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Sand at Dysart

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Abstract

A deposit of sand on the property *Mauriceton* at Dysart is being considered as a source of bedding sand for construction purposes. Samples of this sand, and two other sand occurrences in the area, were submitted to the Department and subjected to grainsize analysis to determine their suitability for various potential uses.

LOCATION AND ACCESS

An occurrence of sand is located at AMG co-ordinates EN095919 on the *Mauriceton* property, 9 km NW of Dysart. Two samples of sand taken from prospecting pits 50 m apart were submitted to the Department. A mining lease, ML 1328P/M of 12 ha in the name of J. S. D. Allen, is held over the area.

PREVIOUS WORK

Six pits are shown on the Department of Mines Construction Materials Register in the vicinity of this new area (fig. 1). All of these existing pits are in the Ferntree Mudstone rock unit, and produce coarse broken rock suitable for use on unsealed roads and as a base course on sealed roads.

The geology of the *Mauriceton* area is shown on the Geological Survey Atlas 1:50 000 Series 'Brighton' sheet (Leaman, 1975). The area from which the sand samples were taken is shown as Ferntree Mudstone, the same host rock as other pits in the locality. This rock unit consists of unfossiliferous quartz siltstone with some coarse sandstone horizons. In this case weathering has produced a mantle of fine sand, which would probably not be very thick. The depth of the sand has not yet been determined, and no estimate has been made of the quantity of sand available.

USES OF SAND

Sand is used for a large variety of purposes in the construction materials industry and very pure grades of sand have metallurgical uses. In determining the possible end uses of a sand product both the chemical composition and the grainsize of the sample must be ascertained.

The sample is analysed by determining the proportion by mass or weight of grains which remain, or which pass through sieves of certain sizes. The sieve sizes are known as "Australian Standard Sieves". The results are plotted, showing the proportion of the sample that passed through each of the various sieves. This is called a "grading curve".

Various building and construction commodities have size specifications to determine what is, and what is not, suited to a particular use. The upper and lower limits of a specification can be plotted, giving a "grading envelope". This shows the range of proportions of each of the grain sizes which are either recommended, or permitted, for a specific task.

Potential uses for sand include:

1. *Bedding sand:* used in the laying of pavements etc. The sand should not contain an excessive amount of fines and should not be gap-graded (i.e. lacking some grainsizes within the grading envelope). The grains should preferably be angular (sharp), not rounded. Such sand should not contain any soluble salts and should have a uniform (low) moisture content in the range 4–8%.

2. *Joint-filling sand:* used to fill the small gaps or joints between paving units, which are usually 2–4 mm wide and must be filled with a relatively fine sand. This sand should pass a 2.36 mm sieve and be well graded.

   A small proportion (not more than 5–10%) of fine material (passing 75 μm sieve) may be added to the sand. These fines help restrict the penetration of water into the cracks or joints of a pavement. Joint-filling sand should be dry when used and should not contain any soluble salts.

3. *Sharp sand (fine aggregate):* used in the making of concrete, having a small or no proportion of fine material.

4. *Fat sand:* used in the making of mortar, and having a proportion of fine material, usually clay, which helps in the binding of the mortar. Not more than 10% of material should be finer than 75 μm, and not more than 1% of material should be larger than 2.36 mm. Many Australian sands used to make mortar are in fact finer than this.

5. *Foundry sand:* must have a very high silica (SiO_2) content (>99.6%) with low aluminium, iron and titanium content. Is generally finer than bedding sand and joint-filling sand.

