Pavement Management Program: Optimizing Tax Payer Investment in Infrastructure

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What is Pavement Management?

The systematic planning of maintenance and rehabilitation activities in order to maximize pavement conditions and minimize costs of maintaining a road network.

Why Do Roads Need Constant Maintenance?

- A pavement is a structure of various material layers

- A properly designed and constructed pavement can last 20 years or more*

- With properly timed maintenance and preservation, the life of a pavement can be extended significantly

- Many times, inadequate funding requires tough choices to be made about what can be done to fix a road

Factors That Contribute to Pavement Distress and Failure

- Traffic loads (ever increasing demand)

- Soil/road base conditions

- Drainage conditions

- Environmental conditions

- Inadequate design of layers

- Poor construction techniques

- Material failures

- Poorly timed maintenance

- Insufficient funding of repairs

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How Does the County Manage These Factors?

Background

- County has implemented pavement management since mid-90's

- Utilized a simplified Pavement Management System (PMS) to track pavement condition and repair costs

- Limited functionality

    - No predictive modeling

    - No budget analysis capability

    - Not customizable to county needs

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Background

- In 2011, County acquired state-of-the-art PMS software to provide budget optimization capabilities and pavement performance prediction

- Provides improved decision making capabilities within the department

- The continued use, management, and application of this new process is essential to success

AgileAssets Pavement Analyst Software

- State-of-the-art functionality

- Web-based software, zero footprint

- Customized to meet County PMS business needs

- Pavement predictive modeling capabilities

- Multi-constraint optimization analysis

- Project work plan management

- GIS mapping capabilities

Inventory Management

- County maintains a pavement inventory database

  - Network mileage: approximately 903 centerline miles of paved roads

- Many attributes are stored

  - Road name

  - Geometric information: length, width, etc.

  - Commissioner district

  - Maintenance district

  - Subdivision

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Pavement Condition Surveys

- County has performed pavement condition surveys since the mid-90's

- Collecting pavement surface distresses on each road in the network

  - Distress severity (how bad)

  - Distress extent (how much)

  - Structural distresses – cracking, rutting, patches/potholes

  - Functional distresses – cracking, raveling, weathering

Pavement Condition Index

- Pavement Condition Index (PCI) calculated from distresses

- 0 to 100 scale

  - 100 = perfect/new condition

  - 0 = not passable

- Used for performance modeling

- Used for repair decision making

- Used for reporting network condition

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Treatments

- Preservation

  - Microsurface

  - Smooth seals

- Rehabilitation

  - Thin overlays: mill and fill, patch and overlay (< 2")

  - Thick overlays: deep patching and thick overlays (>2")

- Reconstruction
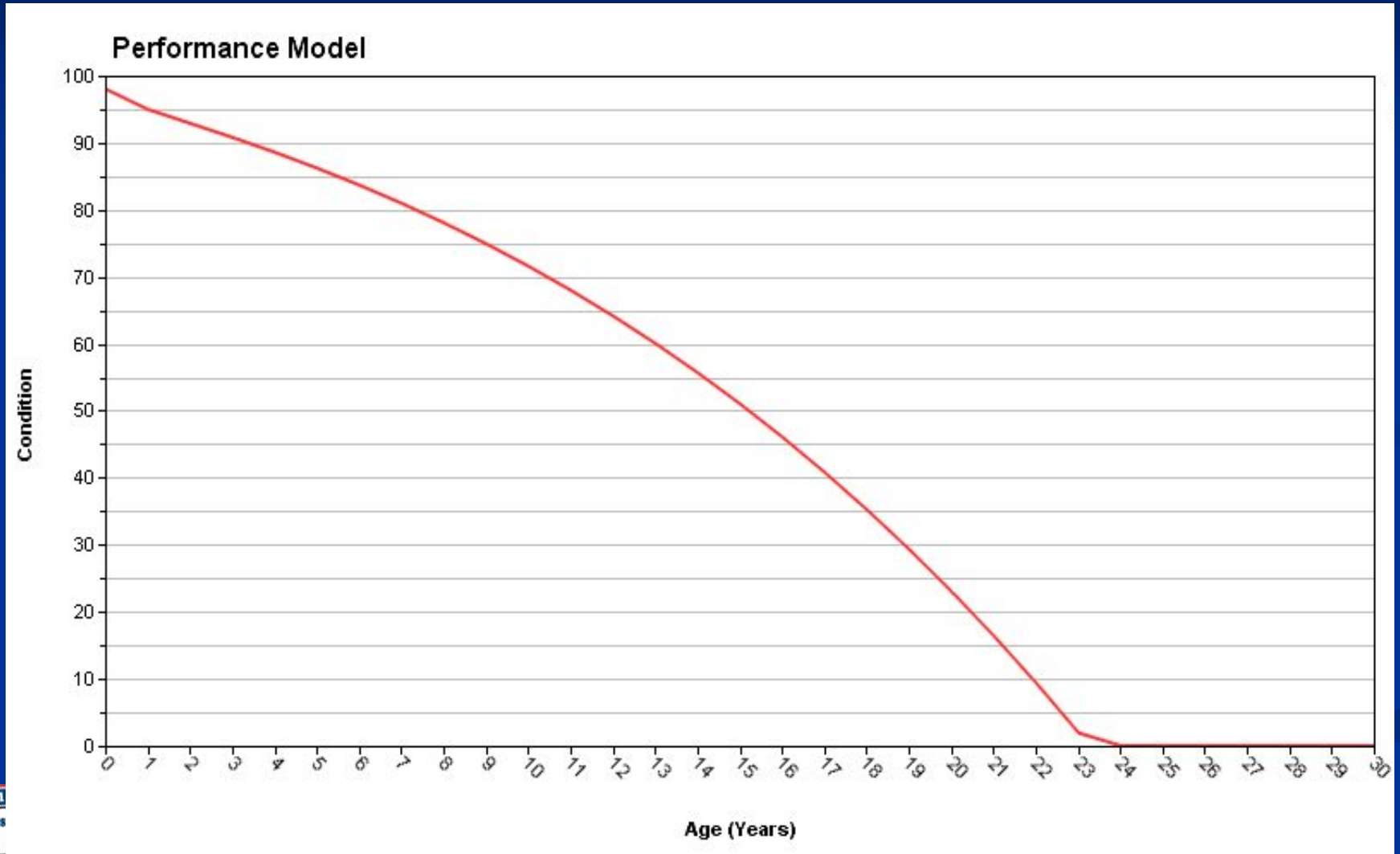
  - Full depth reclamation

