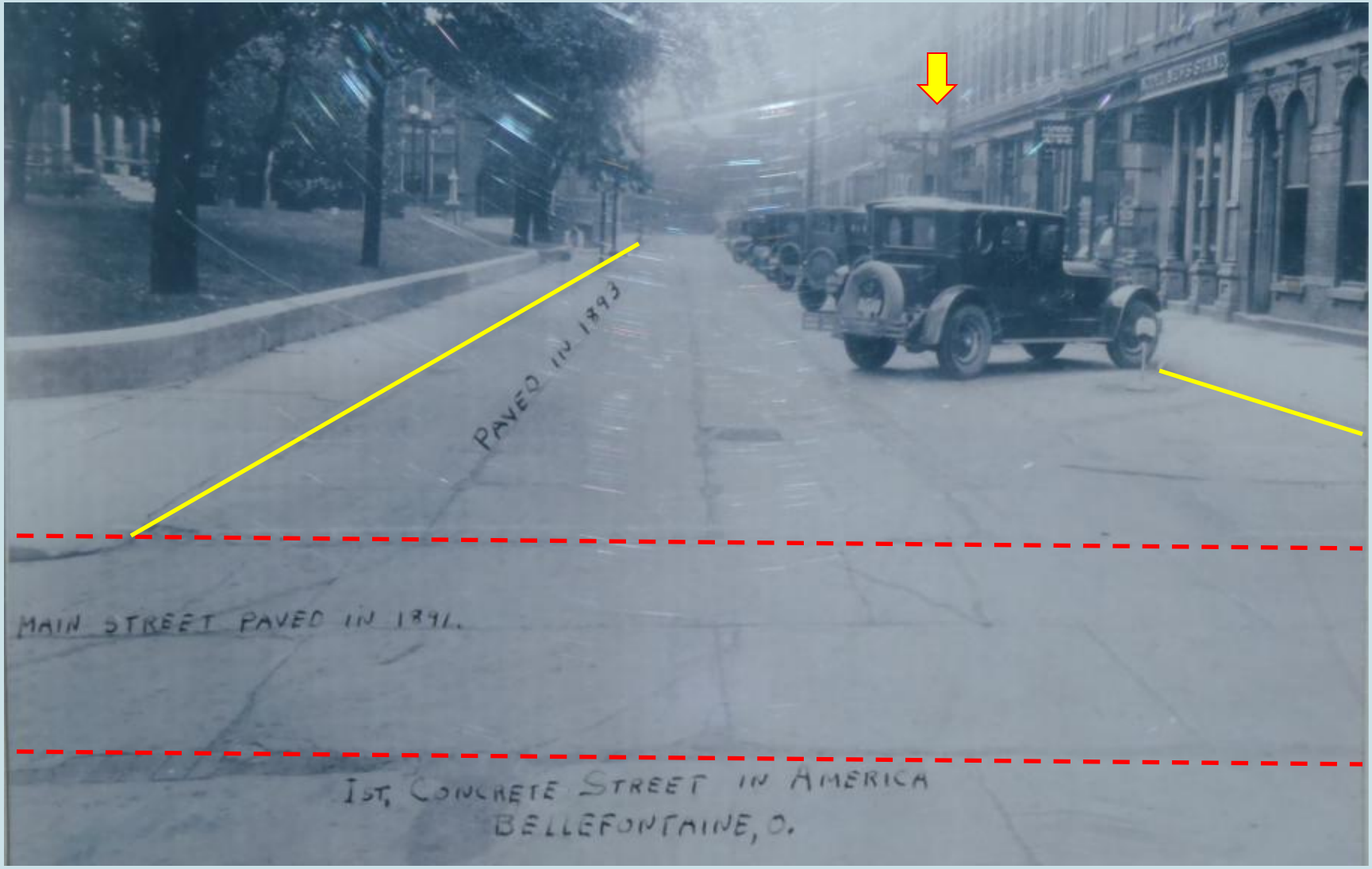
Concrete Pavement Preservation

OR "Show Me Your Data"

Larry Scofield
IGGA

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

Why Preserve Concrete Pavement! Bellefontaine, Ohio



Bellefontaine, Ohio 2012

120 Years Old

Preservation Can Work (122 Years)

Washington -1919

Iowa --1910

Trends We May Want to Start: the JFK Example

- A Nation of Doers
- Compelling Vision
- Funding, Funding, Funding, Funding

The IBM 7090

A dual 7090 system at NASA in about 1962.

Could store 32,768 36-bit words.

That's about .00015 gigabytes.

Cost:

about $3,000,000.

or $19,794,000
2005 dollars

….Doers….

- Kennedy Challenges the Nation to put a Man on the Moon—Sept 12, 1962
- Neil Armstrong Walks on the Moon—July 20, 1969 ……. Seven Years Later…….

….Doers….

"Those who came before us made certain that this country rode the first waves of industrial revolution, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming of the age of space. We mean to be part of it. We mean to lead it."—John F. Kennedy

…Compelling Vision…

…"We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others too.". John F. Kennedy

…Funding…

"…To Be Sure, all this costs us all a good deal of money. This year's space budget is three times what it was in January 1961, and it is a greater than the space budget of the previous 8 years combined. That budget now stands at $5,400 million a year-a staggering sum, thought somewhat less than we pay for cigarettes and cigars every year. Space Expenditures will soon rise some more from 40 cents per person per week to more than 50 cents a week for every man, woman, and child in the United States, for we have given this program a high national priority even though I realize that this is in some measure and act of faith and vision. .." John F Kennedy

….Doers???….

