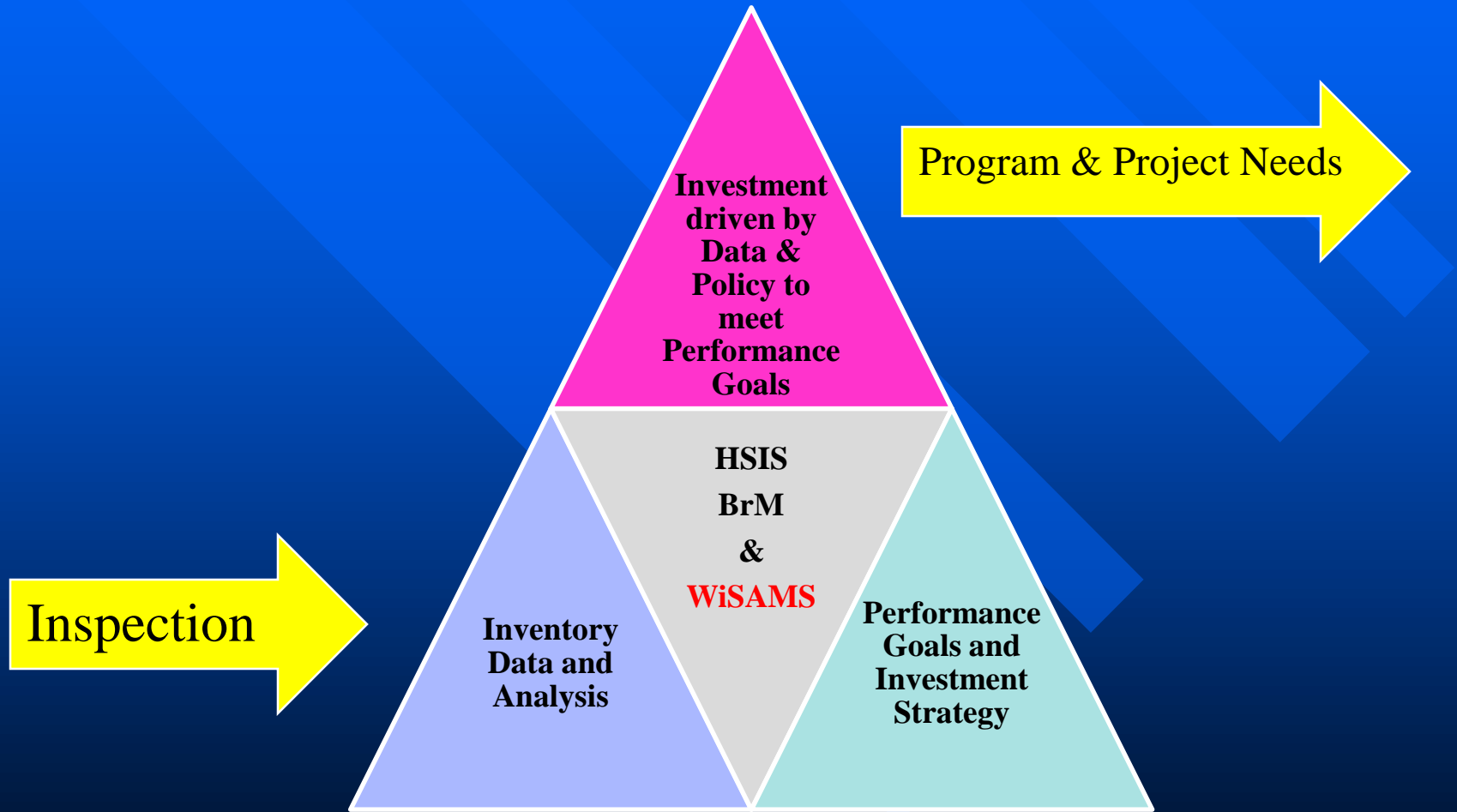


# **Wisconsin DOT Bridge Asset Management**

## **2016 Midwest Bridge Preservation Partnership Annual Meeting**

**Monday October 3<sup>rd</sup>, 2016**

# Bridge Management & Asset Management



# The main goal of a bridge preservation program

- Maximize the useful life of bridges in a cost effective way.
- To meet this goal, many of the strategies are aimed at **applying the appropriate bridge preservation treatments and activities at the proper time** resulting in longer service life at an optimal life cycle cost.



**WISCONSIN DEPARTMENT OF TRANSPORTATION**  
**BUREAU OF STRUCTURES**



**Bridge Preservation Policy Guide**

Version 1.02

**2016**

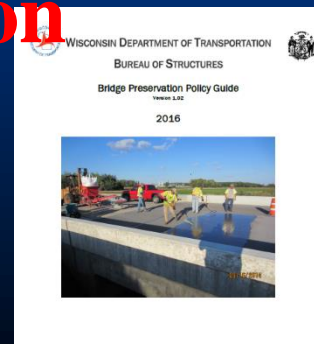


# Regional Bridge Maintenance

- David Bohnsack, P.E.
- John Bolka, P.E.
- Thomas Hardinger, P.E.
- Dan Jashinsky, P.E.

