What's MnDOT's Working

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Topics

- When to chip seal
- Fog Seal Research
  - CFS-1h
  - Value of fog sealing
- Dealing with Pavement Markings
- Micro Milling with Chip Seal or Micro Surfacing
- Micro Surfacing Research
- Texas Under Seal

When to Apply Chip Seal

- Built an aging study
  - Because 15 years take 15 years
- 3 inch Mill & Fill 1999
  - PG 58-28 binder
  - Chip seal 1 mile section each year starting in 2000
  - Last sections was chip seal 2004

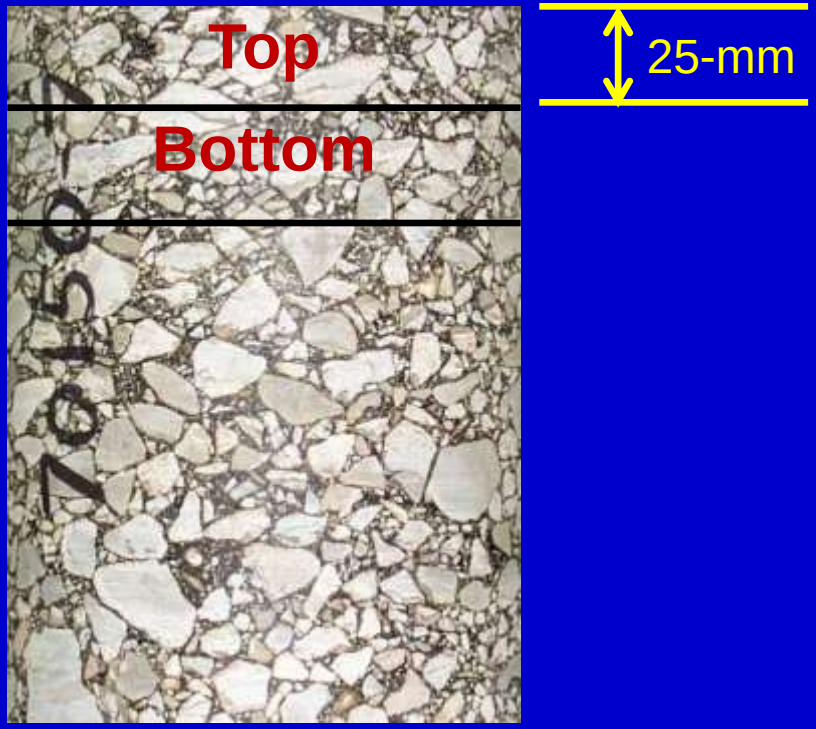
Aging Study

- Cored in 2011 for Asphalt Institute study
- Wanted to see what effect PM has on aging
- When is best time

Aging Study

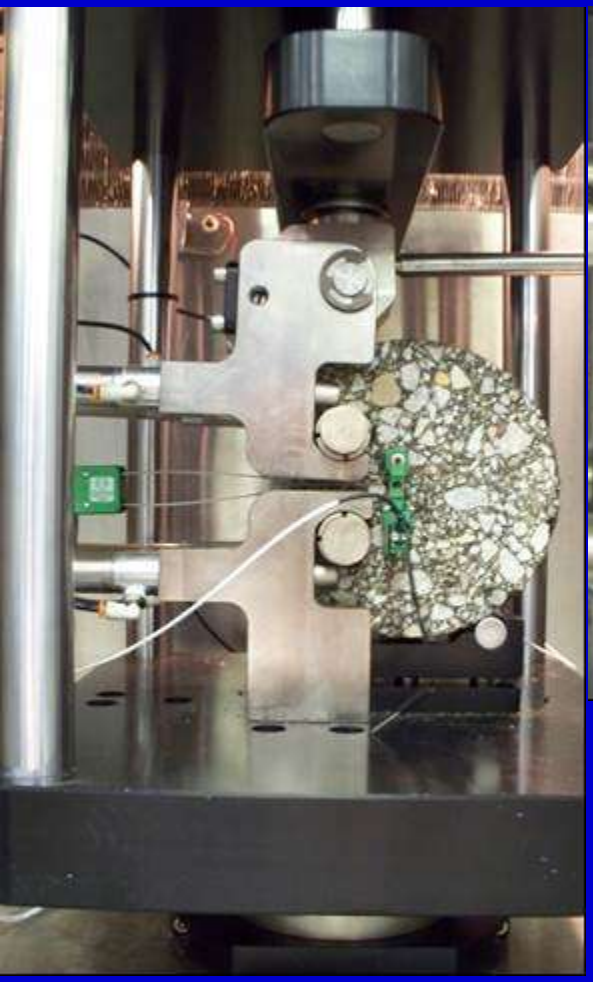
MINNESOTA TH 56 SITE LAYOUT				
14 TO 15	13 TO 14	12 TO 13	11 TO 12	10 TO 11
2000	2001	2002	2003	CONTROL
1 YEAR	2 YEAR	3 YEAR	4 YEAR	Age when treated
ORIGNAL CONSTRUCTION- 1999				

