WisDOT Asset Management

Theme X' Investment Strategy Overview

(Performance-Based Practical Design)

For

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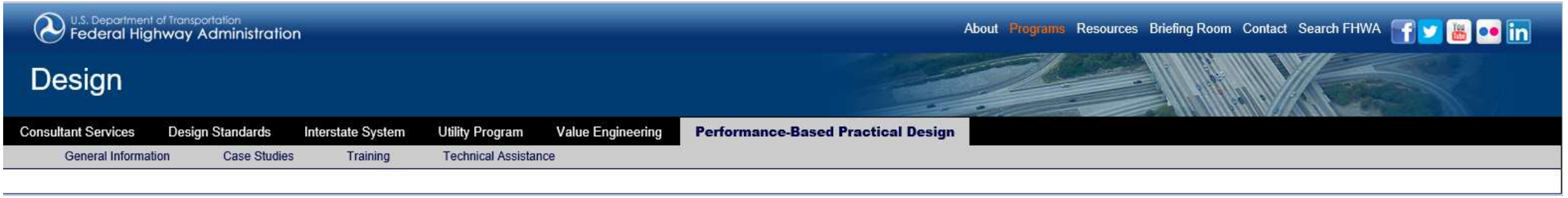
MAP-21

Theme X' Investment Strategy Meets These Objectives



Performance-Based Practical Design Issue

Theme X' is a Performance-Based Practical Design Approach

State Departments of Transportation (DOT) are increasingly challenged with addressing their system performance, mobility, and safety needs in the current era of financial limitations.

Summary

The Federal Highway Administration (FHWA) conducted an in-depth review of the Practical Design concept, including interviewing a number of States about their practices.

Though the name, definition, and approach of Practical Design vary from State to State, most States with a Practical Design program emphasize a renewed focus on scoping projects to stay within the core purpose and need. By exercising a greater level of discipline, agencies may eliminate nonessential project design elements resulting in lower cost and improved value. This approach enables States to deliver a greater number of projects than otherwise possible under their previous project development approaches. By implementing Practical Design, States realized cost savings by utilizing flexibility that exists in current design guidance and regulations.

A concern is that agencies may overemphasize short-term cost savings without a clear understanding of how such decisions could impact other objectives (such as safety and operational performance, context sensitivity, life-cycle costs, long-range corridor goals, livability, and sustainability).

To address this concern, agencies can make more informed decisions by evolving towards a Performance-Based Practical Design (PBPD) approach grounded in a performance management framework. PBPD can be articulated as modifying a traditional design approach to a "design up" approach where transportation decision makers exercise engineering judgment to build up the improvements from existing conditions to meet both project and system objectives. PBPD uses appropriate performance-analysis tools, considers both short and long term project and system goals while addressing project purpose and need.

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A Practical Design Approach to System Preservation

- Data-Driven Decisions
  - Preserve assets and minimize lifecycle cost
  - Operate in a financially sustainable manner
  - Provide a framework to improve performance on a long-term basis

- System Preservation Focus
  - A practical design approach to maintain service
    - Strategies that provide the best system-wide service at the lowest cost

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A Practical Design Approach to System Preservation

(continued)

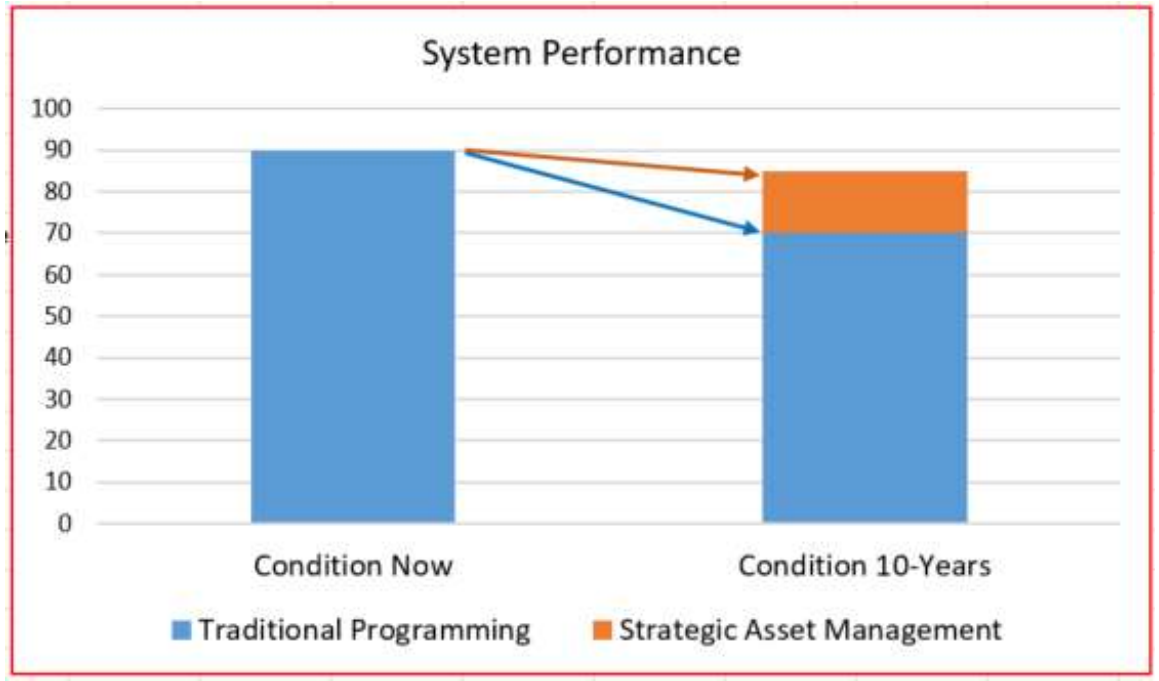
- Data-Driven Decisions
- System Preservation Focus