  - Remove and replace

Treatments

There is a most cost-effective treatment
for every combination of distresses

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Decision Trees

PCI<20
RC FDR

20<=PCI<45

Classification:
3
3,4...
RC Rehab-Thick

Classification:
5,6
6...
RC FDR

45<=PCI<65
RC Rehab-Thin

65<=PCI<80

Subdivision:
Yes
RC Ultra-Thin Overlay

Subdivision:
No
RC Microsurface

PCI>=80
Monitor

Performance Models

Construction History Management

- County manages past contract data in PMS

- General data stored includes

  - Contract number and name

  - Contract year

  - Location of work completed

  - Type of work completed

- Also used to update pavement performance models

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Project Work Plan Management

- County manages list of future planned work which has already been programmed

  - Applied in analysis to prevent software from selecting projects at a different time

- General data includes

  - Project location

  - Project year

  - Treatment (repair category)

  - Repair cost

  - Work plan status

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"Complete" Pavement Management Program

- **PMS software is only part of the process**
    - It is a <u>tool</u> to manage DPW's policies and practices

- **Comprehensive Pavement Management Program**
    - Field testing

    - Pavement design

    - Quality contract documents and administration

    - Thorough construction inspection

    - Continuous pavement health monitoring

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Why Implement Pavement Management?

Identify the long-term consequences of today's funding decisions

Show the best use of limited tax dollars for maintaining county road infrastructure

Why Implement Pavement Management?