- AASHTO New Design Guide: 1996: 17 years Later…
- FHWA Performance Measures: 2 Years +
- Concrete Pavement Strategy Life Extension

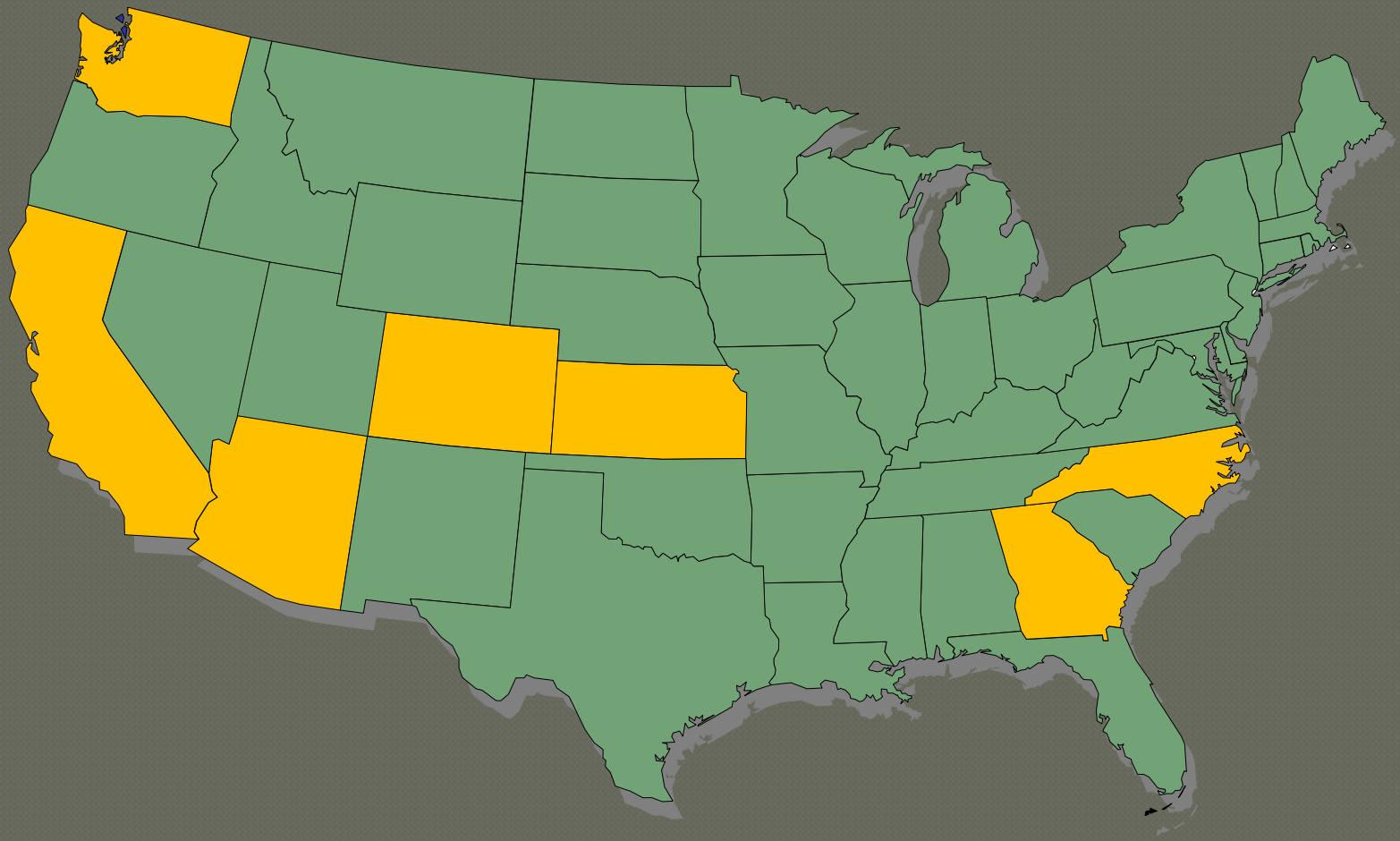
Returning to the Old Ways

- Lets Talk Implementation not Innovation
- Lets Talk Every Dollar Counts not Every Day Counts
- Lets Preserve the Greatest Transportation System in the History of Mankind
- Become a Member of the MSH Club
- Show Me Your DATA!

The LTPP SPS-2 Experiment **The Nations Largest Concrete Research Effort**

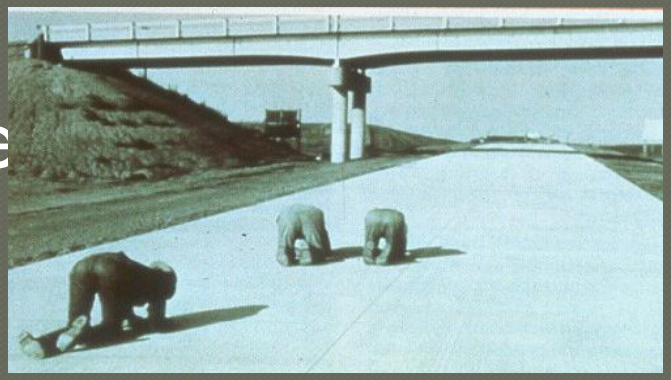
Pooled Fund On SPS-2 Pavement Preservation

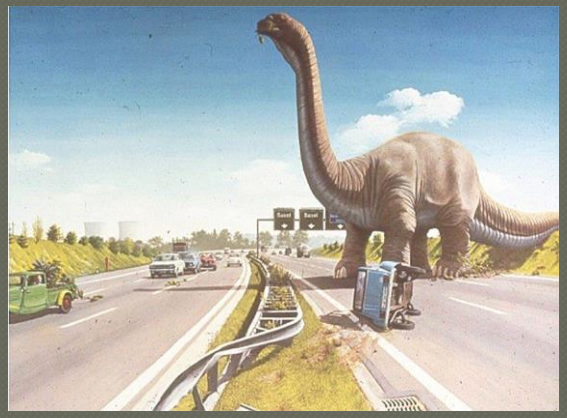
Map of SPS-2 Pooled Fund States

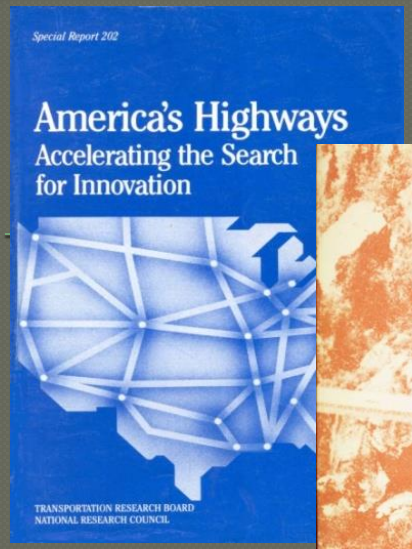


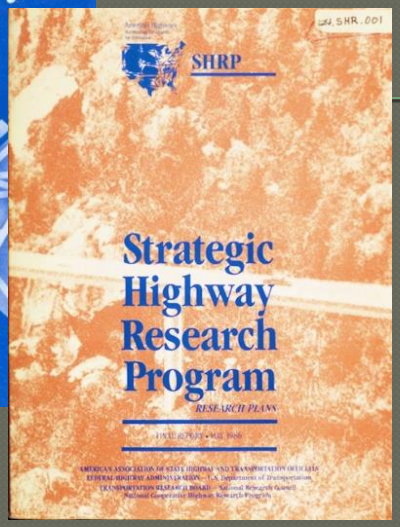
SHRP Program Areas (5 Year Effort)

