Pavement and Asset Management from a City's Perspective

Mike Rief, PE, DBIA
and
Andrea Azary, EIT

February 12, 2015

What is Pavement Management?

At a Network Level:

Pavement management refers to a systematic process of maintaining, upgrading and operating a network of pavements and involves three major components: the pavement life cycle, the costs associated with this life cycle and pavement management systems.

What is Pavement Management?

What this means is…..

We are going to gather performance data on our roads on a regular interval and use that information to:

1. *Determine the effectiveness of construction and maintenance techniques*
2. *Determine the best fix and the timing of that fix*
3. *Determine how best to allocate funds either at a system level or for an individual segment of road*
4. *Have a tool to predict future performance and budgetary needs*

City Level Pavement Management

Why is Pavement Management different for a City?

- Geography and geology is better defined
- Fewer variables to address
- Field evaluations and surveys are often more inclusive
- Owner has better knowledge of the system
- Range of construction activities and maintenance techniques is often limited
- Enterprise Asset Management System for all Pavements, Roads, Trails and Parking lots

City Level Pavement Management

Why is Pavement Management a needed tool for a City?

- Provides a fact based tool to support decisions
- Provides a database for maintaining historical information on construction, maintenance cost and performance
- Provides budgets, forecasts and needs
- It can define the “what if” scenarios for engineers and councils
- Can support the decision to assess or not
- Accountability to City Council and residents

Field Distress Surveys

Each distress type is weighted and have severity levels of low, moderate or high

Bituminous	Concrete
AC Block Cracking	PCC Corner Breaks
AC Fatigue Cracking	PCC Durability Cracking
AC Linear Cracking	PCC Linear Cracking
AC Patching	PCC Faulting
AC Bumps and Sags	PCC Blow Ups/Buckling
AC Potholes	PCC Patching
AC Raveling	PCC Joint Seal Damage
AC Edge Cracking	PCC Divided Slab
AC Rutting	PCC Scaling

Overall Condition Index (OCI)

Excellent	Good	Fair	Poor	Failed
100 - 90	90 - 70	70 - 50	50 - 25	<25

← Preventive Maintenance →

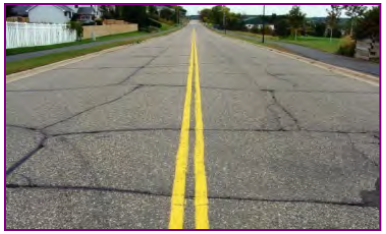
← Preservation →

← Rehabilitate/Reconstruct →

OCI = 97.01

OCI = 85.78

OCI = 76.47



OCI = 43.09

OCI = 7.15

Overall Condition Index (OCI)

Excellent	Good	Fair	Poor	Failed
100 - 90	90 - 70	70 - 50	50 - 25	<25

← Preventive Maintenance →

← Preservation →

← Rehabilitate/Reconstruct →

City Level Pavement Management

City of Lakeville, Minnesota

- Population 58,562
- A suburb 23 miles south of downtown Minneapolis in Dakota County in the State of Minnesota
- Area: 37.83 sq. miles (97.98 km²)
- 262 lane miles of roadway
- 104 miles of trails
- 37 municipal parking lots

Lakeville
A Pavement Management Case Study

- Pavement Management Overview
- Existing Pavement Conditions
- Current Pavement Management Philosophy
- Proposed Pavement Management Philosophy
- Planned Improvements
- Surrounding Pavement Management Programs
- 20 Year Budgeting Scenarios