# Bridge Preservation Goals

- Maintain 95% bridges in good or fair condition
- Maintain 95% bridge decks in good or fair condition
- Maintain 90 – 95% steel surfaces, expansion joints, bearings in **condition state 2 or better**



# Bridge Elements Eligibility Matrix

Table 4 - Other Bridge Elements Eligibility Matrix

NBI Item	Element	NBI Criteria	Defect	Element Defect Condition State Criteria	Repair Action	Potential Benefits to NBI or CS	Anticipated Service Life Years
Super	Steel Elements	Item 59 $\geq$ 5		N/A	Superstructure Washing/Cleaning	NA	1 to 2
			3440	CS2 + CS3 Area $>$ 5% ⑥	Painting - Spot	CS1	1 to 5
				CS3 Area $\leq$ 25% ⑥	Painting - Zone	CS1 ①	5 to 7
				CS3 Area $\geq$ 25% ⑥	Painting - Complete	CS1 ②	15 to 20
		Item 59 $\geq$ 4		CS2, CS3, or CS4	Superstructure Restoration ③	NBI $\geq$ 7	5 to 20
	Bearings	Item 59 $\geq$ 5		CS3 or CS4	Bearing Reset/Repair	CS1 or CS2	1 to 5
				CS2 or CS3	Bearing Cleaning/Painting	CS1 or CS2	5 to 7
				CS3 or CS4	Bearing Replacement	CS1 or CS2	10 to 15
	Sub	Item 60 $\geq$ 5		N/A	Substructure Washing/Cleaning	NA	1 to 2
			3440	CS2+CS3+CS4 Area $>$ 5% ⑥	Painting - Spot	CS1	1 to 5
			3440	CS3 Area $>$ 25% ⑥	Painting - Complete	CS1 ②	10 to 20
				CS2 or CS3 or CS4	Substructure Restoration ⑤	NBI $\geq$ 7	5 to 20
			9290	CS1 or CS2	Pier Protection ⑨	NBI $\geq$ 7	5 to 20
				CS3 or CS4	Scour Counter Measure ⑩	NBI $\geq$ 7	5 to 20

# WisDOT / FHWA

## Agreement for the use of Federal Funds for Preventative Maintenance of Structures

### AGREEMENT FOR THE USE OF FEDERAL FUNDS FOR PREVENTIVE MAINTENANCE OF STRUCTURES

This agreement between the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Division of the Federal Highway Administration (FHWA), is intended to further implement the use of Federal-aid Highway Funding for Preventive Maintenance (PM) and Preservation activities as authorized in 23 USC 116 (e), and the FHWA Memorandum dated February 25<sup>th</sup>, 2016 titled "Guidance on Highway Preservation and Maintenance" on all eligible Federal Aid Highways in the State of Wisconsin.

The criteria used to develop this Agreement is based on the FHWA Bridge Preservation Guide (FHWA-HIF-11042) published in August 2011, which is the basis for the Wisconsin Bridge Preservation Policy Guide. The Wisconsin Bridge Preservation Policy Guide documents consistent and systematic criteria to identify Structure PM and Preservation activities that are eligible for the use of Federal-aid Highway Funded Projects.

This agreement is limited to PM and Preservation activities on Structures. This agreement includes inspection and training activities to support data driven application of Preventative Maintenance (PM) and Preservation. It does not cover PM activities on Roadways. A separate agreement has been developed for PM activities on Roadways.

By signing this agreement, WisDOT and the FHWA incorporate by reference the laws, regulations, policies, standards, and procedures which govern or are applicable to Federal-aid projects. WisDOT certifies that it will comply with all provisions of 23 USC 133(b), "Surface Transportation Block Grant Program" and 23 USC 119(d) "National Highway Performance Program".

Nothing in this agreement shall be construed to relieve WisDOT from ultimate accountability for compliance with Federal Laws and regulations with respect to the expenditure of Federal-aid highway funds for PM activities in the State of Wisconsin, including those funds used for local government projects.

This agreement shall become effective May 1<sup>st</sup>, 2016. It may be canceled or modified at any time by mutual agreement of WisDOT and the FHWA.

#### Wisconsin Department of Transportation

  
Joseph S. Olson, P.E., Administrator  
Division of Transportation System Development

05/13/16  
Date

#### Federal Highway Administration

  
Michael Davies, P.E., Division Administrator  
Wisconsin Division

4/25/16  
Date



# Changes to PM Agreement

- **Operational Structure Asset Management System to identify and prioritize structure work activities (HSIS & WISAMS).**
- **More work types that support Preventative Maintenance and Preservation**
- **Systematic criteria, tools, and process for implementation of PM work**

- Power washing decks or bridges
- Sealing cracks or joints
- Sealing decks
- Concrete deck patching
- Thin Polymer Overlay
- Asphalt deck overlay with membrane
- Asphalt deck overlays without membrane
- Polymer asphalt deck overlay
- Concrete deck overlay
- Installation of a Cathodic Protection System
- Chloride Extraction

- Repair Box Culvert (aprons, barrels, slope protection)
- Riprap placement
- Channel Restoration
- Channel debris removal
- Flood damage repair
- Channel scour mitigation & repair
- Slope protection repair
- Fill Erosion

## More Work Types Eligible for Federal Funding

- Clean Expansion Joints
- Open expansion joint replacement with a waterproof joint
- Joint gland repair and replacement
- Expansion joint repair or joint replacement
- Expansion joint elimination

