Pavement Management: Making Smart Funding Decisions at WYDOT

Rocky Mtn. Asphalt Conference
February, 2011
Brief History in Time

1991: ISTEA required PMS for fed. funded systems – WYDOT in-house development started
1993: Initiated network condition data collection
2004: Started transition from in-house system to Agile Assets
Legislative Service Office

• **Recommendation:**
  “WYDOT should begin to revise policies and re-orient the district focus to support a (Statewide) system-level project selection approach.”

WYDOT and General Fund Appropriations for Highways, April 14, 2008
Pavement Management

Excellence in Transportation
Objective Condition Measurement

- Roughness
- Rutting
- Condition (Cracking)
- Friction

Excellence in Transportation
Data Archives
Data Archives

• Pavement data used for section ratings:
  – Pavement smoothness: International Roughness Index (IRI) in inches/mile
  – Rutting: inches
  – Pavement cracking and distresses: Pavement Condition Index (PCI)
  – Composite: Present Serviceability Rating (PSR)
Collection Vehicle
Friction Tester
Composite Condition Index
Composite Condition Index

• Present Serviceability Rating (PSR)
  – Composite rating to determine overall condition of section; 0-5 scale
  – Asphalt: combines PSI, rutting, and PCI
    • $PSR = PSI - (4 \cdot Rut^2) - 3 \cdot (1 - PCI/100)$
  – Concrete: combines PSI and PCI only
    • $PSR = PSI - 5 \cdot (1 - PCI/100)$
Pavement Serviceability Rating (PSR)

0  5
Poor  Fair  Good  Excellent

2.5  3.0  3.5
Excellence in Transportation
Agile Assets Pavement Management System

- Data Management
- Materials Modeling and Performance
- Pavement Performance History
- Analytics
  - Performance Projections
  - Funding Optimizations (strategy selection)
  - Project Rehab timeline
  - Project Recommendations
AA Pavement Module Setup Flow Chart

- Performance Modeling Categories
- Performance Model Development
- Pavement Treatments
- Decision Trees
- Budget Categories
- Network Analysis
- Candidate Project List
Performance Modeling Categories

Performance Model Development

Pavement Treatments

Decision Trees

Budget Categories

Network Analysis

Candidate Project List
Performance Modeling Categories (PMC)
Performance Modeling Categories (PMC)

• Why do we need to put sections of road into performance modeling categories?
Performance Modeling Categories (PMC)

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Performance Modeling Categories (PMC)

• Why do we need to put sections of road into performance modeling categories?
Performance Model Development
Performance Model Development

• Maintenance activities such as chip seals, crack seals and patching included in models
  – All roads have received periodic maintenance
    • Maintenance work has not always been documented
  – Other than pavement friction, improvement can be difficult to quantify. However, life of pavement is extended.
Performance Modeling Categories

Performance Model Development

Pavement Treatments

Budget Categories

Network Analysis

Decision Trees

Candidate Project List
Pavement Treatment Types
Pavement Treatment Types

• Maintenance
  – Chip Seal
  – Crack Seal
  – Patching
  – Isolated slab replacement (concrete)
Pavement Treatment Types

• Maintenance
  – Chip Seal
  – Crack Seal
  – Patching
  – Isolated slab replacement (concrete)
Pavement Treatment Types
Pavement Treatment Types

• 1R – preventative
  – Micro-surface
  – Thin overlay (< 2”)
  – Mill & OGFC
  – Grind & texture (concrete)
Pavement Treatment Types

• 1R – preventative
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Pavement Treatment Types

• 1R – preventative
  – Micro-surface
  – Thin overlay (< 2”)
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  – Grind & texture (concrete)

• 2R – minor rehabilitation
  – Surface prep.* & ≥ 2” overlay
  – Dowel bar retrofit & grind (PCCP)
  *mill, level, FDR, or combination
Pavement Treatment Types

• 1R – preventative
  – Micro-surface
  – Thin overlay (< 2”)
  – Mill & OGFC
  – Grind & texture (concrete)

• 2R – minor rehabilitation
  – Surface prep.* & ≥ 2” overlay
  – Dowel bar retrofit & grind (PCCP)

*mill, level, FDR, or combination
Pavement Treatment Types
Pavement Treatment Types

• 3R – major rehabilitation
  – Widen, surface prep.* & ≥ 2” overlay
  – Crack & seat, level, & 4” overlay
Pavement Treatment Types

• 3R – major rehabilitation
  – Widen, surface prep.* & ≥ 2” overlay
  – Crack & seat, level, & 4” overlay

• 4R – full reconstruction
Pavement Treatment Types

• 3R – major rehabilitation
  – Widen, surface prep.* & ≥ 2” overlay
  – Crack & seat, level, & 4” overlay

