

# **VIRGINIA QUIET PAVEMENT STUDY**

*(AKA, DEPLOYMENT OF FUNCTIONALLY  
OPTIMIZED SURFACE MIXES)*

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**SURF 2012**  
**Norfolk, VA**



## ***Code of Virginia § 33.1-223.2:21 (2011)***

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### **Directs VDOT to:**

- *Expedite the development of quiet pavement (QP) technologies such that applicable contract solicitations include specs for QP technology if sound mitigation is a consideration.*

### **To that end, VDOT will:**

- **Construct demonstration projects to assess QP technologies.**
- **Evaluate functionality/ safety in Virginia's climate over two full winters.**

# Quiet Pavement Technologies

## Asphalt:

- **Open-graded with 9.5mm top-size stone and rubberized AC (AR-PFC 9.5)/25mm**
- **Open-graded with 9.5mm top-size stone and polymer-mod. AC (PFC 9.5)/25mm**
- **Open-graded with 12.5mm top-size stone and polymer-mod. AC (PFC 12.5)/50mm**

## Concrete:

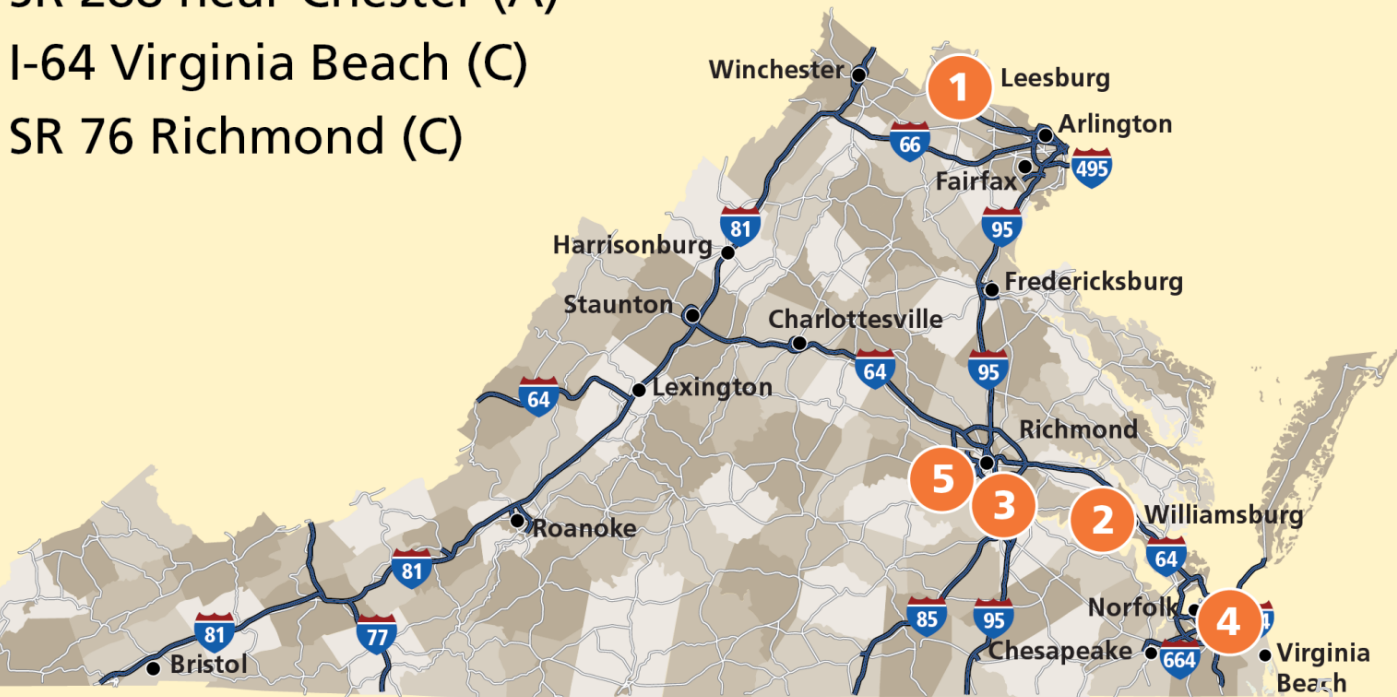
- **Conventional Diamond Grind (CDG)**
- **Next Generation Conc. Surf. (NGCS)**

# Project Selection Criteria

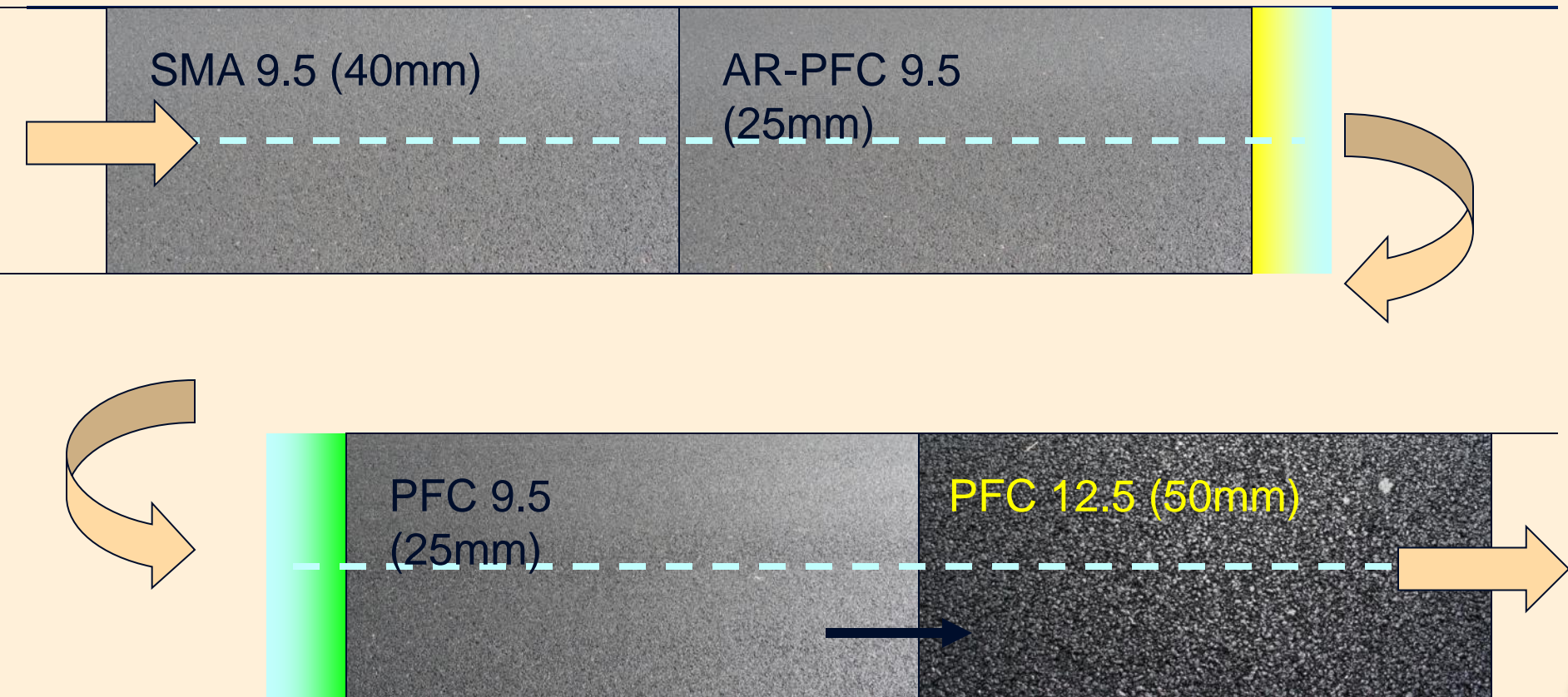
- **Four-lane divided, high-speed corridor**
- **Good overall pavement structure**
- **Good geometrics**
- **Limited at-grade intersections**
- **1-mile per asphalt technology/ ½-mile for concrete**
- **No curb/gutter or existing sound mitigation measures**

