Memorandum

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Project Title:	STA-62-24.05			Date:	7-19-2018
Project No:	P403160049	Client Project No:	100824	To:	ODOT District 4
Subject:	STA 62 Pavement Design Calculations			From:	Walid Antonios, PE

Pavement Design Approach

Pavement calculations were performed for the US 62 mainline and the US 62 ramps (ramps A and B). It was found that the US 62 mainline has significant levels of truck traffic to warrant the use of superpave items. Ramps A and B were not found to require the use of superpave items, however, due to the short length of the ramps in comparison to the overall project area, it is recommended that the same pavement mixes be used for the ramps that will be used for the mainline. Pavement calculations were not performed for the side roads of the project, due to a lack of certified traffic information on these roads for the proposed project condition. For the stage 1 submittal, the mainline pavement buildup has been shown for the side roads. This pavement buildup is a place holder only, and the side road pavement design will be finalized in subsequent submissions after design assumptions can be discussed and agreed upon between TranSystems and the district. The CBR value used for all roads on the project is 9, per the geotechnical investigation.

Pavement Design - US 62 Mainline

CBR = 9 (from geotechnical investigation)
2025 ADT = 43,120 midyear traffic (2035) = 43,120 + (45,280 - 43,120)(.5) = 44,200
2045 ADT = 45,280
24 hour truck % = 4%
principal arterial - urban

Mr = 1,200 × 9 = 10,800 psi

Per 202-1:
D = 50%
Lane Factor = 80%
B:C = 2:1
ESAL for B trucks = 1.04
ESAL for C trucks = 0.41
reliability = 90%
overall standard deviation = 0.49
design serviceability loss = 2.0

B trucks: (44,200)(0.04)(0.50)(0.80)(2/3)(1.04) = 490
C trucks: (44,200)(0.04)(0.50)(0.80)(1/3)(0.41) = 97
Total = 490 + 97 = 587

20 year design period ESAL: (587)(365.25 day/yr)(20 yr) = 4,288,035 → 4.3×10^6

See pages 2 & 3 for graphical determinations → SN = 3.83

opening day truck traffic: (43,120)(0.04) = 1,725 → greater than 1,500, use item 442, 12.5 mm