6. *Glass making:* grades also vary, however even for coloured glass the silica content must be quite high (at least 99%) with not too much iron. For better quality types of glass, from colourless glass and to lead crystal

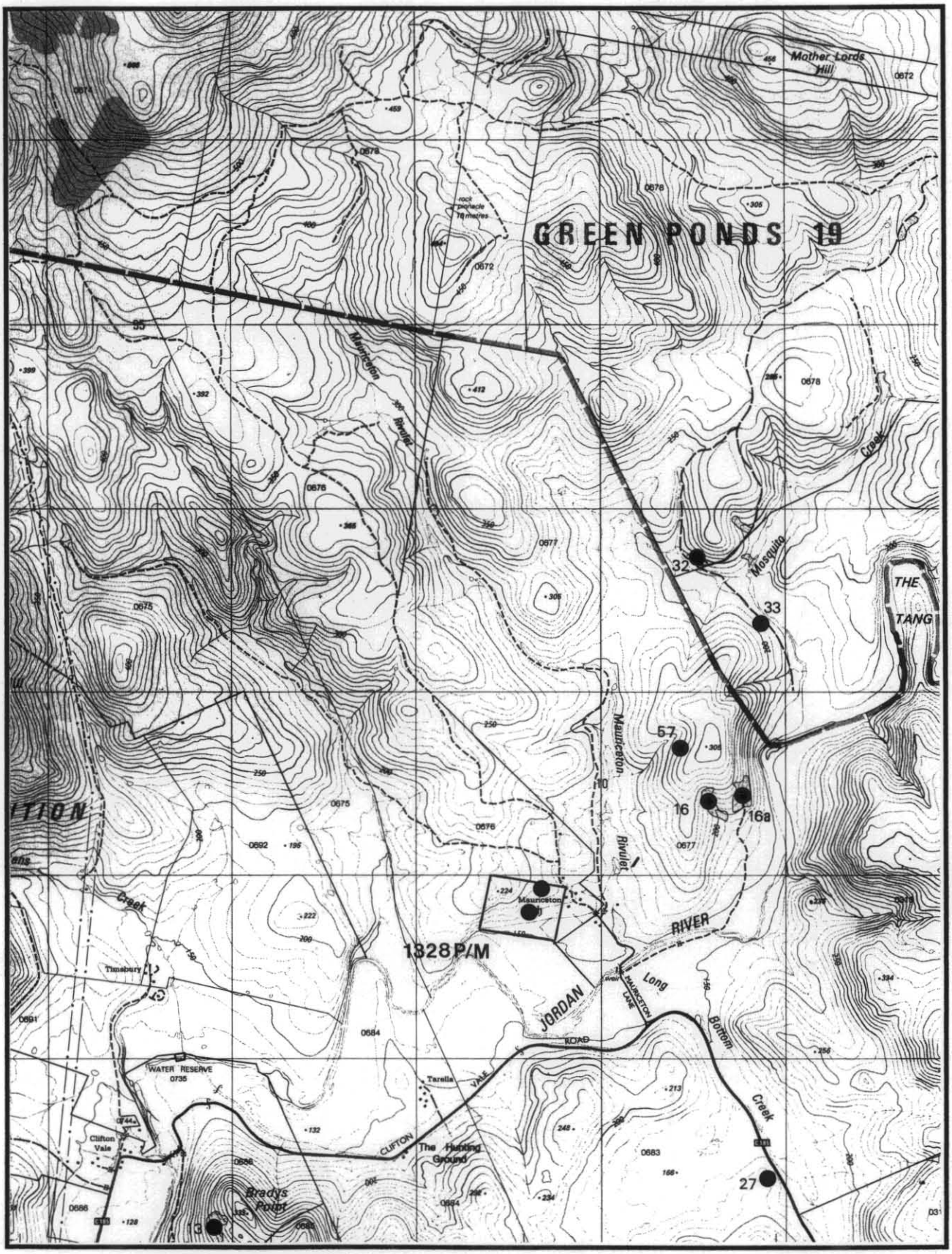

Figure 1.

Gravel pits near Dysart.

● 57 DOM CONMAT registered pit
● Sample location, Mauriceton

to lenses and optical fibres, progressively better quality material is needed. Generally a fine sand is used, with the majority of sand grains being between 150–600 μm. For the top end of the market (optic fibres, etc.) the sand must be exceptionally pure (>99.9% SiO_2).

SAND SPECIFICATIONS

Some specifications for various sands are given in Table 1. These should only be taken as a rough guide; particular projects may require further specifications.

