

# Asphalt Mix Design

## CSIR Transportek Wheel tracking

Development of limits:

Number of wheel passes to a rut depth of 10mm

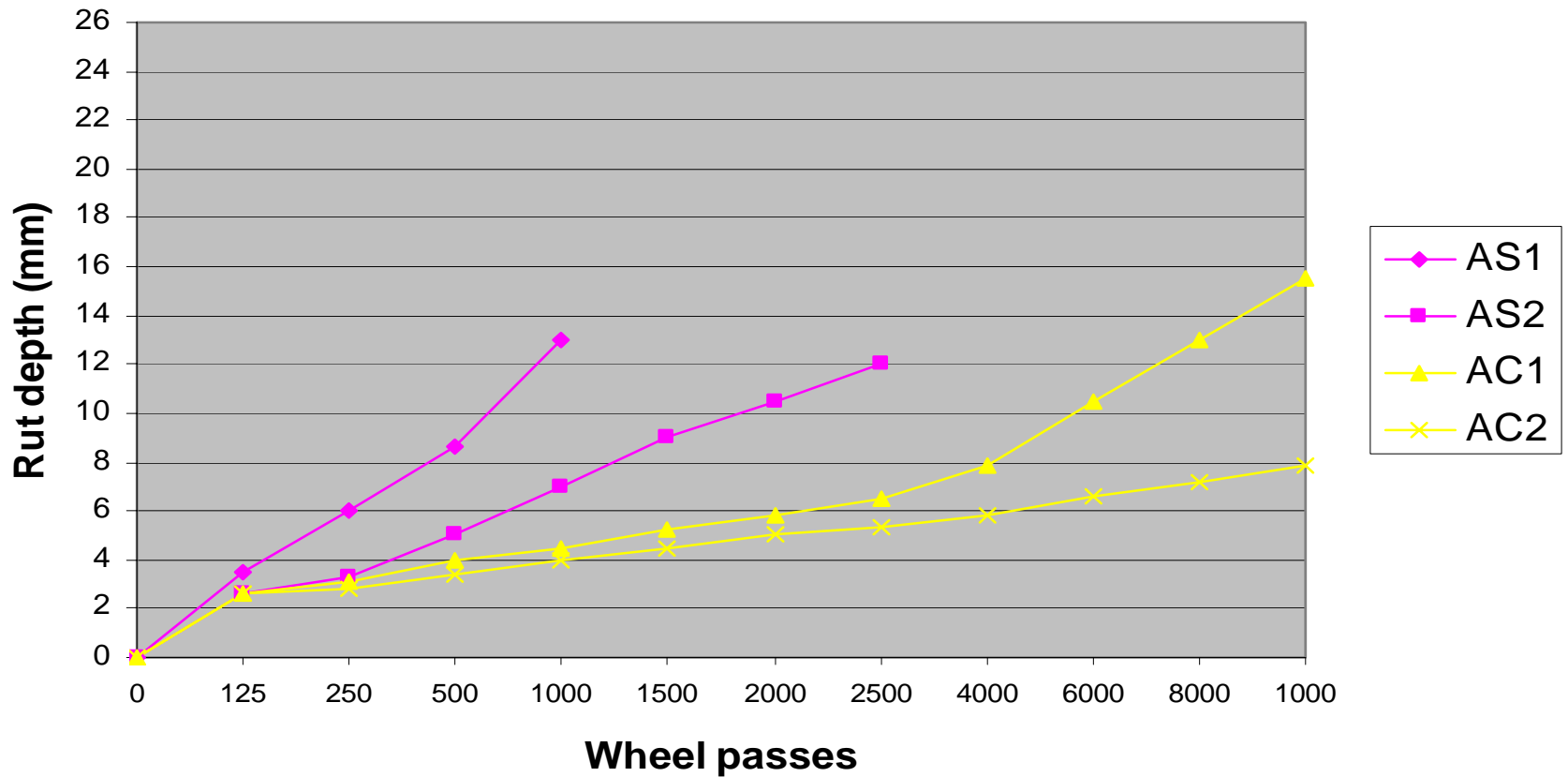
< 2500 – poor

2500 to 5000 – medium

> 5000 - good

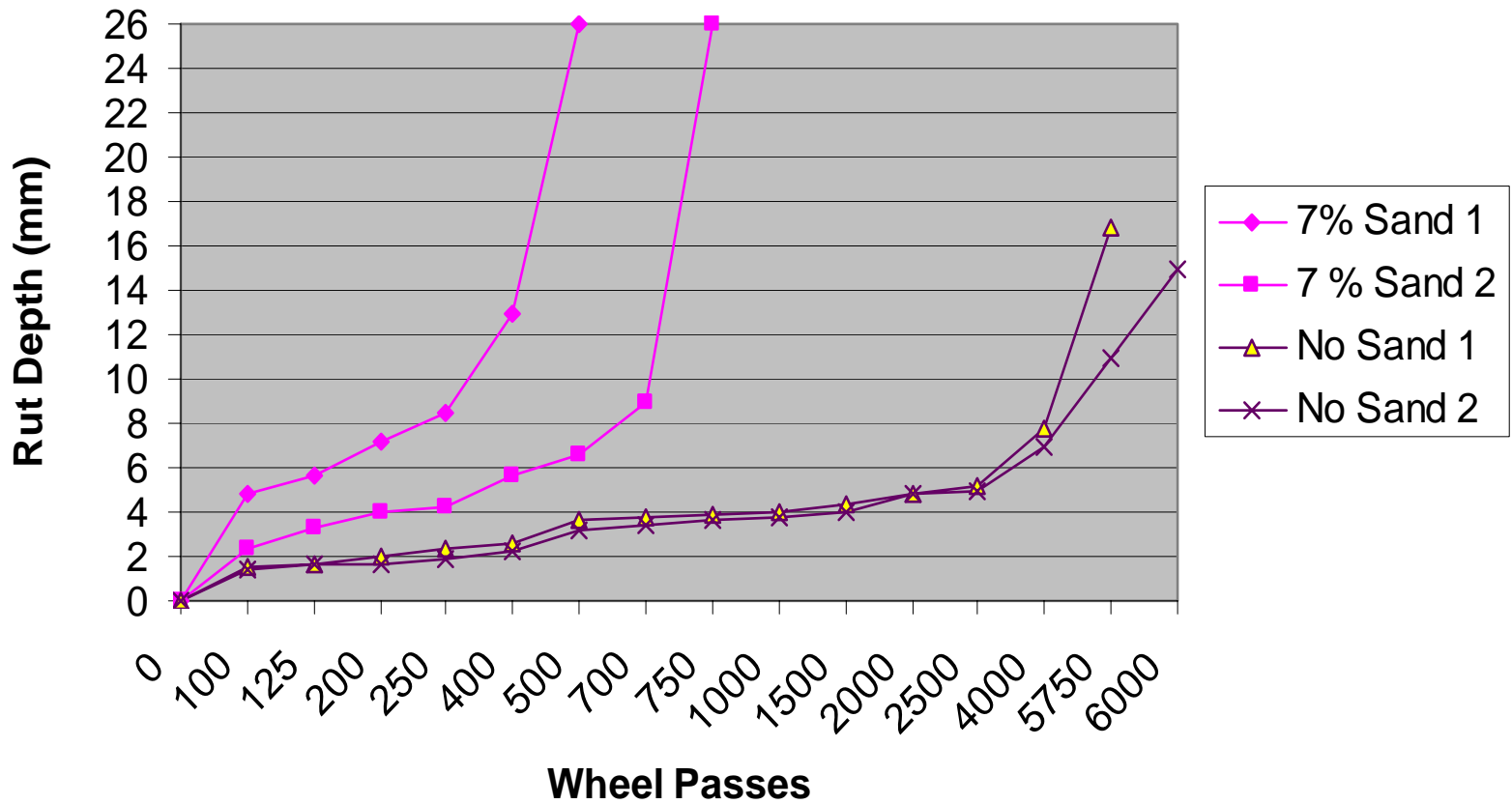
# Asphalt Mix Design

## Wheeltracking Test



# Asphalt Mix Design

## Wheel Tracking Test



## Wheel Tracking Test

- Limitations**
- **Sample preparation**
  - **Lab mix**
  - **Differing properties of modified binder lab/plant**
  - **Effect of ageing (setting up)**
  - **Maintaining test temperature**

