

# FHWA / WisDOT DENSITY DEMONSTRATION PROJECT

WAPA CONFERENCE  
November 29, 2016



# FHWA DENSITY DEMO 2016

STH 21 Juneau Co.



# FHWA DENSITY DEMONSTRATION



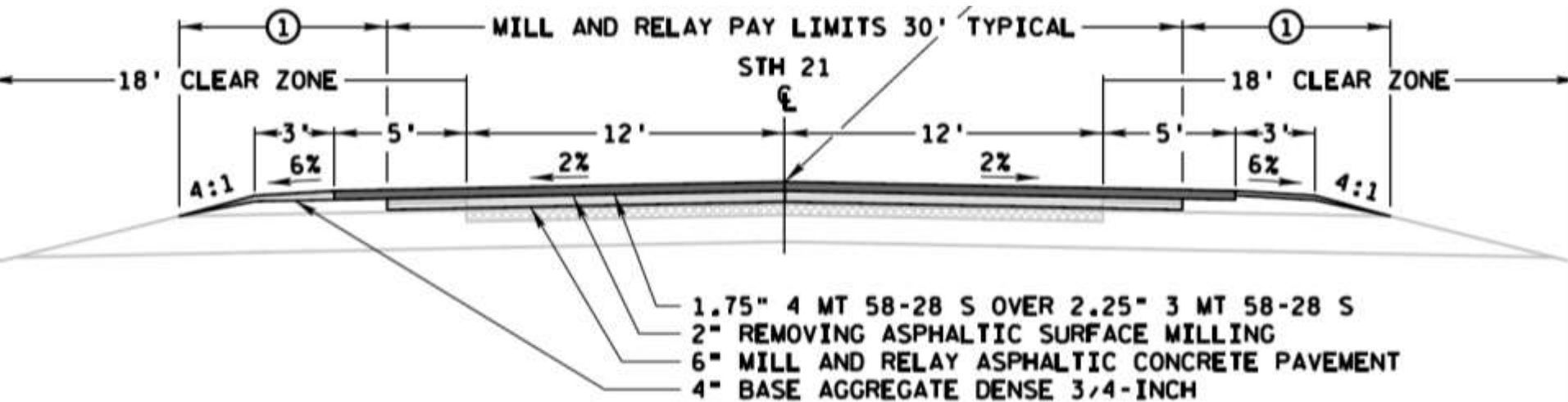


# STH 21 Juneau County

- ▶ Letting of April 12, 2016
- ▶ Proposal #27: 7010-01-61, WISC 2016 127
- ▶ Tomah - Necedah
- ▶ West County Line to Sheridan Avenue in Necedah



# TYPICAL SECTION



**2" REMOVING ASPHALTIC SURFACE MILLING**

**6" MILL AND RELAY ASPHALTIC CONCRETE PAVEMENT**

**1.75" 4 MT 58-28 S OVER 2.25" 3 MT 58-28 S**



# ADDENDUM NO. 2 SPV

7010-01-61

April 12, 2016

19. HMA Pavement 3 MT 58-28 S, Item 460.6223;  
HMA Pavement 4 MT 58-28 S, Item 460.6224.

Add the following to section titled E Payment:

**Payment for HMA Pavement 4 MT 58-28 S**  
**includes work required under the Construction**  
**of Density Demonstration Test Sections For HMA**  
Pavement 4 MT 58-28 S, Item 460.6224 article.



# ADDENDUM NO. 2 SPV

## 24. Construction of Density Demonstration Test Sections HMA Pavement 4MT 58-28 S, Item 460.6223.

Perform this work according to the pertinent requirements of the item of HMA Pavement 4MT 58-28 S and as hereinafter provided.

This work will require the construction of test sections for a density demonstration project offered through a program by FHWA. The test sections will consist of segments of 800 feet. The locations will be determined by the engineer. **There will be a minimum of 3 sections constructed as listed below.**





# ADDENDUM NO. 2 SPV

**1. Control Section:** This section will be constructed using standard rolling as done on the majority of the project with a target density minimum of 92.0%.