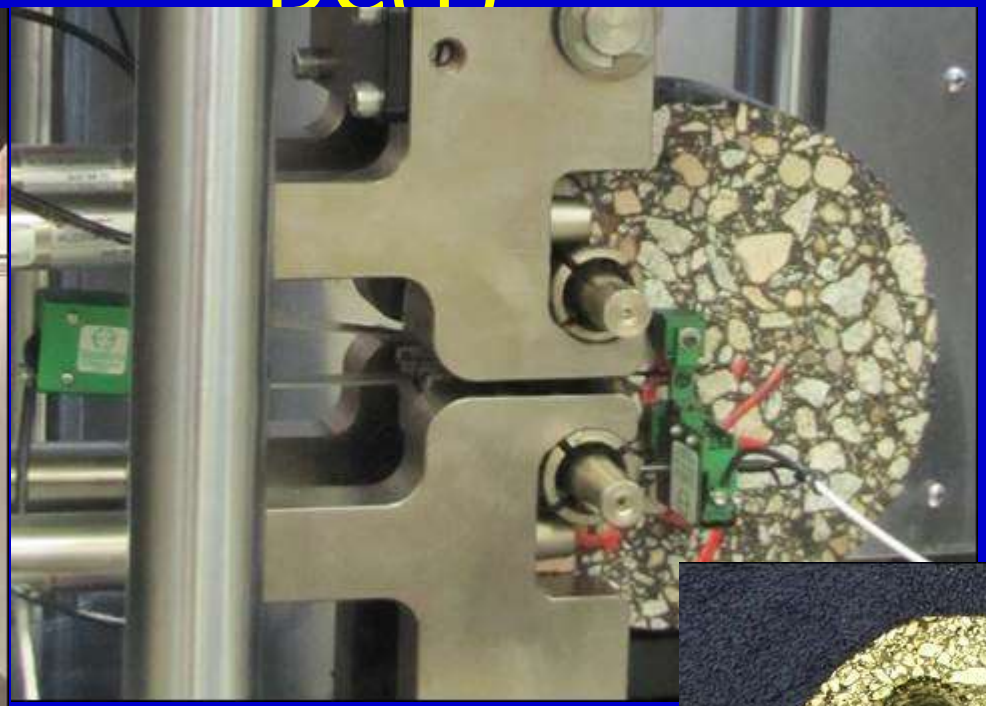
TH56 Cores



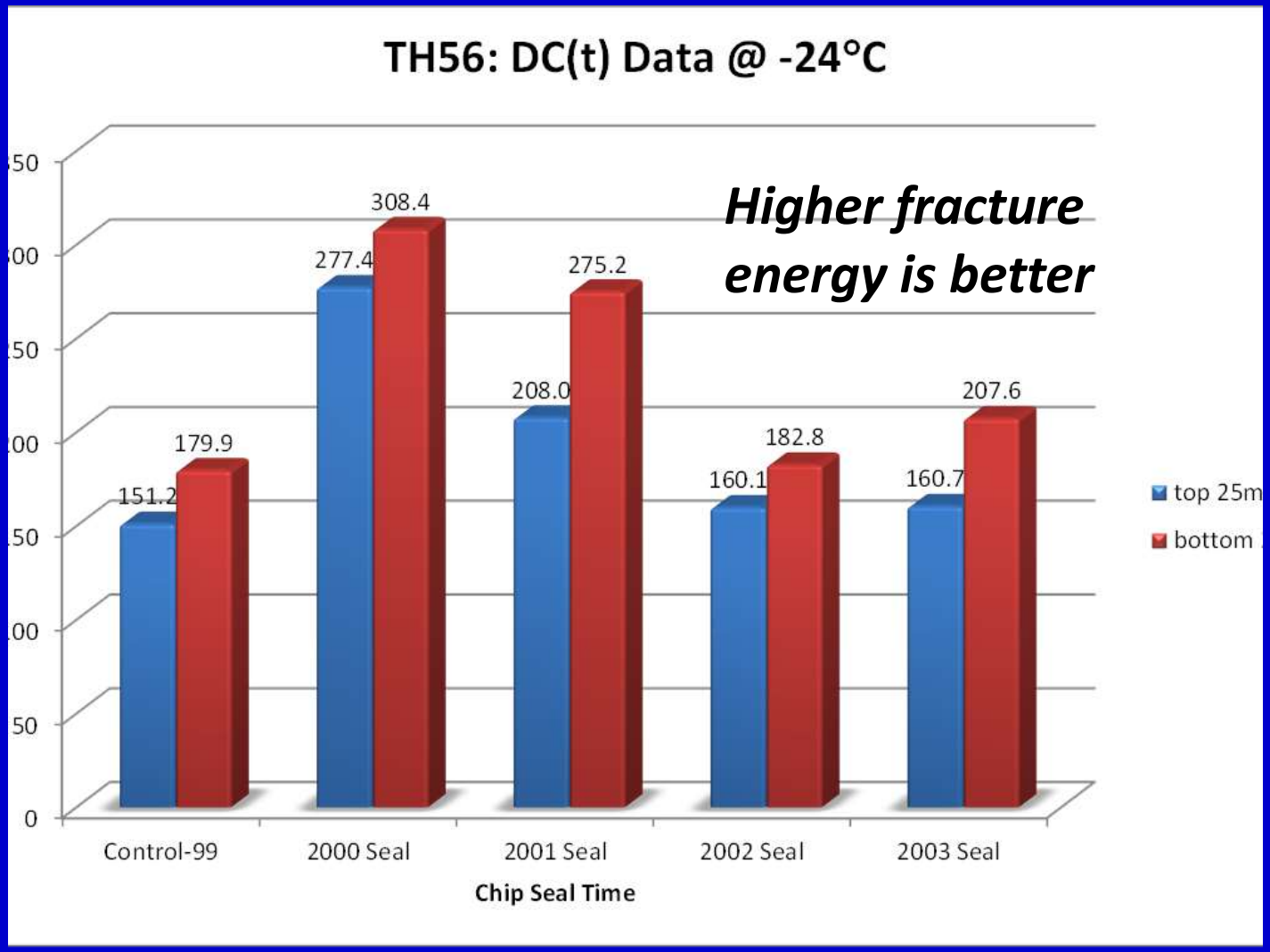
- Cores
  - Remove chip seal (if any)
  - Cut into two 25-mm layers
  - Test for fracture energy (cracking potential)
  - Recover component asphalt to check aging

Disk-Shaped Compact Tension Test: DC(T)