- Replace-In-Kind
  - Practical design approach to reconstruction
    - Can current and future needs be met by reconstructing within existing footprint?
    - Safety is primary driver for expanding footprint
    - Lower R.O.W and environmental study costs means more $ for pavement and bridge improvements

Transportation Challenge…

A Solution Alternative…

Asset Management!



Investment Theme Research & Development Guides Asset Management Methodology

The Latest Testing Reveals…

…How We Deal With The Following Issues Will Have A Large Impact On Future System Conditions:

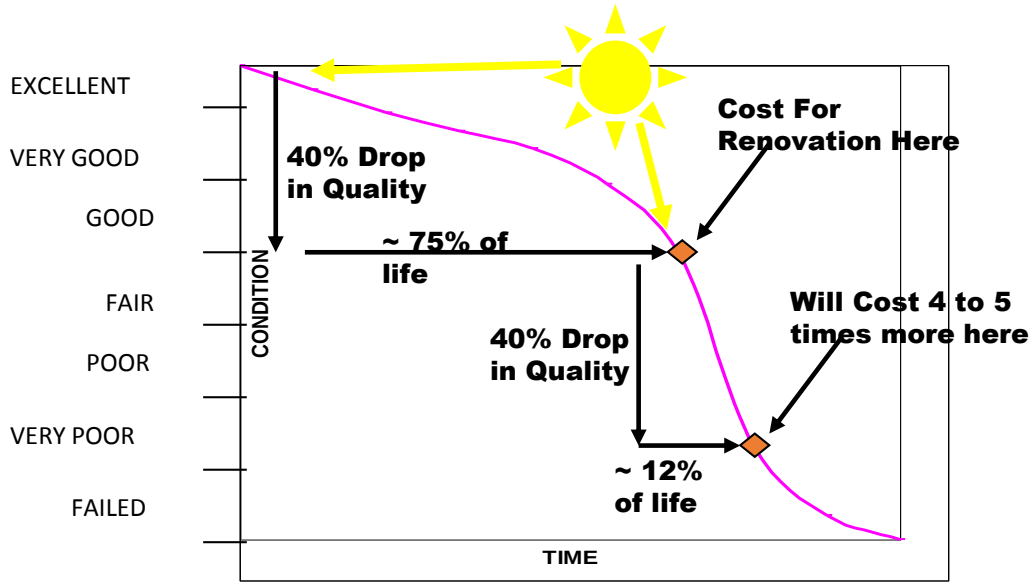
- Pavement Preservation
- Pavement Replacement
- Safety
- Downshift For Lower Function Highways