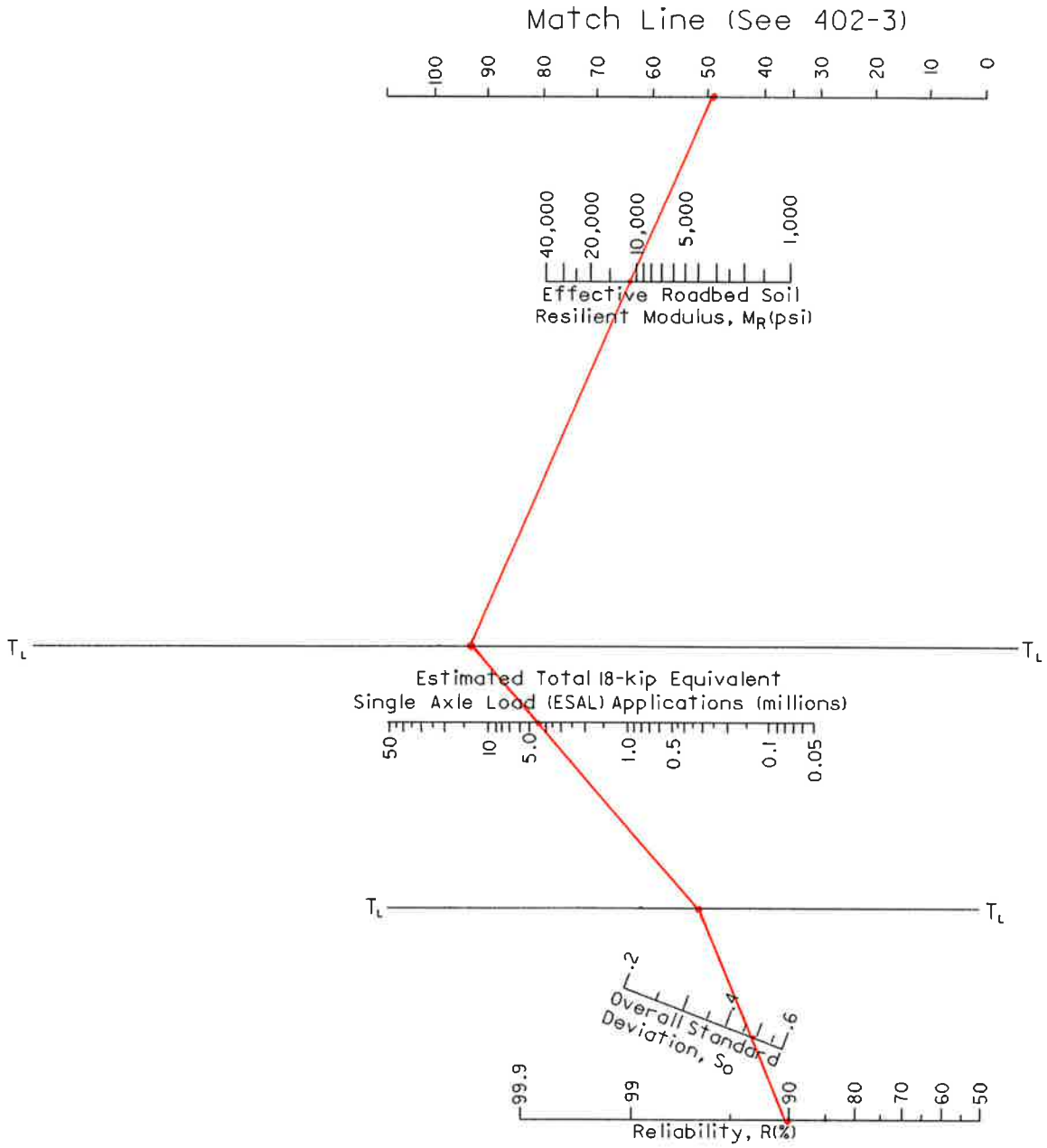
442 AC surface course:	min.	1.5" @ 0.43	= 0.65
442 AC int. course:	min.	1.75" @ 0.43	= 0.75
302 AC base course:	min.	4" @ 0.36	= 1.44
304 agg. base:		6" @ 0.14	= 0.84
			3.68
			+ 0.72
			4.40

