# NDIA DESIGN & CONSTRUCTION OF HIGH PERFORMANCE MIXES

Terminal
Taxiway Layout

Existing taxiway 500mm of HMA over dense aggregate base. 200mm of PMB WC 300mm 60/70 pen Base.

Paved in 2010 2011 opened to traffic spring 2014

# FIELD DISTRESS.

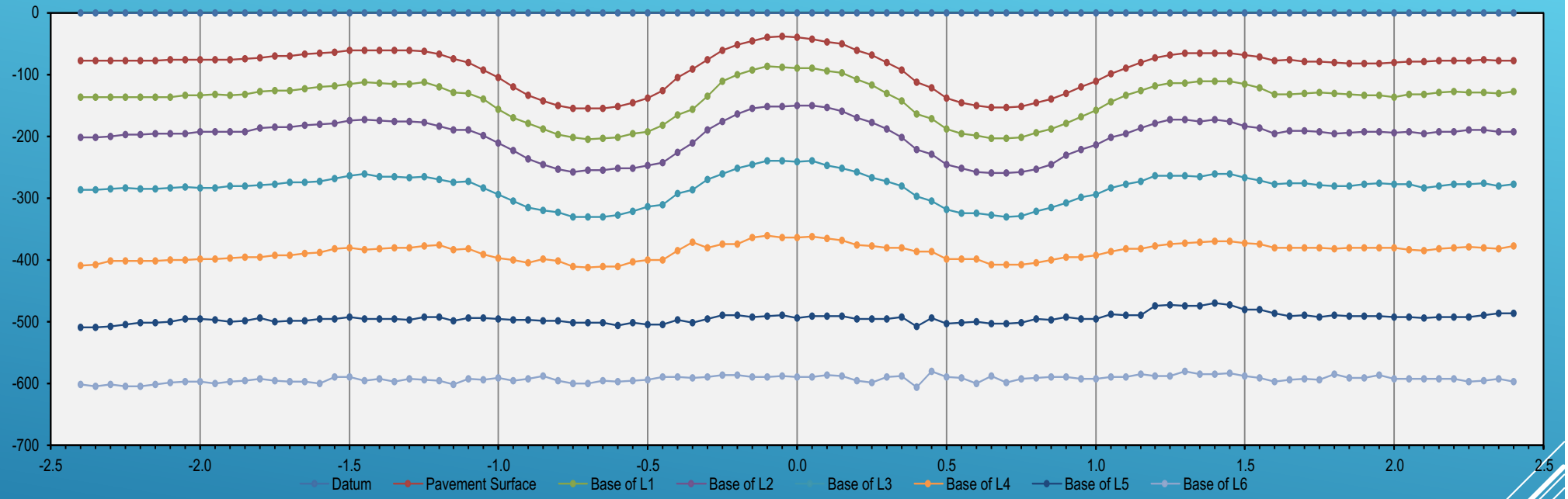
Clear Rutting east taxi before remedial works 2014

Broad Shallow Depression West Taxi

Heavy rutting and cracking on the west taxiway.

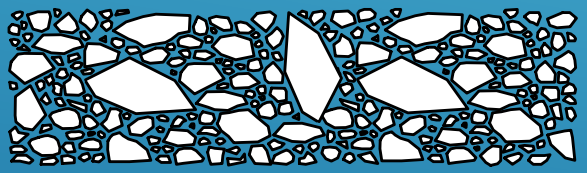
Soon after opening to traffic the taxiways experienced severe rutting.

Taxiway ALFA

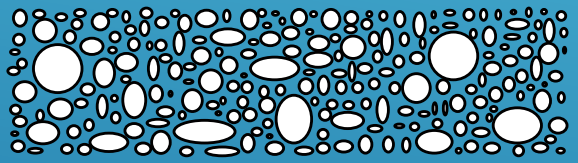

0
-100
-200
-300
-400
-500
-600
-700
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
Datum
Pavement Surface
Base of L1
Base of L2
Base of L3
Base of L4
Base of L5
Base of L6

# SELECTION OF MATERIALS

## Contrasting Stone Skeletons



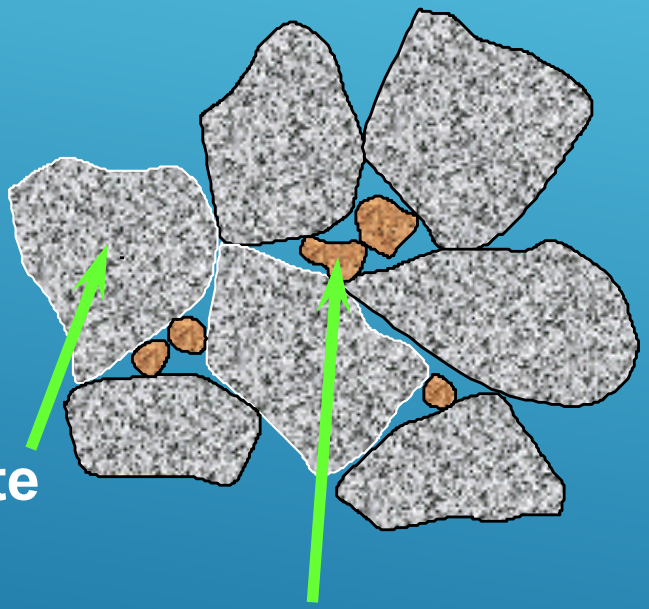
Cubical Aggregate



Rounded Aggregate

# COARSE AGGREGATE SKELETON

Aggregate properties are checked to assure good quality and durability and gradation established to address use. Looking for good stone on stone contact.