205th Street

Existing Pavement Conditions

Ipava Avenue: OCI Range 90-100, Actual OCI = 97.01

Existing Pavement Conditions

205th Street : OCI Range 60 - 90, Actual OCI = 85.78

Existing Pavement Conditions

210th Street: OCI Range 60 - 90, Actual OCI = 76.47

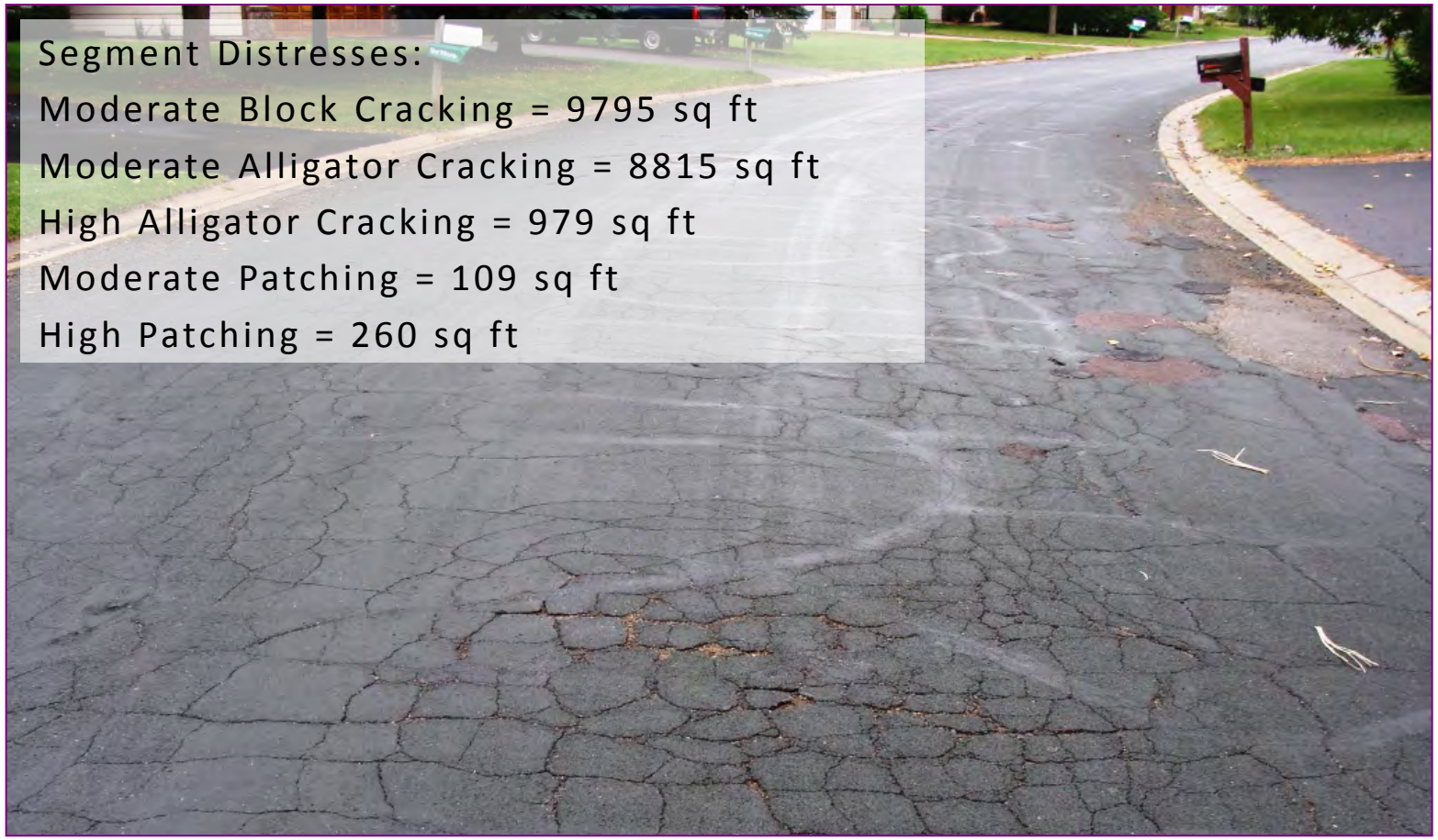
Existing Pavement Conditions

Jonquil Avenue: OCI Range 60 - 90, Actual OCI = 65.78

Existing Pavement Conditions

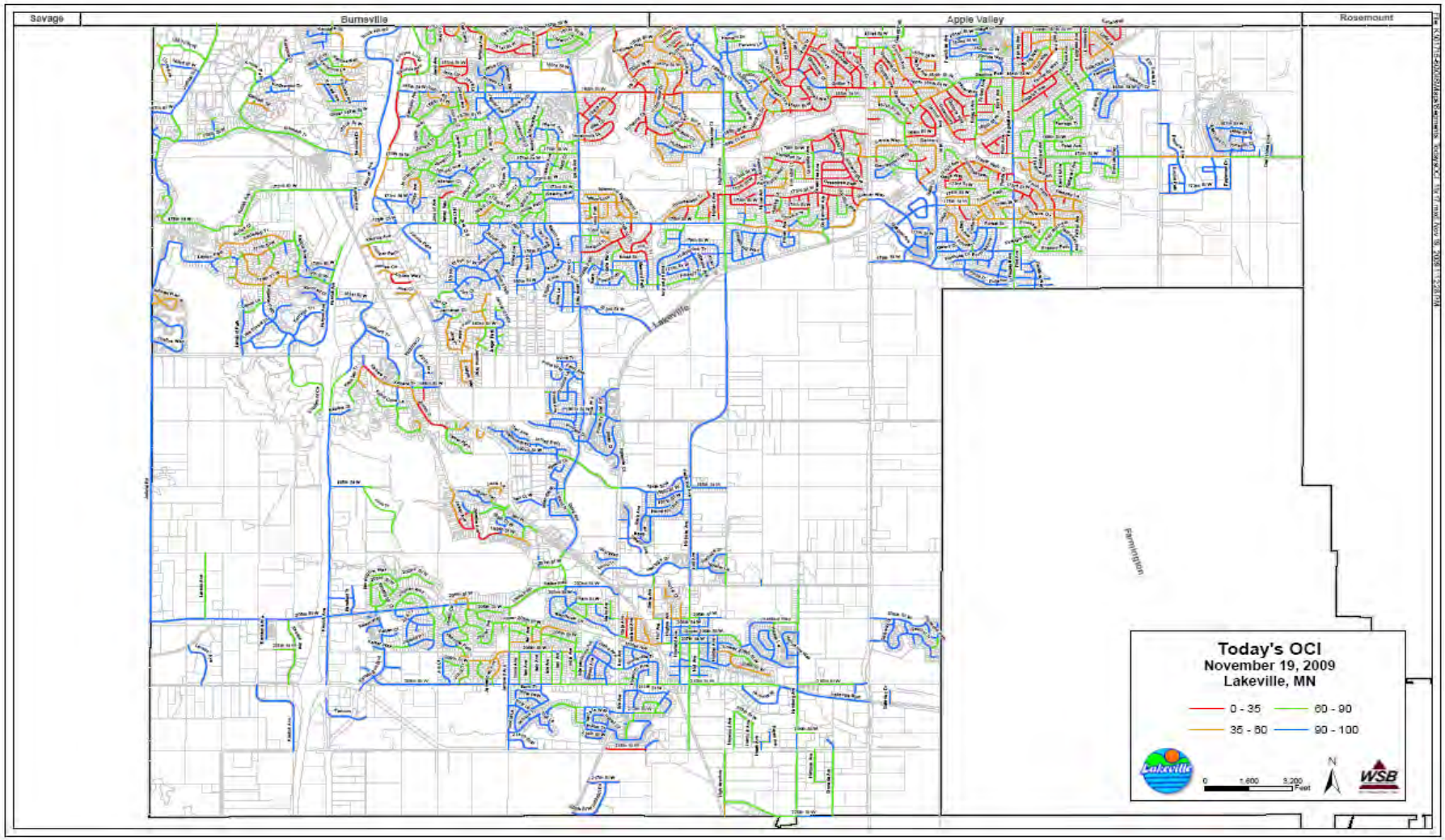
165th Street : OCI Range 35 – 60, Actual OCI = 43.09