→ increase 302 layer to 6"
2" @ 0.36 = 0.72

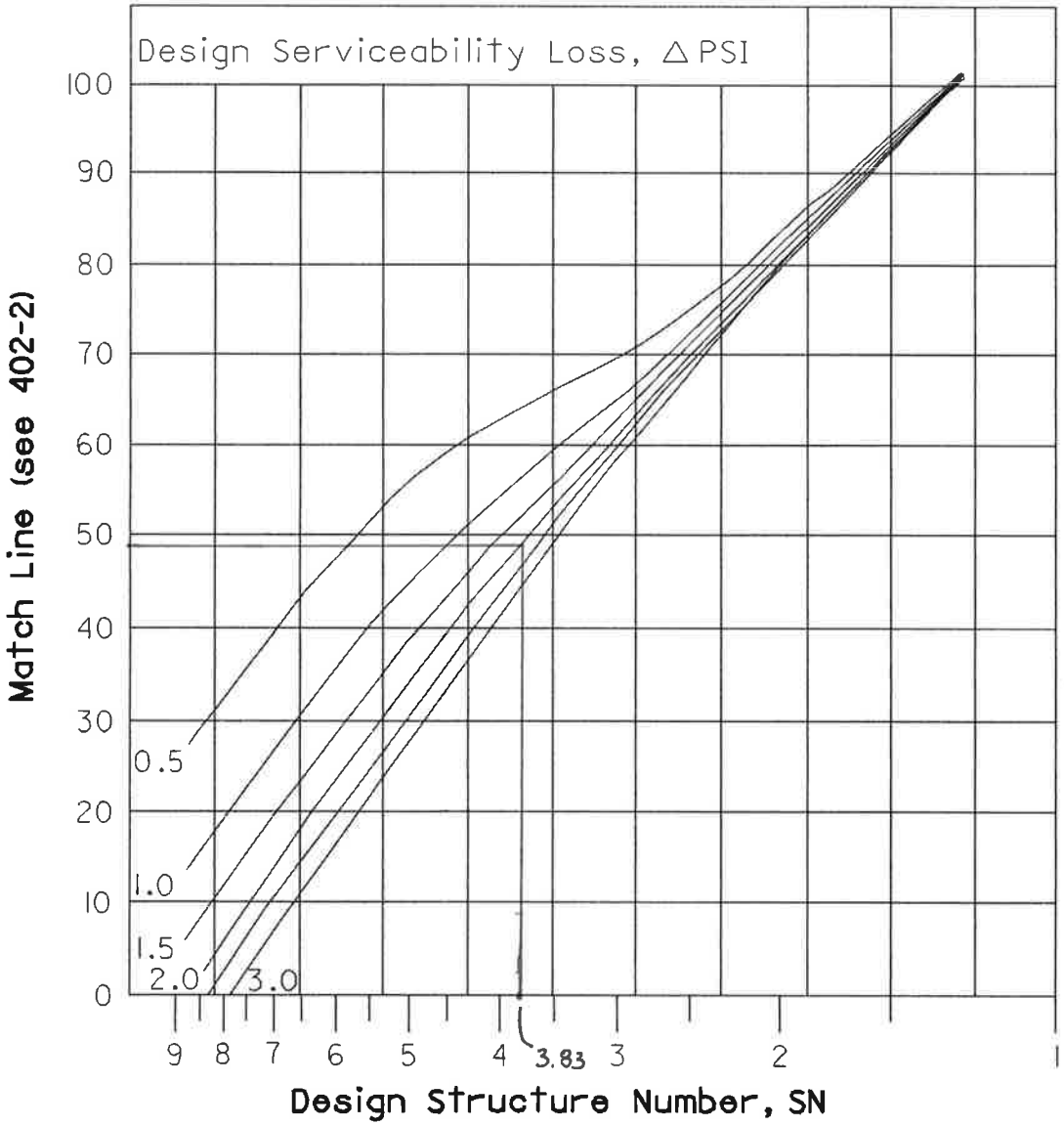
✓ greater than SN of 3.83

442 AC surface course: 1.5"
442 AC intermediate course: 1.75"
302 AC. base course: 6"
304 aggregate base: 6"

Flexible Pavement Design Chart Segment 1	402-2 July 2008 Reference Section & Figure 402, 402-1(step 3)



Flexible Pavement Design Chart Segment 2	402-3 July 2008 Reference Section & Figure 402, 402-1(step 3)



US 62 Pavement Design - Ramps A & B

CBR = 9 (from geotechnical investigation)
2025 ADT (ramp A) = 5,240
2045 ADT (ramp A) = 5,390
2025 ADT (ramp B) = 1,260
2045 ADT (ramp B) = 1,500
24 hour truck % (A) = 0.04
24 hour truck % (B) = 0.02

Ramp A midyear traffic = 5,240 + (5,390 - 5,240)(.5) = 5,315

Ramp B midyear traffic = 1,260 + (1,500 - 1,260)(.5) = 1,380

$M_r = 1{,}200 \times 9 = 10{,}800$ psi
D = 100%
Lane factor = 100%
B:C = 2:1
ESAL for B trucks = 1.04
ESAL for C trucks = 0.41
reliability = 90%
overall standard deviation = 0.49
design serviceability loss = 2.0

Ramp A: B trucks = 5,315 (0.04)(1)(1)(2/3)(1.04) = 147.4 → 147
C trucks = 5,315 (0.04)(1)(1)(1/3)(0.41) = 29
Total = 147 + 29 = 176

Ramp B: B trucks = 1,380 (0.02)(1)(1)(2/3)(1.04) = 19.1 → 19
C trucks = 1,380 (0.02)(1)(1)(1/3)(0.41) = 4
Total = 19 + 4 = 23

ESAL (Ramp A): (176)(365.25 day/yr)(20 yr) = 1,285,680 = 1.3×10^6

ESAL (Ramp B): (23)(365.25)(20) = 168,015 = 0.2×10^6

see pages 2 & 3 (4 & 5) for graphical determinations → SN (Ramp A) = 3.2
SN (Ramp B) = 2.3