- Asphalt
- Long Term Pavement Performance (LTTP) ($50M)(20 yr)
- Concrete and Structure
- Winter Maintenance
- Highway Operations

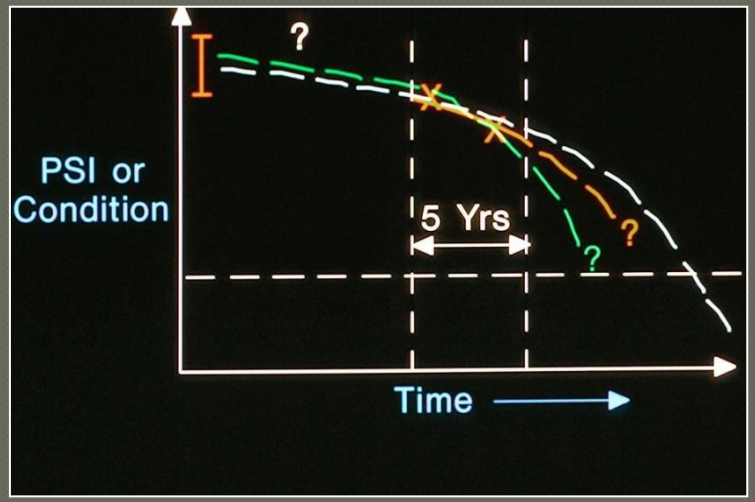








LTPP's GOAL is…

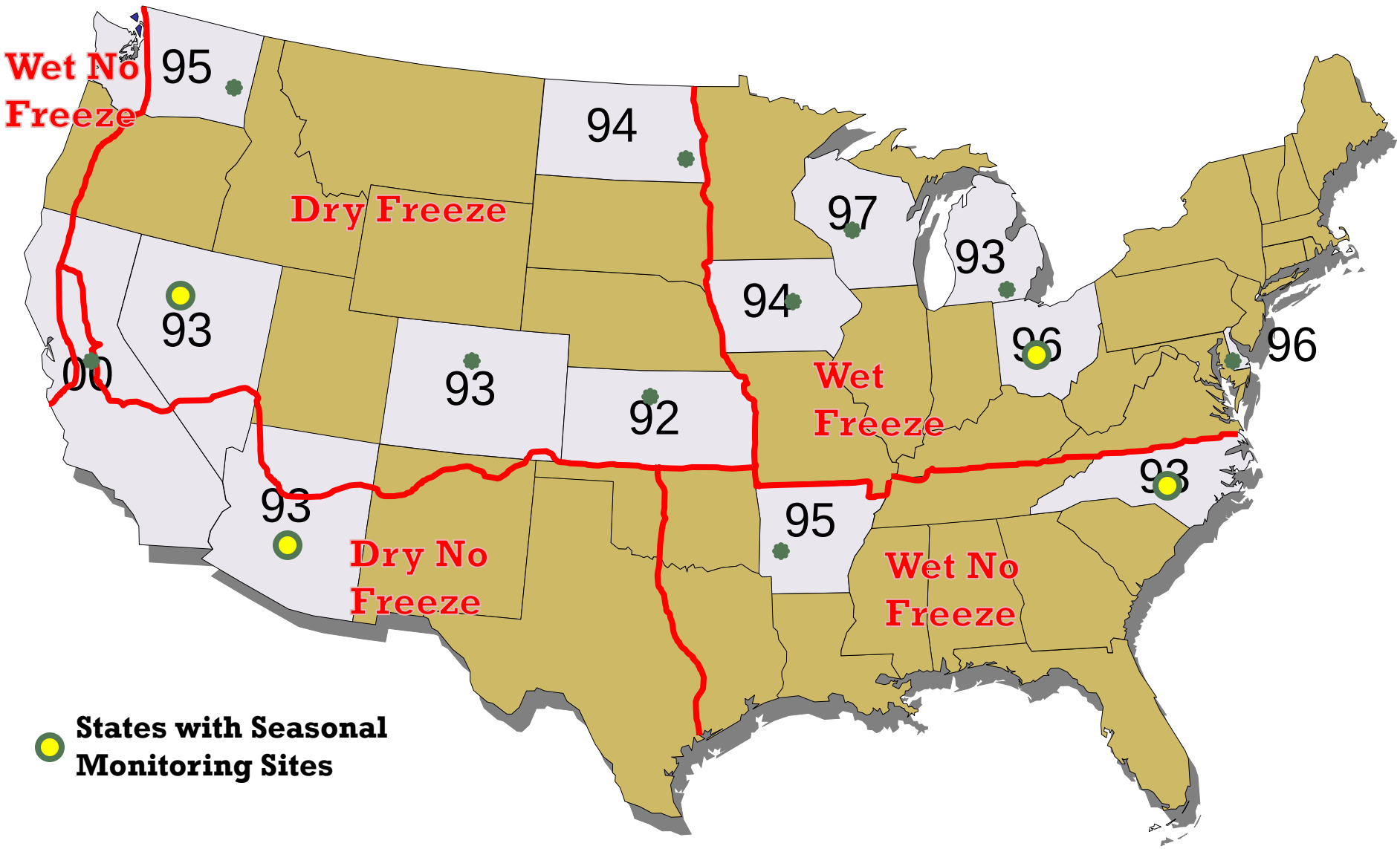


to provide answers to ***HOW*** and ***WHY*** pavements perform as they do!