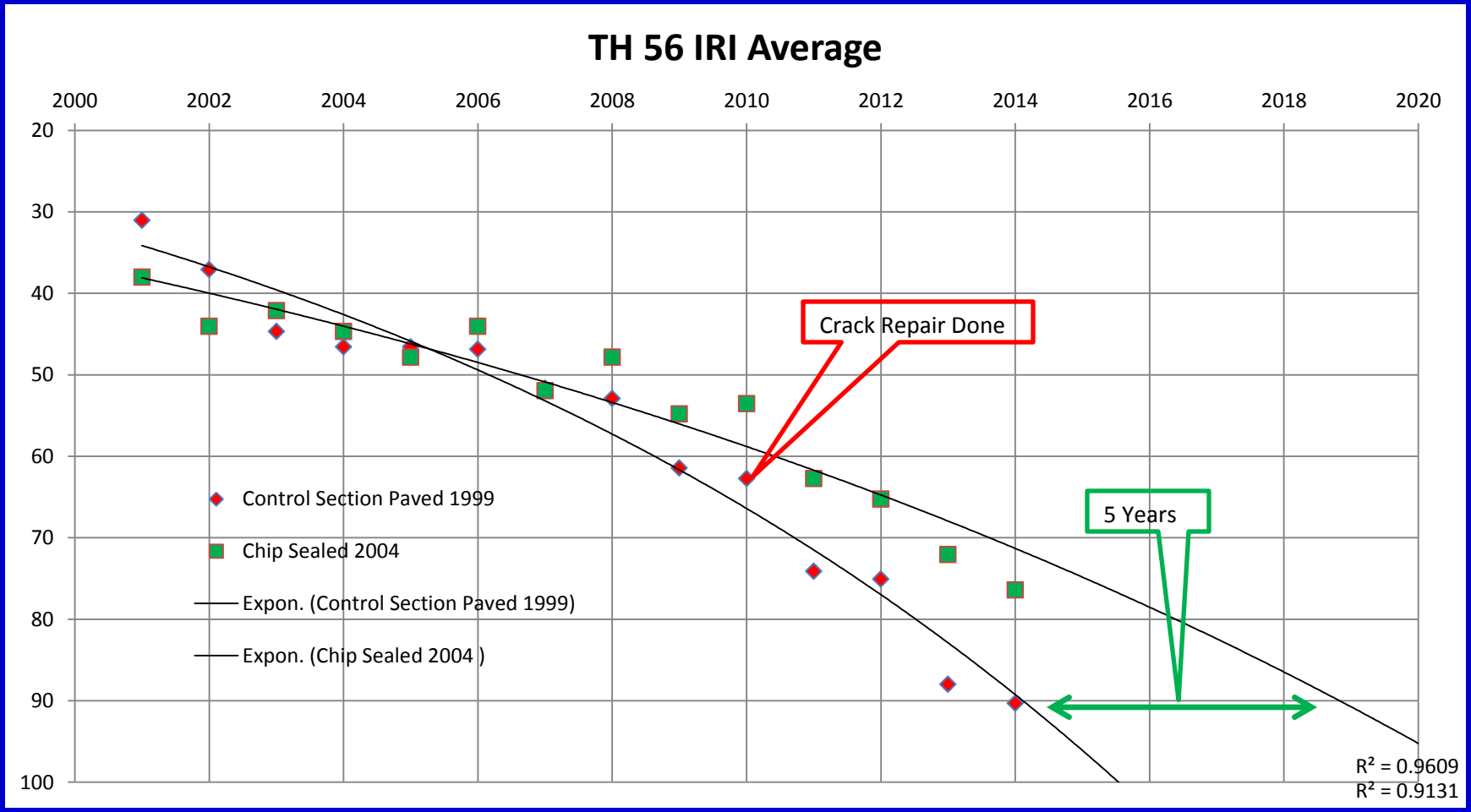
DC(T) Results: TH-56



TH56 Findings

- Sealing improves resistance to aging (cracking)
- Sooner is better when sealing
  - Waiting for 3 or more years to seal after construction produced similar results as unsealed pavement related to DCT
  - Sealing after 1 or 2 years showed improvement in resistance to aging (cracking)