The grading envelopes of some sand specifications are shown in Figures 2 to 4.

In addition, sands used in metallurgy must be of appropriate quality. Chemical analyses for typically used sands are given in Table 2. Again, these are only a rough guide.

SAND SAMPLES FROM DYSART

Grainsize and chemical analyses are listed in Tables 3 and 4. The grading profiles are shown in Figure 5.

CONCLUSIONS

The sand samples submitted were all extremely fine grained, finer than the normal specifications for bedding and paving sand, but they just fell within the SAA draft standard for mortar sand. The material has potential to be used as a road materials binder.

Further laboratory tests would be needed to verify the suitability of the material for mortar sand.

The material is chemically unsuited to any of the usual metallurgical applications for sand, such as glass manufacture.

REFERENCE

LEAMAN, D. E. 1974. Geological atlas 1:50 000 series. Sheet 75 (8312N). Brighton. *Department of Mines, Tasmania.*

[30 March 1992]

Table 1.

Sand specifications.

Use	Bedding*	Joint filling*	Mortar+	Foundry# (fine)	Foundry# (coarse)	Glass
Sieve size	% passing	% passing	% passing	% passing	% passing	% passing
9.52 mm	100					
4.75 mm	95–100					
2.36 mm	80–100	100	99–100			
1.18 mm	50–85	90–100	30–100	100	100	100
600 μm	25–60	60–90	15–100	96	70	98
300 μm	10–30	30–60	5–50	45	8	47
150 μm	5–15	15–30	0–15	3	<1	3
75 μm	0–10	5–10	0–10	0.1		0.1

* recommended by the Cement and Concrete Association

\+ draft SAA Mortar Standard BD/34/74-459

\# typical industrial specifications

Table 2.

Chemical analyses, metallurgical sands.

Sand	High quality glass (%)	Foundry (%)
SiO_2	99.9	99.6
Al_2O_3	0.03	0.04
Fe_2O_3	0.012	0.06
TiO_2	0.02–0.04	0.16
LOI	0.02	0.10

Table 3.

Grainsize analysis of sand samples.

	Mauriceton (Top of Hill)		Mauriceton (Bottom of Hill)		Bally Hooly		Castle Hill	
Sieve Size	Mass (%)	Cum. mass (%)	Mass (%)	Cum. mass (%)	Mass (%)	Cum. mass (%)	Mass (%)	Cum. mass (%)
+2.36 mm	0.26	0.26	0.03	0.03	0.21	0.21	0.04	0.04
+1.18 mm	0.15	0.41	0.15	0.18	6.01	6.21	2.30	2.34
+ 600 µm	0.39	0.80	5.07	5.25	28.91	35.13	0.34	2.68
+ 300 µm	4.94	5.74	31.33	36.58	34.09	69.22	11.24	13.92
+ 212 µm	14.10	19.84	34.72	71.30	26.30	95.53	23.54	37.46
+ 150 µm	31.34	51.18	23.33	94.63	3.56	99.09	26.86	64.33
+ 106 µm	27.61	78.80	3.42	98.05	0.91	100.00	26.69	91.02
+ 75 µm	10.94	89.73	1.95	100.00			5.53	96.55
+ 38 µm	6.38	96.11					3.45	100.00
- 38 µm	3.89	100.00						

Table 4.

Chemical analyses of sand samples.

	Mauriceton (Top of Hill)	Mauriceton (Bottom of Hill)	Bally Hooly	Castle Hill
SiO_2	91.65	93.10	93.88	91.43
TiO_2	0.41	0.28	0.25	0.35
Al_2O_3	4.02	3.26	2.34	3.76
Fe_2O_3	0.74	0.86	0.85	1.54
MnO	<0.01	<0.01	<0.01	<0.01
CaO	<0.01	<0.01	<0.01	0.15
Na_2O	0.81	0.65	0.20	0.92
K_2O	1.88	1.24	0.86	1.22
P_2O_5	<0.01	<0.01	<0.01	<0.01
SO_3	<0.1	<0.1	<0.1	<0.1
LOI	1.00	1.10	1.50	1.00
MgO	<0.01	<0.01	<0.01	<0.01

