UR1977-42

1977/42. Reserves of dolerite gravel at Sugarloaf Road gravel pit, Carlton.

V.M. Threader

An area of about 5 ha adjacent to the Sorell Council gravel pit on the property named 'Carlton House' [EN566548] was investigated to assess reserves of rippable road-making material.

The area was drilled by percussion rig on a rectangular grid laid out by surveyor G. Benn. The holes were drilled to 15 m or to hard ground, whichever was encountered first. Samples were collected at each drill steel change (*i.e.* 3 m) and examined for rock type and degree of weathering.

Two seismic spreads were fired by geophysicist D.E. Leaman for comparison with the drilling results.

The rock type in all 18 holes was dolerite and depths of weathering are given in Table 1, with seismic interpretation where possible. There is a reasonable degree of correlation although some discrepancy is inherent in the two methods. This is particularly noticeable in variable ground such as this where jointed blocks of weathered dolerite contain hard kernels of fresh rock of various sizes. In the quarry area these kernels range from 10-50 cm across. The seismic method would appear to give more reliable results as it is continuous across the spread whereas the drilling results would be prejudiced by the number of hard kernels encountered.

Area	*ha*	m^2	*Interpreted thickness of rippable dolerite (m)*	m^3	*Less 20% for kernels*
A	3.2	32 000	15	480 000	384 000
B	0.95	9 500	5	47 500	38 000
				Total:	422 000

(An estimated 20% is allowed for reject material)

Table 1.

Bore Hole	Depth of weathering (m)	Thickness of rippable material (seismic interpretation) (m)
Q1	6	
Q2	3	
Q3	6	
Q4	9	
Q5	3	
A1	>15	
A2	>15	
B1	>15	15 (average of values between 2 spreads)
B2	>15	13 (variable)
B3	>15	24
B4	>15	
C1	9	13-22
C2	9	13-22
C3	9	14-20
C4	<3	
C5	<3	
D4	<3	
D5	<3	

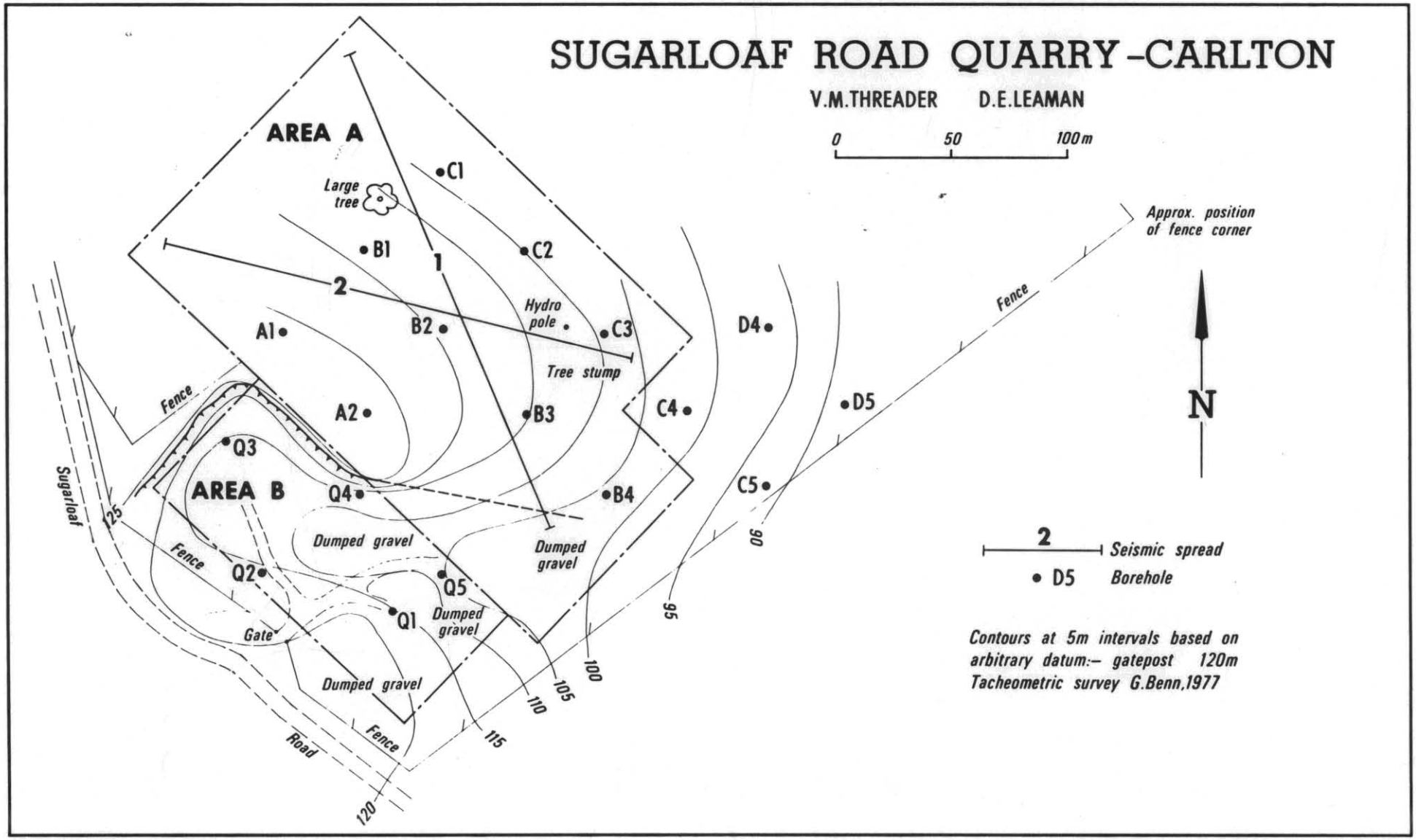
SUGARLOAF ROAD QUARRY-CARLTON
V.M.THREADER D.E.LEAMAN
0 50 100m
AREA A
AREA B
Large tree
Hydro pole
Tree stump
Approx. position of fence corner
Fence
Sugarloaf
Gate
Road
Dumped gravel
N
2 Seismic spread
D5 Borehole
Contours at 5m intervals based on arbitrary datum:- gatepost 120m
Tacheometric survey G.Benn,1977
C1
B1
C2
A1
B2
C3
D4
A2
B3
C4
D5
Q3
B4
C5
Q4
Q2
Q5
Q1
125
120
115
110
105
100
95
90