**2. Additional 1.0-2.0% Density Section:** In this section, **an increase in density will be achieved with only additional compactive effort** as agreed upon by the advisory team on the project. The advisory team will consist of BTS staff along with FHWA representatives. The additional compaction may come from additional roller passes, increasing vibratory efforts, adjusting timing of rolling or other agreed to methods.



# ADDENDUM NO. 2 SPV

## 3. Asphalt Binder Regression to 3.0% Voids section:

This section will be constructed with compaction identical to the Control Section with mix produced with **additional Asphalt Binder**. Regression interpolates the **asphalt content at 3.0% from the mix design**. The additional Asphalt Binder will be determined by the engineer.

Construction of the test sections will be incidental to the item of HMA Pavement 4MT 58-28 S.

Density values will be measured as per current specifications. Any incentives/disincentives for density will be given as per the current contract specifications.



# FHWA DENSITY DEMO 2016

## 8 SECTIONS/DAYS:

1. 4.0% AIR VOIDS 12.5mm (4MT)
2. 4.0% AV + ROLLER
3. 3.0% AIR VOID REGRESSION VIA EXTRA BINDER
4. 3.0% AVR + ROLLER
5. 4.0% AV WMA
6. 4.0% AV HMA w/ADDITIVE AS COMPACTION AID
7. 3.0% AV WMA VIA EXTRA ADDITIVE
8. 4.0% AV 9.5mm (5MT)