Designed to Evaluate Relative Influence of 5 Design Factors and 3 Site Factors on Long Term Performance

- Concrete Thickness (8" & 11")
- Base Type (LCB, DGA, PATB/DGA)
- Flexural Strength (550 & 900)
- Lane Width (12' & 14')
- Drainage (with and without)
- Site Factors
  - Temperature
  - Precipitation
  - Subgrade

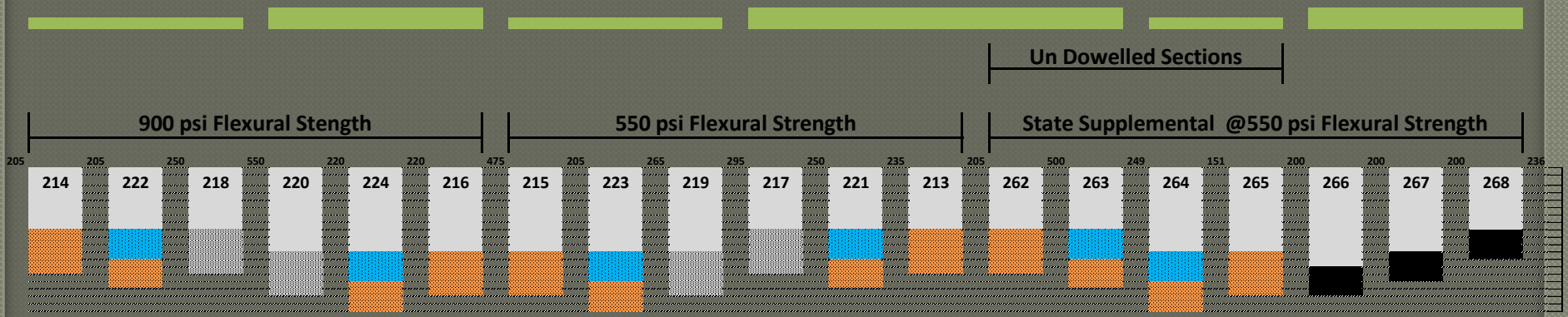
States Constructing SPS-2 Projects



SPS-2 Experiment

Pavement Structure					Climatic Zones, Subgrade															
		PCCP			WET								DRY							
Drainage	Base Type	Thickness (inches)	Flexural Strength 14-D (psi)	Lane Width (ft)	FREEZE				NO FREEZE				FREEZE				NO FREEZE			
					Fine		Coarse		Fine		Coarse		Fine		Coarse		Fine		Coarse	
					J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
No	DGAB	8	550	12																
				14																
			900	12																
				14																
		11	550	12																
				14																
			900	12																
				14																
No	LCB	8	550	12																
				14																
			900	12																
				14																
		11	550	12																
				14																
			900	12																
				14																
Yes	PATB	8	550	12																
				14																
			900	12																
				14																
		11	550	12																
				14																
			900	12																
				14																

Test Section Layout



Base Types

- Dense Graded Aggregate Base (4" & 6")
- Permeable Bituminous Treated Base (4") Note: These are the only Sections with Edge Drains
- Lean Concrete Base (6")
- Bituminous Treated Base (4")

Shoulder Types

- 12 ft Shoulder Width
- 14 ft Shoulder Width

Some SPS-2 "Show Me Your DATA"

Lessons Learned from National SPS-2 Experiment

- Base Type Effects Resulting Distresses
- Widened Slap Improves Performance (13ft)
- Longitudinal Cracking Influenced by Base Type and thickness
- Thicker Slabs Resulted in More Initial Roughness than Thinner Slabs
- Sections with Drainage Exhibited Less Roughness Development than Sections Without Drainage
- 900 psi Sections Exhibited Map Cracking
- Most Distress Exhibited on Sections with LCB Base