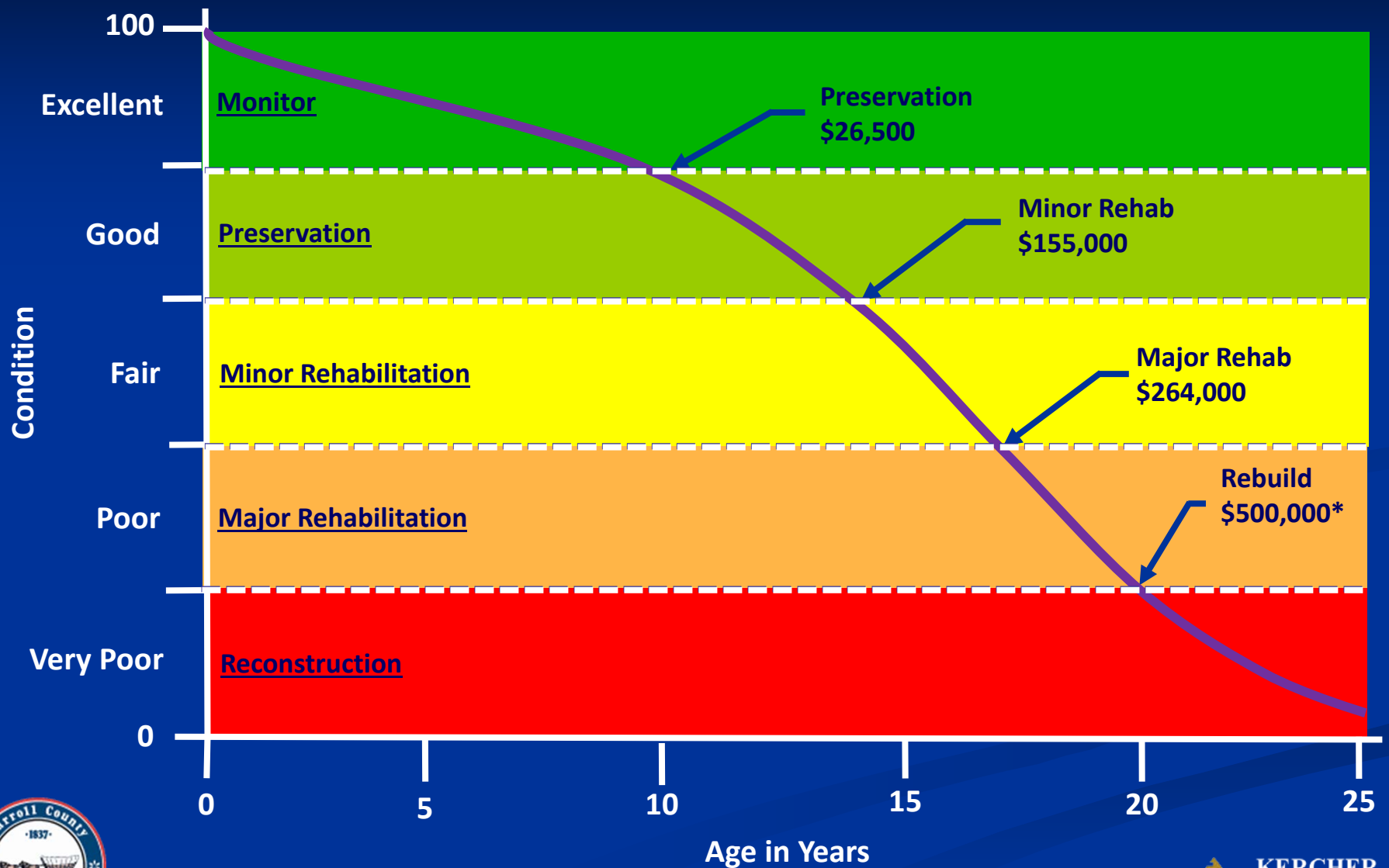Preserve today that which will cost more to rehabilitate tomorrow

FHWA: The 3 R's

Right Treatment, Right Place, Right Time

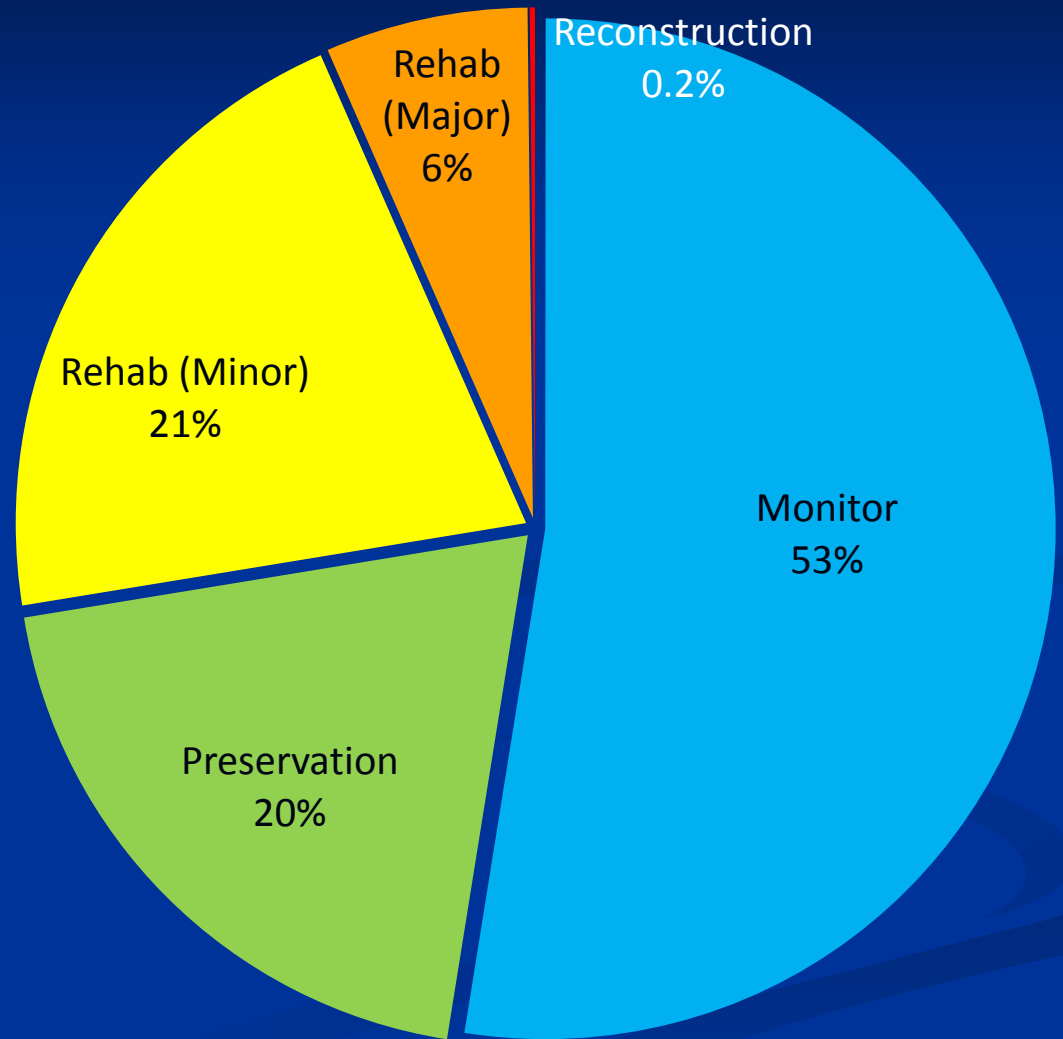*This is a basic foundation of Pavement Management and why a system is important*