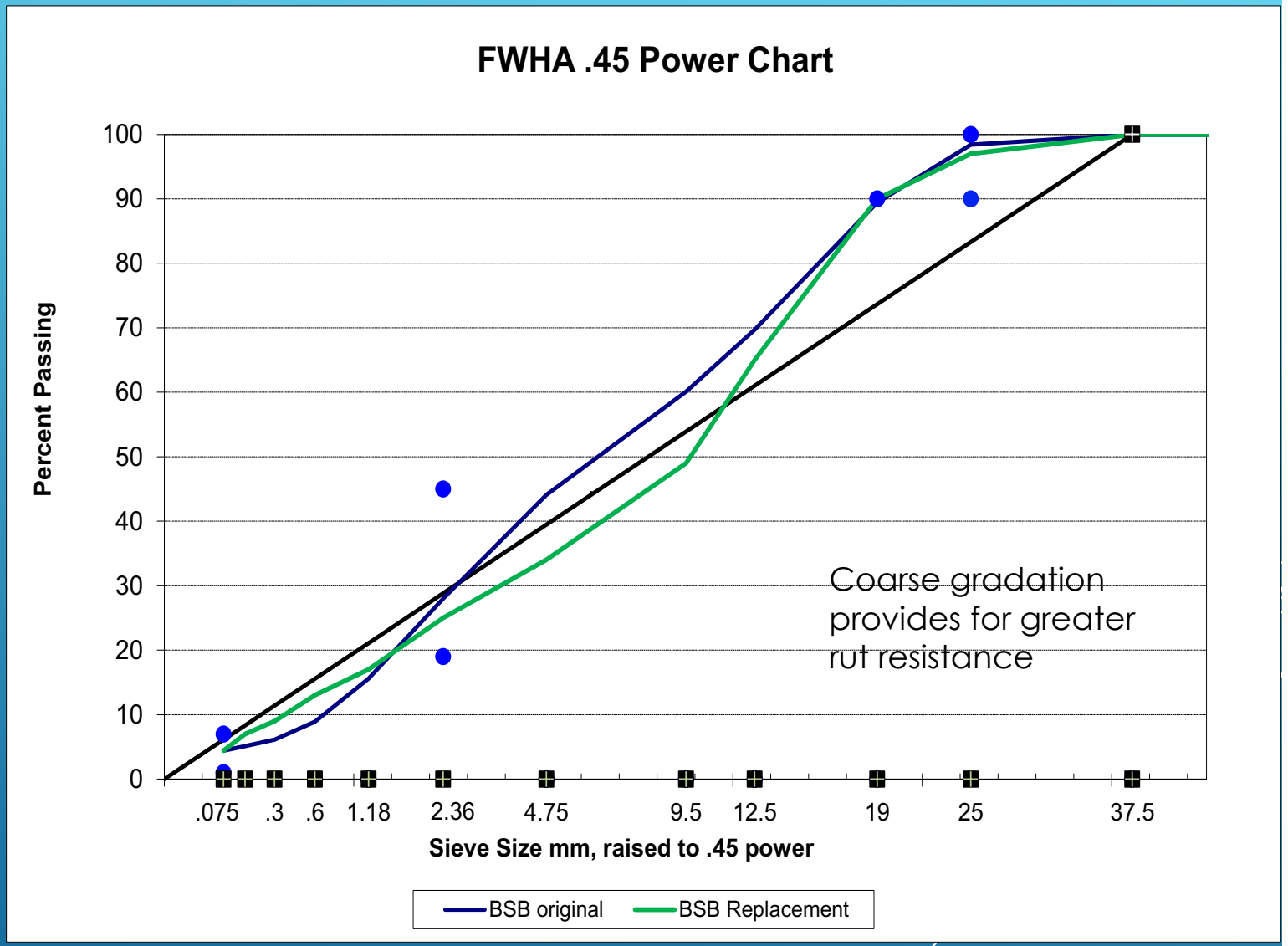


# CCC NEW 19MM WC MIX

| Mix | New CCC 25mm |
|---|---|
| Gyration level | 100 |
| Voids Ndes | 4.0 |
| Voids Nmax | 3.2 |
| VMA | 14.2 |
| AC | 4.6 |
| VFA | 70.8 |

Binder PG 76E -10
Design air voids of 4% for good stiffness and
Design VMA @ 14% for good durability