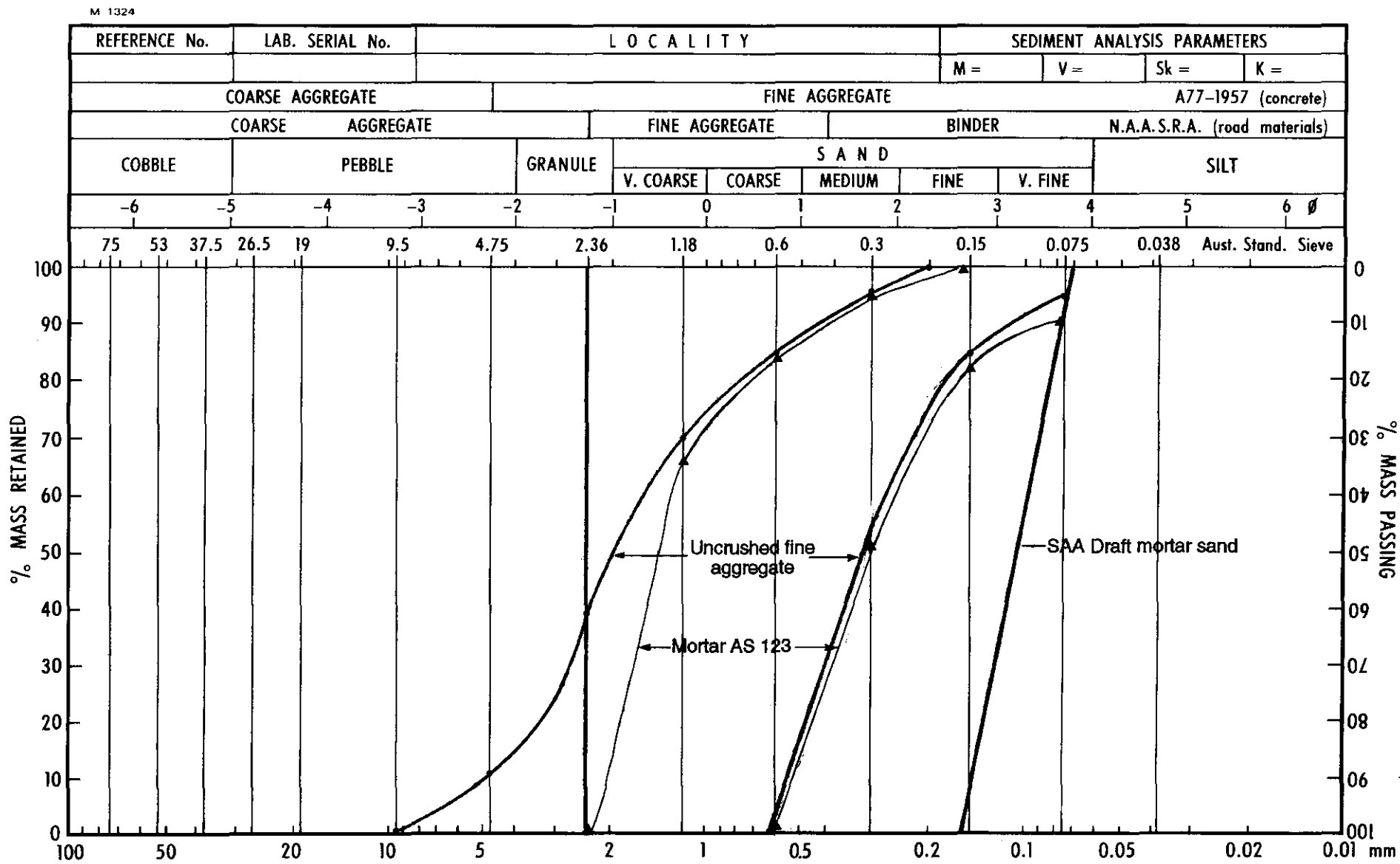

Figure 2. Grading envelopes: Mortar, crushed aggregate