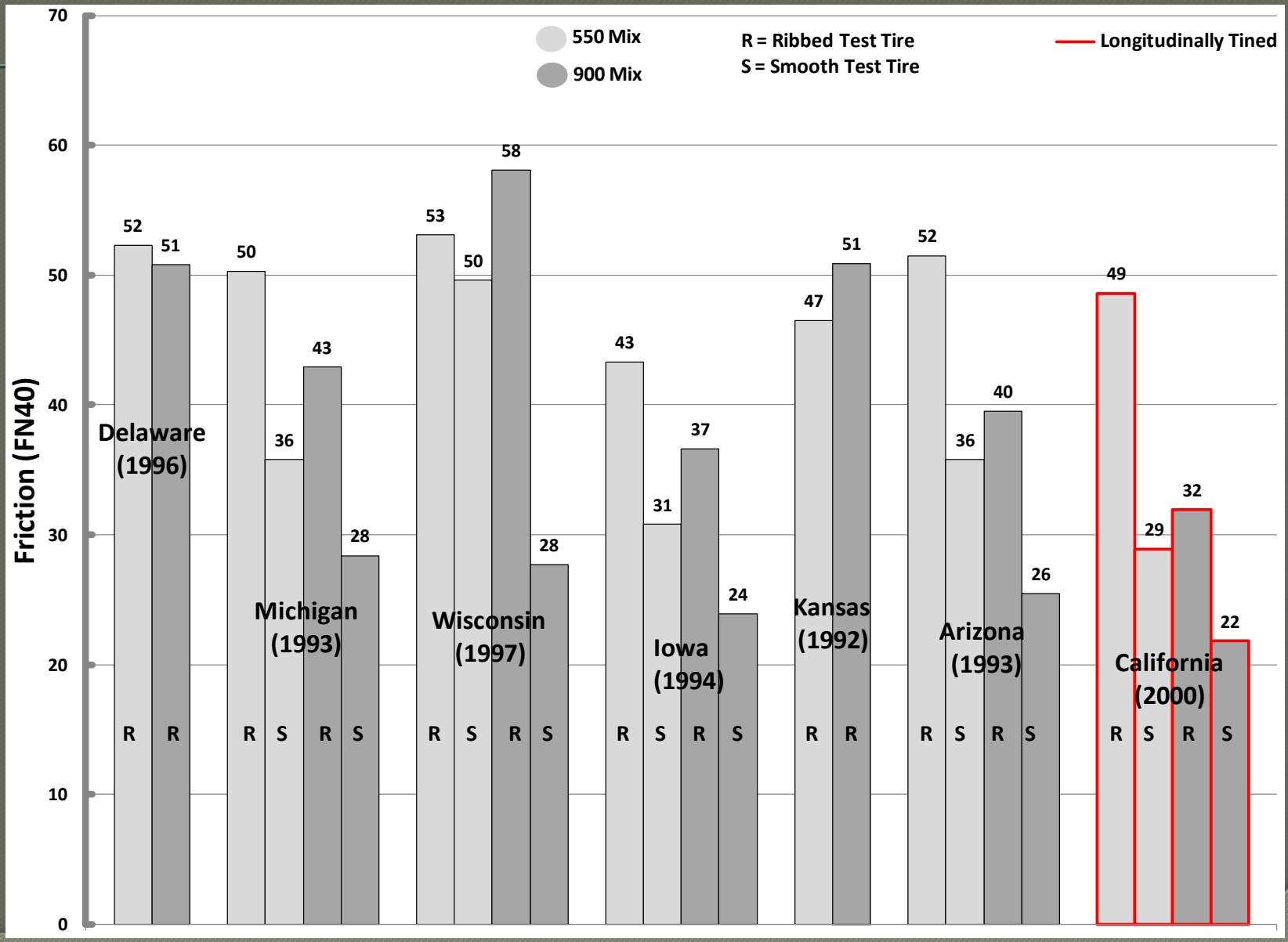
20 Year Old Silicone Sealed Joint

Daily Change in Roughness

Pavement Structure					Climatic Zones, Subgrade								Analysis Zone		
		PCCP			WET				DRY						
Drainage	Base Type	Thickness (inches)	Flexural Strength 14-D (psi)	Lane Width (ft)	FREEZE		NO FREEZE		FREEZE		NO FREEZE		Flexural	Thickness	Base Type
					Fine	Coarse	Fine	Coarse	Fine	Coarse	Fine	Coarse			
					KS ND DE WI		NC	AR	WA CO			CA AZ			
No	DGAB	8	550	12	17.5				8.2		10.6		11.0	15.1	13.3
				14											
			900	12	18.7		15.2		22.0		13.8		17.4		
				14											
		11	550	12	13.5		1.2		10.4		15.9		10.2	11.6	
				14											
			900	12	9.2				18.7		12.0		13.3		
				14											
No	LCB	8	550	12	15.0				10.0		9.8		11.6	12.3	13.0
				14											
			900	12	17.7		6.3		19.3		8.1		12.9		
				14											
		11	550	12	15.4		12.9		4.5		18.6		12.8	13.6	
				14											
			900	12	6.7		22.8		15.3		12.7		14.4		
				14											
Yes	PATB	8	550	12	10.4		8.0		2.1		12.7		8.3	10.9	10.3
				14											
			900	12	7.9		9.2		12.7		24.4		13.5		
				14											
		11	550	12	10.2		5.5		7.2		15.0		9.5	9.8	
				14											
			900	12	1.8		6.6		10.2		22.0		10.1		
				14											

IGGA E-274 Friction Test Device

Overall SPS-2 Results



900 PSI Test Site

550 PSI Test Site Aggregate Armoring Effect

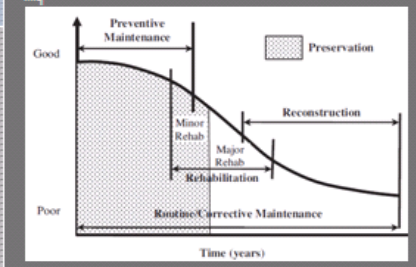
Filling In the Gaps

2011¶

Development·of·an·SPS-2·Pavement·Preservation·Experiment¶

Preliminary·Draft—Not·for·Distribution¶

This·report·provides·a·concept·to·develop·a·pooled·fund·effort·targeted·at·developing·and·implementing·a·pavement·preservation·experiment·for·extending·the·service·life·of·the·LTPP·SPS-2·projects.··The·report·contains·general·information·regarding·the·original·experimental·design·and·presents·potential·pavement·preservation·opportunities.··The·appendix·contains·more·detailed·information·regarding·the·original·experimental·design·and·the·supplemental·sections·constructed·by·the·14·states·that·participated·in·the·SPS-2·Experiment.¶



INTERNATIONAL GROOVING & GRINDING ASSOCIATION

IGGA¶
Larry Scofield¶
12/12/2011¶

The Second
STRATEGIC HIGHWAY RESEARCH PROGRAM

SHRP 2 REPORT S2-R26-RR-2

Guidelines for the Preservation of High-Traffic-Volume Roadways

D. Peshkin, K. L. Smith, A. Wolters, and J. Kristulovich
Applied Pavement Technology, Inc.
Urbana, Illinois

J. Moulthrop and C. Alvarado
Pugro Consultants, Inc.
Austin, Texas

TRANSPORTATION RESEARCH BOARD
WASHINGTON, D.C.
2011
www.TRB.org

Treatment	Expected Performance	
	Treatment Life (yr)	Pavement Life Extension (yr)
Concrete joint resealing	2–8	5–6
Concrete crack sealing	4–7	NA
Diamond grinding	8–15	NA
Diamond grooving	10–15	NA
Partial-depth concrete patching	5–15	NA
Full-depth concrete patching	5–15	NA
Dowel bar retrofitting	10–15	NA
Ultra-thin bonded wearing course	6–10	NA
Thin HMA overlay	6–10	NA

What are Potential Opportunities

- Life Extension of Concrete Pavement Preservation Treatments
- Development of PMS Triggers for Concrete Preservation
- Improved Ride Quality
- PCCP Design Life Verification
- Comparison of Remaining Capacity to Remaining Service Life
- Sealant Research