1 ROLLER @ 7 PASSES  
2 ROLLER @ 5 PASSES (=10 TOTAL)



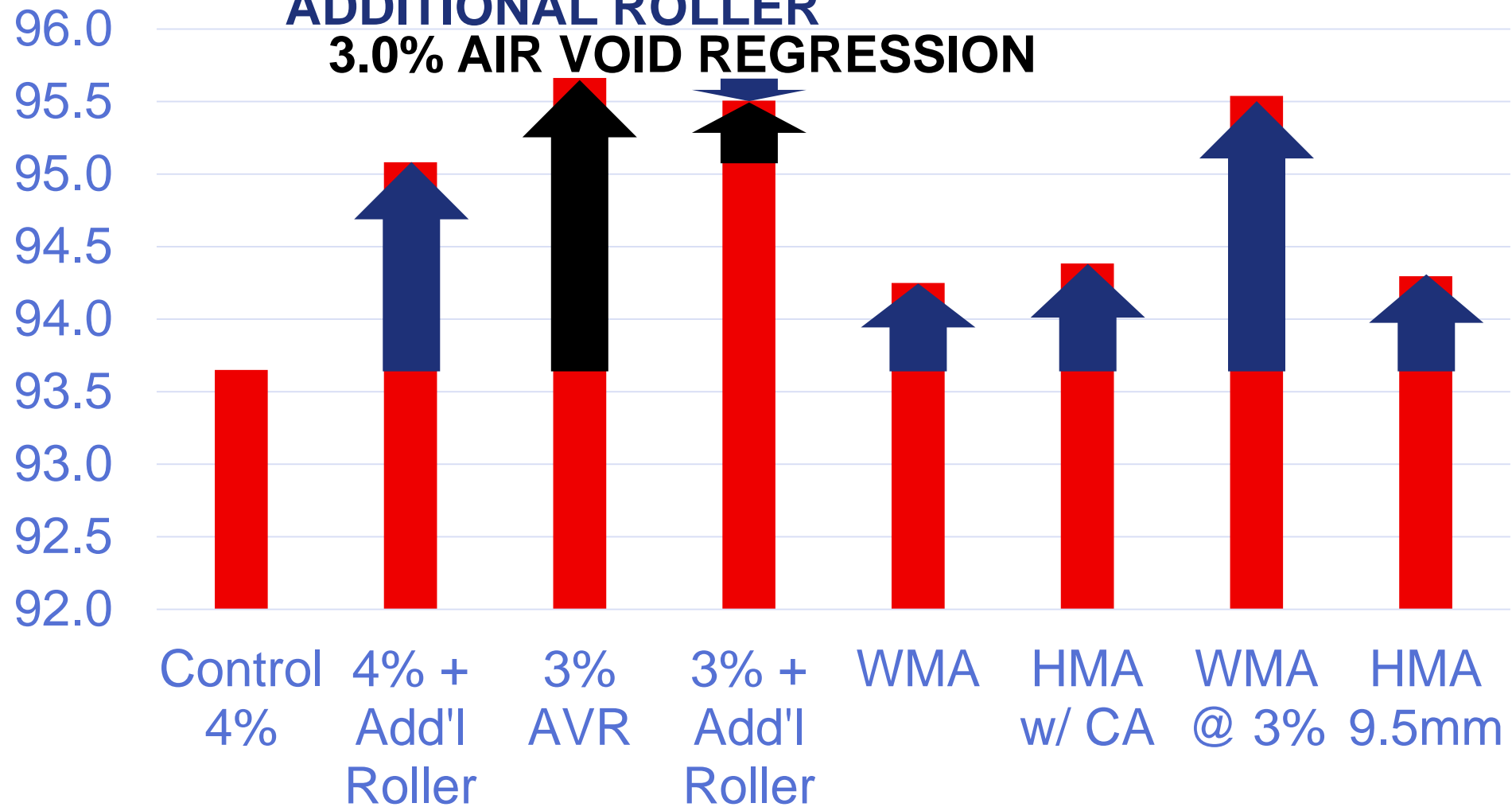


# DENSITY DETERMINATION

- ▶ **USED QC NUCLEAR GAUGE READINGS**
- ▶ **CHECKED READINGS AGAINST 4 CORES WHICH SHOWED DIFFERENT OFFSETS**
- ▶ **USED QC DATA WITH MINI CORE CORRELATION.**