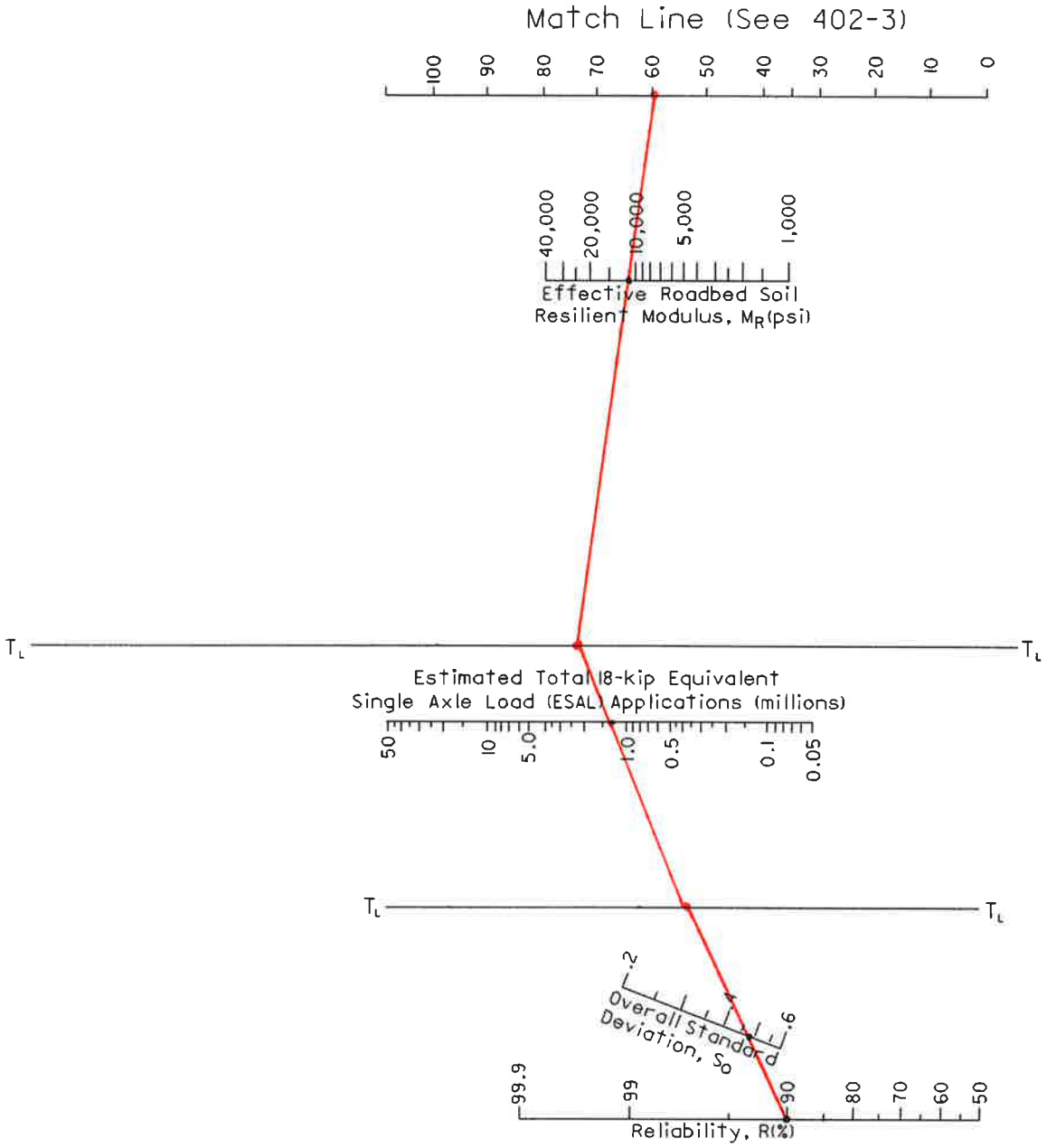
Ramp A opening day truck traffic: 5,240 × 0.04 = 210
Ramp B opening day truck traffic: 1,260 × 0.02 = 25