Cost of Delaying Pavement Repairs

2014 Network Statistics

- Total network length = 903 miles

- Average network PCI = 76.5

- Approximate network cost backlog = $60 million

Reconstruction 0.2%

Rehab (Major) 6%

Rehab (Minor) 21%

Monitor 53%

Preservation 20%

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Gorsuch Road
From: MD 140 | To: MD 482 | 5.85 Miles

Condition: Good

Recommended Repair: Routine Maintenance (Crack Sealing and Patching)

Early Preservation Candidate
Approx. Cost = $165,000

Stone Road
From: MD 97 | To: Flickinger Road | 4.99 Miles

Condition: Fair

Recommended Repair:
Asphalt Mill and Overlay
Functional Repairs
Approx. Cost = $775,000

Middleburg Road
From: MD 194 | To: MD 84 | 6.72 Miles

Condition: Fair

Recommended Repair:
Asphalt Mill and Overlay
Structural Repairs
Approx. Cost = $1.86 Million

Pleasant Valley Road
From: MD 97 | To: Richardson Road | 3.25 Miles

Condition: Poor/Very Poor

Recommended Repair:
Reconstruction/FDR
Approx. Cost = $1.03 Million

Misty Meadow Road
From: Greens Mill Road | To: Cul-de-sac | 1.01 Miles

Condition: Very Poor

**Recommended Repair:
Reconstruction/FDR
Approx. Cost = $410,000**

AgileAssets
Multi-Constraint
Optimization Analysis

Optimization Goals

- Obtain the best set of projects

  - The projects meet a set of constraints

  - Maximizes or minimizes an objective (maximize condition, minimize budget, etc.)

- The desired OUTPUT of the analysis is a WORKPLAN, that is:

  - Which sections to fix (where)

  - Using which treatments (what)

  - In which year (when)

Optimization Output

- Optimized project work plan

- Supports County's budgeting process
  - Provides objective justification for increasing or maintaining pavement funding stream