Existing Pavement Conditions



Iceland Trail: OCI Range 0 – 35, Actual OCI = 7.15

Existing Pavement Conditions



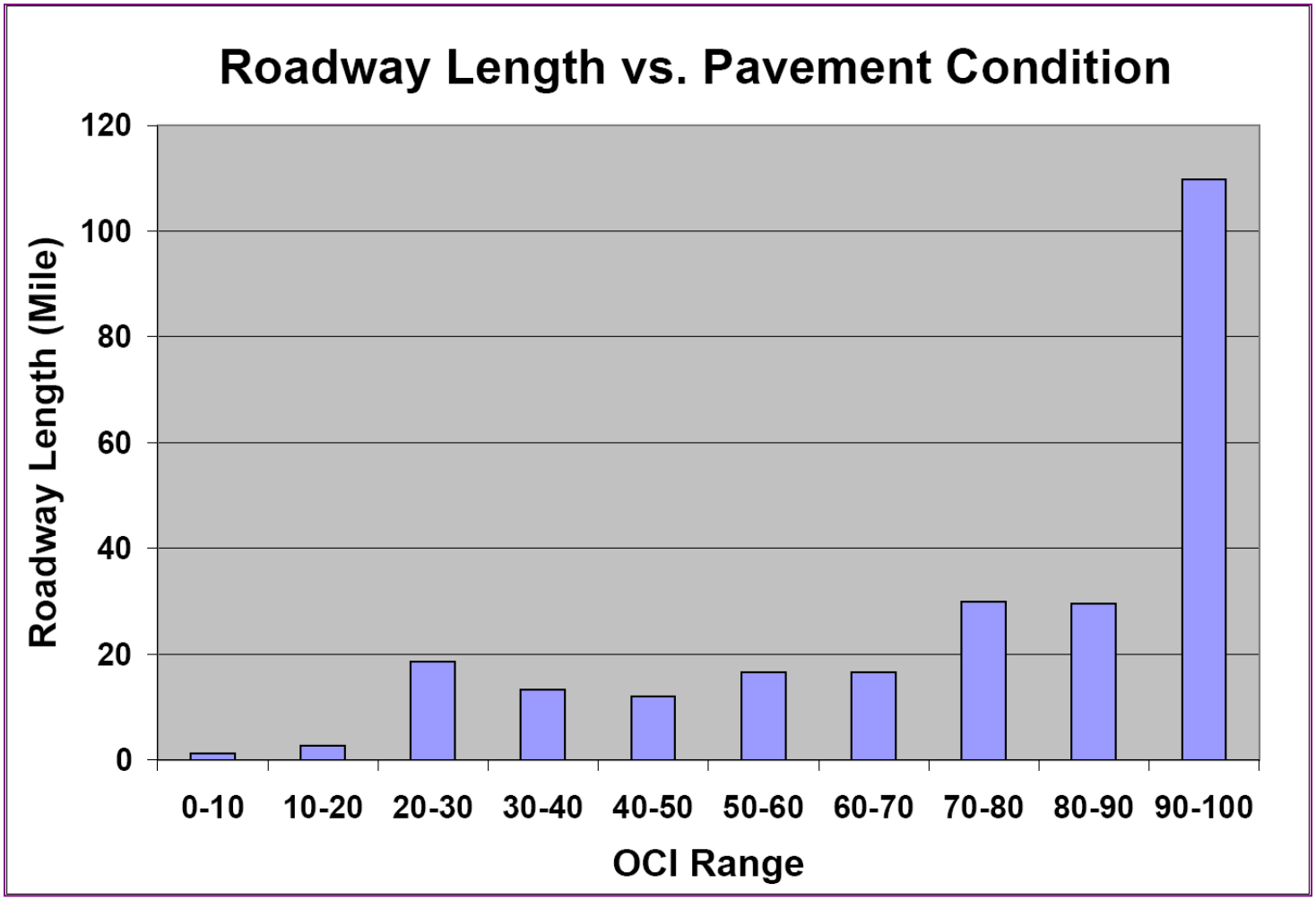
Existing Pavement Conditions

NETWORK OCI RATINGS	
OCI Range	% Roadway
0-35	11.4%
35-60	13.4%
60-90	29.0%
90-100	46.2%

NETWORK OCI RATINGS		
OCI Range	% Roadway	Length (Miles)
0 – 10	0.6%	1.2
10 – 20	1.2%	2.7
20 – 30	8.1%	18.5
30 – 40	5.9%	13.3
40 – 50	5.4%	12.0
50 – 60	7.3%	16.6
60 – 70	7.2%	16.5
70 - 80	13.1%	30.0
80 – 90	12.9%	29.6
90 - 100	38.3%	109.8

NETWORK AGE	
Age	% Roadway
0 – 5	6.9%
5 – 10	16.7%
10 – 15	22.3%
15 – 20	11.1%
20 – 25	16.3%
25 – 30	6.8%
30 – 35	5.8%
35 - 40	6.5%
40 – 45	1.9%
45 – 50+	5.8%

Existing Pavement Conditions



Current Pavement Management Program Goal

NETWORK OCI RATING		
Network Rating	Proposed Goal	Current
Lakeville	Recommend 75	77.04
Eagan	75	Approx: 80
Rosemount	75 Collector	77.38*
	60 Local	

* Weighted Average of Collector and Local Roadways

Lakeville
Pavement Management Philosophy

- Ratings are recommended to be completed every 3 years
- Street ratings to be based on COE Rating System:
- Individual street segments are given a pavement rating on a scale of 0-100 based on the recorded data
  - 0-35: Reclamation/Reconstruction
  - 36-60: Mill & Overlay / Patch / Repair
  - 61-90: Seal Coat / Crack Seal / Routine Maintenance
  - 90-100: Do Nothing / Minimal Maintenance
- Maintain higher network OCI on collector roadways