## Demonstration Projects (2011)

- 1 SR 7 By-Pass in Leesburg (A)
- 2 SR 199 west of Williamsburg (A)
- 3 SR 288 near Chester (A)
- 4 I-64 Virginia Beach (C)
- 5 SR 76 Richmond (C)



# Demonstration Projects (Asphalt)

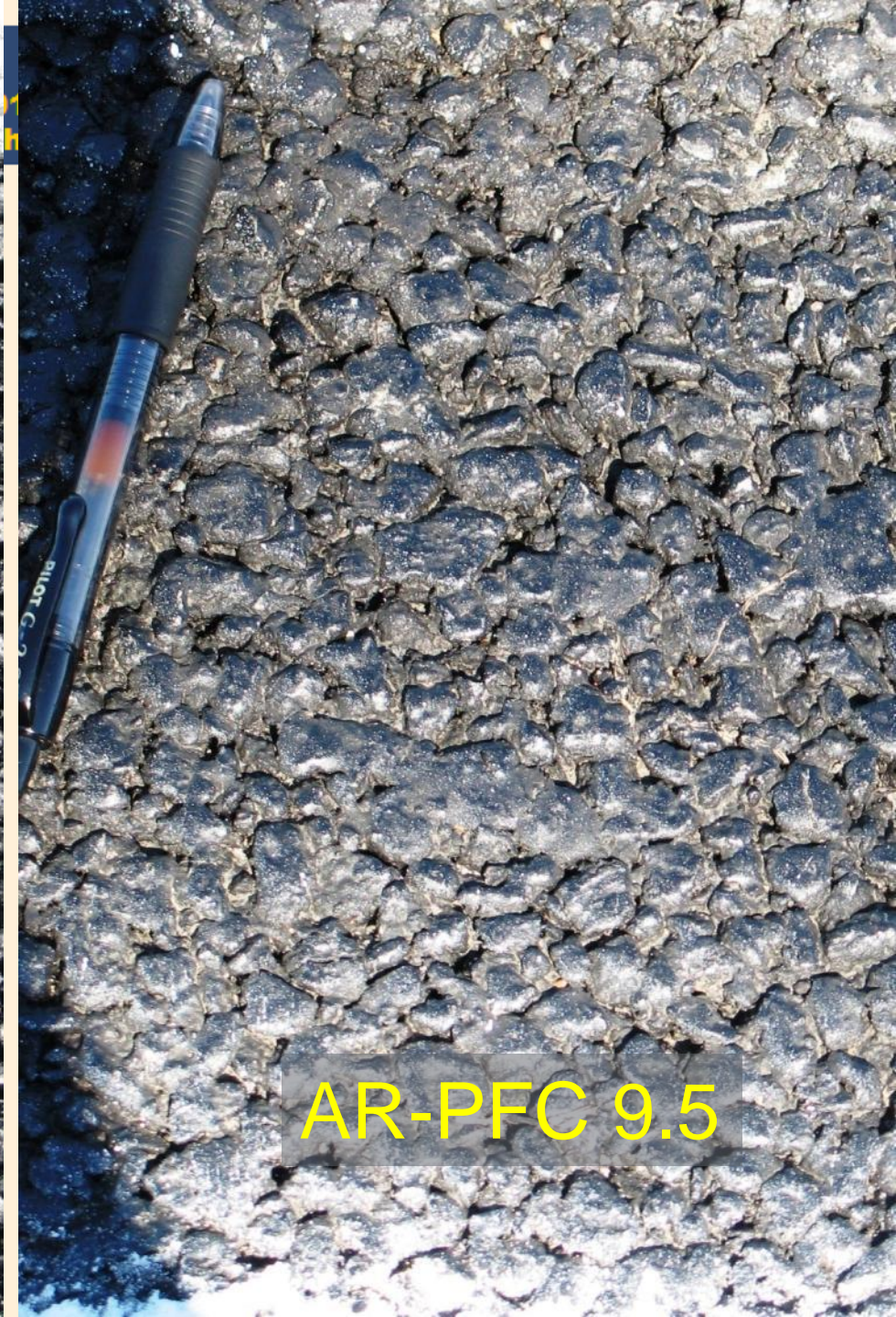