Theme X' Has a Safety Emphasis…

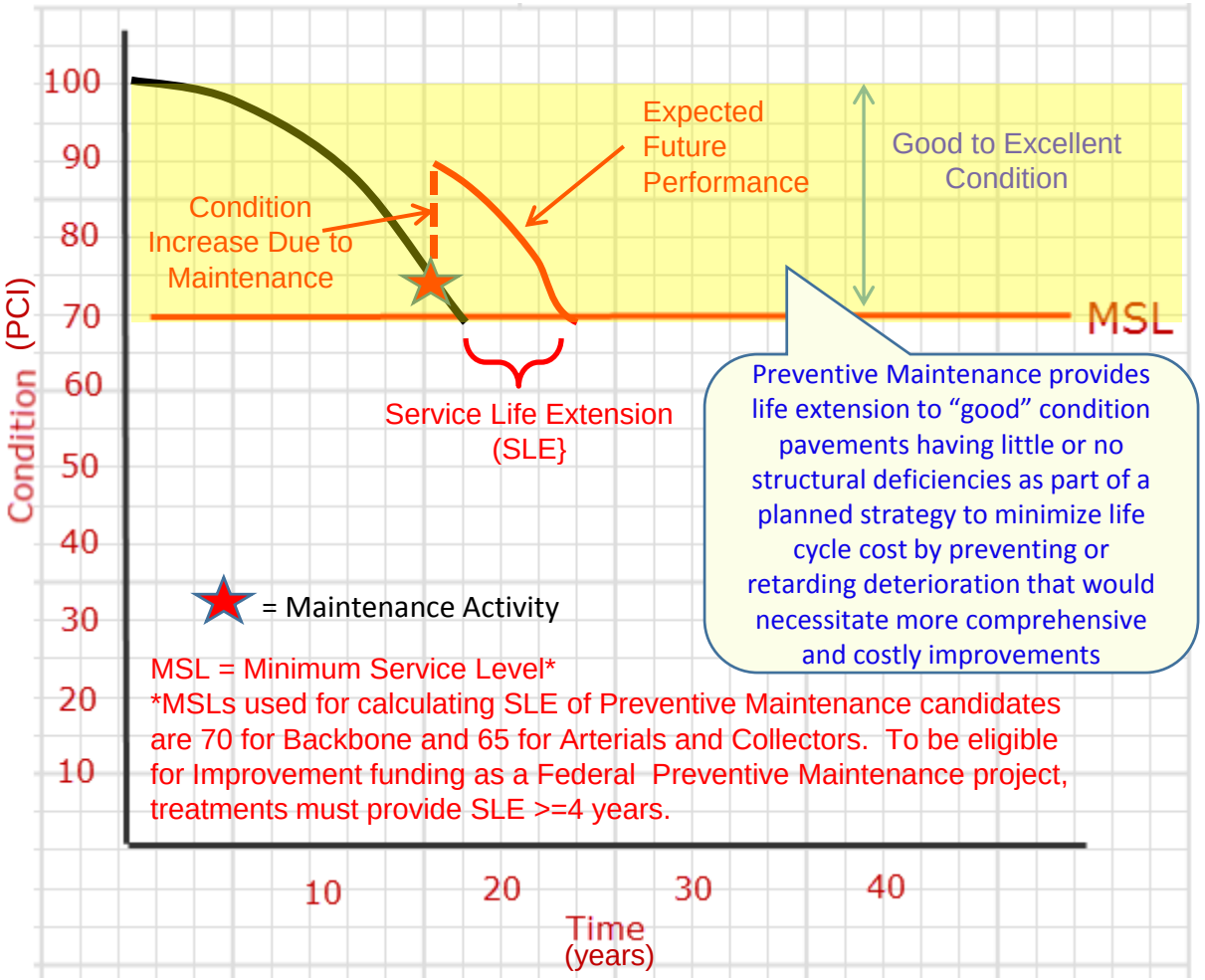
Programmatic Safety BCA to Determine Level of Safety Improvement For Planning Purposes…

Theme X' Has a Pavement Preservation Emphasis…

Typical Pavement Condition Life Cycle



Preventive Maintenance Is Also "Preservation"



Why Emphasize Preservation ???

An Example From FHWA and the National Center For Pavement Preservation…

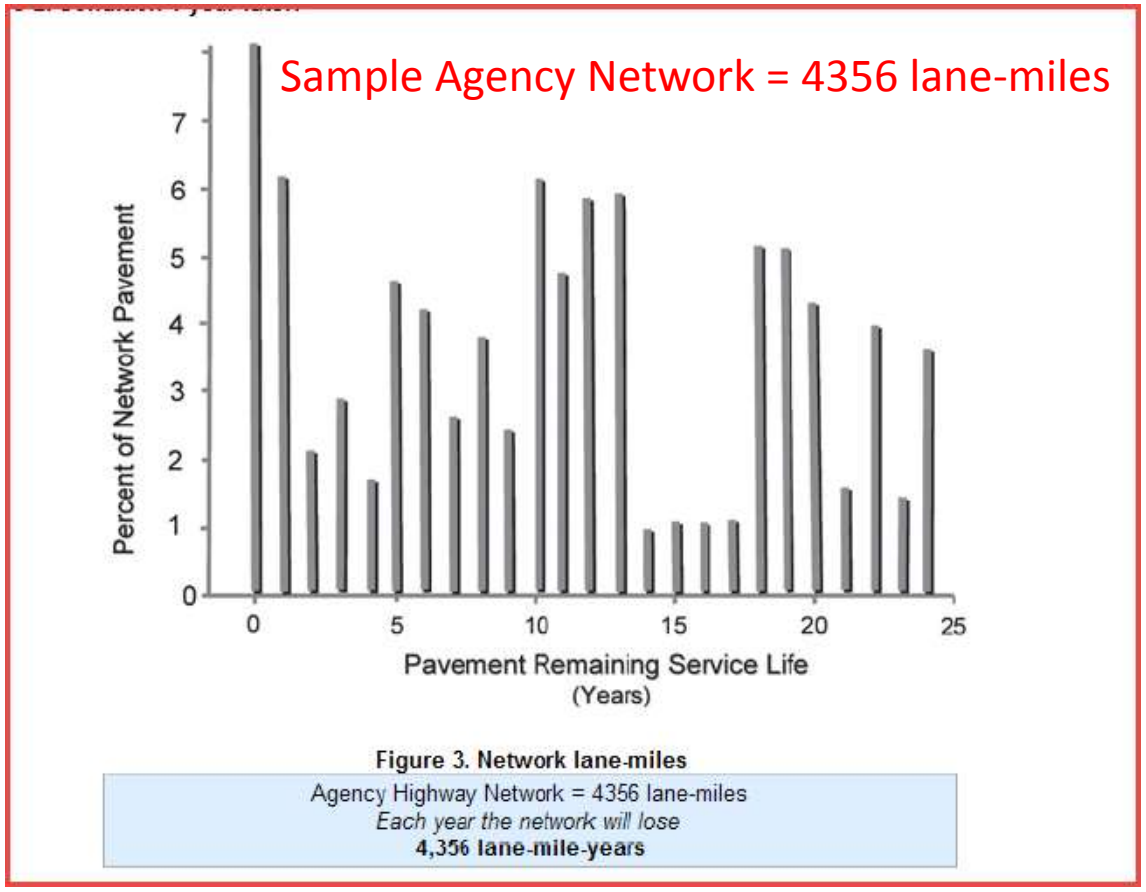


Figure 3. Network lane-miles

Agency Highway Network = 4356 lane-miles
Each year the network will lose
4,356 lane-mile-years