- Bridge Rail Restoration/Retrofit to New Standards
- Installing vehicle warning systems
- Bridge sign placement and repair

- Spot painting
- Zone repainting
- Complete repainting
- Spot repainting with complete overcoat
- Bearing repairs, painting, or replacements
- Railing spot & zone painting
- Railing retro-fit and replacement

- Repair Anchor Rod
- Repair Galvanizing
- Tighten loose nuts /replace bolts

# Existing Program Work Types

Existing Structure Work Types
Bridge Replacement
Bridge Elimination
New Bridge
Rehab Deck Overlay
Rehab Deck Replacement
Other

Status	Structure Work Type Codes	Structure Work Type Descriptions	Estimated Service Life Extension
Proposed	01	NEW STRUCTURE - BRIDGE OR BOX CULVERT	75
Proposed	03	OVERLAY DECK - CONCRETE	20
Proposed	06	REPLACE DECK	40
Proposed	07	PAINT (COMPLETE)	27
Proposed	08	REPLACE SUPERSTRUCTURE	50
Proposed	20	OVERLAY DECK - CONCRETE / NEW RAIL AND JOINTS	20
Proposed	21	OVERLAY DECK - BIT. HOT MIX ASPHALT (HMA)	20
Proposed	58	OVERLAY DECK - CONCRETE / NEW JOINTS	20
Proposed	65	OVERLAY DECK - BIT. POLYMER MODIFIED ASPHALT (PMA)	20
Proposed	68	REPLACE DECK / WIDENING	40
Proposed	77	OVERLAY DECK - THIN POLYMER	10
Proposed	80	REPLACE DECK / PAINT (COMPLETE)	50
Proposed	91	REPLACE STRUCTURE	75
Proposed	92	OVERLAY DECK - POLYESTER POLYMER	20
Proposed	95	REPLACE DECK / THIN POLY OVLY / PAINT (COMPLETE)	50
Proposed	96	OVERLAY DECK - THIN POLYMER / REPAIR JOINTS	12
Proposed	97	REPLACE DECK / THIN POLYMER OVERLAY	50
Proposed	98	OVERLAY DECK - CONCRETE / PAINT	20
Proposed	99	OVERLAY DECK - THIN POLYMER / NEW JOINTS	15
Proposed	02	WIDEN BRIDGE	50
Proposed	04	REPAIR JOINTS	8
Proposed	09	WIDEN - BOX CULVERT EXTENSION	50
Proposed	10	REPAIR SUPERSTRUCTURE - RESTORE CONDITION AND CAPACITY	25
Proposed	11	REPLACE RAILING OR PARAPET	25
Proposed	12	REPAIR RAILING OR PARAPET	15
Proposed	14	REPAIR SUBSTRUCTURE - RESTORE CONDITION AND CAPACITY	25
Proposed	28	REPAIR DECK - FULL DEPTH	8
Proposed	29	REPAIR OR RESET BEARINGS	40
Proposed	35	SEAL DECK- CONCRETE	4
Proposed	40	RAISE STRUCTURE	5
Proposed	42	REPLACE BEARINGS	50
Proposed	43	OTHER (UNSPECIFIED "LET" WORK TYPES)	
Proposed	49	REPLACE JOINTS	12
Proposed	66	REPAIR SCOUR COUNTERMEASURES (RIPRAP OR OTHER)	10
Proposed	72	REPLACE OR REPAIR WINGWALLS	50
Proposed	75	PAINT (ZONE OR SPOT)	12
Proposed	79	REPAIR BOX CULVERT	40
Proposed	90	ELIMINATION - BRIDGE OR BOX CULVERT	
Proposed	93	RAISE STRUCTURE / REPLACE DECK	50
Proposed	94	REPLACE OR REPAIR APPROACH SLABS	15
Current	BR	BRIDGE REPLACEMENT	
Current	EL	BRIDGE ELIMINATION	
Current	NB	NEW BRIDGE	
Current	OL	REHAB DECK OVERLAY	
Current	OT	OTHER	
Current	RE	REHAB DECK REPLACEMENT	