# Comparison of the original BSB to the New 25mm BSB

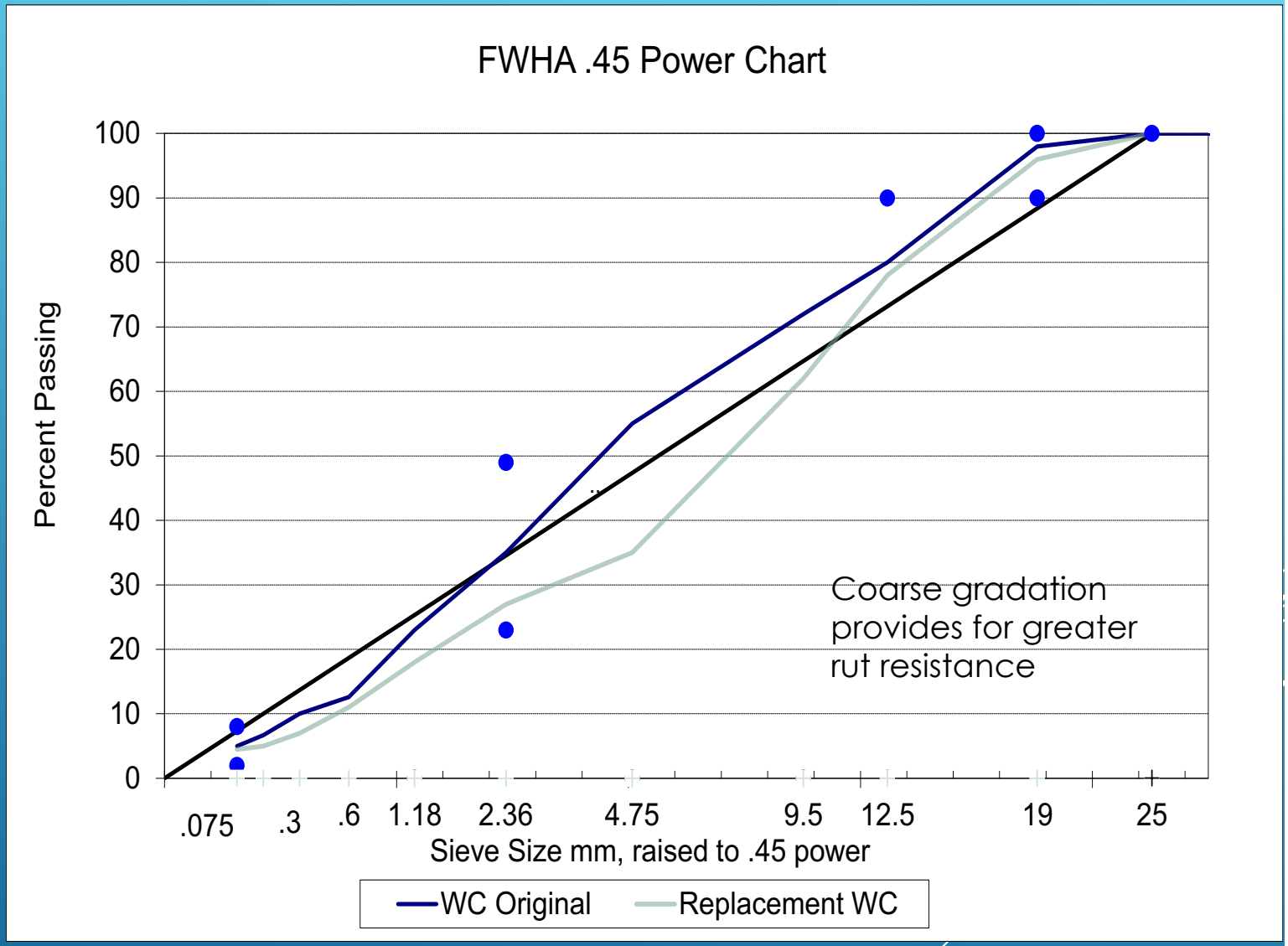


# CCC NEW 25MM BASE MIX

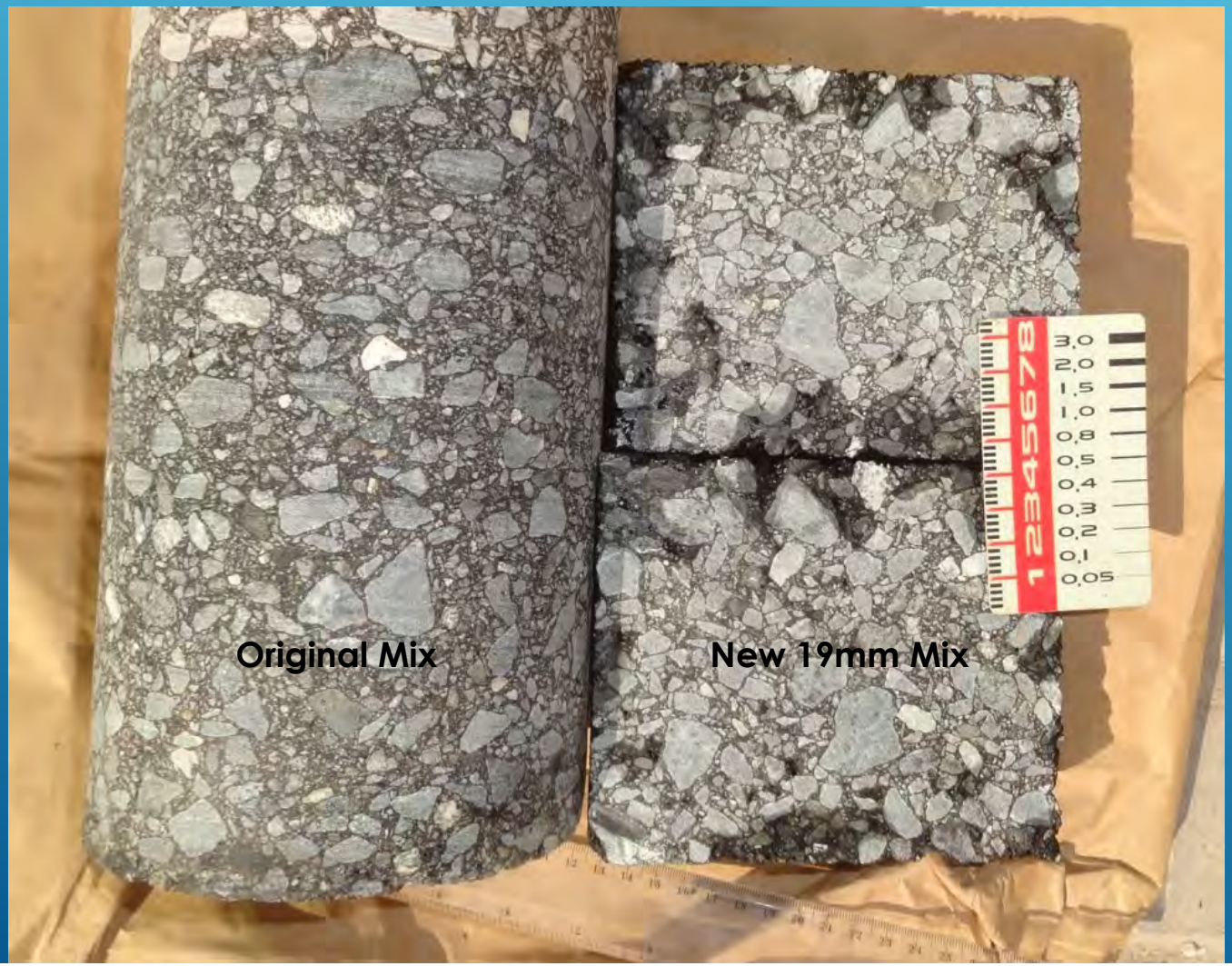
| Mix | New CCC 19mm |
|---|---|
| Gyration level | 100 |
| Voids Ndes | 4.0 |
| Voids Nmax | 2.8 |
| VMA | 14.6 |
| AC | 4.2 |
| VFA | 72.2 |

Binder PG 76E -10
Design air voids of 4% for good stiffness and
Design VMA @ 13% for good durability