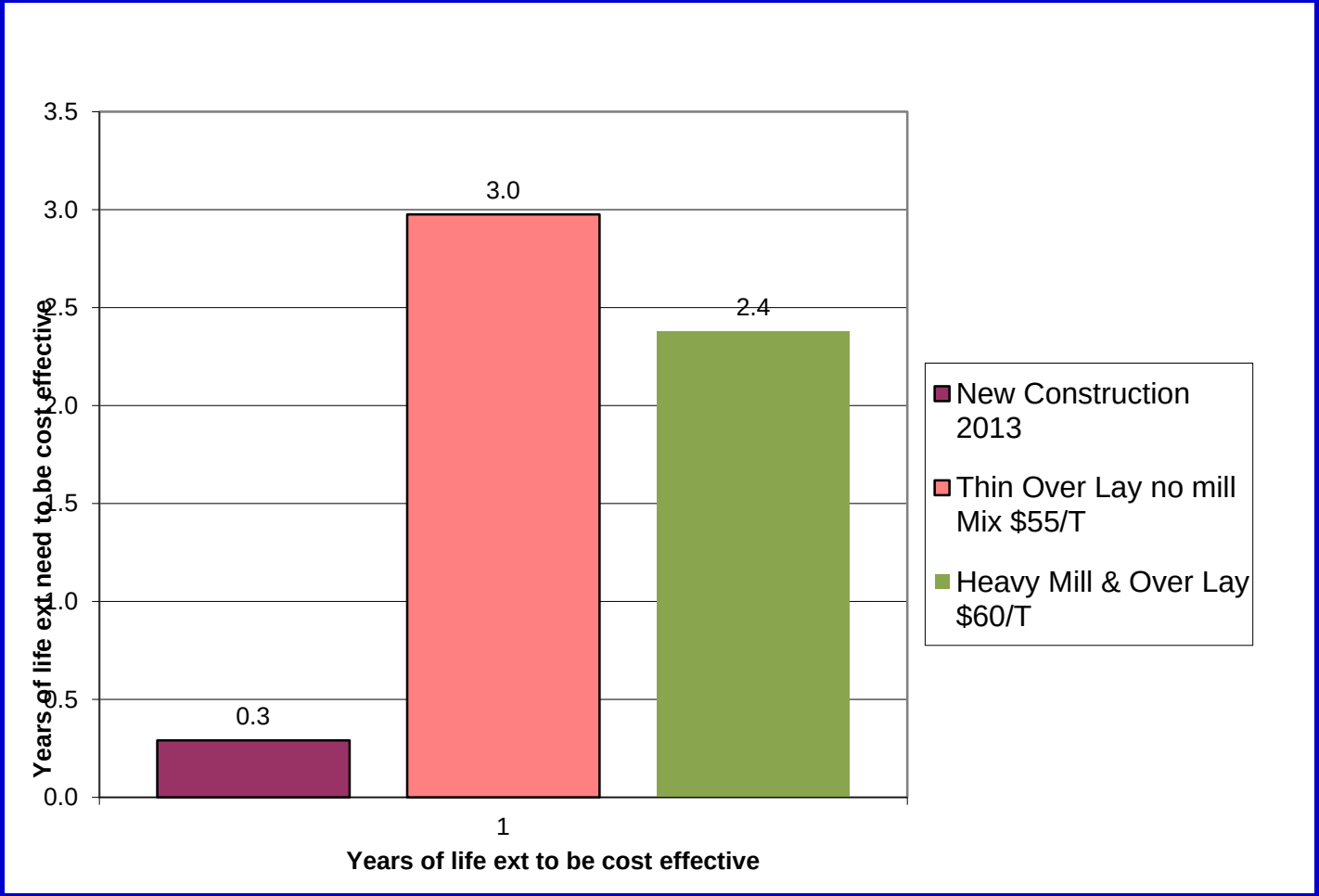
Ride Data


TH 56 IRI Average
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
20
30
40
50
60
70
80
90
100
Crack Repair Done
5 Years
Control Section Paved 1999
Chip Sealed 2004
Expon. (Control Section Paved 1999)
Expon. (Chip Sealed 2004)
R² = 0.9609
R² = 0.9131

Control Section Never Chip Sealed

Last Section Chip Sealed 2004

Life Extension of Chip Seal Needed to Break Even



Fog Sealing Research

Issues with fog sealing

- Slow curing rate
- High cost of traffic control
- Limited working hours

Developing Faster Setting Emulsion CFS-1h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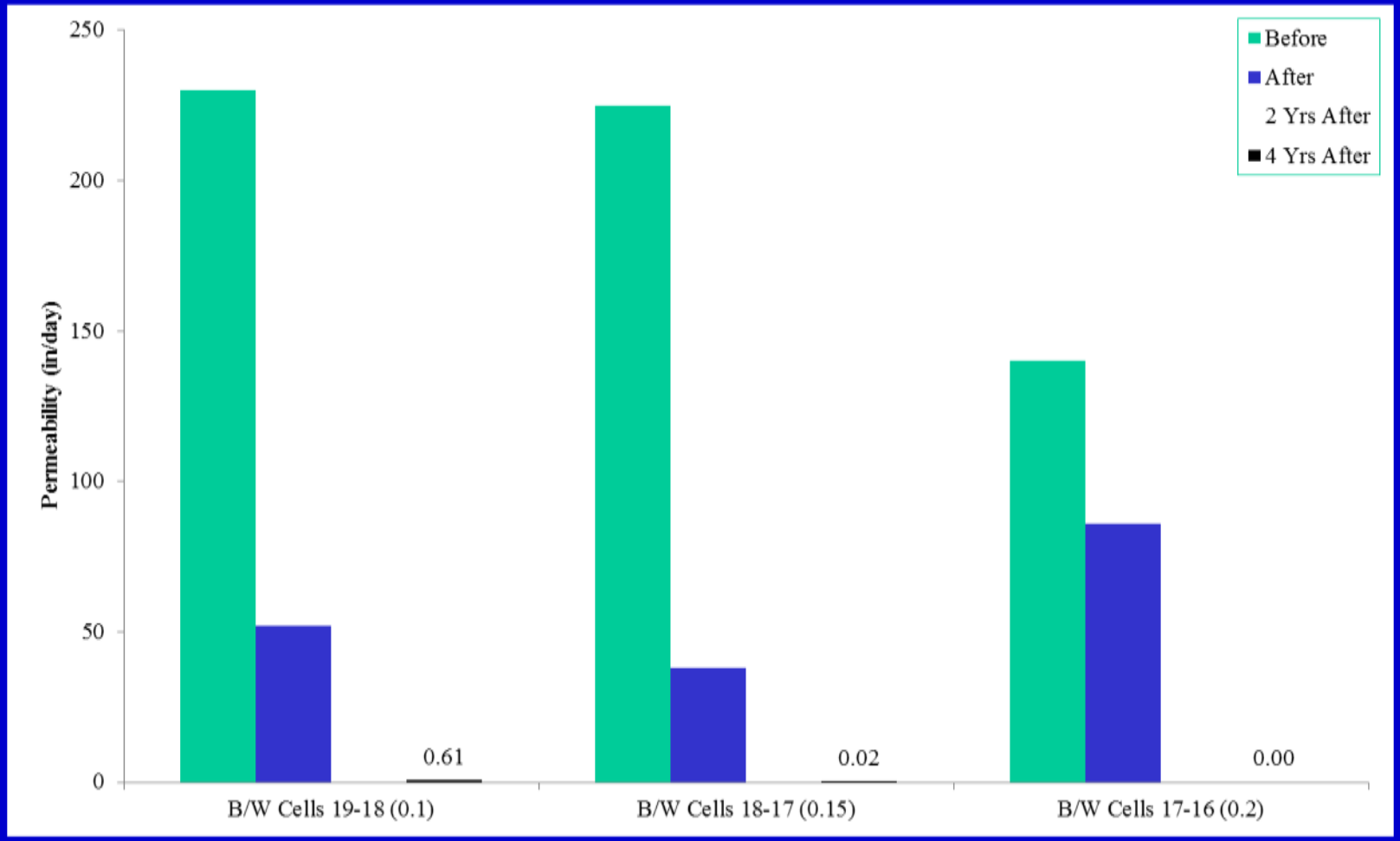
What is it