Plan View





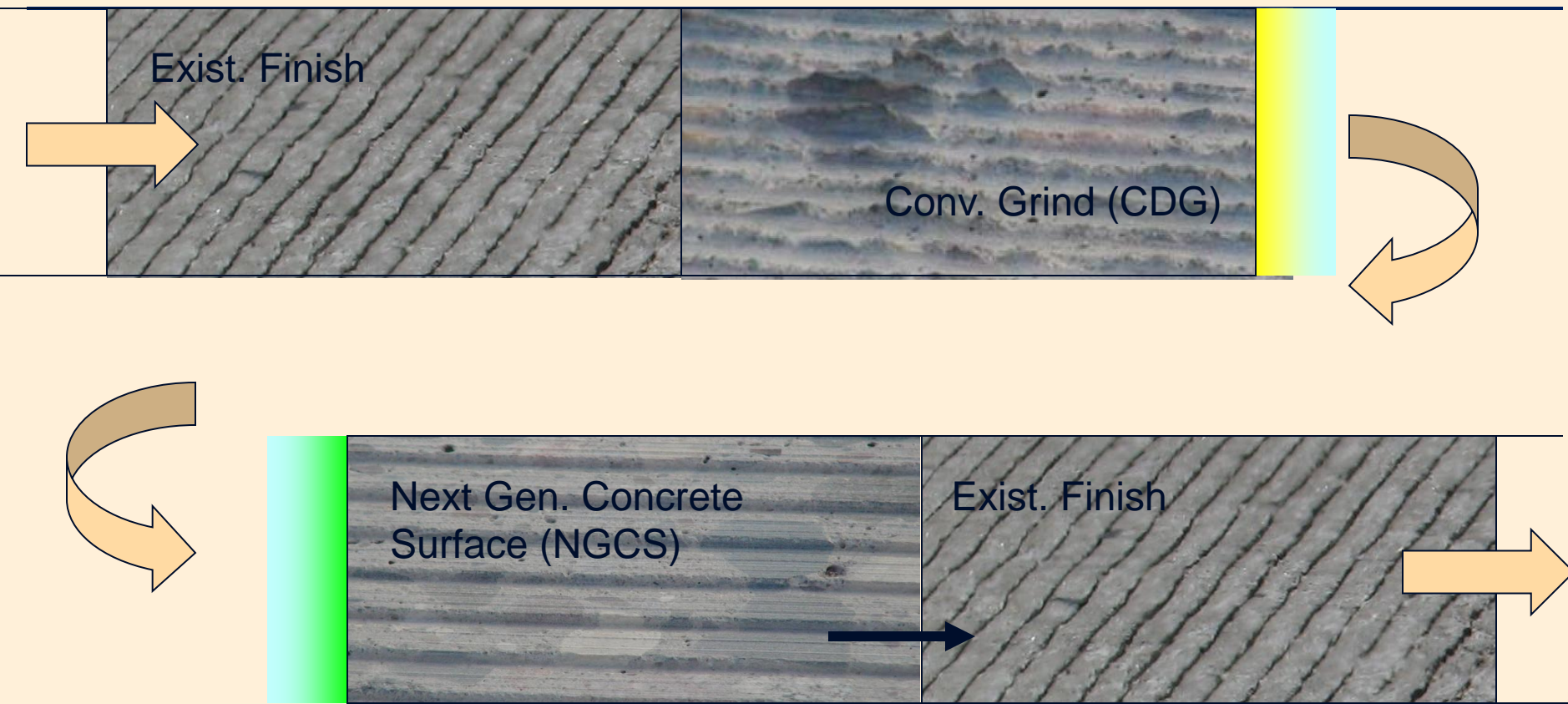
PFC 12.5



AR-PFC 9.5



# Demonstration Projects (Conc)



Plan View



NGCS





# Conventional Grind





# **Preliminary Findings – functional assessment of “new” materials and treatments**





# Noise Measurement