# New Program Work Types

# New FIIPS Work Types

Status	Structure Work Type Codes	Structure Work Type Descriptions	Estimated Service Life
Proposed	01	NEW STRUCTURE - BRIDGE OR BOX CULVERT	75
Proposed	03	OVERLAY DECK - CONCRETE	20
Proposed	06	REPLACE DECK	40
Proposed	07	PAINT (COMPLETE)	27
Proposed	08	REPLACE SUPERSTRUCTURE	50
Proposed	20	OVERLAY DECK - CONCRETE / NEW RAIL AND JOINTS	20
Proposed	21	OVERLAY DECK - BIT. HOT MIX ASPHALT (HMA)	20
Proposed	58	OVERLAY DECK - CONCRETE / NEW JOINTS	20
Proposed	65	OVERLAY DECK - BIT. POLYMER MODIFIED ASPHALT (PMA)	20
Proposed	68	REPLACE DECK / WIDENING	40
Proposed	77	OVERLAY DECK - THIN POLYMER	10
Proposed	80	REPLACE DECK / PAINT (COMPLETE)	50
Proposed	91	REPLACE STRUCTURE	75
Proposed	92	OVERLAY DECK - POLYESTER POLYMER	20
Proposed	95	REPLACE DECK / THIN POLY OVLY / PAINT (COMPLETE)	50
Proposed	96	OVERLAY DECK - THIN POLYMER / REPAIR JOINTS	12
Proposed	97	REPLACE DECK / THIN POLYMER OVERLAY	50
Proposed	98	OVERLAY DECK - CONCRETE / PAINT	20
Proposed	99	OVERLAY DECK - THIN POLYMER / NEW JOINTS	15
Proposed	02	WIDEN BRIDGE	50
Proposed	04	REPAIR JOINTS	8
Proposed	09	WIDEN - BOX CULVERT EXTENSION	50
Proposed	10	REPAIR SUPERSTRUCTURE - RESTORE CONDITION AND CAPACITY	25
Proposed	11	REPLACE RAILING OR PARAPET	25
Proposed	12	REPAIR RAILING OR PARAPET	15
Proposed	14	REPAIR SUBSTRUCTURE - RESTORE CONDITION AND CAPACITY	25
Proposed	28	REPAIR DECK - FULL DEPTH	8
Proposed	29	REPAIR OR RESET BEARINGS	40
Proposed	35	SEAL DECK- CONCRETE	4
Proposed	40	RAISE STRUCTURE	5
Proposed	42	REPLACE BEARINGS	50
Proposed	43	OTHER (UNSPECIFIED "LET" WORK TYPES)	
Proposed	49	REPLACE JOINTS	12
Proposed	66	REPAIR SCOUR COUNTERMEASURES (RIPRAP OR OTHER)	10
Proposed	72	REPLACE OR REPAIR WINGWALLS	50
Proposed	75	PAINT (ZONE OR SPOT)	12
Proposed	79	REPAIR BOX CULVERT	40
Proposed	90	ELIMINATION - BRIDGE OR BOX CULVERT	
Proposed	93	RAISE STRUCTURE / REPLACE DECK	50
Proposed	94	REPLACE OR REPAIR APPROACH SLABS	15
Current	BR	BRIDGE REPLACEMENT	
Current	EL	BRIDGE ELIMINATION	
Current	NB	NEW BRIDGE	
Current	OL	REHAB DECK OVERLAY	
Current	OT	OTHER	
Current	RE	REHAB DECK REPLACEMENT	

20 Primary

21 Incidental

6 Existing

# Wisconsin Structure Asset Management System (WiSAMS )

- A new simple, practical method to determine optimal work candidates for improving the condition of structures **AND MORE.....**
- These work candidates include rehabilitating or replacing structure elements as well as **replacing structures entirely.**
- The new method **relies on historical bridge inspection data.** It also relies on deterioration curves and user-refined eligibility criteria applied to work candidates.

# WiSAMS

- Data import from HSI, FIIPS, and other storage locations (costs, deterioration data, etc.)
- Identification of **Primary** and **Incidental** work candidates based on existing bridge age and condition
- Calculation of the cost of selected work items
- Calculation of the Condition Assessment Index (CAI) of the bridge prior to and after work candidate.

# Rules and Optimal Work Candidates

RULE ID	DATA FIELD(S)	CONSTRAINT(S)	WORK ACTION	ADD THESE MISCELLANEOUS ACTIONS, IF ELIGIBLE	REPORT FOR STATE OPTIMAL WORK CANDIDATES?
OVERLAY REVIEW					
15	DECK_NBI	$\geq 7$	Thin Polymer Overlay	20, 21, 22, 23, 24, 26, 27, 28, 29, 30	
	# OF OVERLAYS	0			
	DEFECT 1080	$CS2+CS3+CS4 < 5\%$			
16	DECK NBI	6	PMA or Concrete Overlay	20, 21, 22, 23, 24, 26, 27, 28, 29, 30	
	# OF OVERLAYS	0			
	DEFECT 1080	$CS2+CS3+CS4 < 20\%$			
17	DECK NBI	5	Concrete Overlay	20, 21, 22, 23, 24, 26, 27, 28, 29, 30	Yes
	# OF OVERLAYS	0			
	DEFECT 1080	$CS2+CS3+CS4 < 20\%$			
18	DECK NBI	6, 7, 8	Replace PMA or Concrete Overlay	20, 21, 22, 23, 24, 26, 27, 28, 29, 30	
	# OF OVERLAYS	$< 2$			
	DEFECT 3210 OR 8911 OR 3220	$CS2+CS3+CS4 < 20\%$			
	DEFECT 1080	$CS2+CS3+CS4 < 20\%$			
19	DECK NBI	6, 7, 8	Replace Concrete Overlay	20, 21, 22, 23, 24, 26, 27, 28, 29, 30	Yes