- Same base asphalt as CSS-1h
- Uses Rapid Set emulsifiers
- Designation CFS – 1H
  - Minimum 30% residual asphalt
  - Not diluted in field
  - Pen range 40 to 90 pen
  - Sieve 0.1% max
- Cost similar to diluted CSS-1h

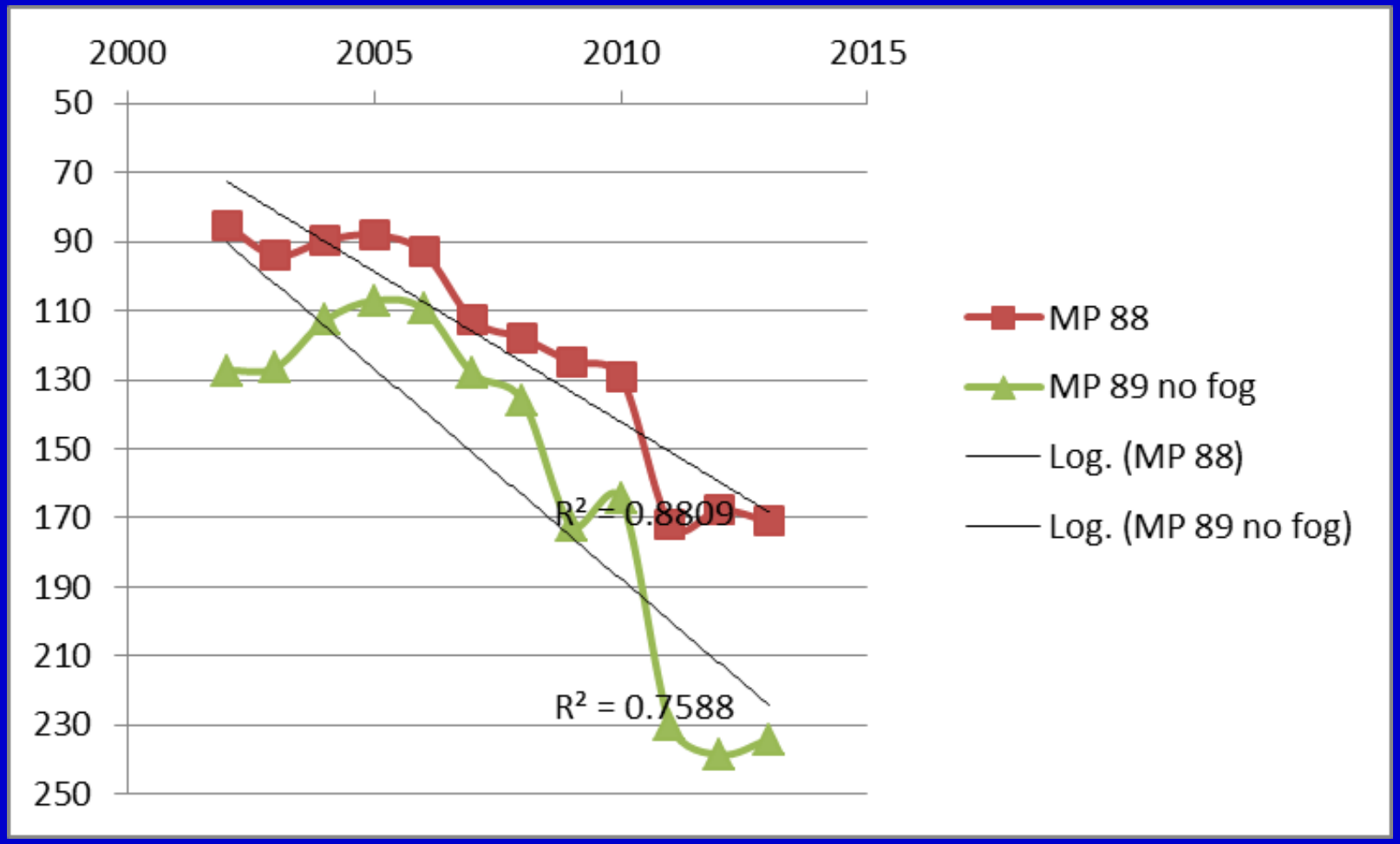
Value of Fog Sealing

Why Fog Sealing Shoulders (Picture taken in 2009)

Fog Sealing still working after 4 years



Value of Fog Sealing over chip Seal



Pavement Markings

Dealing with in place Pavement Markings

- Trouble with de-bonding of chip seal
- 2 Options
  - Grind off
    - Cost $0.85 to $1.00 linear foot
  - Prime
    - CRS-2p 0.10 to 0.15 gal/y^2
    - Cost $0.02 to $0.03 linear foot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Micro Milling with PM Treatments