What are Potential Opportunities

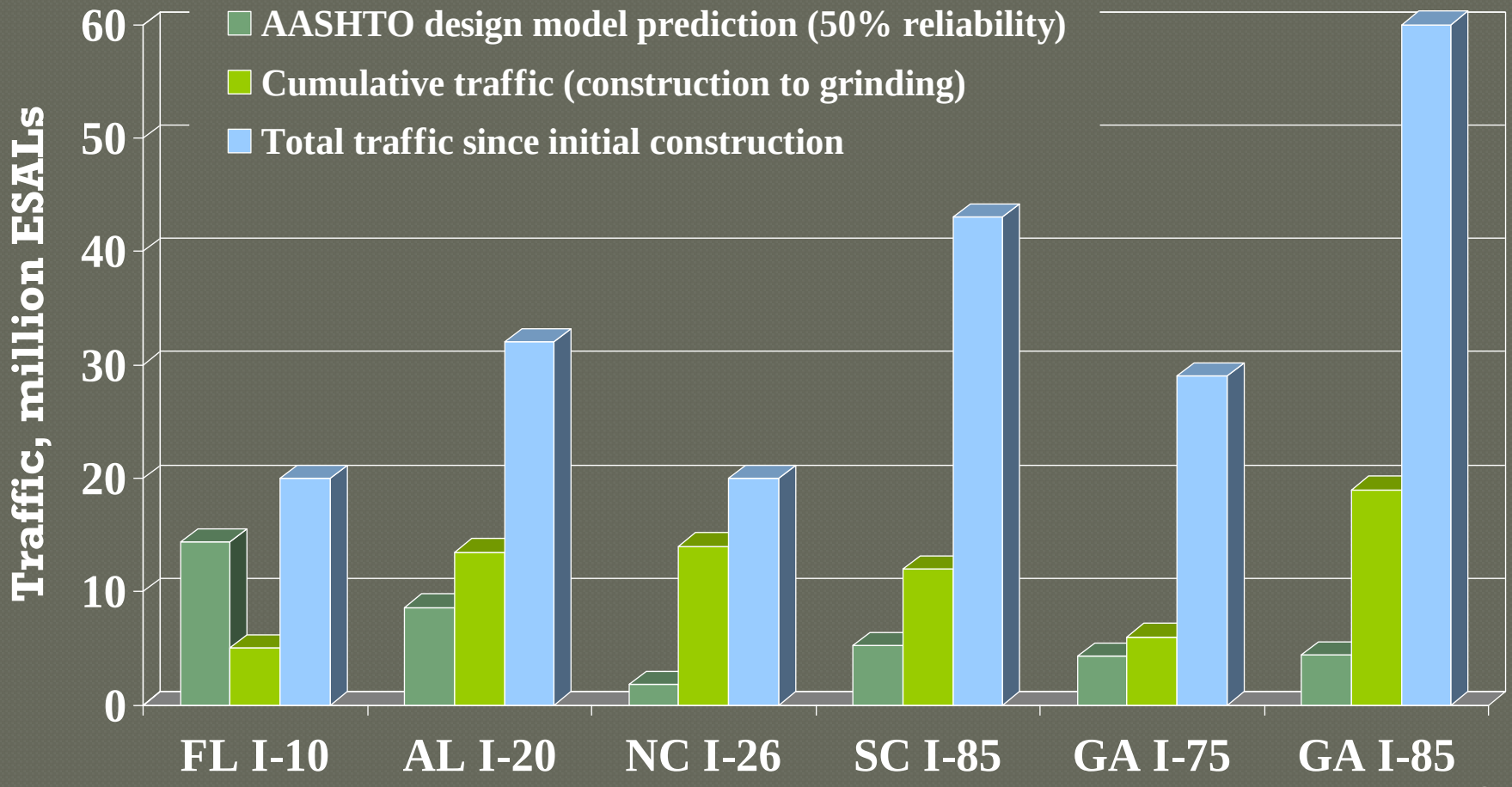
- Texture Durability
- Changes in Material Properties Over Time
- Development of the Best Preservation Techniques and Materials
- US Scanning Tour of the SPS-2 Performance
- Evaluation of Non Destructive Test Devices
- Extending Environmental Monitoring Test Results
- Improving the Current SPS-2 Experiment

The Value of Smooth Pavements

- Passenger Cars: Decrease in IRI of 63 in/mi results in approximately a 2% fuel savings (Chatti and Zaabar 2012)
- Trucks: Decrease in IRI of 63 in/mi results in a 1% fuel savings at highway speeds and 2% at low speeds (35 mph) (Chatti and Zaabar 2012)

More “Show Me Your Data”