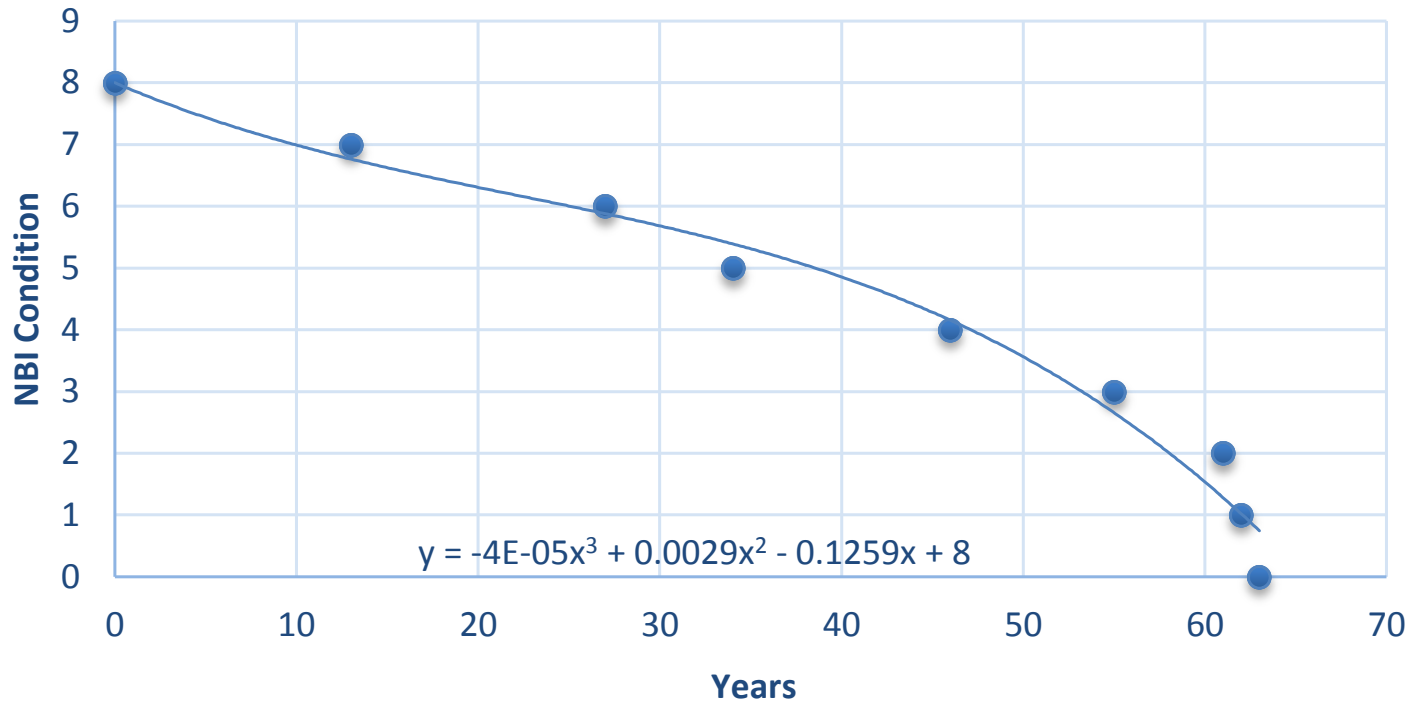
# WiSAMS

- Deterioration of **NBI** values and **Elements** for a given window of time.
- Analysis of programmed work items (FIIPS), showing benefit of work to CAI
- Calculation of a priority index (Criticality) for doing work on a particular structure