## Comparison of the original WC to the New 19mm WC



# COMPARISON OF GRADATIONS FOR THE 19MM WC

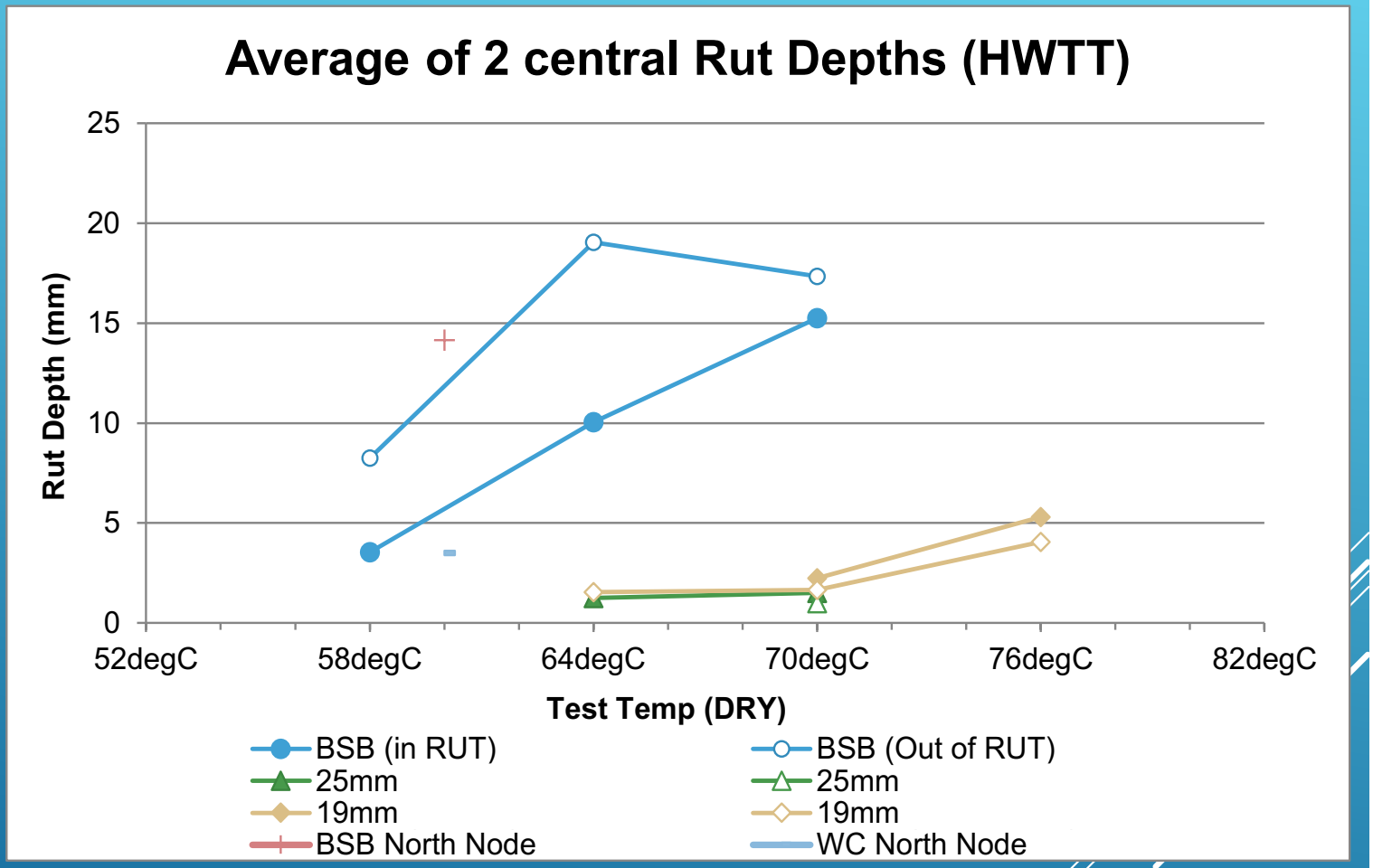



**New mix has significantly more aggregate structure to resist depressions and rutting.**

New mixes show very strong rut resistance.

Initial consolidation is not rutting.

After initial consolidation minimal additional movement.



Design Criteria
Slow speed Taxiway 25 to 15km/hr. This accounts for short standing times 3 to 5 minutes.

Slower speeds result in significantly high strains in the lower layers.

| Layer | Thickness (mm) | Speed of 25 km/hr | Speed of 5 km/hr | Speed of 0.5 km/hr |
|---|---|---|---|---|
| | | Frequency (Hz) | Frequency (Hz) | Frequency (Hz) |
| Layer 1 | 200 | 4.63 | 1.02 | 0.12 |
| Layer 2 | 100 | 3.90 | 0.86 | 0.10 |
| Layer 3 | 200 | 3.28 | 0.72 | 0.08 |