## MMLS Testing

- Test Conditions**
- 40 mm Surfacing on G1 base
  - 51 – 53°C middle of layer
  - 2,7 kN wheel load
  - 690 kPa tyre pressure
  - 7200 axles per hour

## MMLS Testing

- Calibration with HVS @ NCAT test programme
- HVS indicates that site S9 ranks best wrt rutting
- MMLS indicates that site S9 ranks best wrt rutting
- S9 Section has received 10 million ESALs with rut < 10mm

## MMLS Testing

**N1/16 – A/C mix (60/70 pen binder)**

**Test A - mix  $\pm$  60 days aged**

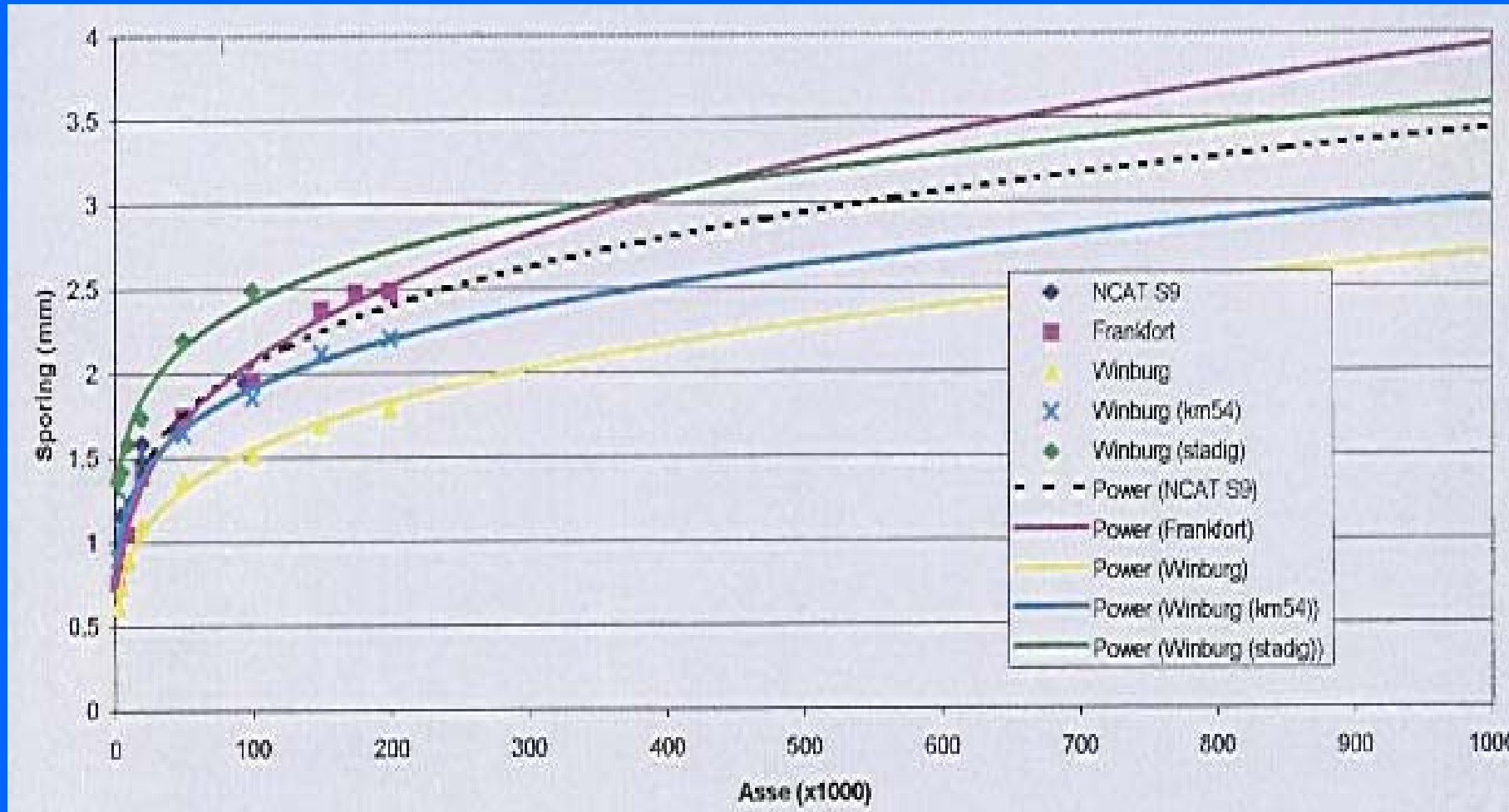
