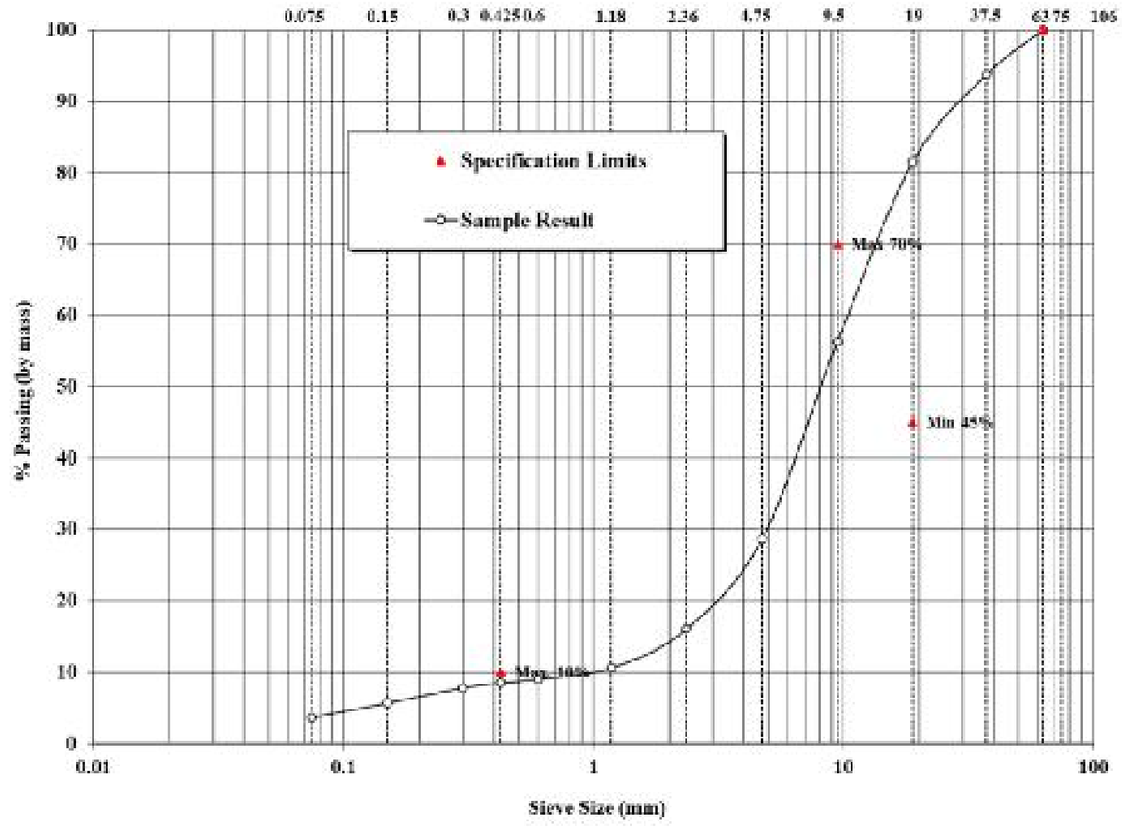
Regional Subbase Specifications - Do current practices follow the principles in NZTA M/3 Notes?



GeoSolve & CTS

NZTA M/3 Notes (1986) Requirements

- Grading exponent between n=0.4 and 0.7 relative to 25%ile particle size
- PSD should be well graded ie plot as straight lines on log-log
- Grading shape control measure not included
- Limit the percentage on the 0.15 mm sieve
- Permeability> 1x10E-4 m/s
- Sand equivalent: permeability may be satisfied “by specifying a minimum” but often misconstrued as 40 (as in M/4).

NZTA M/3 Notes (1986) Requirements

- Grading exponent between n=0.4 and 0.7 relative to 25%ile particle size: seldom found in specifications
- PSD should be well graded ie plot as straight lines on log-log seldom plotted this way
- Grading shape control not quantified but implicit in the straight line log-log plot suggestion
- Limit the percentage on the 0.15 mm sieve: but no actual quantification in M/3 Notes
- Permeability> 1x10E-4 m/s: seldom tested
- Sand equivalent > 40: not a requirement of M/3 Notes yet is often the only one of these that gets into local specifications, but is it relevant?

M/3 Notes states on Permeability

> This requirement can be waived if a suitable material is unreasonably expensive and the design loading is less than 1 x 10^5 EDA.

Evidence for such a waiver?