- If no improvements are made for 1 year, then remaining life years for each road segment will decrease by 1 year.
- Without improvements, Sample Agency loses 4356 lane-mile-life years per year.
- Improving more than 4356 lane-mile-life years per year, improves the network.
- Improving less than 4356 lane-mile-life years per year lessens the normal network decline, but does not maintain current conditions.

Why Emphasize Preservation ???

An Example From FHWA and the National Center For Pavement Preservat

Sample Agency Budget $37M – Annual Project Mix Example #1

Figure 4. Reconstruction Evaluation.
Projects This Year = 2

Project	Design Life	Lane-Miles	Lane-Mile-Years	Lane-Mile-Cost	Total Cost
No. 1	25 yrs	22	550	$463,425	$10,195,350
No. 2	30 yrs	18	540	$556,110	$10,009,980
Total			**1,090**		**$20,205,330**

Figure 5. Rehabilitation Evaluation.
Project This Year = 3

Project	Design Life	Lane-Miles	Lane-Mile-Years	Lane-Mile-Cost	Total Cost
No. 10	18 yrs	22	396	$263,268	$5,791,896
No. 11	15 yrs	28	420	$219,390	$6,142,920
No. 12	12 yrs	32	384	$115,848	$3,707,136
Total			**1,200**		**$15,641,952**

Figure 6. Preservation Evaluation.
Project This Year = 5

Project	Design Life	Lane-Miles	Lane-Mile-Years	Lane-Mile-Cost	Total Cost
No. 101	2 yrs	12	24	$2,562	$30,744
No. 102	3 yrs	22	66	$7,743	$170,346
No. 103	5 yrs	26	130	$13,980	$363,480
No. 104	7 yrs	16	112	$29,750	$476,000
No. 105	10 yrs	8	80	$54,410	$435,280
Total			**412**		**$1,475,850**

Figure 7. Programmed Tally.
Network Trend

Programmed Activity	Lane-Mile-Years	Total Cost
Reconstruction	1,090	$20,205,330
Rehabilitation	1,200	$15,641,952
Preservation	412	$1,475,850
Total	**2,702**	**$37,323,132**
Network Needs (Loss)	(-) 4,356	
Deficit	**-1,654**	

- With respect to maintaining system conditions, Project Mix #1 is deficient by 1654 lane-mile-life years.

Why Emphasize Preservation ???

An Example From FHWA and the National Center For Pavement Preservat

Sample Agency Budget $37M – Annual Project Mix Example #2

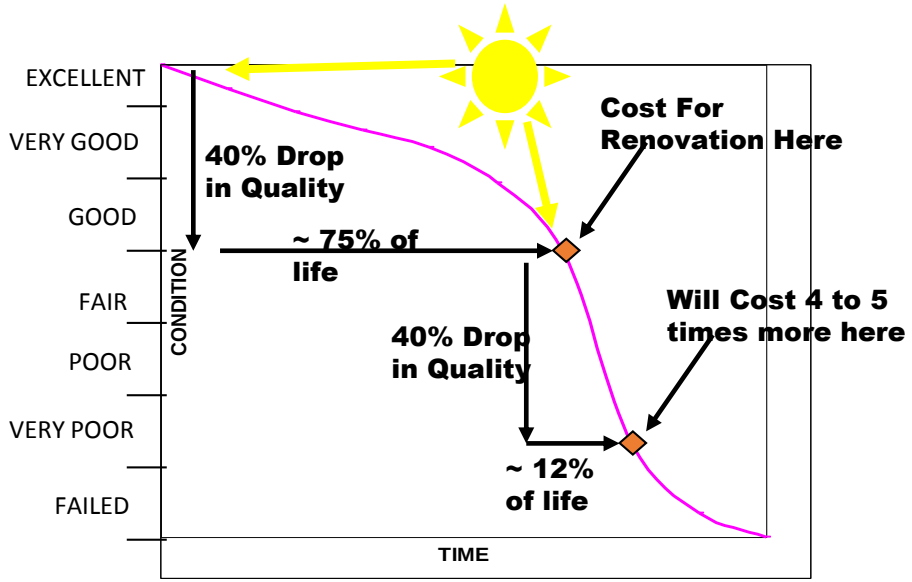
Figure 8. Revised R&R Programs.
Programs Modification

Programmed Activity		Lane-Mile-Year	Total Cost
Reconstruction	31 lane-miles (40 lane-miles)	820 ~~(1,090)~~	$5,004,990
Rehabilitation	77 lane-miles ~~(82 lane-miles)~~	1,125 ~~(1,200)~~	$1,096,950
Pavement Preservation	(84 lane-miles)	(412)	0
Total =		2,357 ~~(2,702)~~	$6,101,940

Figure 9. New Program Tally.