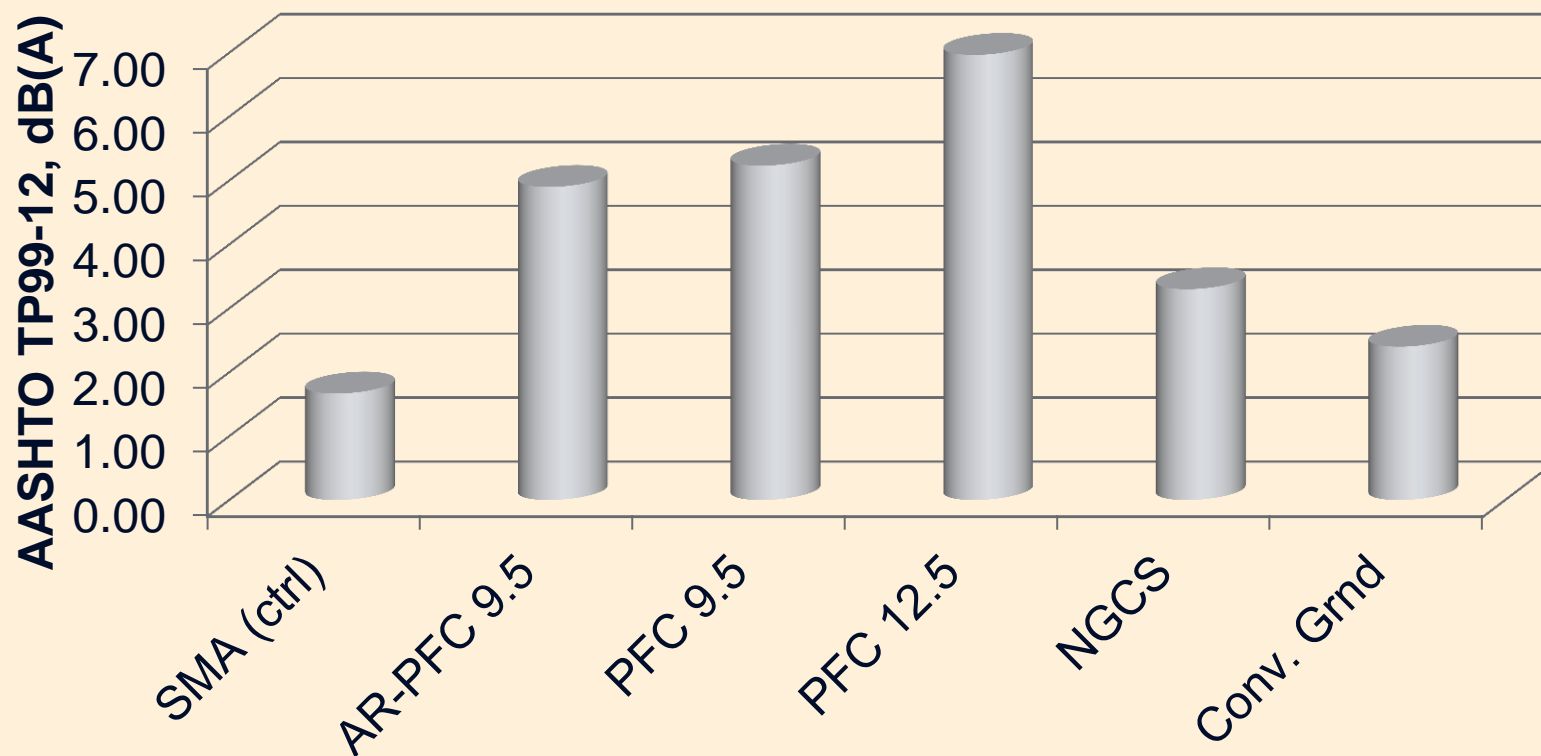


**Wayside**

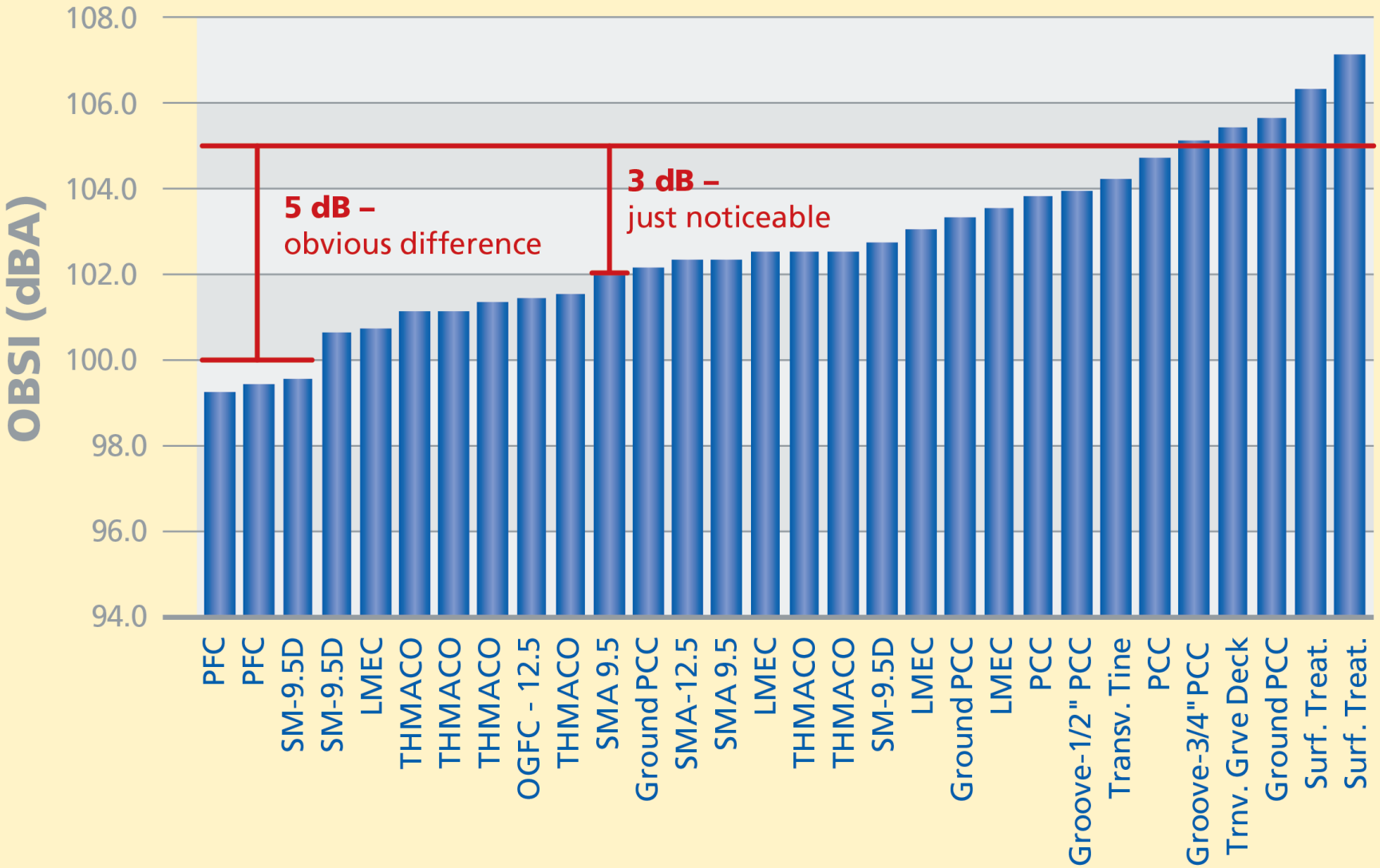


**Tire-Pavement (i.e. OBSI)**

# Wayside Noise (“Reduction”)

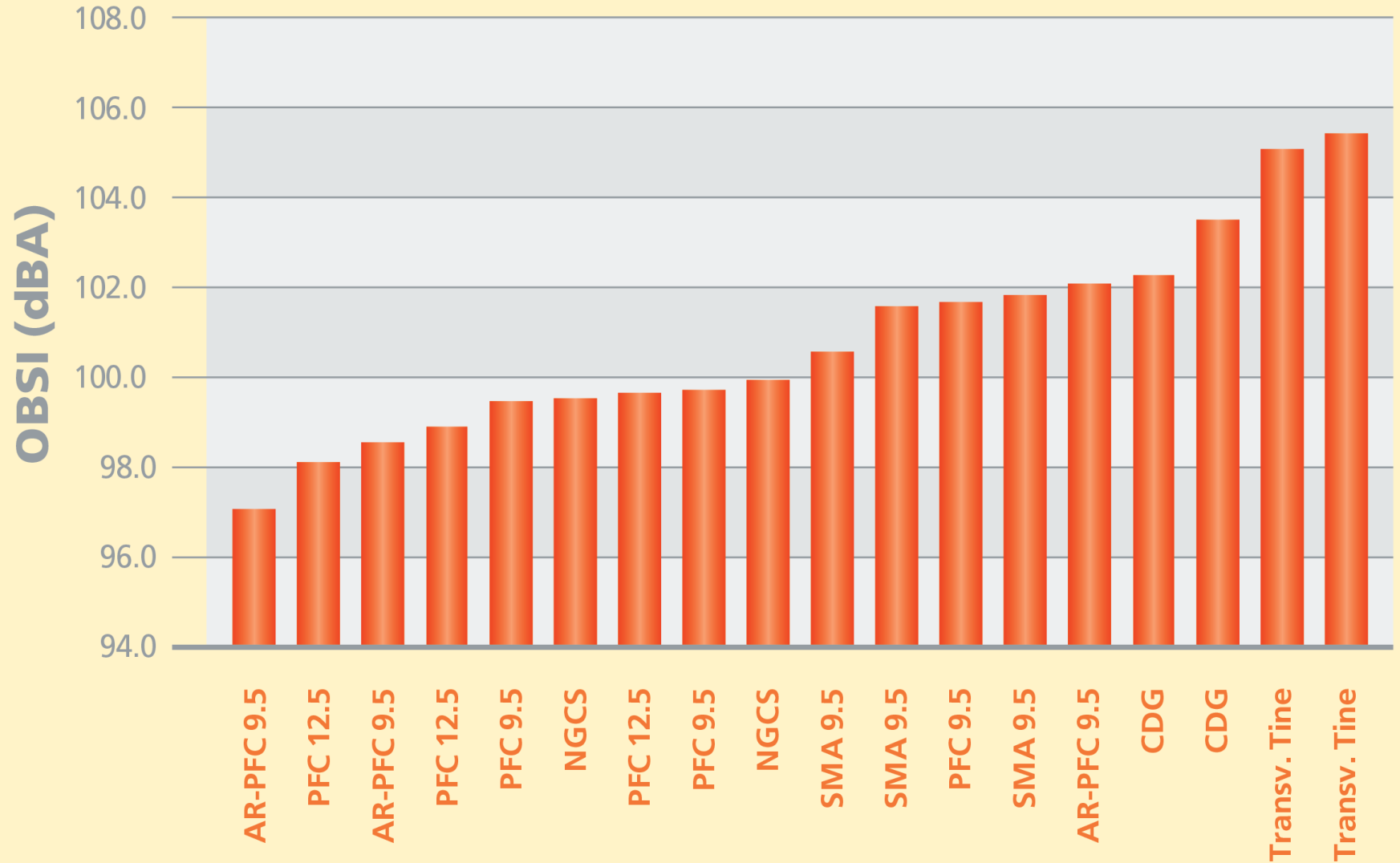


# Typical Virginia Surfaces

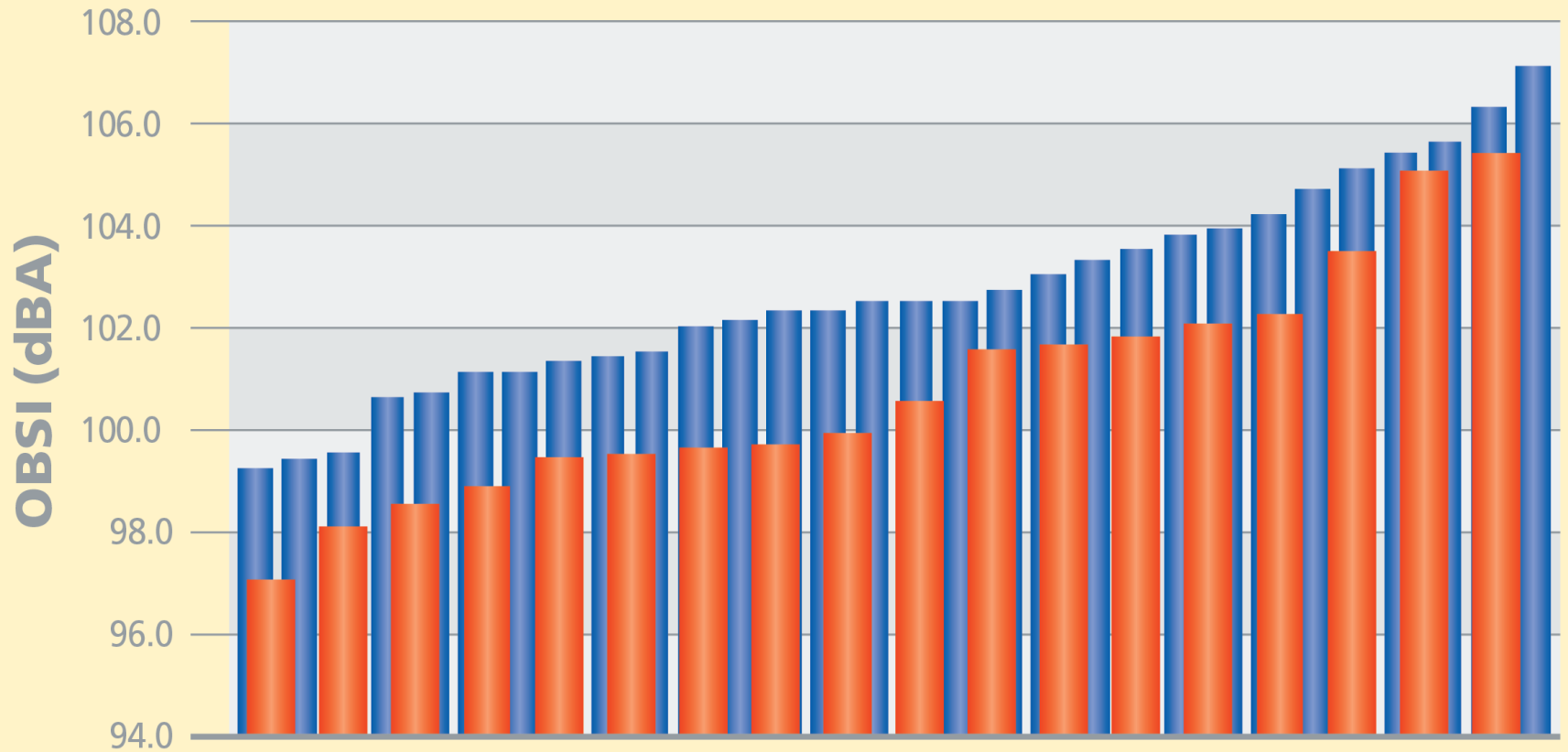




# QP Demonstration Projects – Spring 2012



# Typical Virginia Pavements vs. QP Demonstration Projects



2010 OBSI Survey -  
Typical Virginia Pavements



QP Demonstration Projects -  
Spring 2012

# Tire-Pavement Friction

Locked-Wheel  
System (LWS)