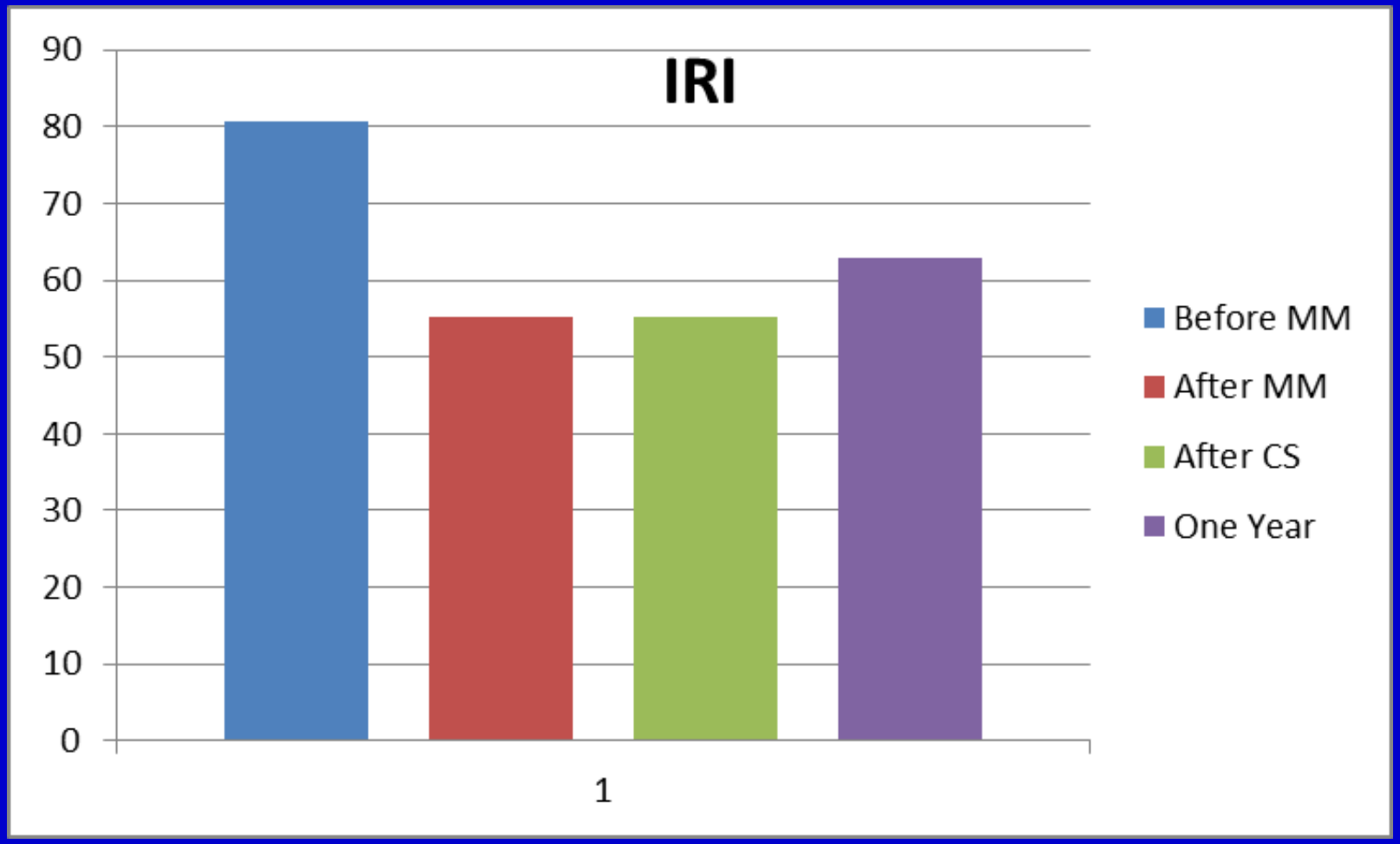
Micro Milling with Chip Seal or Micro Surfacing

- Why?
  - To improve ride
- What are the performance targets
  - Equal to 1½ inch over lay
  - Quicker than overlay
  - Less costly overlay
    - Chip seal 40% of the cost of 1½ inch over lay
    - Micro Surfacing 60% cost of 1 ½ inch over lay

Micro Milling

Micro Milling with Chip Seal

Results for Chip Seal

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SPEED LIMIT 55
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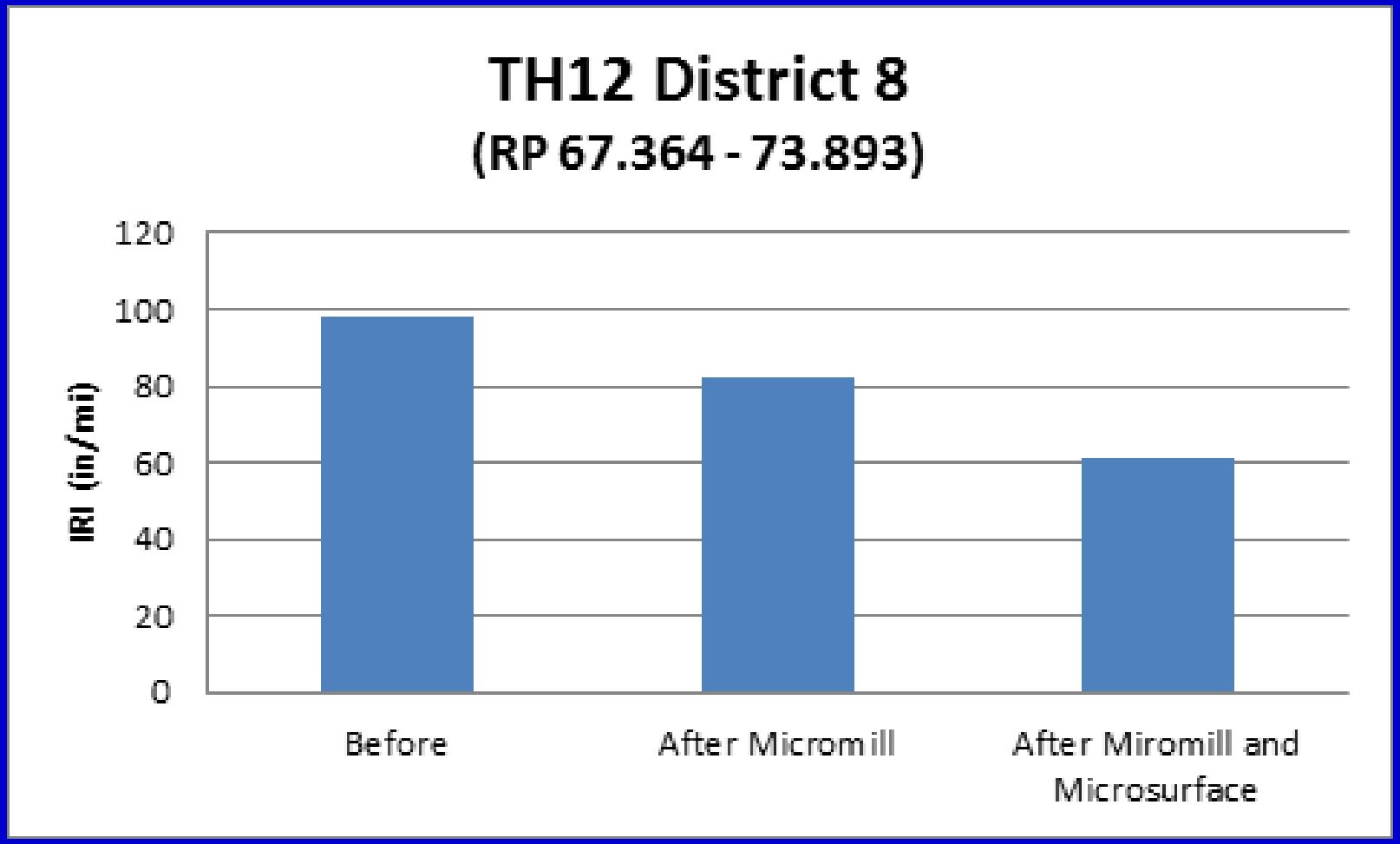
Results Micro Surfacing