**Test B - mix  $\pm$  7 days aged**

**Test C - mix  $\pm$  7 days aged (lower load freq)**

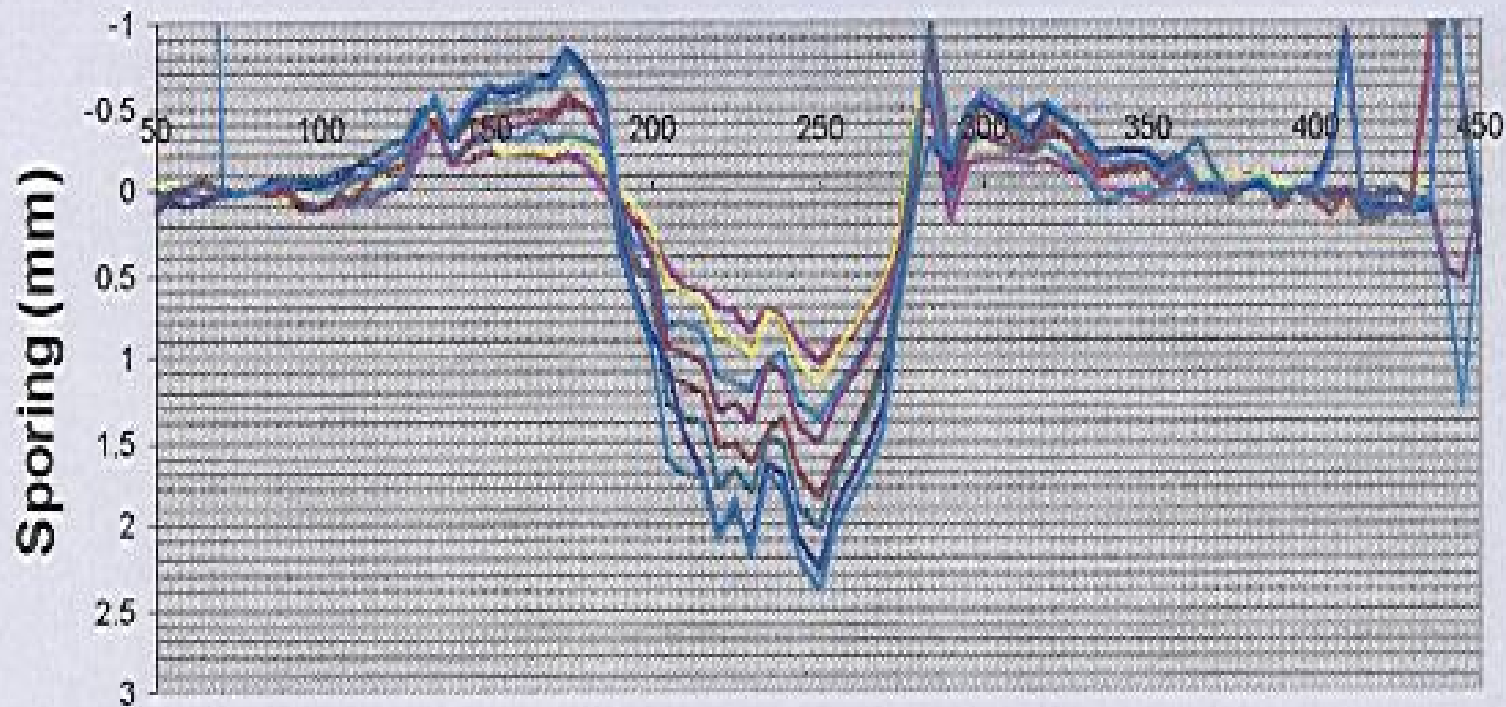
**N1/15 - A/C mix (AE-2 binder)**

**Test D - mix  $\pm$  20 days aged**

# MMLS Results Summary



# Asphalt Mix Design



— 2500 — 5000 — 10k — 20k — 50k — 100k — 1

## MMLS Conclusion

MMLS testing indicates that N1 mixes compare favourably with best performing mix at NCAT programme i.e. S9