| Parameter | Aircraft | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A340-600 | | A380-800 | | B777-300 | | | |
| | 200-5Hz Repl. | 300-5Hz Repl. | 200 - 5Hz Repl. | 300-5Hz Repl. | 200-5Hz Repl. | 300-5Hz Repl. | 300-1Hz Repl. | 300-0.1Hz Repl. |
| $\varepsilon_{v1}$[a], με (middle of surface layer) | 619 | 599 | 634 | 618 | 629 | 617 | 2081 | 2631 |
| $\varepsilon_{v2}$[b], με (middle of top base layer) | 663 | 479 | 627 | 465 | 593 | 435 | 1080 | 1999 |
| $\varepsilon_{v3}$[c], με (middle of bottom base layer) | --- | 565 | --- | 527 | --- | 502 | 891 | 2057 |
| $\varepsilon_{tAC}$[d], με | 350 | 335 | 323 | 310 | 304 | 293 | 378 | 373 |
| $\varepsilon_{v}$[e], με | 721 | 696 | 688 | 666 | 689 | 669 | 852 | 928 |

[a] – Middle of AC sublayer 1 (100 mm below surface for 200 Repl. and 300 Repl.)

# Construction

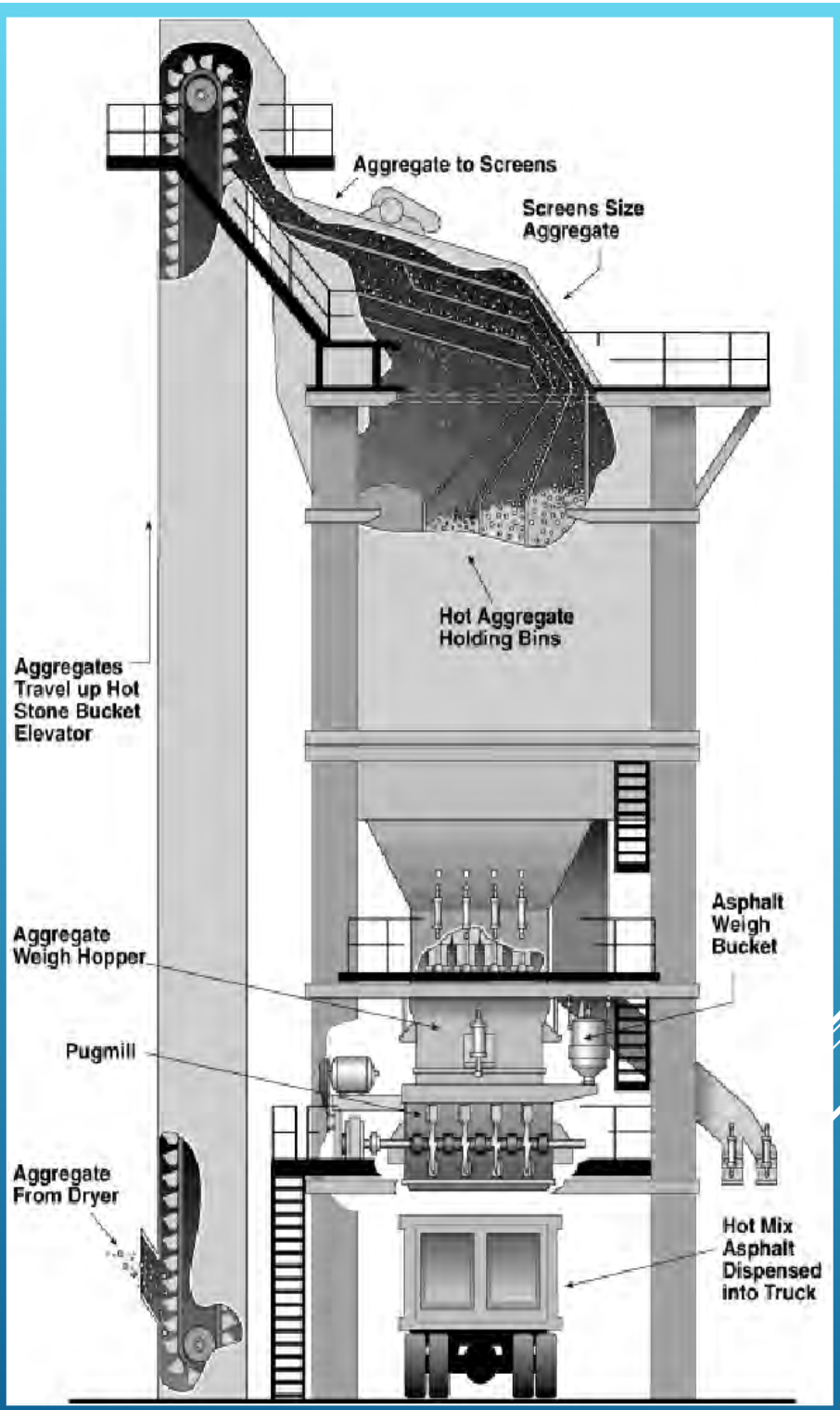
Replicating the mix design on a large scale