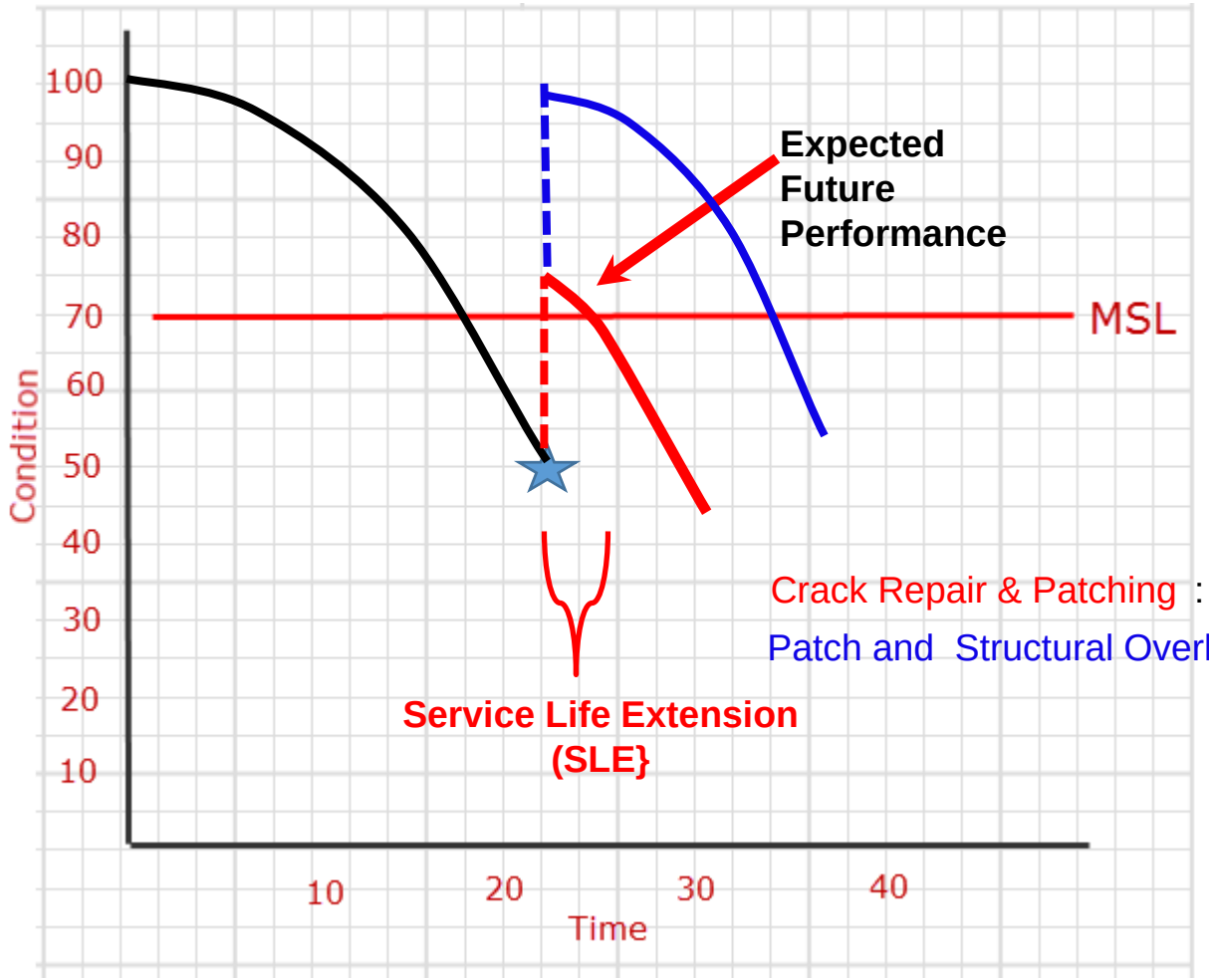
Programmed Activity		Lane-Mile-Year	Total Cost
Reconstruction	(31 lane-miles)	820	$15,200,340
Rehabilitation	(77 lane-miles)	1,125	$14,545,002
Pavement Preservation	(84 lanes-miles)	412	$1,475,850
Concrete Resealing	(4 yrs x 31 lane-miles)	124	$979,600
Thin HMA Overlay	(10 yrs x 16 lane-miles)	160	$870,560
Microsurfacing	(7 yrs x 44 lane-miles)	308	$1,309,000
Chip Seal	(5 yrs x 79 lane-miles)	395	$1,104,420
Crack Seal	(2 yrs x 506 lane-miles)	1,012	$1,296,372
Total –		4,356	$36,781,144

- Reconstruction and Rehabilitation projects are reduced to free-up ~$6M for less costly pavement preservation improvements. (-345 ln-mi-yrs)



- $6M invested in right place and right time preservation treatments yields an additional 1999 ln-mi-life years . (5.8X reduction above)
- Project Mix #2 maintains current conditions!