• 4R – full reconstruction

• Mobility – traffic capacity
  – Extra lanes
Pavement Treatment Types

- **3R** – major rehabilitation
  - Widen, surface prep.* & ≥ 2” overlay
  - Crack & seat, level, & 4” overlay
- **4R** – full reconstruction
- **Mobility** – traffic capacity
  - Extra lanes
- **Pavement Management currently models & recommends only 1R, 2R, and 3R treatments**
Pavement Treatment Types

- 3R – major rehabilitation
  - Widen, surface prep.* & ≥ 2” overlay
  - Crack & seat, level, & 4” overlay
- 4R – full reconstruction
- Mobility – traffic capacity
  - Extra lanes
- Pavement Management currently models & recommends only 1R, 2R, and 3R treatments

*mill, level, FDR, or comb.
Pavement Treatment Improvements
Pavement Treatment Improvements

• 1R – preventative
  – PSR Index: jump 25 not to exceed 85
  – Ride Index: jump 20 not to exceed 85
  – PCI & Rut Index: set to perfect condition
Pavement Treatment Improvements

- **1R** – preventative
  - PSR Index: jump 25 not to exceed 85
  - Ride Index: jump 20 not to exceed 85
  - PCI & Rut Index: set to perfect condition

- **2R** – minor rehabilitation
  - All indices: set to perfect condition
Pavement Treatment Improvements

• 1R – preventative
  – PSR Index: jump 25 not to exceed 85
  – Ride Index: jump 20 not to exceed 85
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• 3R – major rehabilitation
  – All indices: set to perfect condition
Pavement Treatment Costs
Pavement Treatment Costs

- Average cost per square yard was calculated for 1R, 2R, and 3R treatments
  - 1R cost: $2/SY - $9/SY
  - 2R cost: $4/SY - $27/SY
  - 3R cost: $25/SY - $84/SY

Includes all costs specifically related to the mainline surfacing improvement

If a project included roadway widening in order to accommodate an overlay, those costs were included.
Project Costs –
NOT Pavement-Related

- 1R – 31%
- 2R – 35%
- 3R – 55%
- 4R – 57%
Decision Trees
Decision Trees

• Originally, specific treatments were built into trees. However, this was found to be too detailed. Now only general treatments recommended (1R, 2R, 3R)
Decision Trees

- Originally, specific treatments were built into trees. However, this was found to be too detailed. Now only general treatments recommended (1R, 2R, 3R)
- A different decision tree has been developed for each pavement type on each system
Performance Modeling

Categories

Pavement Treatments

Performance Model Development

Decision Trees

Budget Categories

Network Analysis

Candidate Project List

AA Pavement Module Setup Flow Chart
Balancing System Needs

Pavement Funding Buckets
- Surface Treatments (1R, 2R, 3R)
- Systems (Interstate, Non-Int NHS, Non-NHS)

“Other” Funding Buckets
- Safety
- Mobility
- Bridge
Budget Categories

• Needed so statewide budget can be distributed between systems and treatment types. Also, accounts for earmarked funds.
Budget Categories

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• Without buckets, lower volume roads would receive most money because of larger benefits
Budget Categories

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- Without buckets, lower volume roads would receive most money because of larger benefits.
- Buckets allow WYDOT to manage systems and strategies.
Budget Categories
Budget Categories

• 9 Pavement Funding “Buckets”
  – Interstate
    • 1R, 2R, 3R
  – Non-Interstate NHS
    • 1R, 2R, 3R
  – Non-NHS
    • 1R, 2R, 3R
AA Pavement Module Setup Flow Chart

Performance Modeling Categories

Performance Model Development

Pavement Treatments

Decision Trees

Budget Categories

Network Analysis

Candidate Project List
<table>
<thead>
<tr>
<th></th>
<th>Interstate</th>
<th>Non-Int NHS</th>
<th>Non-NHS</th>
<th>Total</th>
<th>Urban</th>
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<tr>
<td>1R</td>
<td>$1 (1%)</td>
<td>$1 (3%)</td>
<td>$1 (2%)</td>
<td>$3 (2%)</td>
<td>$12 (50%)</td>
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<tr>
<td>2R</td>
<td>$5 (7%)</td>
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<td>$5 (9%)</td>
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<tr>
<td>3R/4R</td>
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<tr>
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<td>$26 (46%)</td>
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<tr>
<td>Total</td>
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<td>$61 (32%)</td>
<td>$56 (29%)</td>
<td>$191 (100%)</td>
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## Recommended Pavement Funding Strategy

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</table>
AA Pavement Module Setup Flow Chart

Performance Modeling Categories

Performance Model Development

Pavement Treatments

Budget Categories

Network Analysis

Candidate Project List

Decision Trees
### District 2 1R Interstate Treatment List

<table>
<thead>
<tr>
<th>Route</th>
<th>Direction</th>
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<th>End</th>
<th>Width</th>
<th>Cost</th>
<th>Last Rehab</th>
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### District 2 1R Non-Interstate NHS Treatment List

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<th>Cost</th>
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### District 2 1R Non-NHS Treatment List

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Questions?