black sandy soil		
	2200	1900	clean sand, cemented layer at 1000-1100 mm but breached	1800	
	>2200		cemented sand		
12	300	300	black sandy soil		
	1000	700	clean sand	900	
	>1000		cemented sand		
13	300	300	black sandy soil		
	750	450	sand with scattered pebbles)	800	13(1)
	1150	400	clean sand)		13(2)
	>1150		hard bottom		
14	300	300	black sandy soil		
	600	300	cemented sand	200	
	>800	>200	iron-stained clay		
15	150	150	black sandy soil		
	300	150	clean sand	100	
	450	150	cemented sand		
	>500	>50	yellow clay (water seeping into hole at 450 mm)		
16			cemented sand near surface	nil	
17	300	300	black sandy soil		
	>400	>100	cemented sand	100	

Table 1. (continued)

Pit No.	Depth (mm)	Thickness (mm)	Log	Sand Thickness (A.P.P.M.)	Sample No.
18 19			) as for 17)	nil 100	
20	300	300	black sand soil	100	
21 & 22	450 >450	150	clean sand cemented sand	100	
23	250 >250	250	black sandy soil cemented sand, scattered rounded pebbles		
24	300 >700	300 >400	black sandy soil cemented sand, scattered rounded pebbles		
25	300 350 >2000	300 50 >1650	black sandy soil sandy clay yellow clay with scattered angular quartz grains		
26	300 600 900 >900	300 300 300	black sandy soil black sand clean sand cemented sand		
27	300 >2500	300 2200	black sandy soil clean sand containing discontinuous cemented sand layer		27
28	350 >1850	350 >1500	black sandy clay clean sand with scattered rounded pebbles cemented layer at 1000-1100 mm iron-stained clay at 1300 mm at one end of test pit.		28
29 & 30	300 >500	300 >200	black sandy soil cemented sand containing scattered rounded pebbles		
31	400 >600	400 >200	black sandy soil cemented sand with scattered round quartz pebbles. One metre cemented sand layer is exposed in cutting on old road.		
32	300 >2500	300 >2200	black sandy soil clean sand		32
33	300 500 600 >2300	300 200 100 1700 (>2000 -	black sandy soil clean sand discontinuous cemented sand containing scattered rounded pebbles clean sand total sand thickness)		33

Table 1. (continued)

Pit No.	Depth (mm)	Thickness (mm)	Log	Sample No.
34	300	300	black sandy soil	
	600	300	very coarse sand	
	700	100	clean sand	
	>850	>150	iron-stained, carbonaceous clay	
35	450	450	black sandy soil	
	500	1050	clean sand	35
	>1500		cemented sand	
36	450	450	black sandy soil	
	550	100	cemented sand with scattered rounded pebbles	
37	300	300	black sandy soil	
	450	150	very coarse sand with scattered rounded pebbles	
	>700	>250	carbonaceous clay	
38	200	200	black sandy soil	
	400	200	sand	
	>400		clay and sandy clay	
			old test pit - excavated by bulldozer	
39	300	300	black sandy soil	
	300	500	sand	
	>600	>100	cemented sand	
40	300	300	black sandy soil	
	300	450	sand	
	>600	>150	cemented sand with scattered rounded pebbles	
41	300	300	black sandy soil	
	500	200	coarse black sand	
	700	200	black clayey sand	
	>80	>100	iron-stained clay	
42	300	300	black sandy soil	
	1200	900	clean sand)	
	1350	150	cemented sand)	42
	>5350	>4000	clean sand)	
			(>5050 m sand)	
43	300	300	black sandy soil	
	>600	>300	cemented sand	

Table 2. PARTICLE SIZE DISTRIBUTION ANALYSES

Diam. (mm)	Test pit number											
	2	6	7	8	13(1)	13(2)	27	28	32	33	35	42
	Cumulative mass %											
2.36	13.3	14.9	21.3	25.3	12.5	2.9	18.2	20.8	15.6	19.5	12.3	8.0
1.70			33.8	37.4			29.5	35.9				
1.18	39.1	37.0	47.1	50.4	32.9	18.8	43.6	53.7	40.4	44.7	32.4	24.9
0.85	57.3	51.1			46.5	35.4				59.5	46.0	
0.60	71.4	64.0	70.6	72.4	58.8	51.8	69.7	79.0	64.5	71.6	58.6	49.5
0.30	87.6	84.1	84.7	86.0	78.8	78.6	86.9	90.6	80.2	88.4	80.1	74.3
0.15	93.8	91.4	90.6	91.0	88.6	90.5	92.4	95.1	86.4	94.1	90.5	87.6
0.075	95.5	93.3	92.8	92.5	92.4	93.7	93.9	96.4	88.3	95.7	94.0	91.7
0.038	96.1	94.2	94.3	93.6	94.3	94.9	94.6	97.1	89.6	96.2	96.3	94.3

Sizing data on twelve backhoe pit samples are given in the above table.

A mean cumulative frequency curve representing these particle size distributions is plotted on Figure 4 showing that there is little difference between these samples and those collected by APPM.