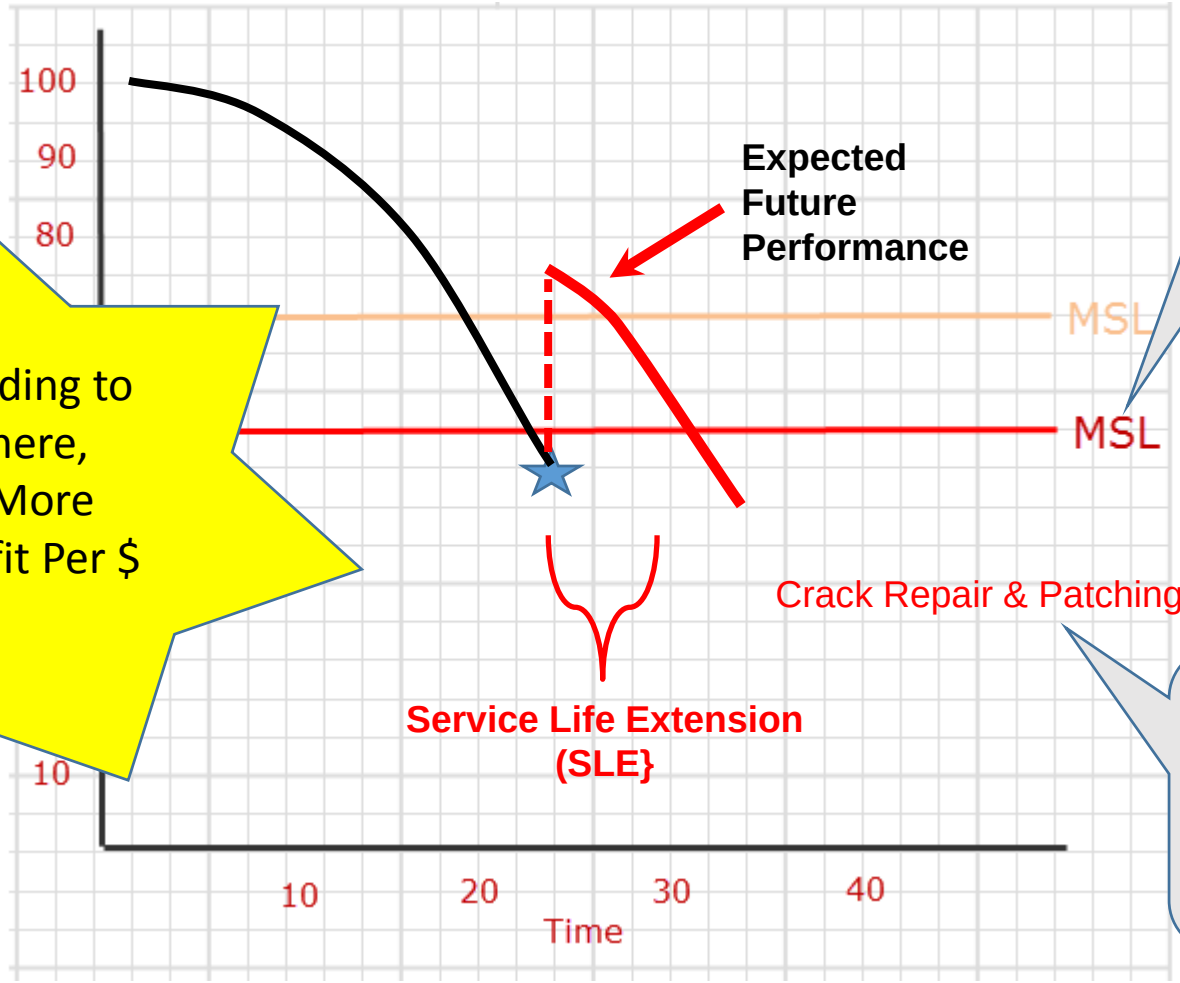
Standard Approach For Identifying Viable Improvement Alternatives…



Crack Repair & Patching : SLE = 3 Years

Patch and Structural Overlay : SLE = 12 Years

"Theme X' Downshift" Approach…



Frees up Funding to Use Elsewhere, Obtaining More System Benefit Per $

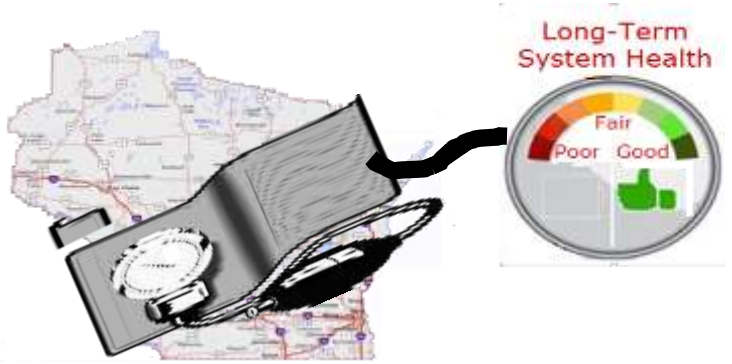
Accepting a Lower Level of Service on Degraded Pavements

Crack Repair & Patching : SLE = 7 Years

Increases The Viability of Low Cost Treatment Alternatives

Suggested Use on Lower Function Highways

Asset Management Investment Theme



WisDOT is:

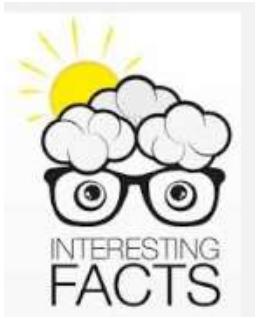
- Making data-driven decisions to achieve the best overall system health given existing funding constraints – this means <u>better long-term conditions and a lower backlog of unmet needs</u>

  - The approach involves a strategic combination of best value and low cost fixes that promote enhanced system health:

    ✓ Place a higher priority on funding timely rehabilitation projects, cost-effective pavement preservation activities, viable lower cost improvement projects, and select reconstruction projects in order to add more system life for the given investment level.