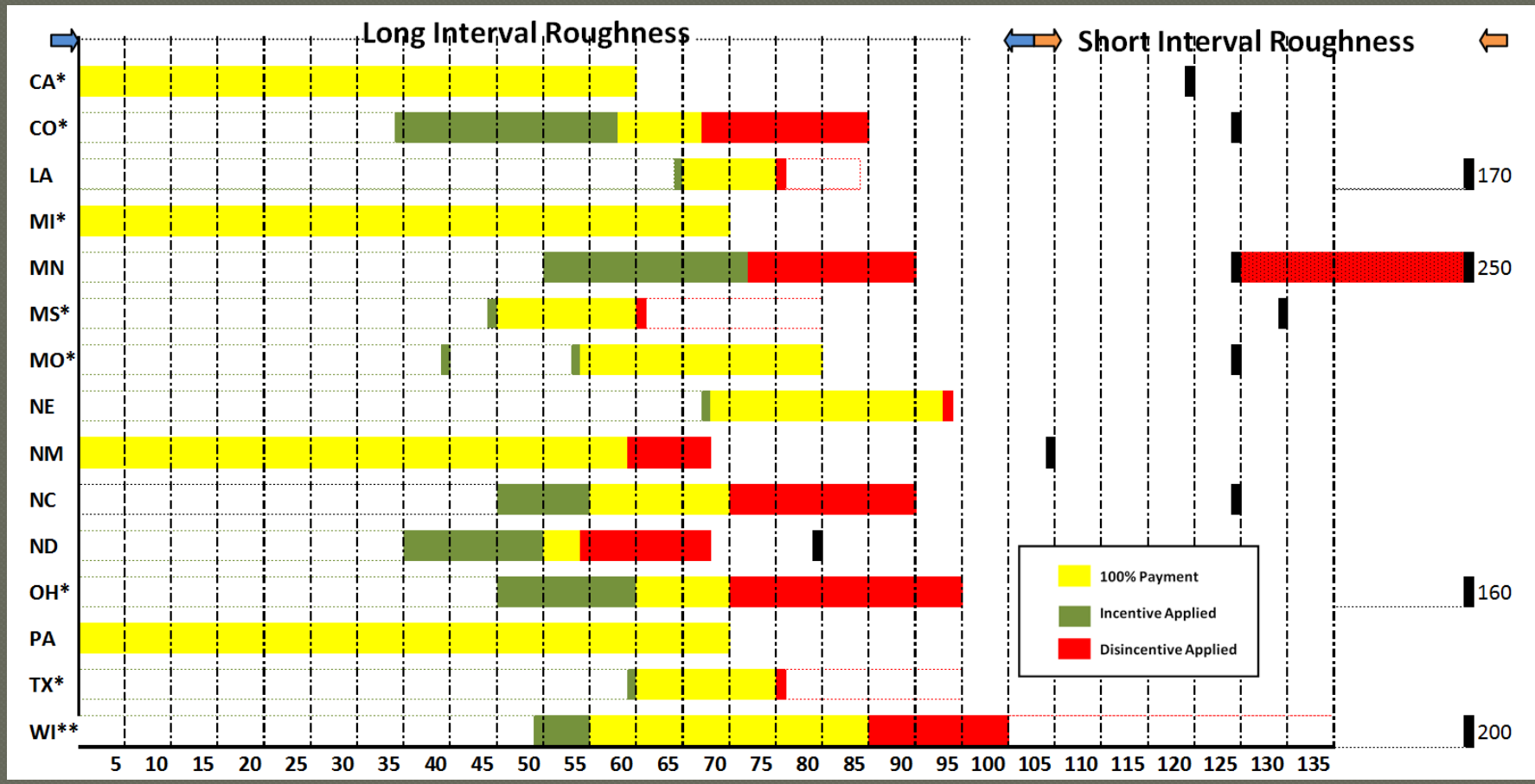
AASHTO Design Model Prediction vs. Actual Traffic



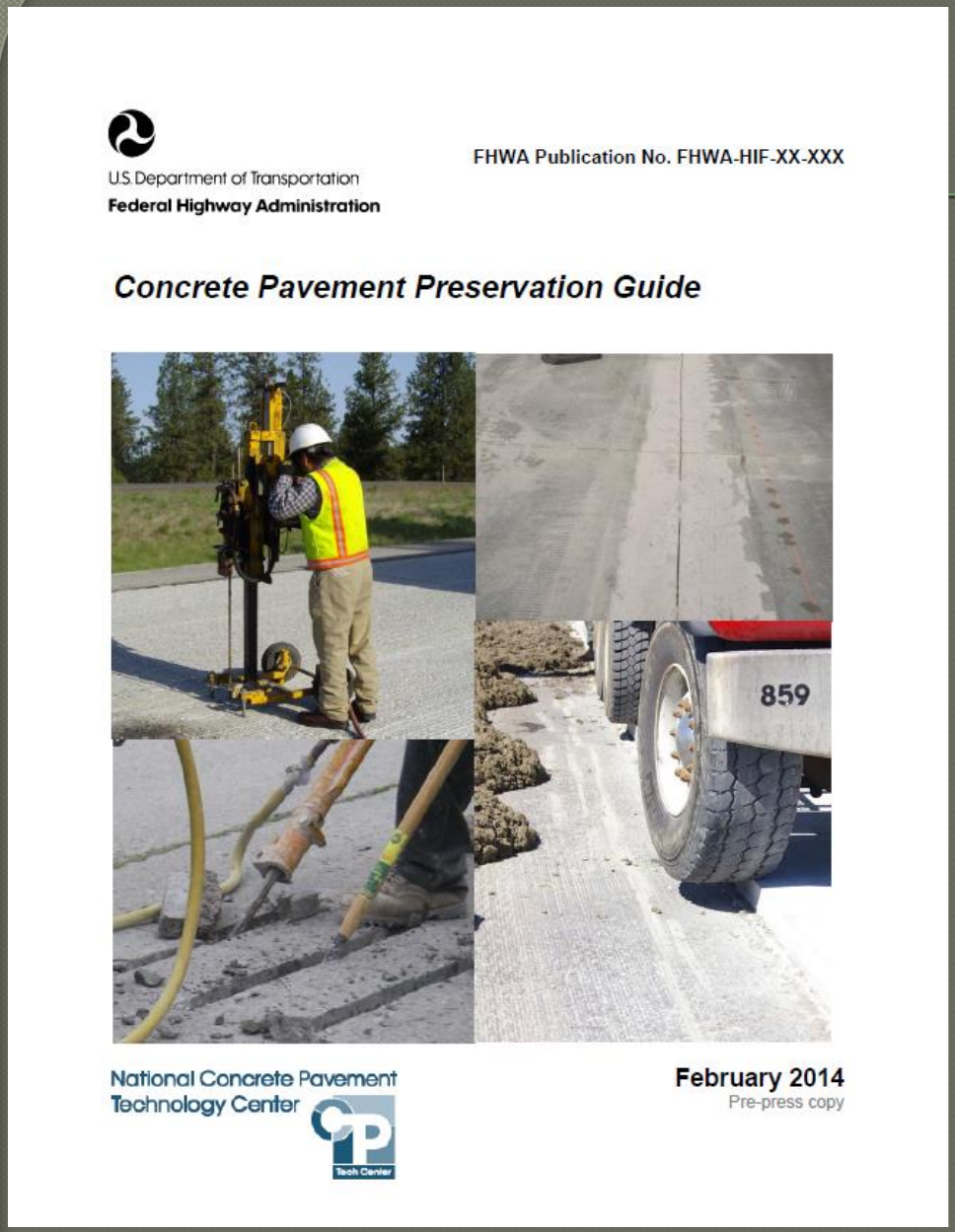
Impact of Initial Pavement Smoothness

- Indiana Smoothness Study by Purdue
  - Analyzed Impact of Initial Smoothness on LCCA
  - Attempted to Define Life Extension due to Smoothness