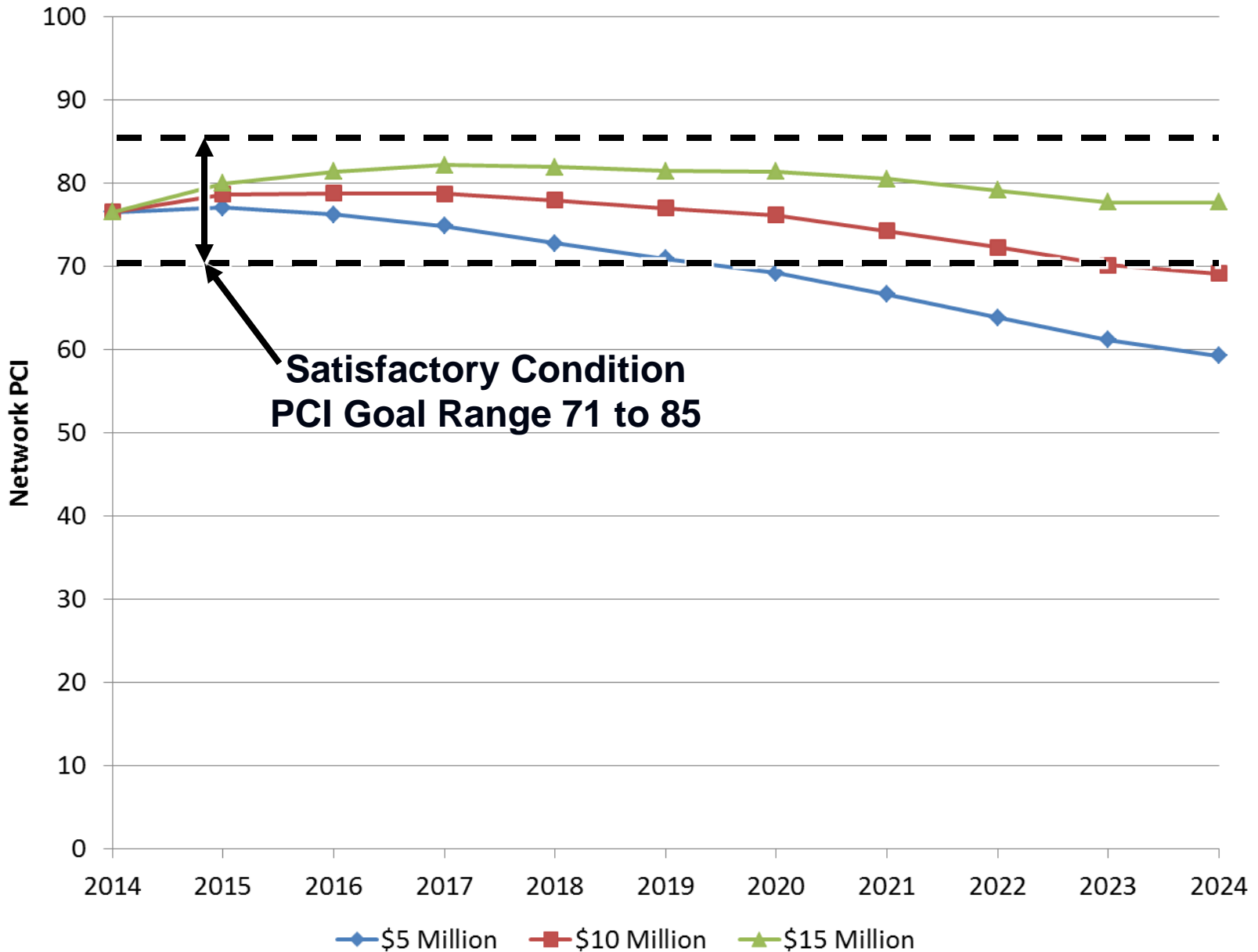- Supports County's pavement performance goals

Performance Monitoring Process

- DPW goal – maintain network average PCI between 71 and 85 (satisfactory level)

- Run various optimization analyses to test funding needs to meet goal