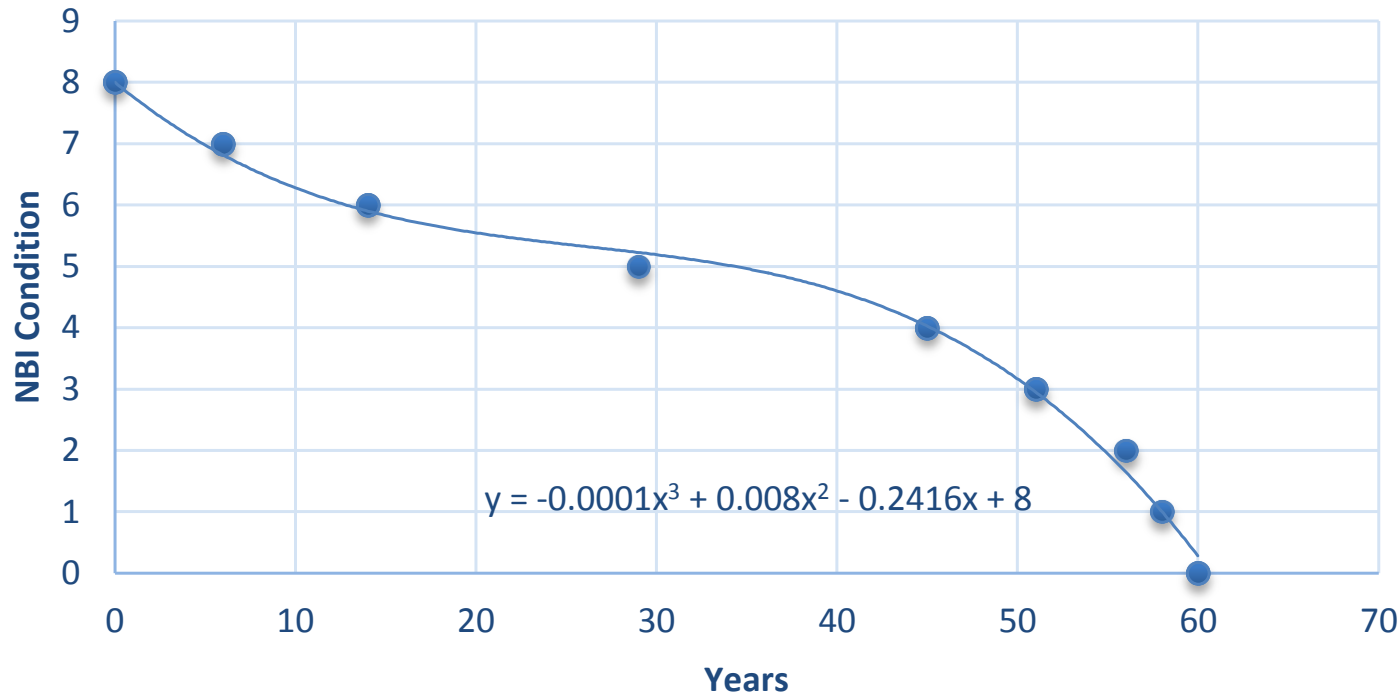
# Deterioration of Bridge

## Superstructure Deterioration



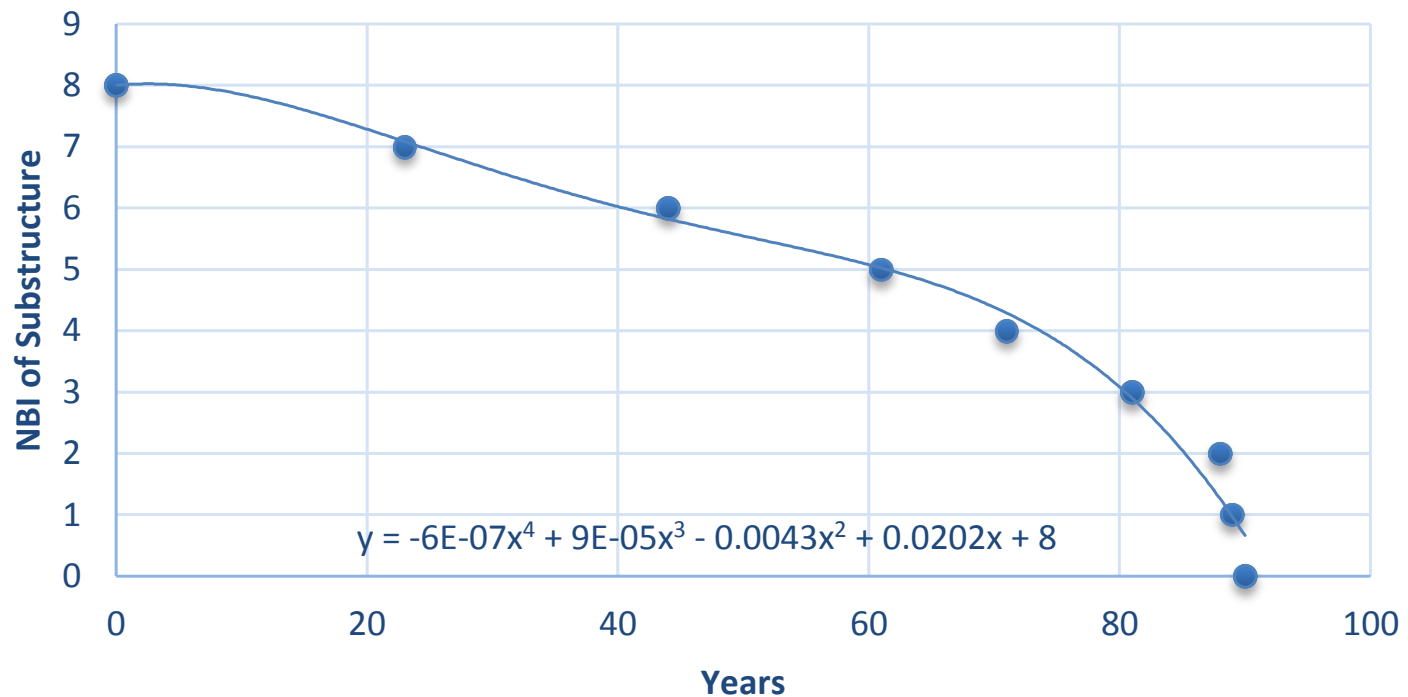
# Deterioration of Bridge Elements and NBI

Deck Deterioration - NBI



# Deterioration of Bridge Elements and NBI

## Substructure Deterioration



# Condition Assessment Index (CAI)

- This measure incorporates:
  - Deck
  - Super Structure
  - Sub-Structure
  - Culvert
  - Paint System
  - Overlay, Joints, & Bearing

# **Additional Tables for Region**

- **Optimal Work**
- **Optimal Year**
- **Benefit of Work to the CAI**
- **Cost of Work**
- **Incidental Work Items**