Figure 1.

5 cm

The present annual production from this pit is stated to be 6000 yd^3 or about 4500 m^3. Allowing a 5% growth rate in demand, 400 000 m^3 would represent approximately 35 years reserves.

The area around C4, C5, D4 and D5 was excluded as fresh rock was encountered in these holes. The area west of the west quarry face was also excluded as this face is in hard ground.

In the geophysicist's report (Appendix 1) attention is drawn to the variability of seismic velocities in the area. The thicknesses in the calculation are interpreted averages.

Material quality

Grain size analyses of two samples from the pit are given in Figure 2. Sample A contains excessive amounts of granule to medium sand and has a liquid limit of 33, plasticity index of 16 (which is excessive), linear shrinkage of 8 and a dust ratio of 0.49. It is therefore of marginal quality but is usable as a material for unsealed roads. Sample B lies within the DMR specification F and can be expected to be less plastic than sample A.

More stringent sampling and testing of this area is necessary before its applicability to sealed road-making can be assessed but on the information here presented, it is unsuitable.

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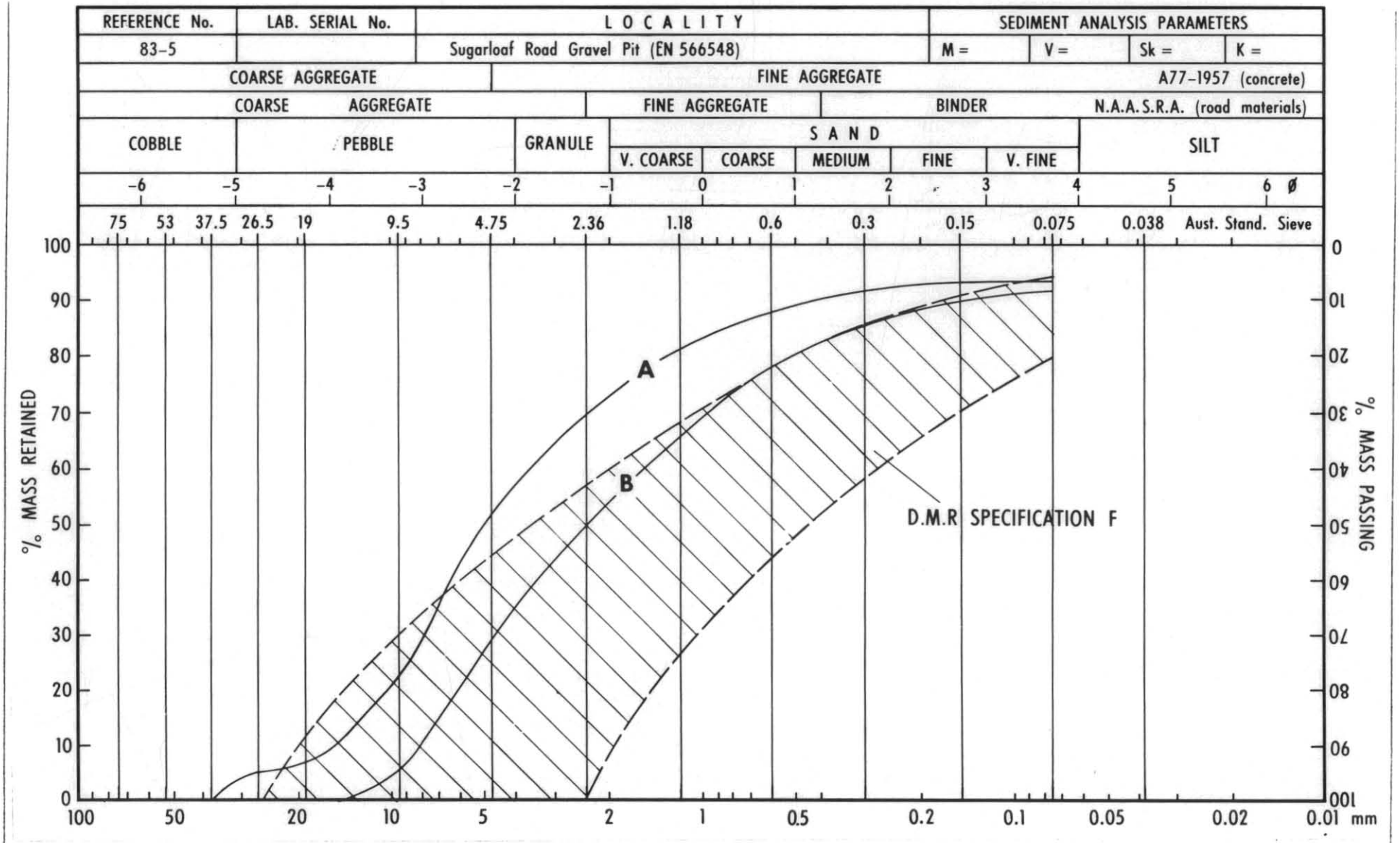