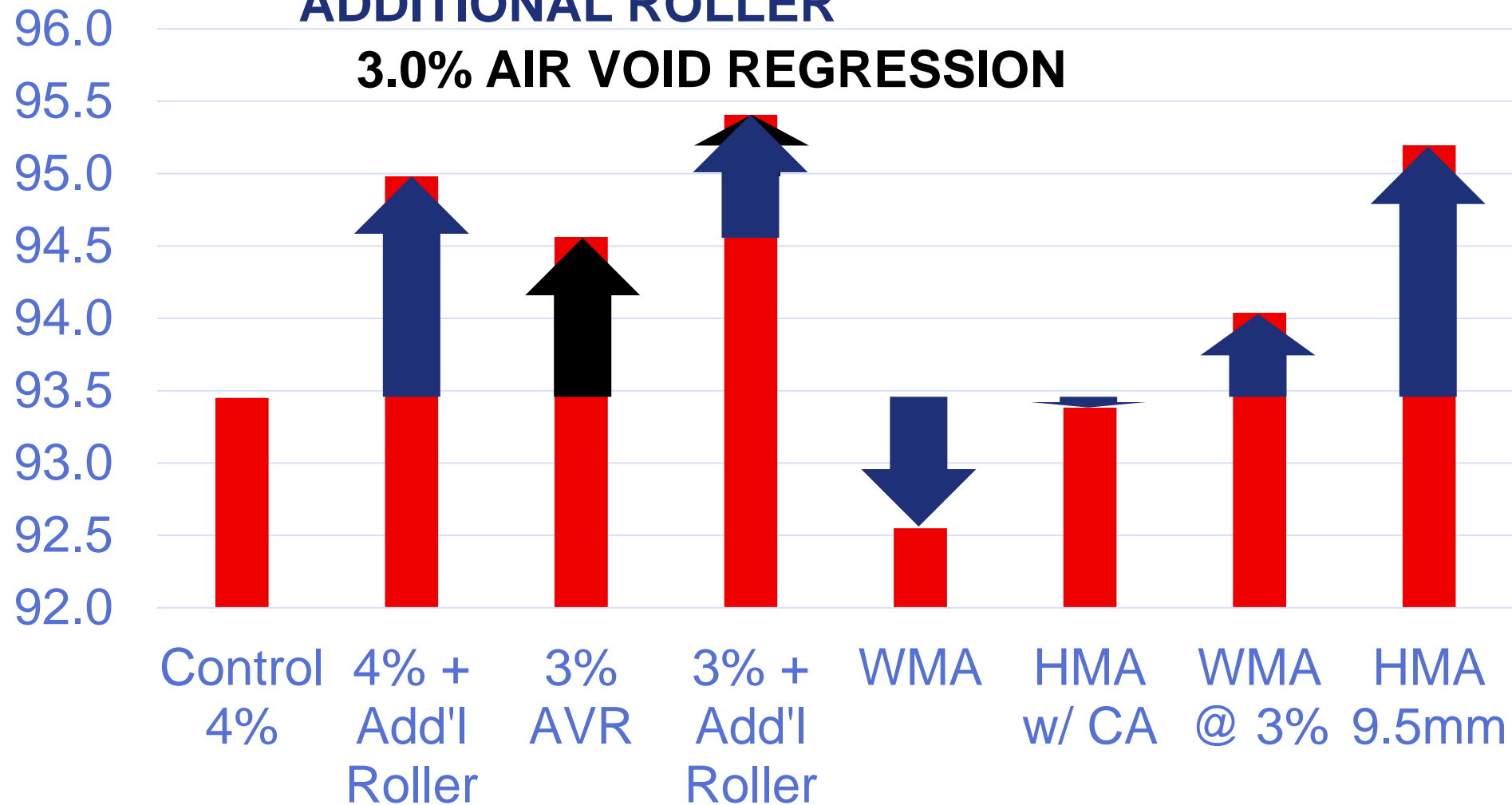


# UNCORRECTED QC NUCLEAR GAUGE ADDITIONAL ROLLER 3.0% AIR VOID REGRESSION





# CORRECTED QC NUCLEAR GAUGE ADDITIONAL ROLLER 3.0% AIR VOID REGRESSION



# DENSITY IMPROVEMENTS

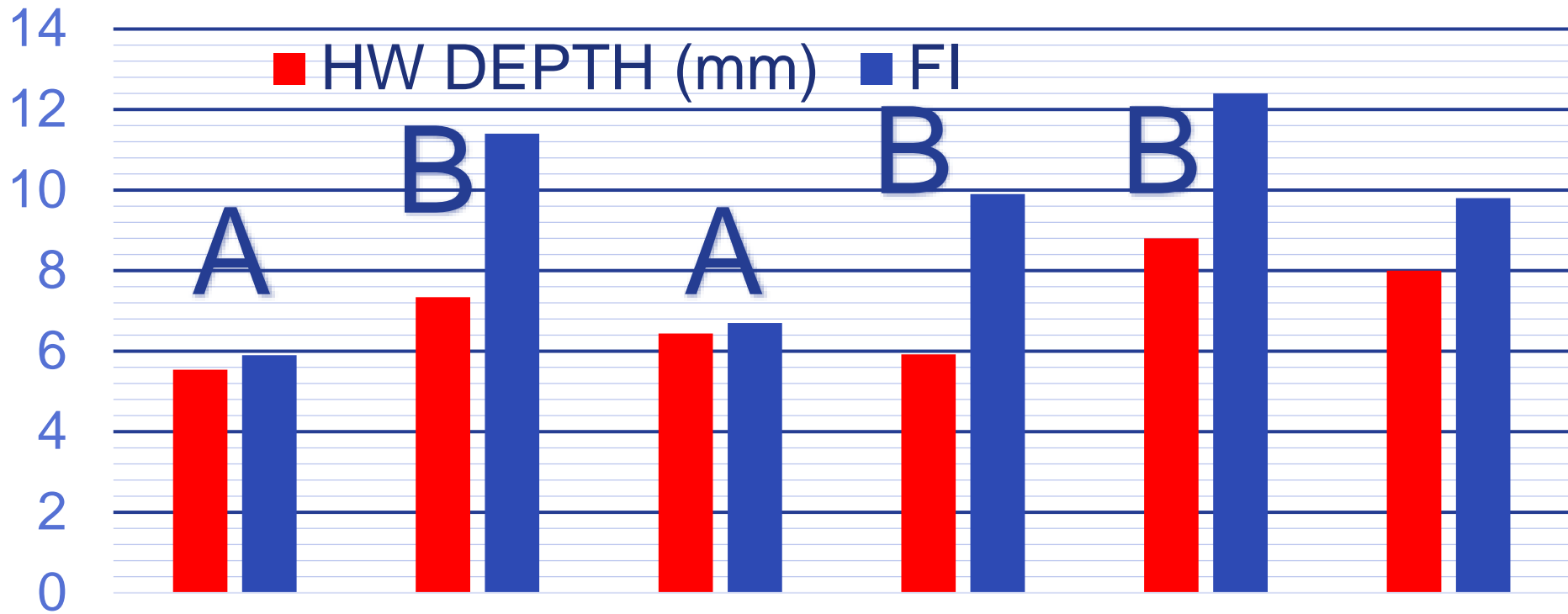
<u>PROCESS</u>	<u>Δ DENSITY</u>
<b>Additional Roller</b>	<b>0.9</b>
<b>3% AV Regression</b>	<b>1.0</b>
<b>WMA</b>	<b>-0.2</b>
<b>HMA w/ Comp Aid</b>	<b>0.3</b>
<b>WMA add @ 3%</b>	<b>1.2</b>
<b>HMA 9.5mm</b>	<b>1.2</b>