# The Modern Batch Plant Facility

- gradation control at the hot bins

- asphalt binder control at the weigh bucket

- things change from design to production

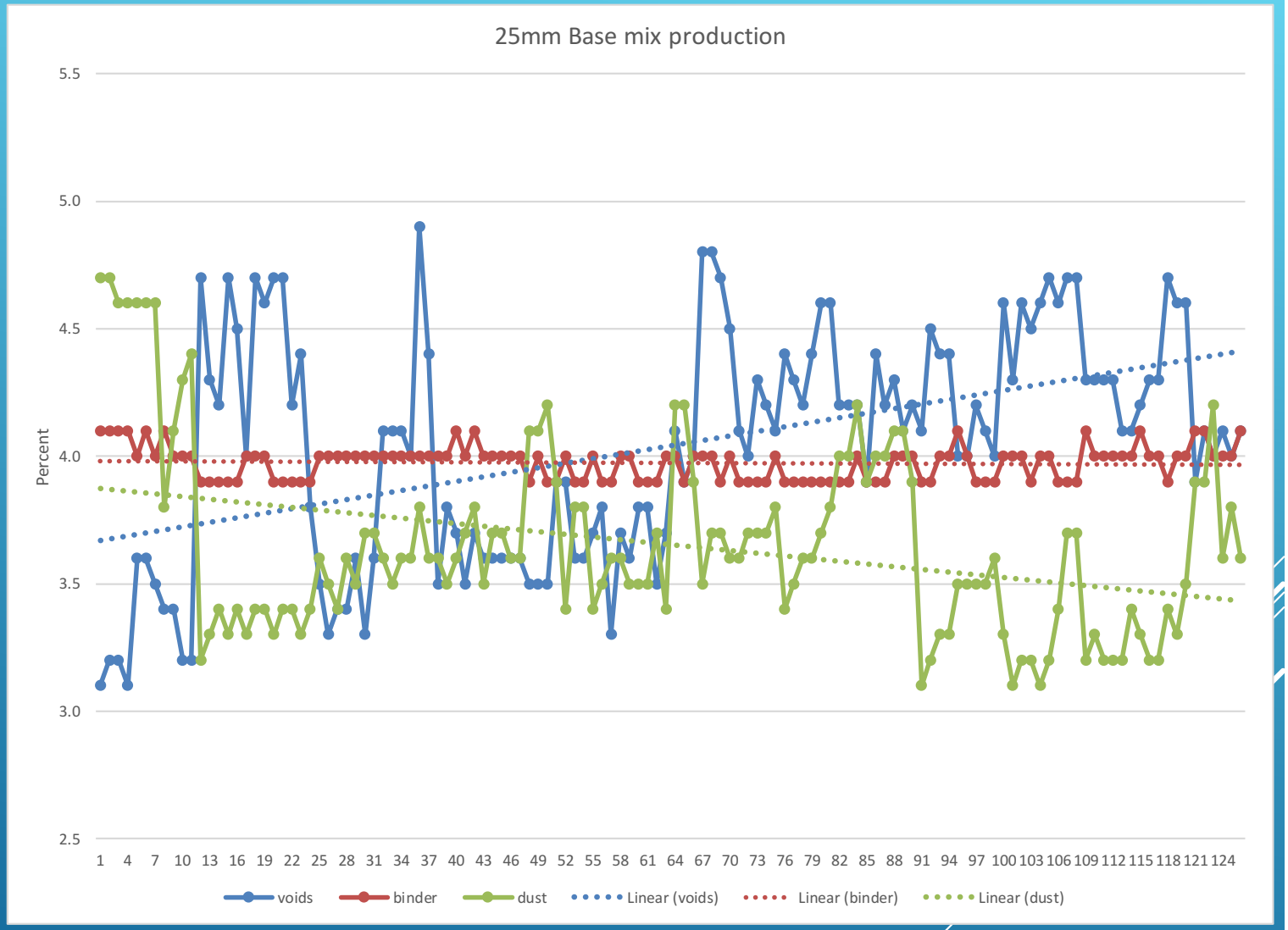


Production Data

Bituminous content on target.