- Compare to CIP budgeting scenario to determine funding needs

- Determine the best funding scenario to minimize backlog cost while maintaining PCI goal
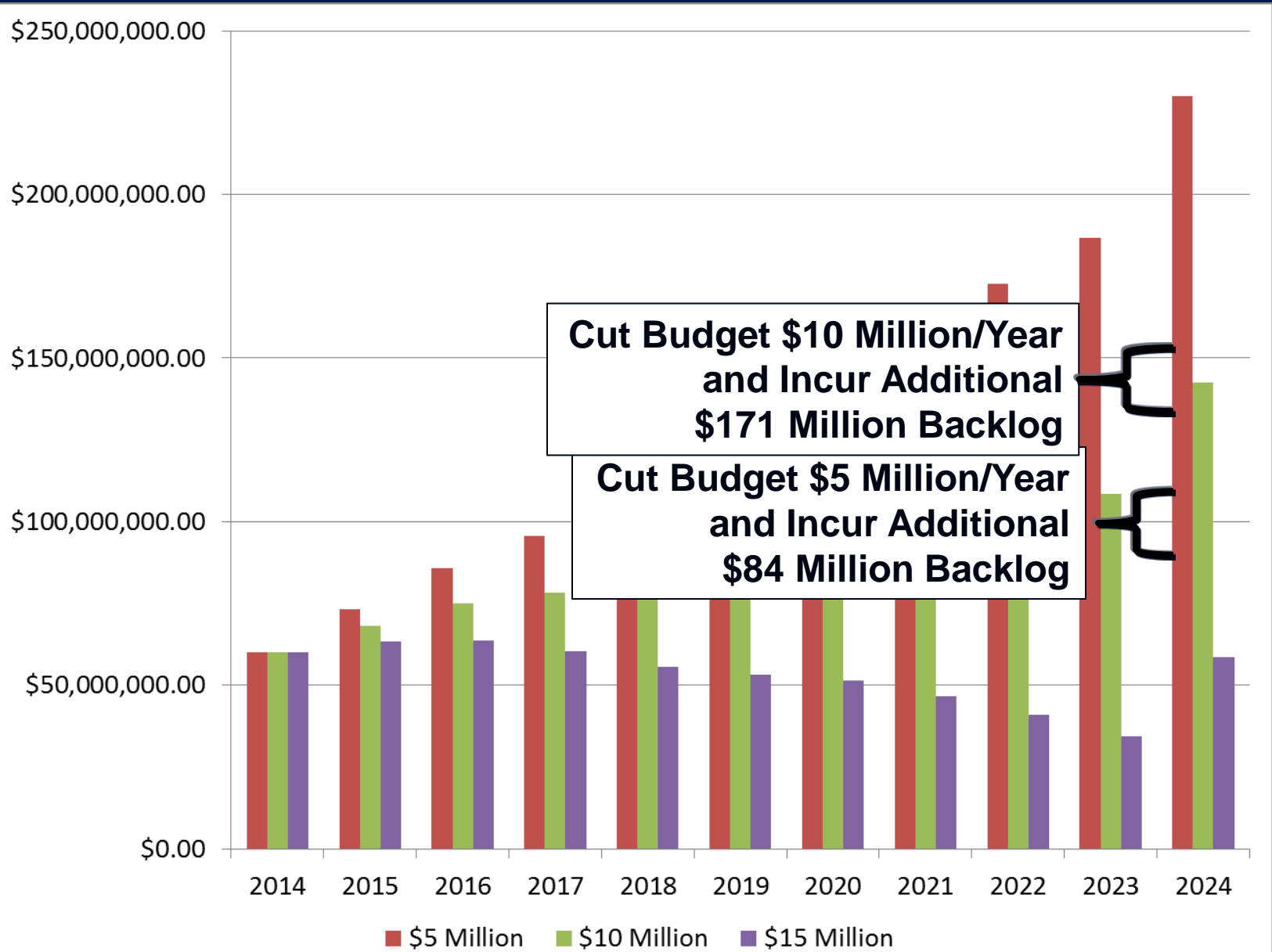
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Budget Comparisons – Network Condition