A low permeability subbase is the probably the second most rapid form of premature terminal distress in unbound granular pavements, and costly to remediate.

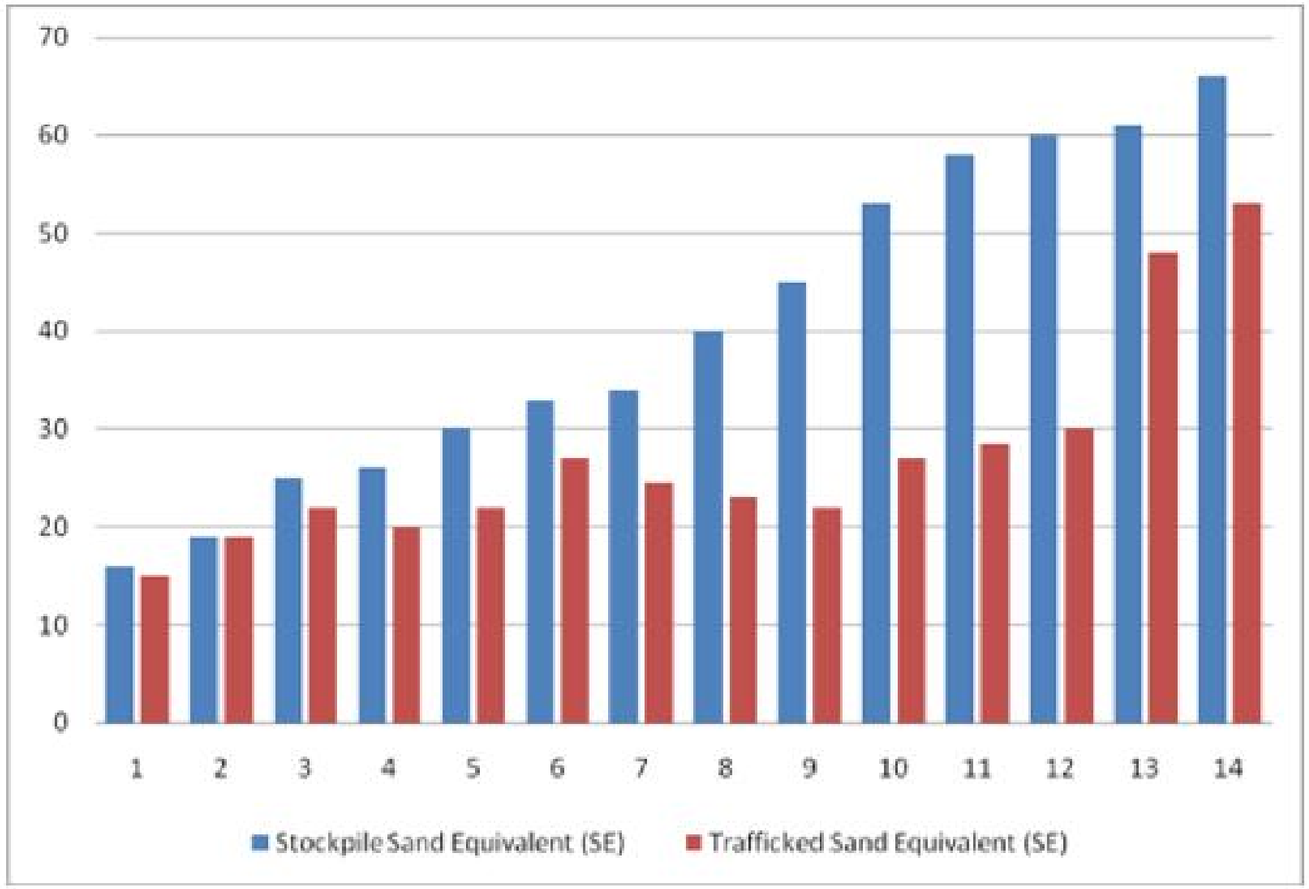
Debatable clause, in an otherwise sound set of principles.

Does SE of basecourse deteriorate in practice?

Sand Equivalent

Was never intended to be a permeability test and in NZ practice (NZTA RR 459) many aggregates that have stockpile SE>40 degrade to <40 after laying and compaction or <30 after initial trafficking.

What is the evidence for using SE>40 in subbase specification.