    ✓ Strategically defer some more costly improvement alternatives to the extent practicable to add more system life by investing elsewhere and adding more system life per investment dollar.

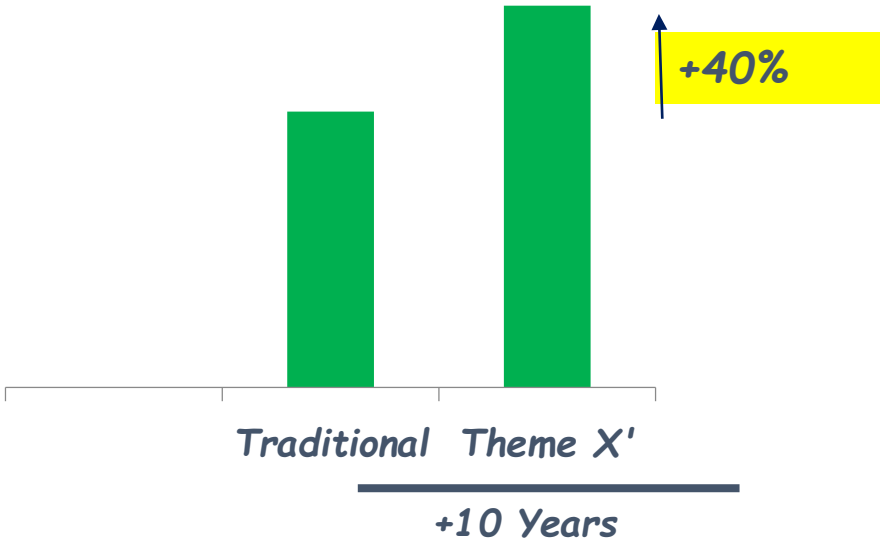
Measuring Impact…



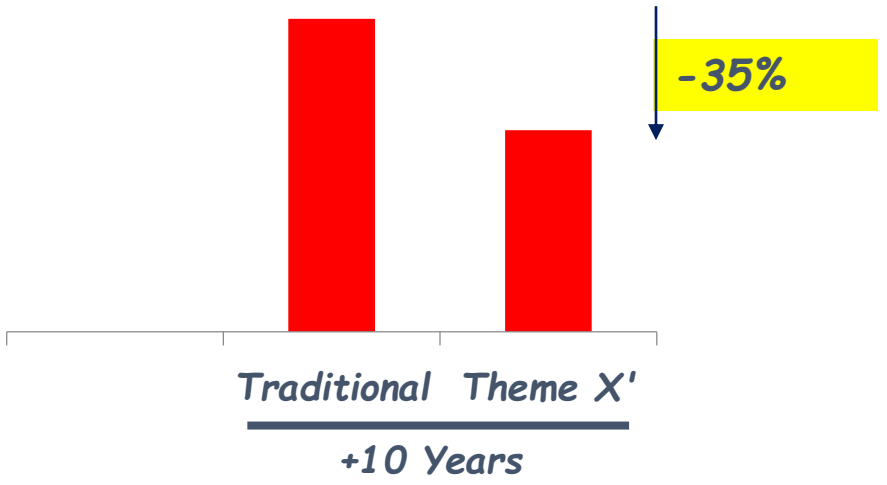
Resulting Pavement Conditions…

(Data Only for Illustrative Purposes)

Pavements "Fair And Above"



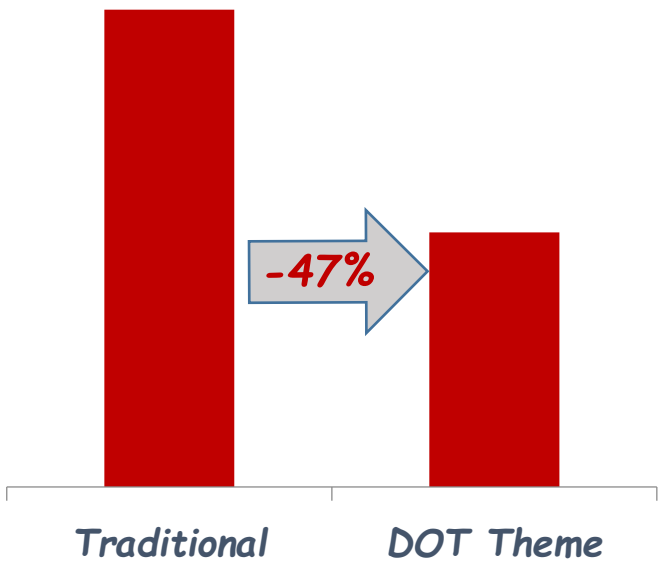
Pavements "Poor Or Worse"