**Satisfactory Condition
PCI Goal Range 71 to 85**

Budget Comparisons – Network Cost Backlog

Cut Budget $10 Million/Year and Incur Additional $171 Million Backlog
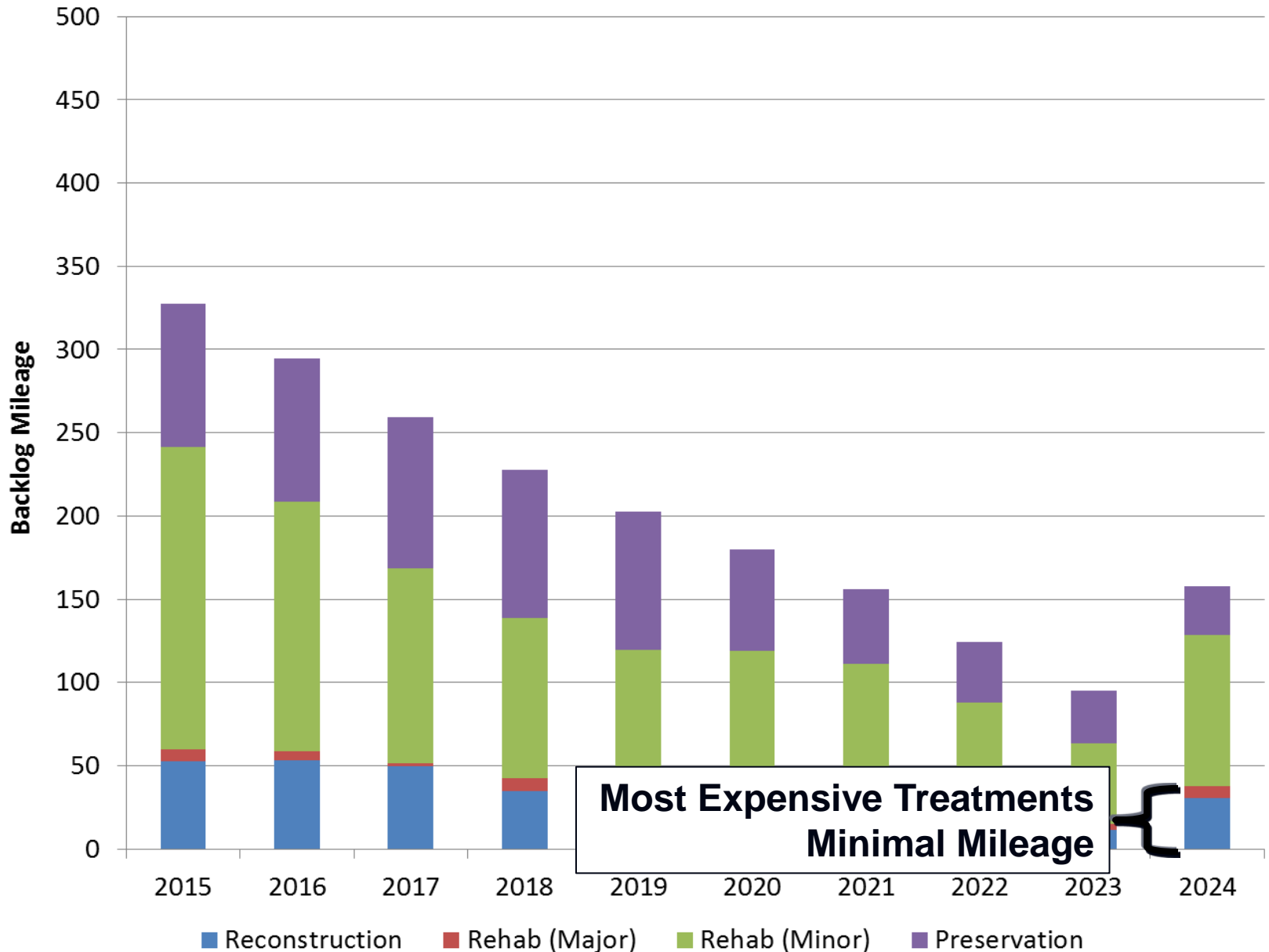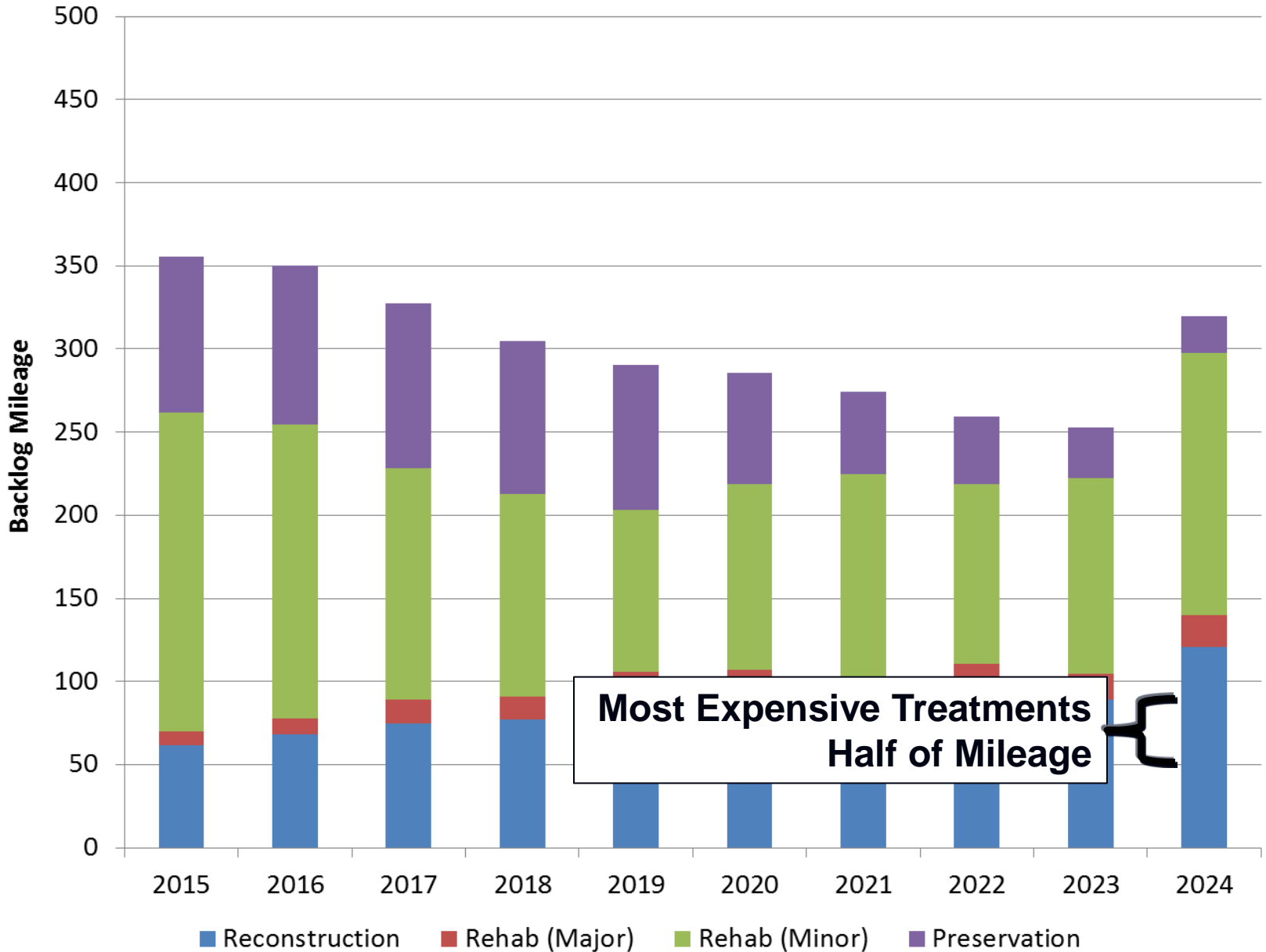
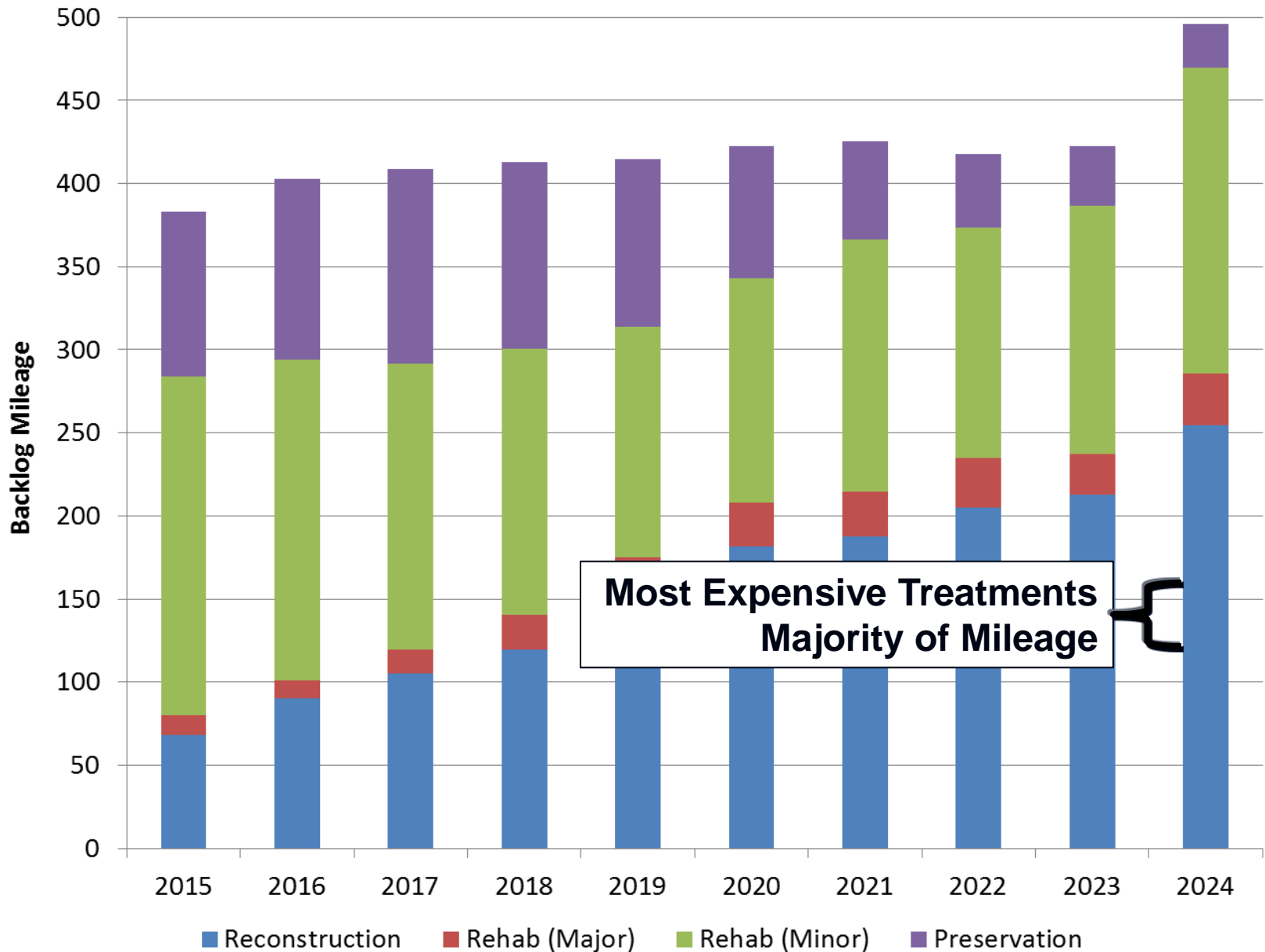Cut Budget $5 Million/Year and Incur Additional $84 Million Backlog

Backlog Mileage - $15 Million/Year Budget

Backlog Mileage - $10 Million/Year Budget

Backlog Mileage - $5 Million/Year Budget

Summary

- Pavement management is a complex process

- Maintain the AgileAssets software to ease the burden

- Use the software to identify budgetary needs and make objective decisions

- Fund the network properly to save money in the long run

- Integrate other assets into the PMS software to manage broader infrastructure funding needs

Resources

- www.kercherei.com

- www.agileassets.com

- www.fhwa.dot.gov/pavement/mana.cfm

- www.pavementinteractive.org/

Thank You!

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