less than 1,500 ∴ no superpave required

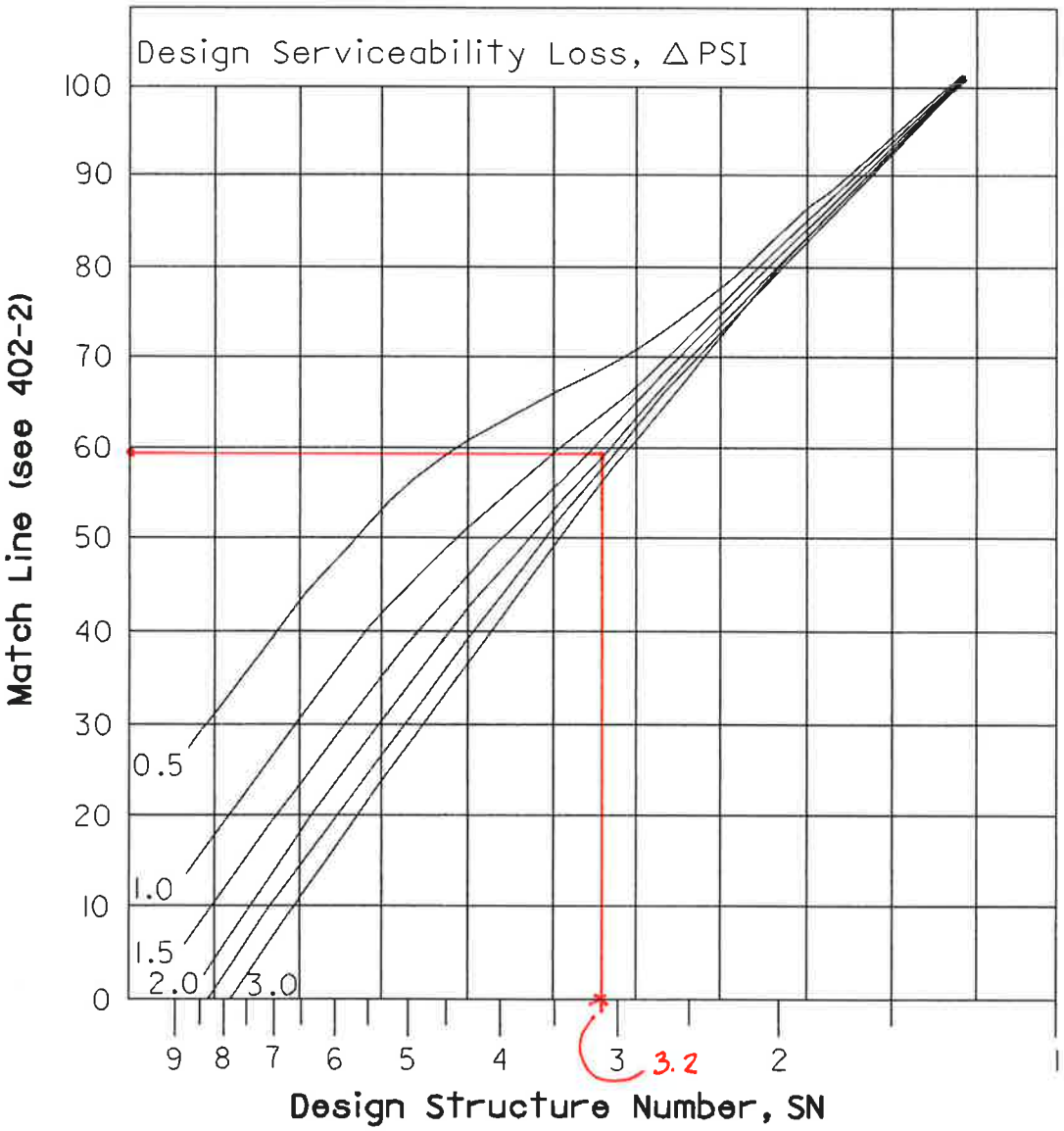
Surface course:	441 @ 1" → 0.43 × 1 = 0.43	@ 1.5"	= 0.65
int. course:	441 @ 1" → 0.43 × 1 = 0.43	@ 1.75"	= 0.75
base course:	301 @ 3" → 0.36 × 3 = 1.08	@ 4"	= 1.44
agg. base:	6" → 0.14 × 6 = 0.84	---->	0.84
	2.78		3.68

Though no superpave is required, due to short length of ramps compared with overall job length, pavement buildup for mainline will be recommended for use on Ramps A and B (442 items).