Results of Enhanced NCC Survey

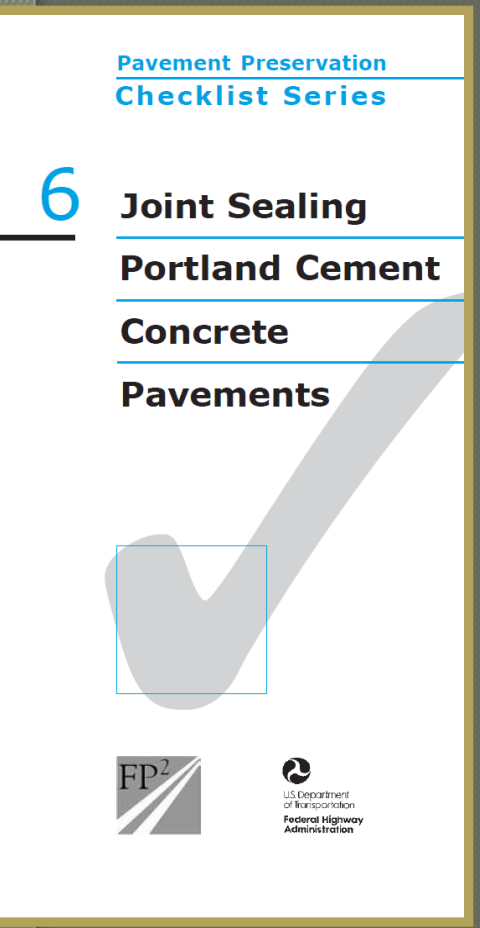


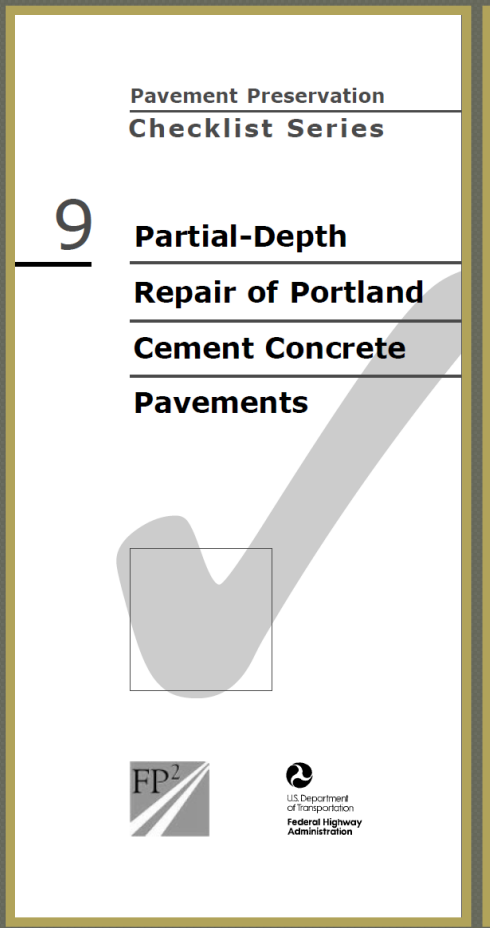
Update Concrete Pavement Preservation Manual-Winter 2014

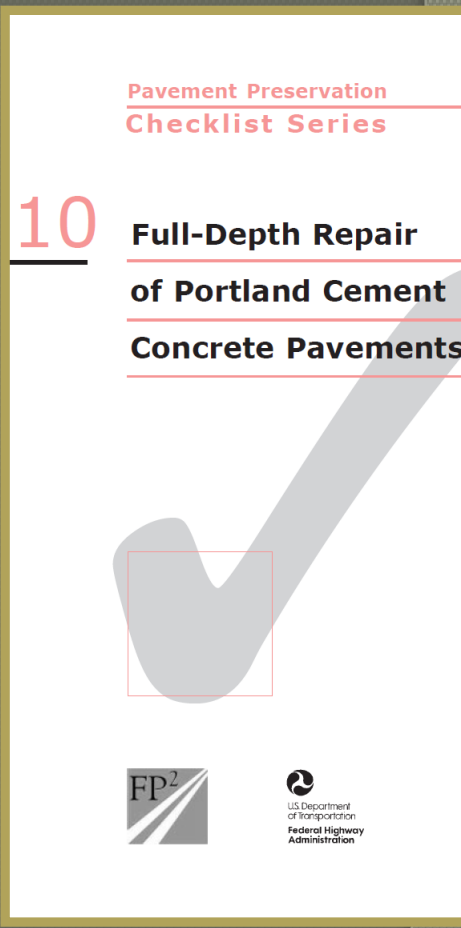


- Contains 12 Chapters on Preservation Techniques
- Added Overlay Chapter
- Working on 11 Training Modules and Instructor Guide
- Plan on 20 future workshops in next two years.
- Technical Assistance to State DOTs

Preservation Checklists







In Summary

- We Need to Create a Data Rich Environment—SHOW ME YOUR DATA
- Life is Simple: Fund it and Build It
- We Need to Focus on Value
- We Need to Focus on Big History Sustainability, Not Short Term

Any Question?

Thank You

and

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www.igga.net

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

ACPA Smoothness Guidelines

ACPA GUIDE SPECIFICATION

TABLE A PRICE ADJUSTMENT SCHEDULE			
Speed Less Than 45 MPH		Speed Equal to or Greater than 45 MPH	
MRI	Adjustment	MRI	Adjustment
<55	+$2.25/sq yd	<40	$2.25/sq yd
55 to 74	(75-MRI)*0.1125	40 to 59	(60-MRI)*0.1125
75 to 90	0	60 to 75	0
91 to 110	(90-MRI)*0.1125	76 to 90	(75-MRI)*0.1125
>110	Corrective Action	>90	Corrective Action

TABLE B SHORT-INTERVAL ROUGHNESS REQUIREMENTS	
Speed Less Than 45 MPH	Speed Equal to or Greater than 45 MPH
IRI $\leq$ 190	IRI $\leq$ 175