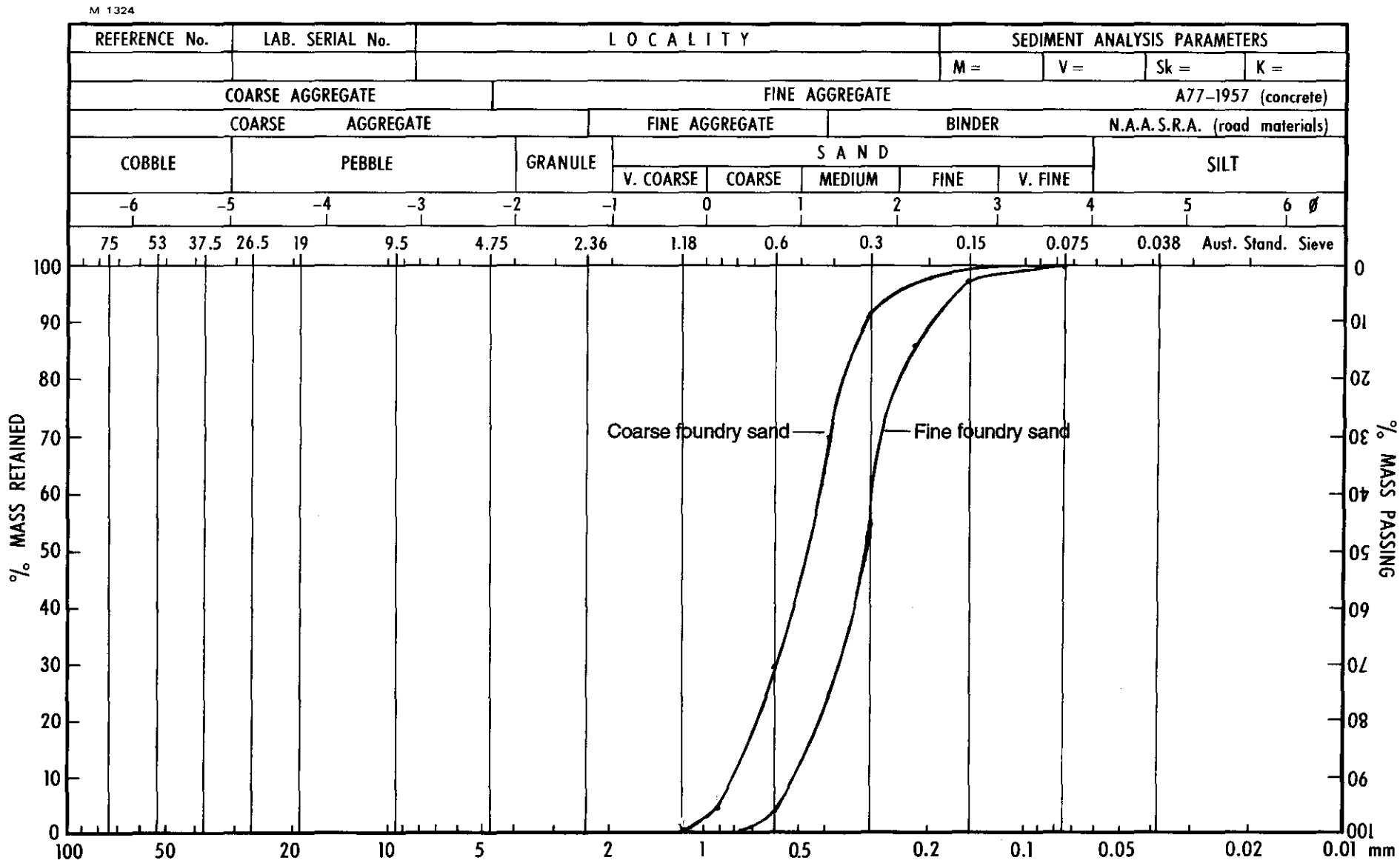

Figure 3. Grading envelopes: Foundry sands