Flexible Pavement Design Chart Segment 1	402-2 July 2008 Reference Section & Figure 402, 402-1(step 3)



Flexible Pavement Design Chart Segment 2	402-3 July 2008 Reference Section & Figure 402, 402-1(step 3)



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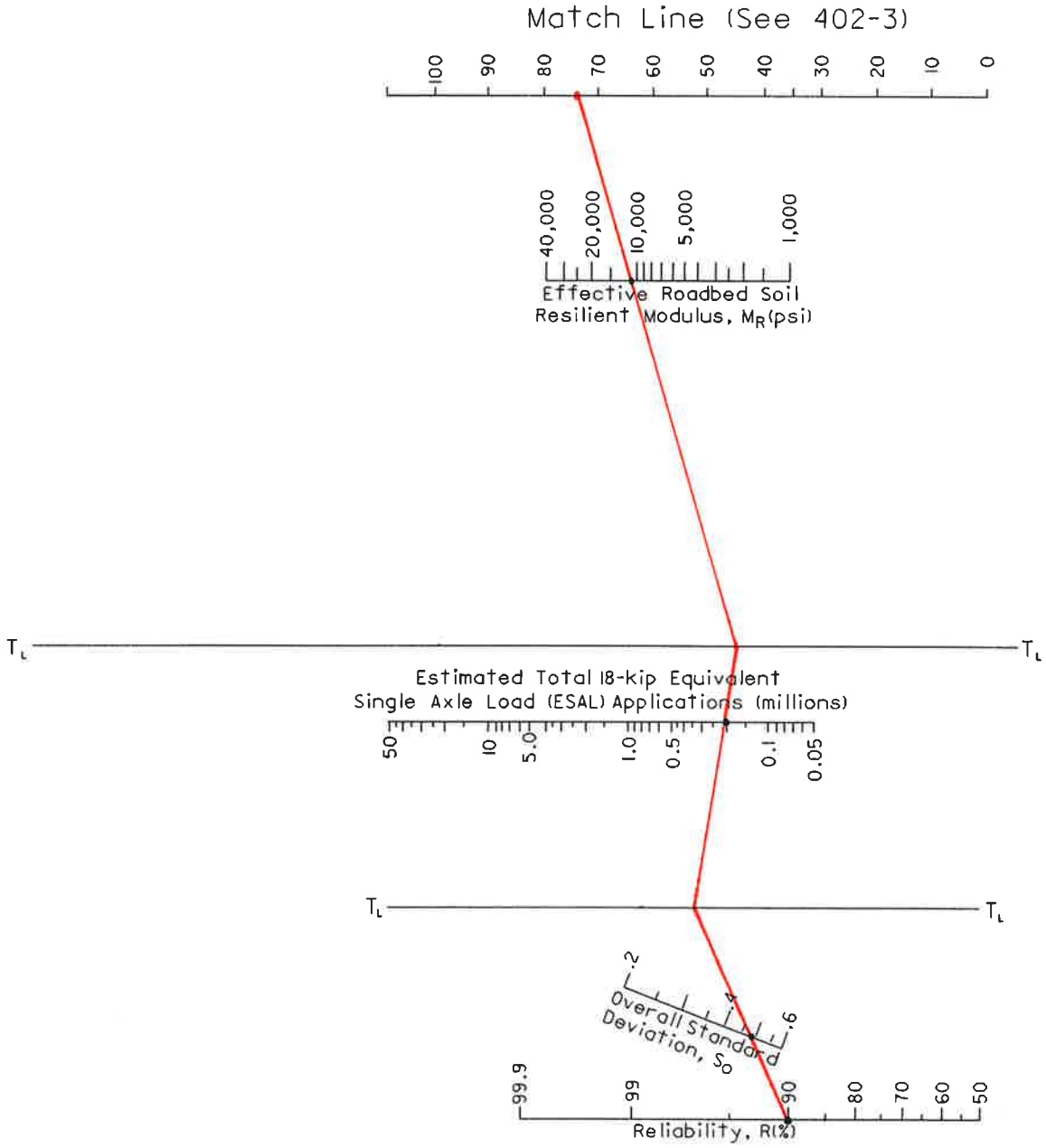

Flexible Pavement Design Chart Segment 2	402-3 July 2008 Reference Section & Figure 402, 402-1(step 3)