Application by Practitioners

Can be a simple addition to the lab report in the PSD spreadsheet

GRAPH DATA	Reference No. 21/3780	0.4	0.7
Sieve Size (mm)	Percent Passing	NZTA Fine Limit (n=0.4)	NZTA Coarse Limit (n=0.7)
37.5	94		
19.0	82	82	82
9.50	56	62	50
4.75	29	47	31
2.36	16	35	19
1.18	11	27	12
0.60	9	20	7
0.30	8	16	4
0.15	6	12	3
0.075	4	9	2

Create additional "Grading Exponent" column - slope of line formed by the current point and points either side

GRAPH DATA	Reference No. 21/3780		0.4	0.7
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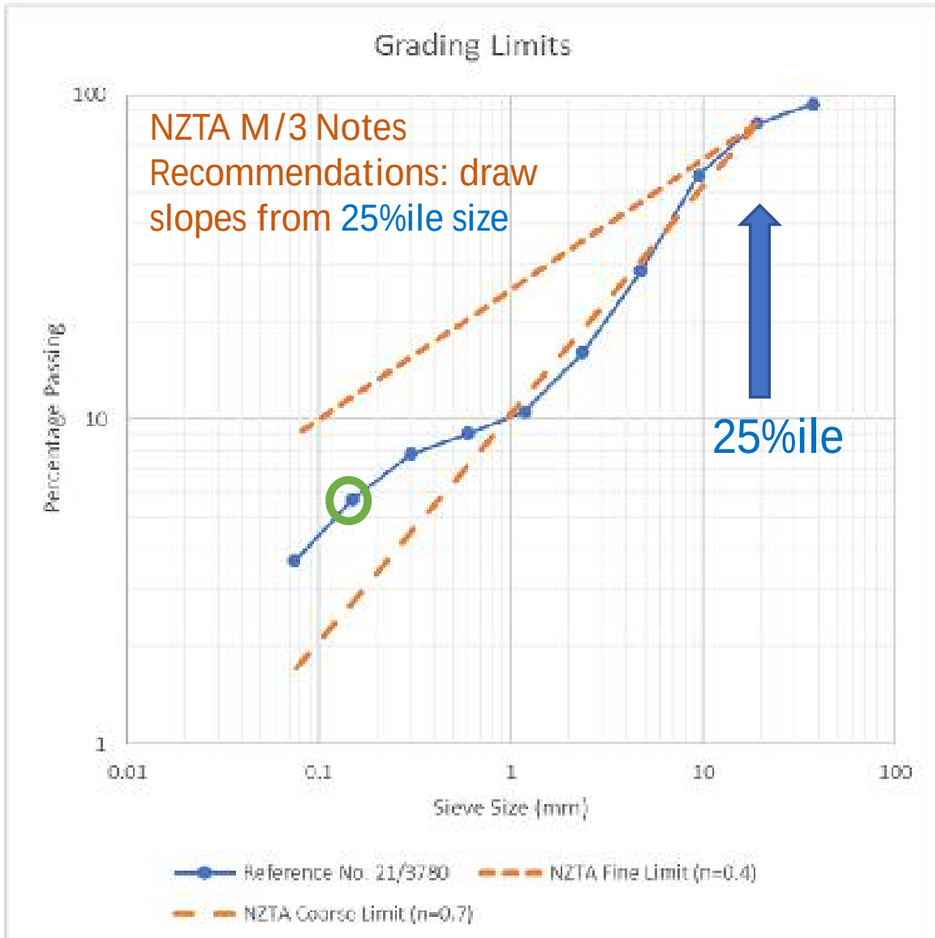
2.36	16	0.7	35	19
1.18	11	0.4	27	12
0.60	9	0.2	20	7
0.30	8	0.3	16	4
0.15	6	0.5	12	3
0.075	4		9	2

The log-log grading exponent lines as constructed in this manner facilitate QA .....

Compliance with M/3 Notes

- Simple spreet, facilitates compliance with various aspects of M/3 Notes often omitted.
- Keeps option for grading limits open
- Adopt SE limit only if there is no more sound criterion for permeability
- Control of %passing 0.15mm
- Permeability as quantified by M/3 Notes.



Conclusions
Closer compliance with M/3 Notes

- If percentage passing 0.15 mm or less passes above the midpoint in this construction (shaded yellow) then carry out in-situ perm test on compacted subbase surface

- For subbase B/2 testing, report also %Sr (saturation should be <60% if no recent water application). A useful nil-cost check, on risk of low permeability subbase aggregate

- No grading shape control quantified, but use this ---→ for QA in production to come progressively closer to the recommendations (preferred upper and lower limits shown)