# PERFORMANCE TESTING

- ▶ HAMBURG  
WHEEL RUT  
DEPTH
- ▶ I-FIT SCB  
FLEXIBILITY  
INDEX





4% CONTROL

3% AVRegression

WMA

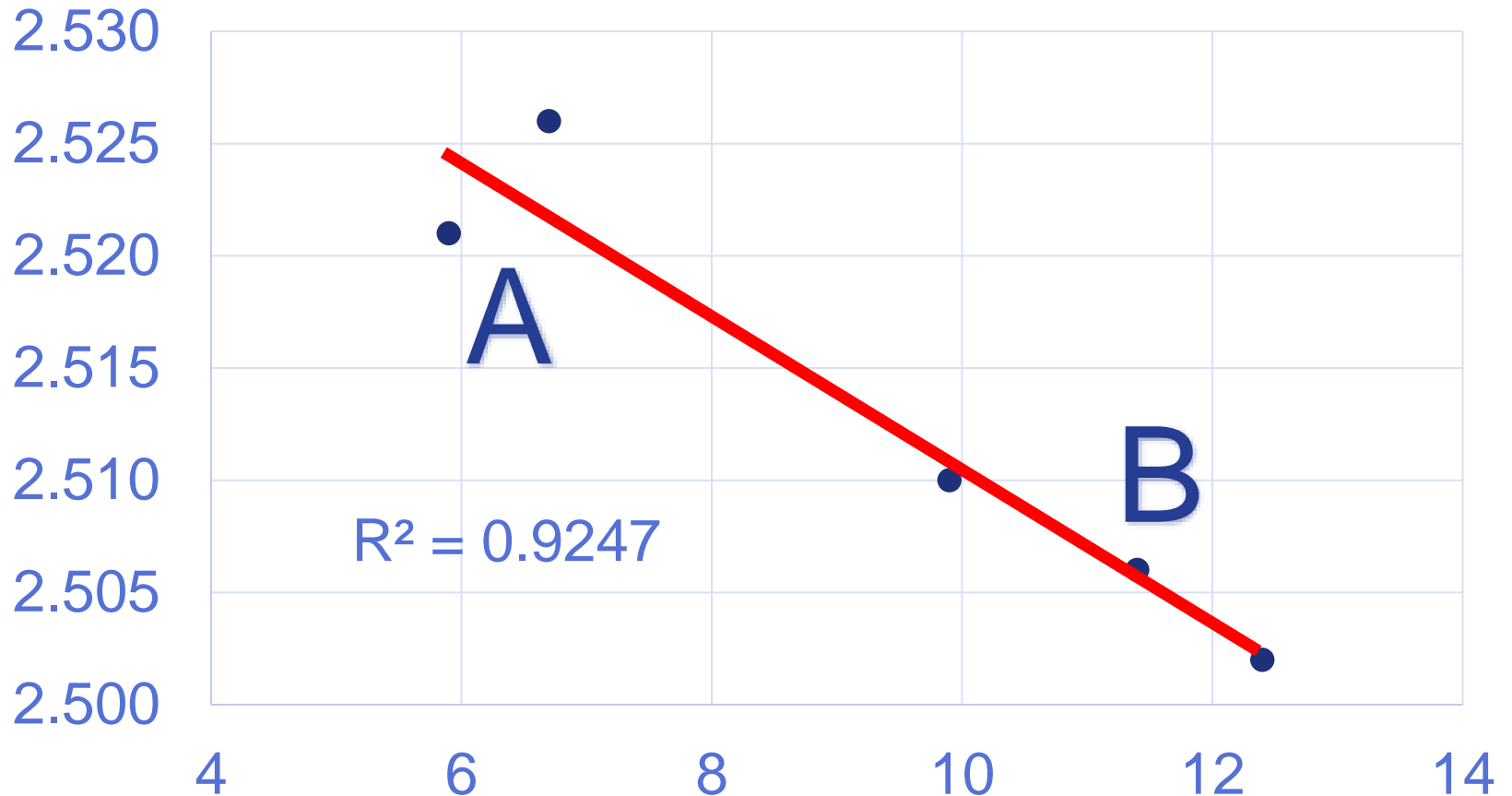
HMA w/ Comp Aid

WMA @ 3% (not AVR)

5 MT HMA (9.5mm)



# Gmm vs FI



# Effect of In-Place Air Voids on Life Cycle Cost

- From the past studies, 1% increase in density would decrease the service life by 10% (conservative estimate)

This means ...

- An asphalt overlay constructed to 93% density might be expected to last 20 years while the same asphalt overlay constructed to 92% density would only be expected to last 18

**THIS SLIDE WAS STOLEN FROM  
THE FHWA DENSITY WORKSHOP**

# BENEFIT OF 1% DENSITY INCREASE

10% OF \$60/TON MIX = \$\$\$\$\$\$

# COST OF 1% DENSITY INCREASE

ADDITIONAL ROLLER = <\$



AVR TO 3% W/BINDER = <\$\$

WARM MIX ADDITIVE = <\$

9.5mm VS 12.5mm = ~\$\$



# WHERE ARE WE GOING?

- ▶ DENSITY REQUIREMENTS ARE RAISED IN ASP-6 FOR 2017
- ▶ DENSITY REQUIREMENTS ARE RAISED AND THE INCENTIVE IS INCREASED IN PWL
- ▶ 3.0% AIR VOID REGRESSION IS INCLUDED ON ALL PROJECTS VIA ASP-6 FOR 2017
- ▶  **DENSITY** +  **FILM THICKNESS** = **LONGER LIFE, MORE DURABLE HMA.**





# THANKS!!!

- ▶ FHWA, PROJECT AND DENSITY WORKSHOP
- ▶ D. L. GASSER CONSTRUCTION
- ▶ MATHY CONSTRUCTION
- ▶ SOUTHWEST REGION, LACROSSE
- ▶ BTS HMA UNIT



# QUESTIONS?



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