# New Regional Needs Tables to Supplement Meta-Manager


Structure	Year	Age	Do-Nothing Scenario	Optimal Scenario						FIIPS Program	
			CAI	Primary WA	Primary WA Last Year	CAI	Cost - Primary WA	Est. Life Extension	Incidentals	Work Action (WA)	CAI
B020414	2017	91	70.7	OVERLAY CONCRETE, NEW JOINTS	2017	83.0	\$80,225	20	REPLACE - BEARINGS		70.7
B020414	2018	92	69.9			81.7	\$0				69.9
B020414	2019	93	69.0			80.4	\$0				69.0
B020414	2020	94	68.2			79.2	\$0				68.2
B020414	2021	95	67.4			78.1	\$0			OVERLAY THIN POLYMER, NEW JOINTS	83.0
B020414	2022	96	66.6			73.1	\$0				81.7
B020414	2023	97	65.7			72.1	\$0				80.5
B020414	2024	98	57.9			71.2	\$0				79.5
B020414	2025	99	57.1			70.3	\$0				78.7
B020414	2026	100	51.6			65.0	\$0				68.9
B020414	2027	101	51.2			64.7	\$0				68.3
B020414	2028	102	51.0			64.3	\$0				67.7
B020414	2029	103	51.0			63.9	\$0				67.0
B020414	2030	104	51.0			63.5	\$0				66.4
B020414	2031	105	46.0			63.0	\$0				65.7
B020414	2032	106	36.0			52.6	\$0				54.9
B020414	2033	107	36.0			52.2	\$0				54.1
B020414	2034	108	36.0			51.8	\$0				53.5
B020414	2035	109	36.0			48.3	\$0				53.0
B020414	2036	110	26.0			48.0	\$0				52.6

Structure	Year	Age	Do-Nothing Scenario	Optimal Scenario						FIIPS Program	
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**Optimal  
Work Type**

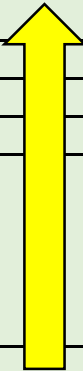
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B020414	2036	110	26.0			48.0	\$0				52.6

**Benefit of Action**

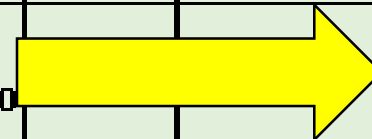
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B020414	2032	106	36.0			52.6	\$0				54.9
B020414	2033	107	36.0			52.2	\$0				54.1
B020414	2034	108	36.0			51.8	\$0				53.5
B020414	2035	109	36.0			48.3	\$0				53.0
B020414	2036	110	26.0			48.0	\$0				52.6



**Incidental  
Work  
Actions**

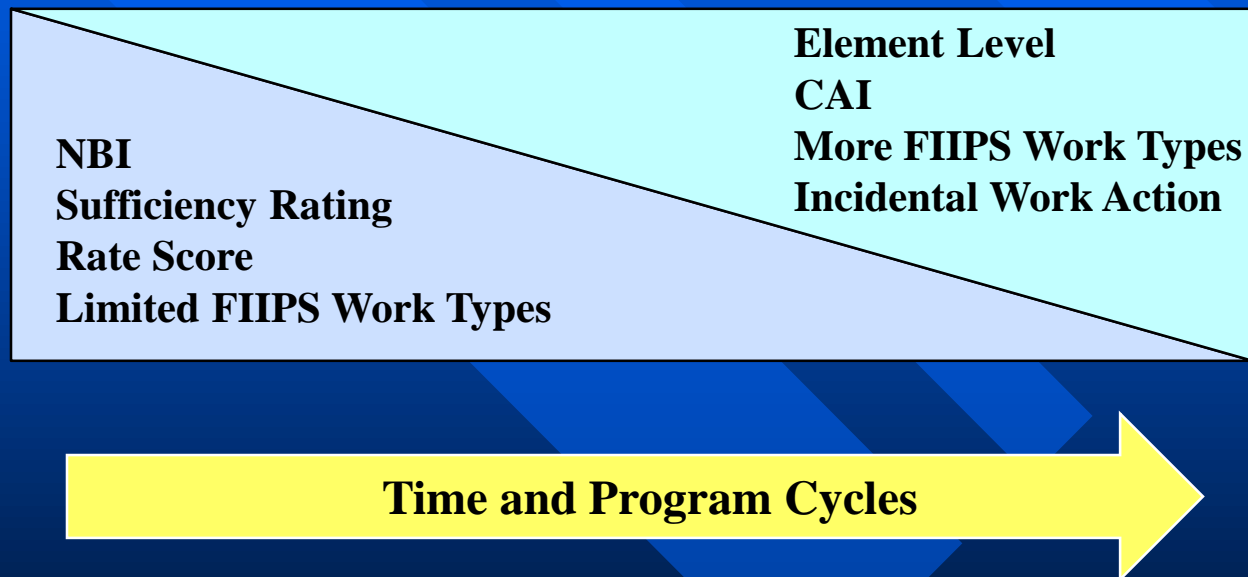
Structure	Year	Age	Do-Nothing Scenario	Optimal Scenario						FIIPS Program	
			CAI	Primary WA	Primary WA Last Year	CAI	Cost - Primary WA	Est. Life Extension	Incidentals	Work Action (WA)	CAI
B020414	2017	91	70.7	OVERLAY - CONCRETE, NEW JOINTS	2017	83.0	\$80,225	20	REPLACE - BEARINGS		70.7
B020414	2018	92	69.9			81.7	\$0				69.9
B020414	2019	93	69.0				\$0				69.0
B020414	2020	94	68.2				\$0				68.2
B020414	2021	95	67.4				\$0			OVERLAY - THIN POLYMER, NEW JOINTS	83.0
B020414	2022	96	66.6			81.7	\$0				81.7
B020414	2023	97	65.7			72.1	\$0				80.5
B020414	2024	98	57.9			71.2	\$0				79.5
B020414	2025	99	57.1			70.3	\$0				78.7
B020414	2026	100	51.6			65.0	\$0				68.9
B020414	2027	101	51.2			64.7	\$0				68.3
B020414	2028	102	51.0			64.3	\$0				67.7
B020414	2029	103	51.0			63.9	\$0				67.0
B020414	2030	104	51.0			63.5	\$0				66.4
B020414	2031	105	46.0			63.0	\$0				65.7
B020414	2032	106	36.0			52.6	\$0				54.9
B020414	2033	107	36.0			52.2	\$0				54.1
B020414	2034	108	36.0			51.8	\$0				53.5
B020414	2035	109	36.0			48.3	\$0				53.0
B020414	2036	110	26.0			48.0	\$0				52.6