N1 mixes (unmodified) should exceed 10 million ESALs without premature rutting

N1 mix (modified) indicates improved performance

Testing cost  $\pm$  R11 000 per mix

Foam Project

Lebombo SDI

# Foam Project

## PROJECT OVERVIEW

Project: Construction of MR439 from Mseleni to Phelandaba in Kwazulu Natal

Location: 120km north of Hluhluwe

Description: Upgrading of 34km of existing gravel road to a 9,0m-surfaced standard.

Design: 6mm slurry seal  
250mm Stabilised foam bitumen  
100mm Upper selected G7/G9  
150mm Lower selected G10

Quantities: Surface area (slurry seal) = ± 305 000m<sup>2</sup>  
Bitumen stabilised base = ± 80 000m<sup>3</sup>  
Quantity of bitumen = ± 6000 t (R12m)

Material: Area notorious for lack of good road building material. "Good" quality gravel/ hard rock > 100km haul.

# Foam Project

## Design Stage

Material for the foam option sourced from: -

- i. Borrow material – Calcareous sandstone/sand (40%).
- ii. Calcrete/sandstone Gravel recovered from existing road (40%).
- iii. Sand from selected borrow pits/cuts/roadbed (20%).

# Foam Project

## Construction

### Blend 1 (Design mix)

TYPE	%	SOURCE	CBR@95	PI	GM
Berea Red (Calcareous)	40	Borrow	13	SP	0.96
Gravel (Calcrete)	40	Off the road	43	9	1.74
Dune sand	20	Top of G7 layer	15	NP	1.01
Foam bitumen	4	80/100			
Lime	2				

Foamed Bitumen	2.5%	3.0%	3.5%	4.0%	SPEC
Dry ITS	197	206	266	335	200
Soaked ITS	37	97	113	187	100
Retained ITS (%)	18.7	47	42	55	

FIELD			LAB MIX		
Dry ITS	Soaked ITS	Retained	Dry ITS	Soaked ITS	Retained
309	117	38	345	115	33
245	170	69	563	230	41

# Foam Project

## Blend 2

TYPE	%	SOURCE	CBR@95	PI	GM
Gravel (Calcrete)	50	Off the road	43	9	1.74
Dune sand	50	Top of G7 layer	15	NP	1.01
Foam bitumen	4	80/100			
Lime	2				

FIELD			LAB MIX		
Dry ITS	Soaked ITS	Retained %	Dry ITS	Soaked ITS	Retained %
349	226	65	427	210	49
256	161	63	595	375	63
227	160	70	347	343	99
328	116	35	287	204	71

# Foam Project

## Blend 3

TYPE	%	SOURCE	CBR@95	PI	GM
Gravel (Calcrete)	40	Off the road	43	9	1.74
Dune sand	30	Top of G7 layer	15	NP	1.01
Calcareous Sandstone	30	Borrow	40	4	
Foam bitumen	4	80/100			
Lime	2				

FIELD			LAB MIX		
Dry ITS	Soaked ITS	Retained %	Dry ITS	Soaked ITS	Retained %
300	155	52	259	146	56
266	188	71			
227	160	70	347	343	99

# Foam Project

## Blend 4

TYPE	%	SOURCE	CBR@95	PI	GM
Gravel (Calcrete)	80	Off the road	43	9	1.74
Dune sand	20	Top of G7 layer	15	NP	1.01
Foam bitumen	4	80/100			
Lime	2				

FIELD			LAB MIX		
Dry ITS	Soaked ITS	Retained %	Dry ITS	Soaked ITS	Retained %
243	138	57	505	134	27
238	109	46	427	197	46

# Foam Project

## **Processing:**

Difficulties experienced with bitumen dispersion initially and number of techniques such as pre-blending of the lime (1%) and then 1% with the foam. Back milling of material to break up the clay clumps in the blend was also attempted with not much success. This problem was alleviated to some extent by speeding up the drum speed to a maximum of 190rpm/min from 140rpm/min. Only once the “Berea sand” was left out did the foam dispersion really improve dramatically.