Gradation on Target Voids trending lower.

Need Field adjustment to bring voids back on target.




QATAR

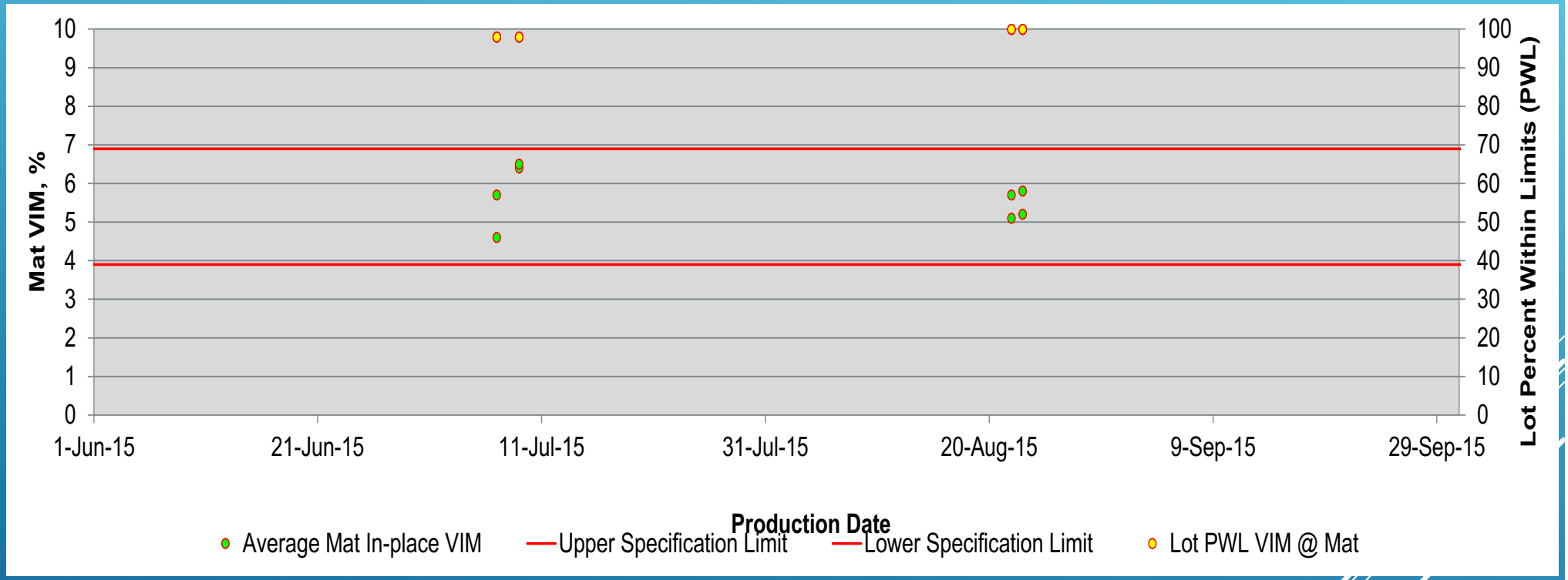

TATA


Heavy Tamper Bar Screed


Breakdown roller right up to paver

# Real Key to Compaction
# pneumatic tire rollers

# CP 27 - Remedial Works - Quality Control Chart 25mm mix Mat Voids in Mix (VIM) (%)




Good mat densities