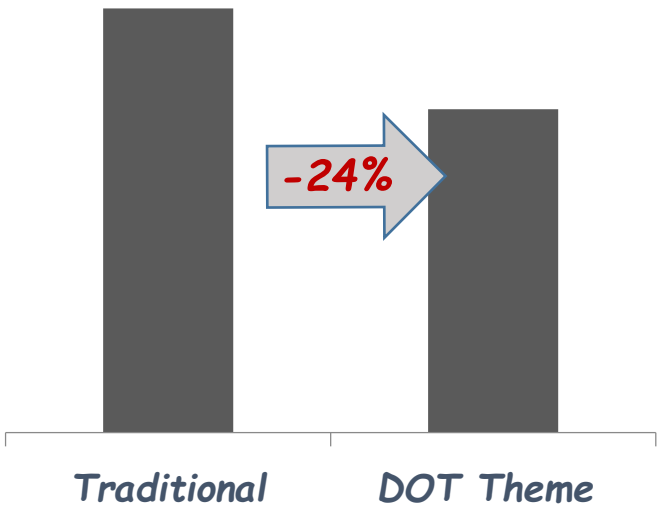
Unmet Highway Need Backlog…

(Data Only for Illustrative Purposes)

Backlog Miles In 10-years



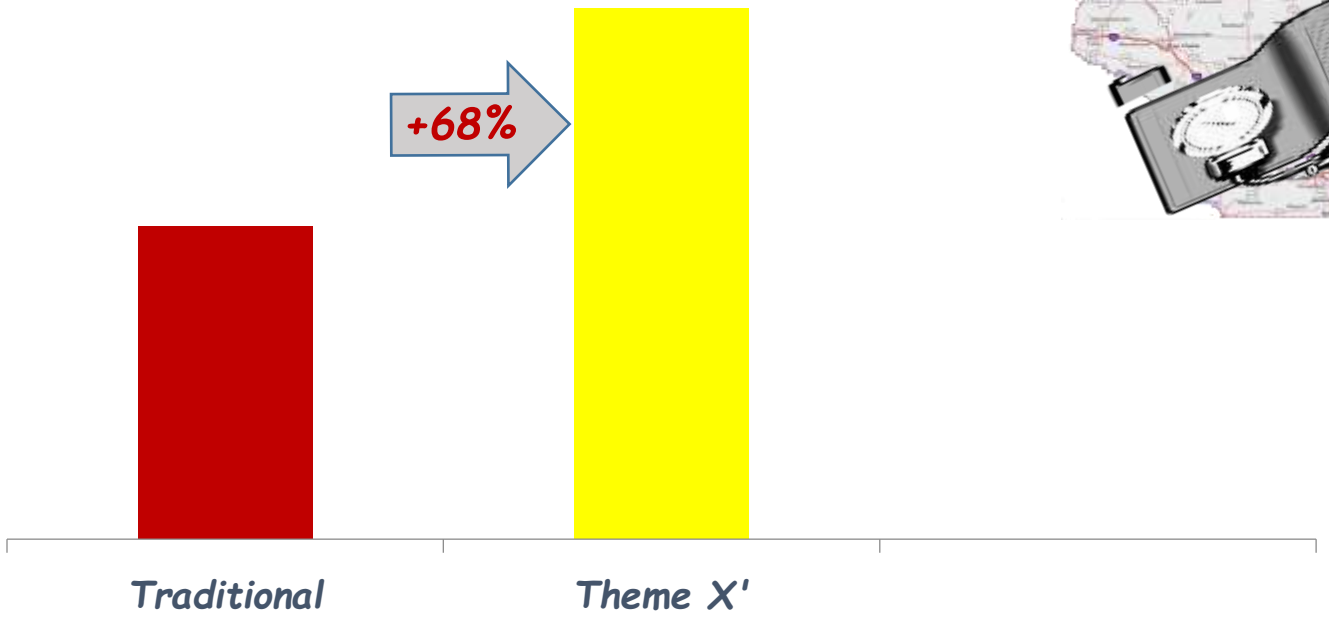
Cost To Fix Backlog

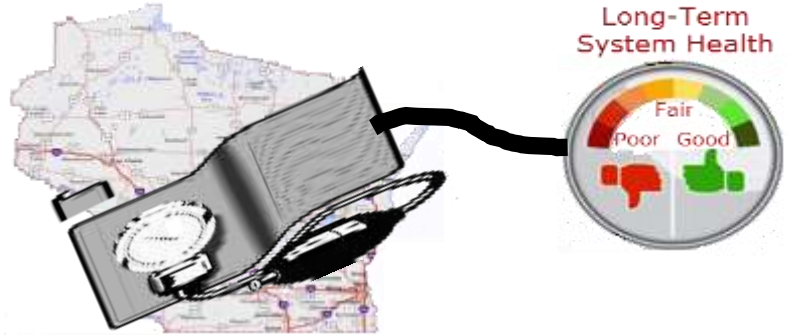


Resulting Highway Life-Years Added…

(Data Only for Illustrative Purposes)

Life Mile Years Added





THANK YOU !

Questions?