Micro Surfacing Research

- Methods to reduce snow plow damage
  - Softer base Asphalt
    - 2013 and 14 allowed PG 58-28 in place of 64-22
    - Required in 2015
    - Designation CQS-1p
    - Will allow PG 49-34 for construction season 2015
      - Two project built successfully so far with PG 49-34
  - Have seen less snow plow damage on pavement markings with softer based asphalt

Micro Surfacing Research

- Allow use of SBS modified asphalt in place of latex modifications
  - Contractor/Supplier choice
- Increase asphalt content micro surfacing
  - Increased from 8% to 10%
  - Increased life
  - Smoother surface

Questions to be answered

- Can a surface treatment such as Micro Surfacing be used to improve ride and hold worn out pavement together for 5+ years?
- Will higher asphalt content Micro Surfacing last longer on high volume roadways?
- Will higher polymer loading and softer binder in Micro Surfacing emulsion reduce reflective cracking?

Before condition Cell 1

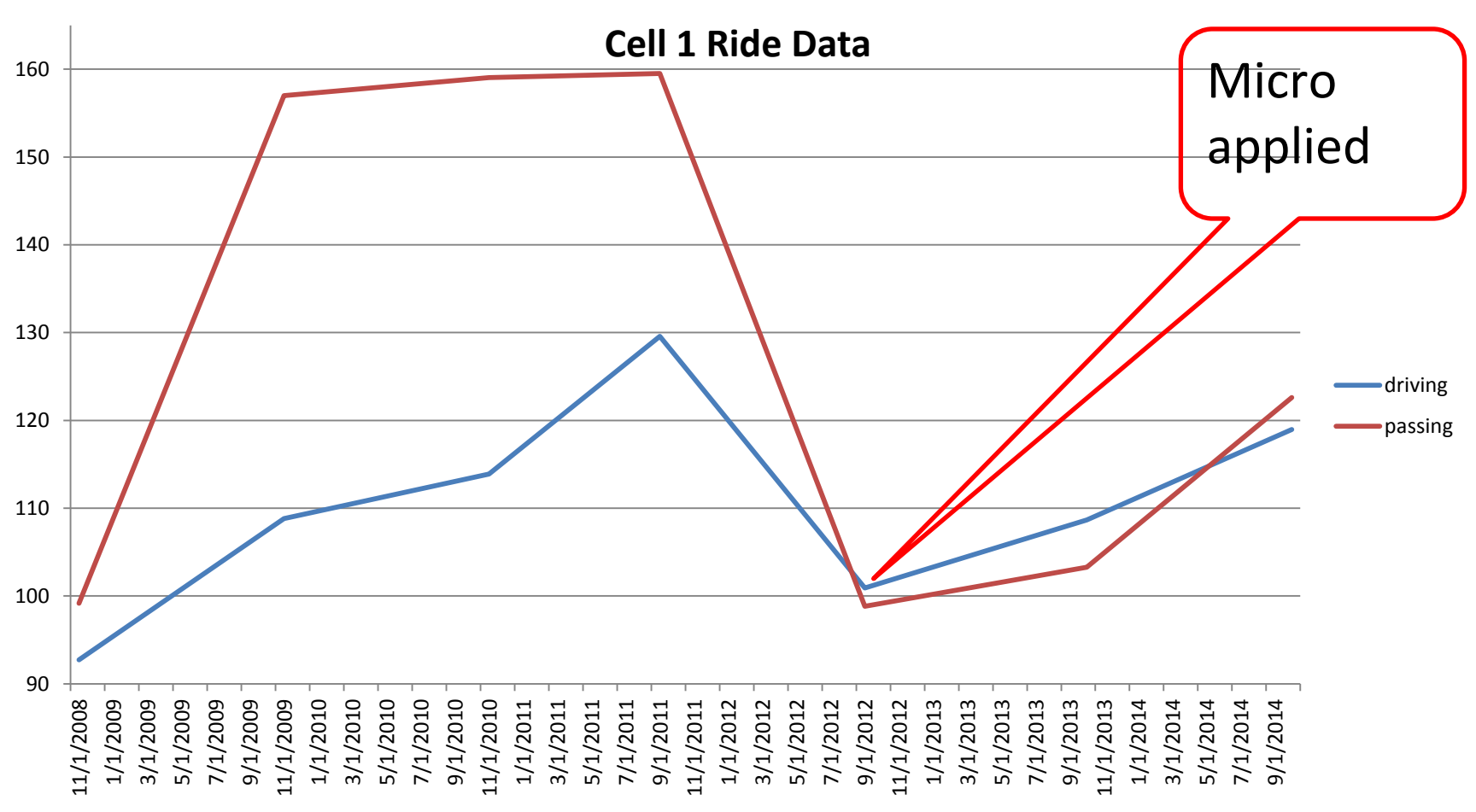
Research method

- Cell 1 received the following
  - Tack coat of CSS-1h diluted
    - Application rate 0.10 gallons per square yard
  - Micro Surfacing
    - Granite
    - Gradation used: MnDOT Type II