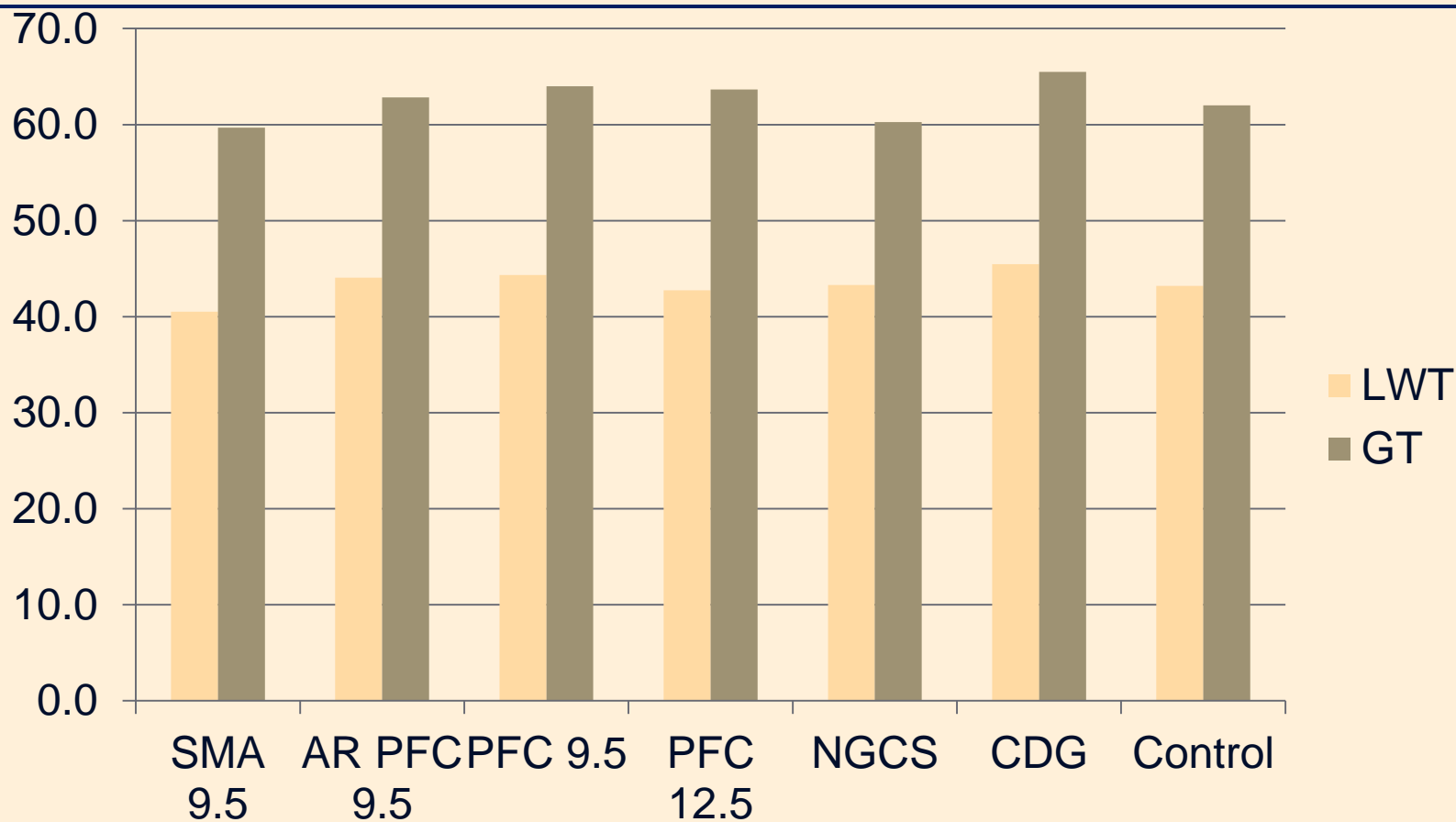


GripTester (GT)



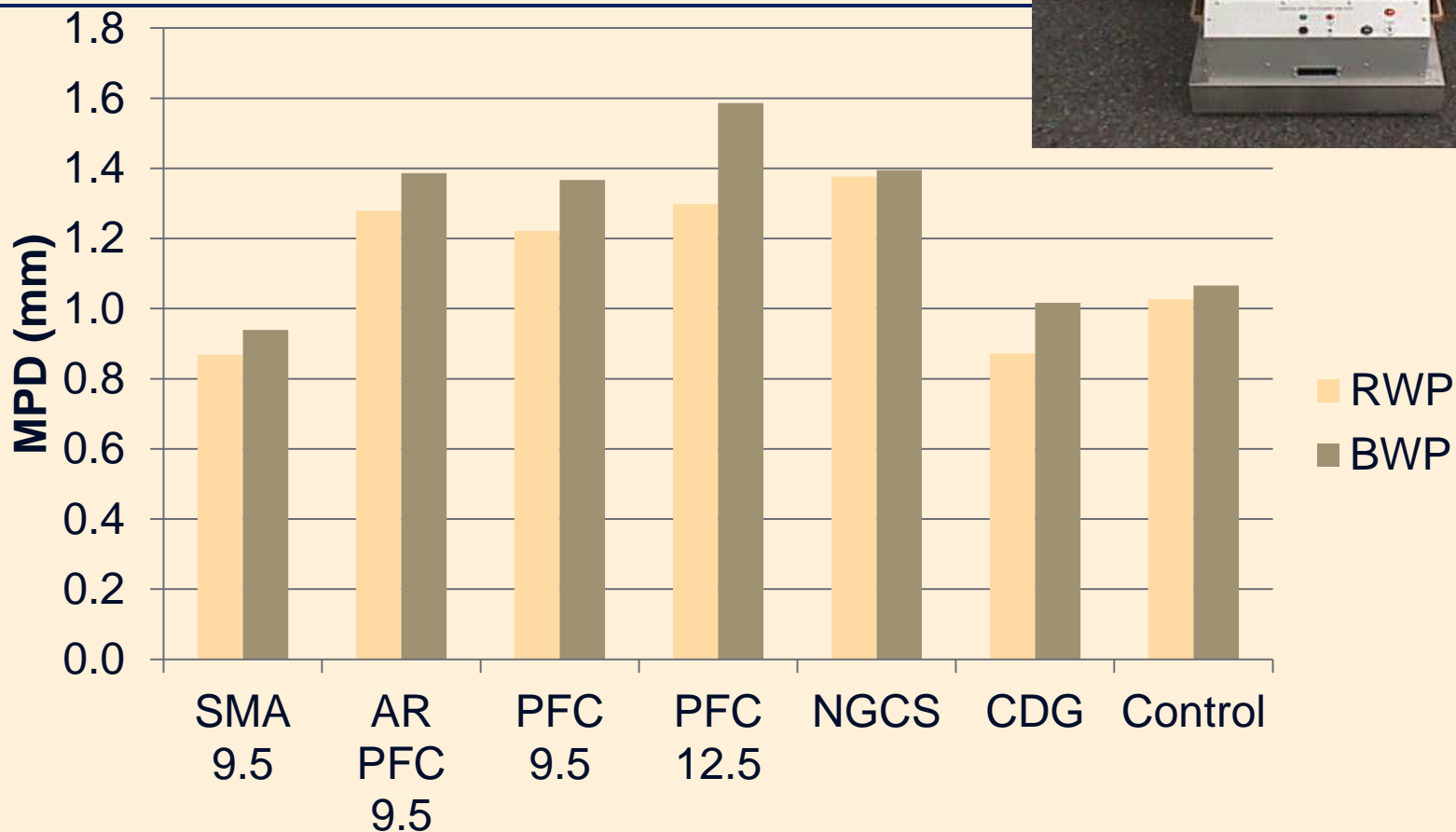
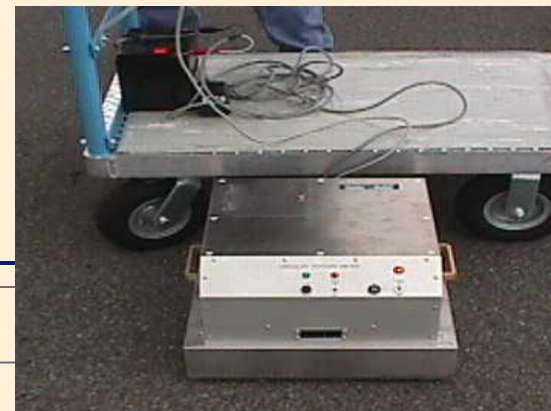