**Existing  
FIIPS  
Program**

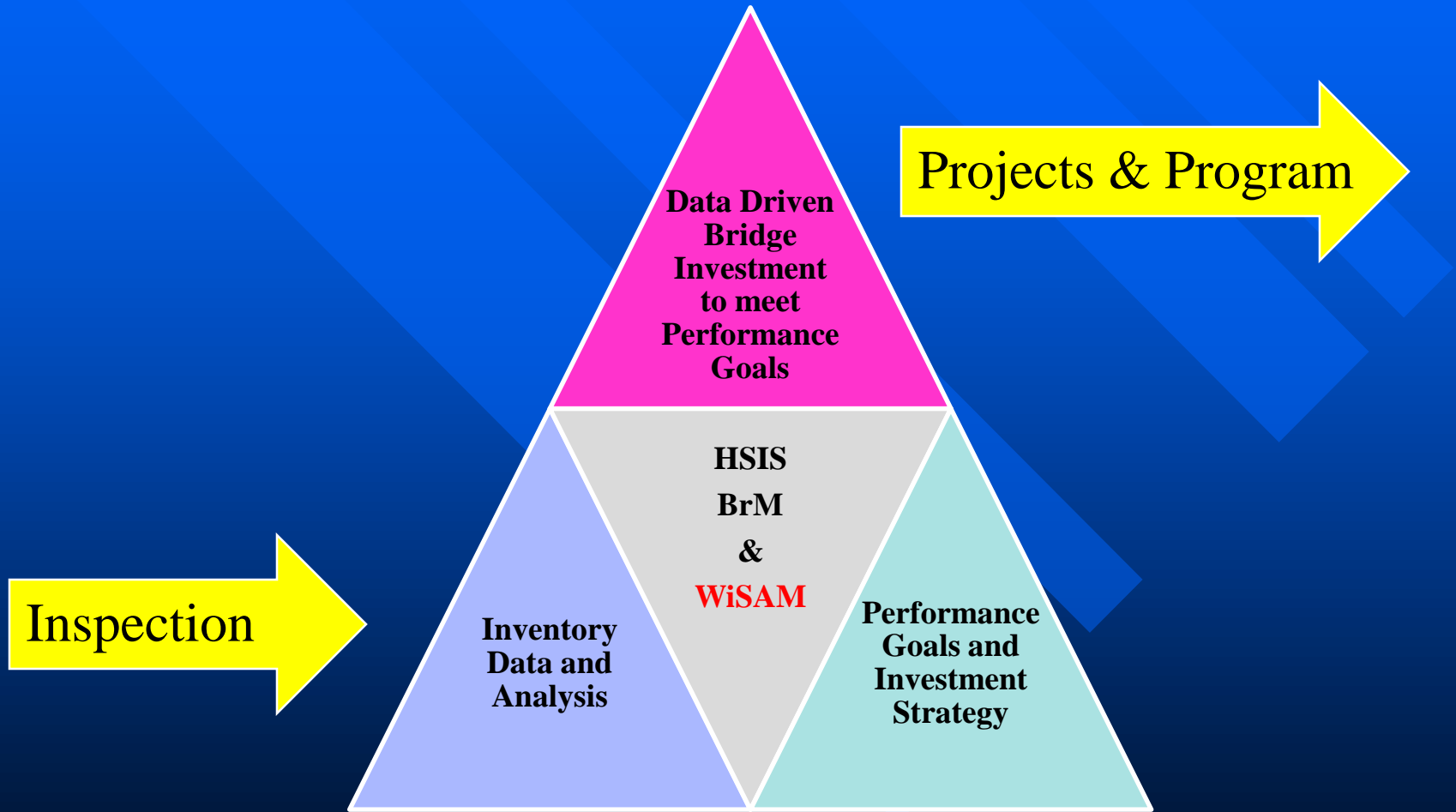


# Moving Forward

- The Transition should be smooth



# Bridge Management & Asset Management



# **Please feel free to talk with our Asset Management Engineers**

- **Philip Meinel –Asset Management Engineer**
- **Ryan Bowers –Asset Management Engineer**
- **Josh Dietsche – Supervisor, Bridge Management unit**

# Question?



**BUREAU OF**  
**STRUCTURES**