    - Scratch course : 12lbs./SY
    - Surface course: 15lbs./SY

Research method

- Emulsion used
  - 6 % Kraton polymer modified base asphalt
  - instead of 3% post added latex
  - Base PG 49-34 instead of PG 64-22
  - 16% add emulsion instead of 13%
  - 10.25% AC instead of 8.3% AC

Results


Cell 1 Ride Data
Micro applied
driving
passing
160
150
140
130
120
110
100
90
11/1/2008
1/1/2009
3/1/2009
5/1/2009
7/1/2009
9/1/2009
11/1/2009
1/1/2010
3/1/2010
5/1/2010
7/1/2010
9/1/2010
11/1/2010
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5/1/2014
7/1/2014
9/1/2014

Cell 1 after Micro Surfacing


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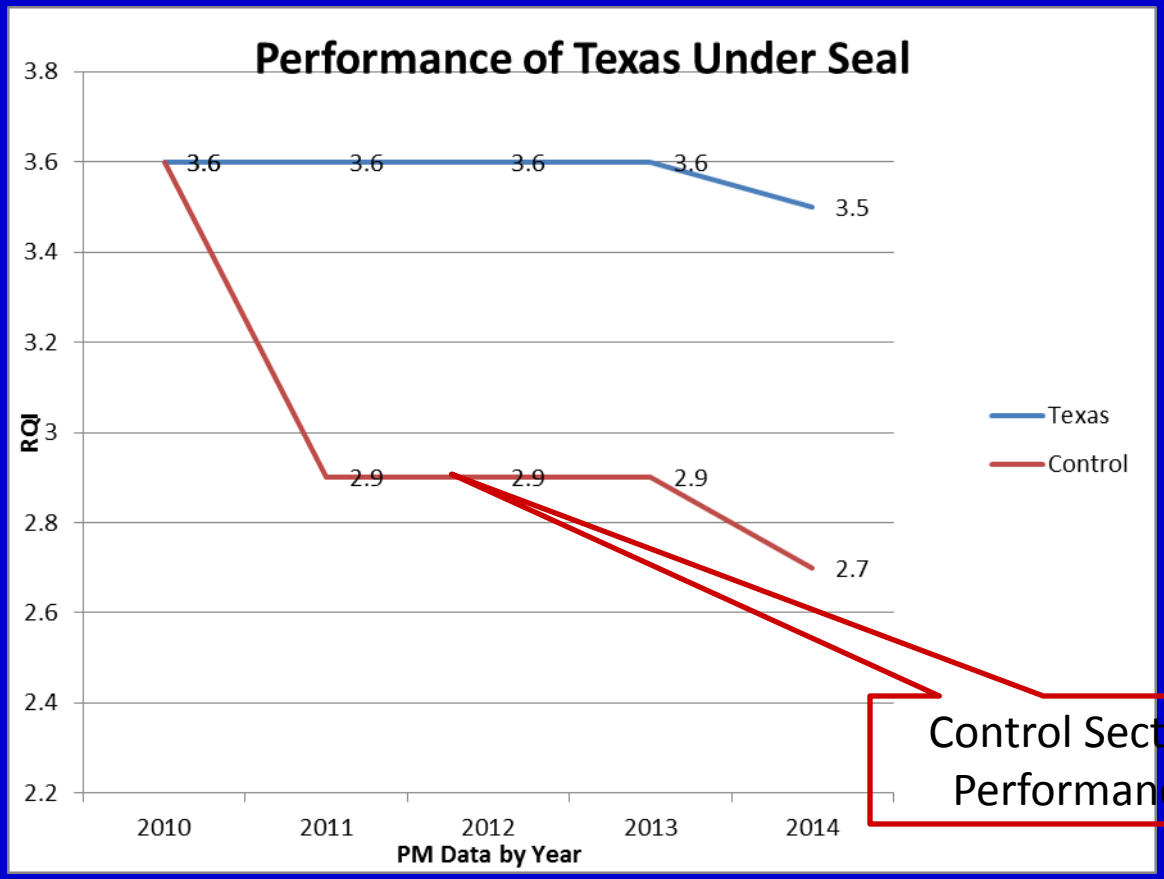
Texas Under Seal

Texas Under Seal

- Chip Seal applied before HMA Overlay
  - Milled surface
  - Non milled surface
- ⅜” minus chip
- CRS-2p
- Light on cover aggregate
- Can pave as soon as rolling & sweeping is completed

PM Performance Data



Texas Under Seal

- Why does it perform
  - Acts as stress relief membrane?
  - Super Tack?
    - Have had other tack methods with higher peak strengths
  - Limits water infiltration from base?
- As of end of 2014 construction year 8 projects have been built

Questions?


Thank You!
STOP