# Tire-Pavement Friction



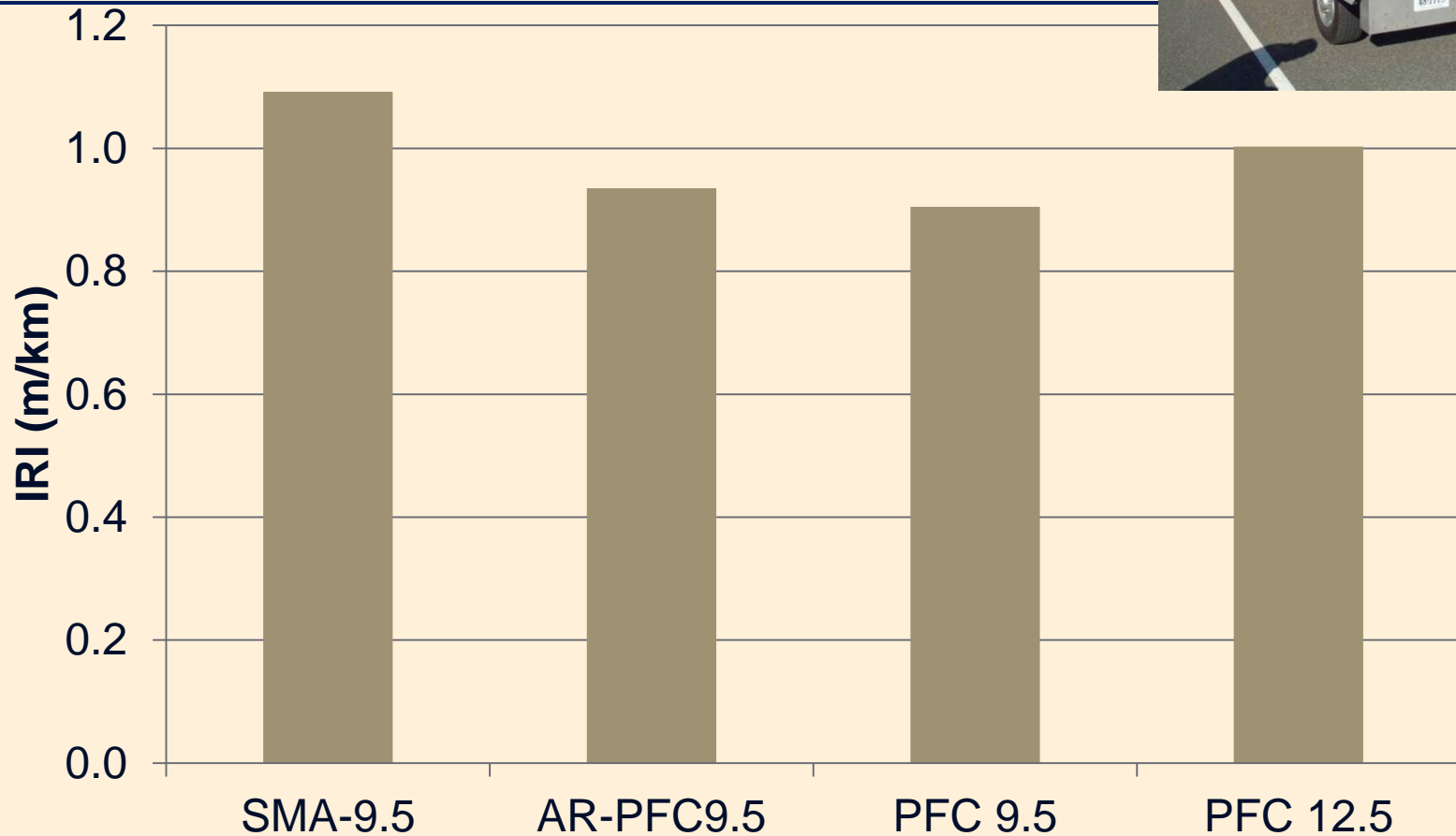
ASTM E2157

# Macrotexture

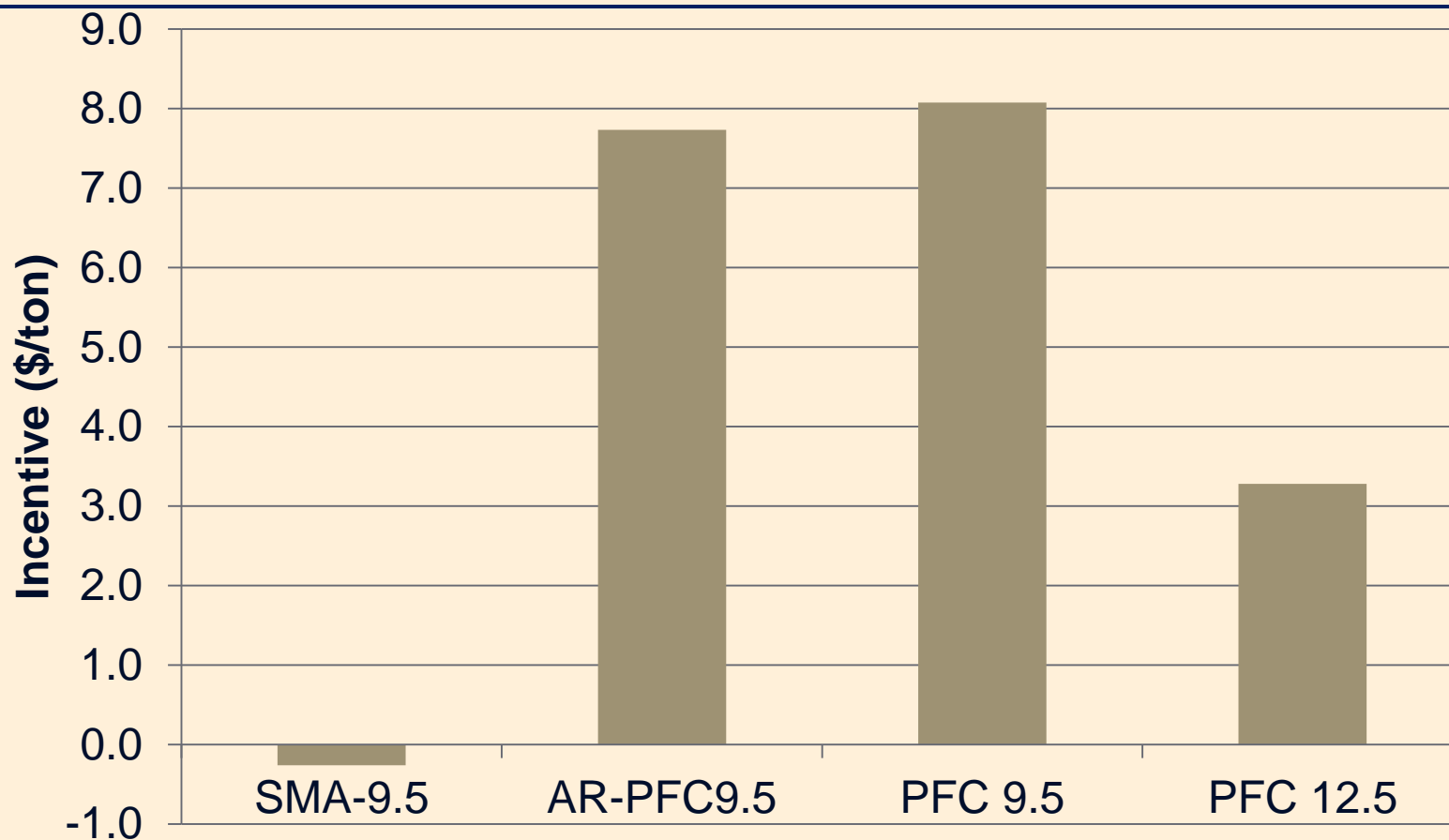


# Ride Quality

Inertial  
Profiler



# Pay Adjustment for Evenness

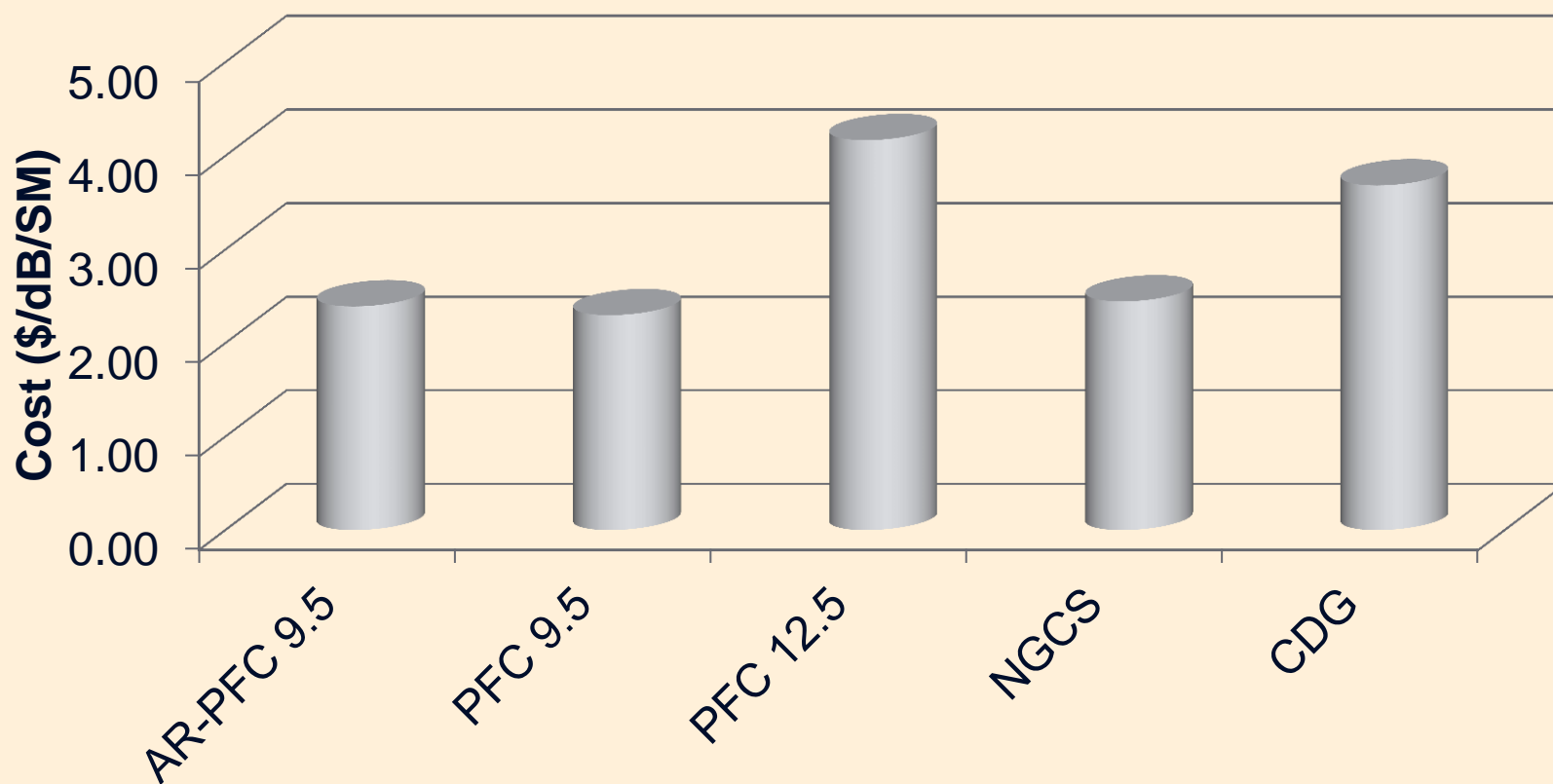




# Technology Costs

Pavement Description	Average Costs	
	Per Ton (\$)	Square Meter (\$)
SMA 9.5 (Control)	108.50	11.00
AR-PFC 9.5	125.81	6.90
PFC 9.5	116.00	6.36
PFC 12.5	110.33	12.09
Diamond Grind	N/A	8.20
NGCS	N/A	12.96

# Effectiveness (Noise Reduction)



# Summary (Tire-Pavement Noise)

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- Quiet asphalt technologies *measurably* less noisy on average than control (note: control technology NOT noisy)
- Next Generation Concrete Surface (NGCS) *noticeably* less noisy than control
- None of the surfaces became louder over the winter (note: milder than normal winter)

# Summary (Other Properties)

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- Ride quality is critical to quiet pavements and excellent ride quality was achieved in the projects.
- The QP technologies exhibit good resistance to skidding
- The QP technologies have reduced splash and spray with improved wet-weather visibility
- There were no reports of compromised safety during winter weather with QP