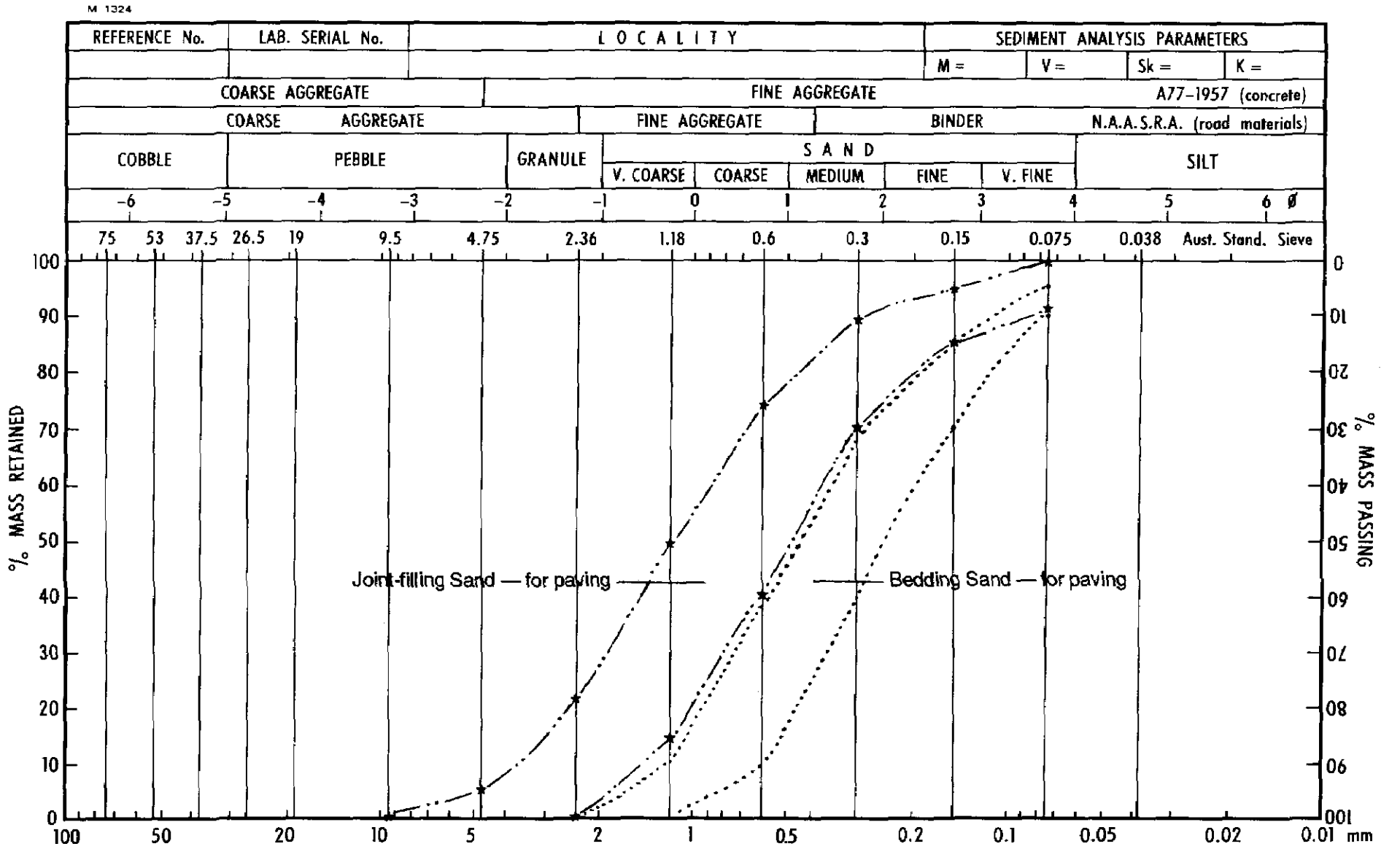

Figure 4. Grading envelopes: Bedding and joint-filling sands