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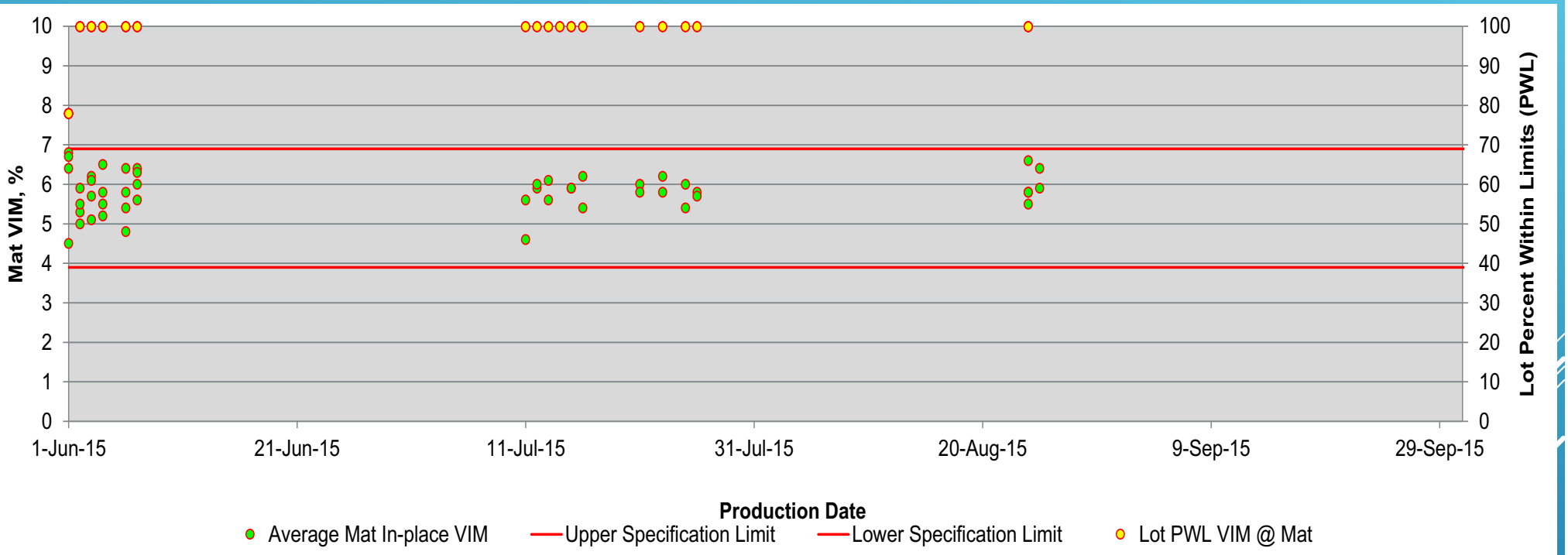
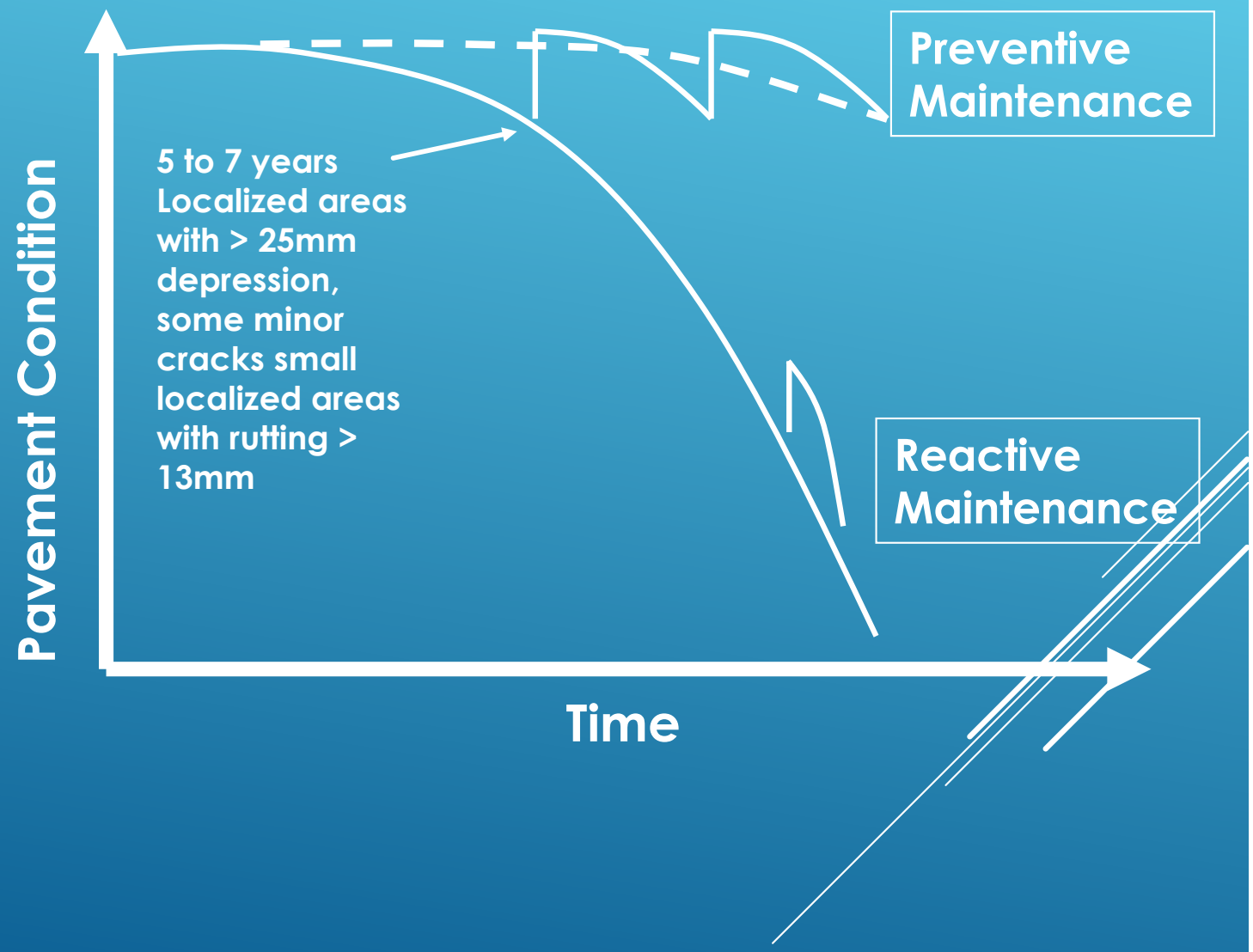



Good mat densities

All pavements exhibit distress with use.

Typical maintenance is needed to maintain serviceability.

- Patching
- Surface renewal
- Crack sealing




In the end good quality pavement with
minimal depressions and cracking