Figure 2. *Grain size analyses.*

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APPENDIX 1

Seismic survey

D.E. Leaman

Two 180 m spreads were fired in the area adjacent to the present workings. The results provide additional information and allow for comparison with the drilling results. As might be expected for dolerite in the condition exposed in this pit a wide range of seismic velocities was recorded. The velocities may be grouped in the following way:

(1)	750 m/s	Soils, totally decomposed material.
(2)	1050-1400 m/s	Wet, highly decomposed material.
(3)	1800-2100 m/s	Very weathered rock.
(4)	2750-3200 m/s	Weathered, fractured rock.
(5)	4200-4500 m/s	Very slightly weathered, fractures tight.
(6)	5500-6000 m/s	Virtually fresh, massive rock.

In terms of workability, only the first three types can be easily ripped or shovelled and the last two categories would require considerable use of explosives. The fourth category lies near the limit of rippability for rocks of this type and local and highly variable factors would determine if, and how much, of the rock could be worked in this way. Critical considerations include the nature and extent of the weathering, the fracture frequency and hence the size of the kernels of fresher rock. It must be noted that the seismic velocity is a bulk average and in consequence, where the rock is very variable, a range of materials will be included. Thus it is likely that some of group four will be rippable but the proportion can not be predicted. For this reason the interpretations provided state two figures - one for the thickness of material which comprises groups 1-3 (rippable) and a second for the limit of group 4. The limit of rippability will lie between these figures but should not be assumed to be closer to the deeper estimate. In some cases rippable rock is underlain by massive rock and in such instances the two estimates are the same.

The location of the spreads and test holes is shown in Figure 1. Table 2 provides interpretations in relation to spread ends or test holes.

Table 2. SUGARLOAF ROAD QUARRY, SEISMIC INTERPETATION

Location	Thickness of weathered/ rippable material (m)	Remarks
N end of Spread 1	13/22	Velocity >4200 m/s at 22 m.
Near Hole C1	13/23	Patches of very high velocity included at more than 23 m.
Near Hole C2	Presumed as for C1.	
Near Hole B2		Very variable conditions in this region.
	to north: 12/20	Velocity 3200 m/s from 12 m. Doubtful rippability.
	to south: 13/13	Velocity 4300 m/s at 13 m.
	to east: 11/25?	No velocity higher than 2800 m/s recorded below 11 m. Probably rippable.
	to west: >18/>25?	No velocity in excess of 2400 m/s recorded. Rippable.

Table 2. (continued)

Location	Thickness of weathered/ rippable material (m)	Remarks
Near Hole B1	12/20	Rippability doubtful below 12 m.
Near Hole C3	>14/>20?	Velocities below 14 m are about 2400-2800 m/s in general but include some suggestion of 6000 m/s kernels. This implies large massive zones are present. Very patchy material.
Near Hole B3	24/27?	Velocities exceed 3000 m/s at 24 m and the rock is unlikely to be rippable.
W end of Spread 2	26.5/30?	
S end of Spread 1	24.5/24.5	

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