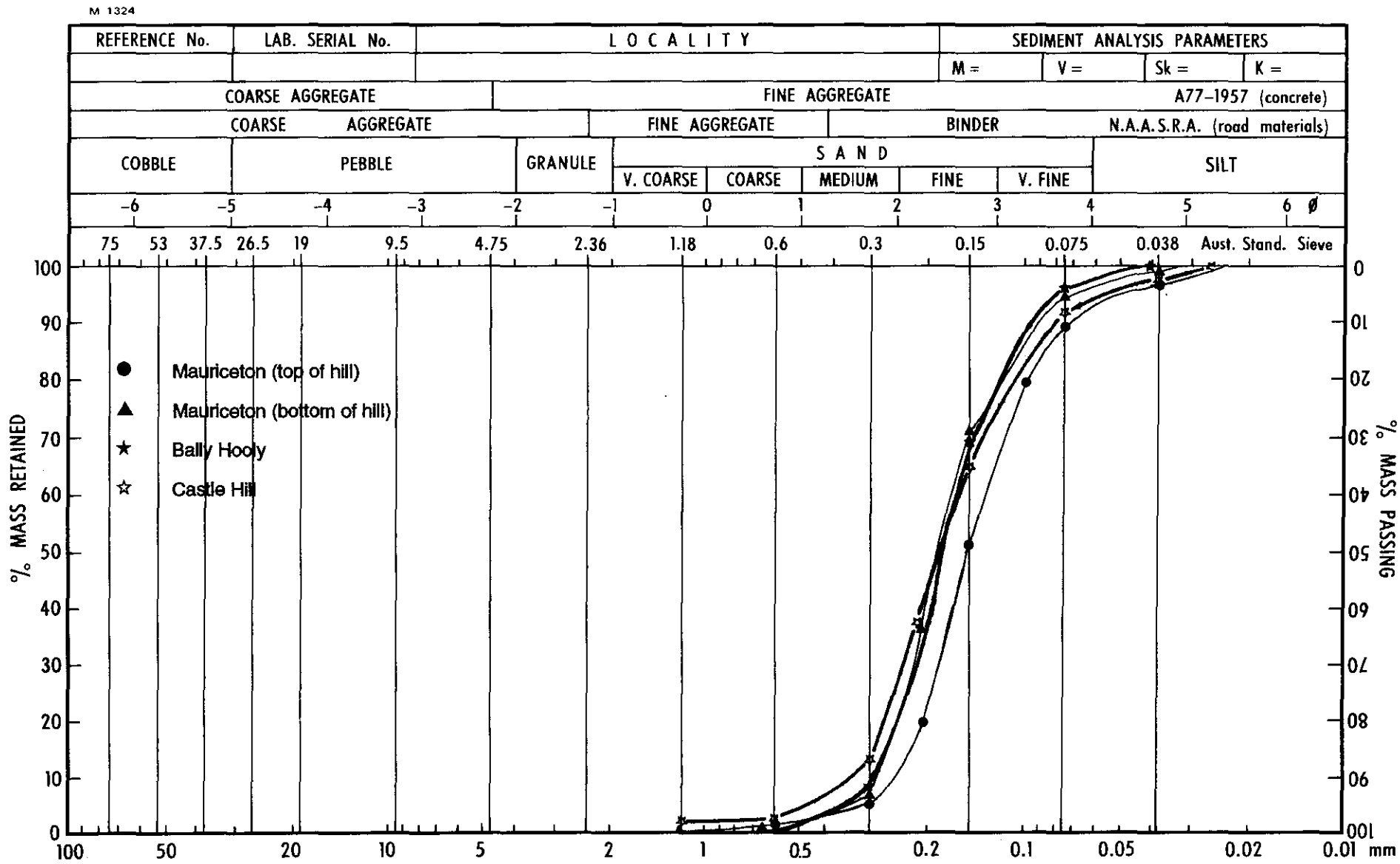

Figure 5. Grading profiles of Mauriceton and associated samples