# Next Steps

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- **More demonstration projects and test section installs in 2012**
  - **AR-PFC 12.5 and AR-SMA 9.5 – NOVA and Culpeper Districts**
  - **National Center for Asphalt Technology (NCAT) – AR-PFC and PFC**
- **Noise (and other) testing continues**
- **Costs will continue to be evaluated**
  - **Life-Cycle Assessment (LCA)**

# Cost Components for LCA

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- Allowable substitution – will FHWA permit QP strategy in lieu of noise barriers?
- “Acoustic longevity” – QP replacement cycle?
- Additional maintenance costs – winter and periodic cleaning/vacuuming
- Value of other functional benefits – e.g., reduced rolling resistance, improved safety & comfort, etc.

FOR MORE INFORMATION:

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LINKS TO INTERIM REPORT:

[HTTP://LEG2.STATE.VA.US/DLS/H&SDOCS.NSF/0/E0A4B50AD340  
248C8525787E0057D09A?OPENDOCUMENT](http://LEG2.STATE.VA.US/DLS/H&SDOCS.NSF/0/E0A4B50AD340248C8525787E0057D09A?OPENDOCUMENT)

[HTTP://WWW.VIRGINIADOT.ORG/VDOT/PROJECTS/ASSET\\_UPLOAD  
FILE884\\_5721.PDF](http://WWW.VIRGINIADOT.ORG/VDOT/PROJECTS/ASSET_UPLOAD_FILE884_5721.PDF)