Proposed Pavement Management Philosophy
Local Roadways

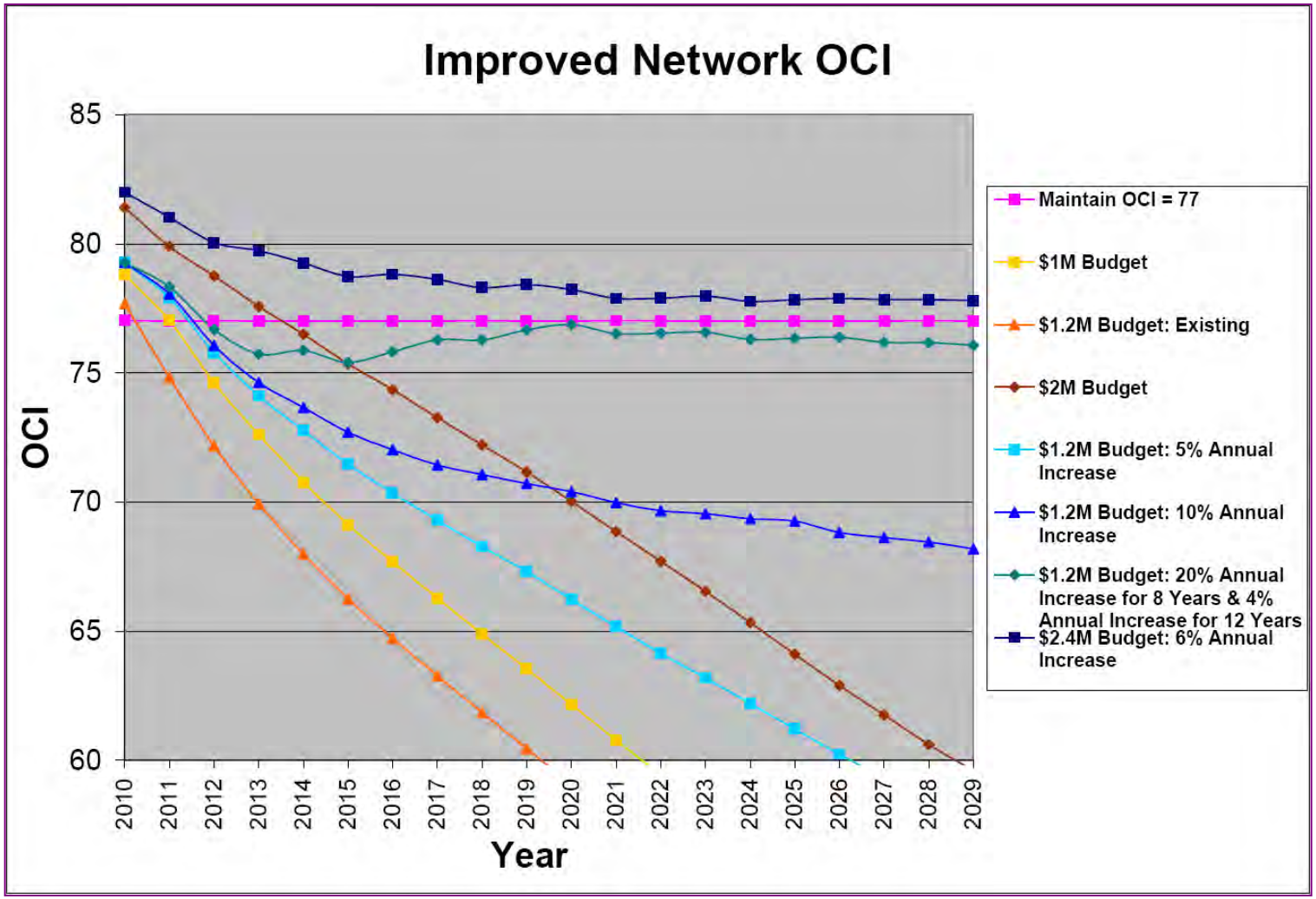
- Pavement condition and not schedule should determine maintenance activities
- Modify crack seal and seal coat schedule
- Complete overlay on local roadways

Typical Maintenance Schedule for Local Roadways				
Cumulative Pavement Age (Years)	Time Between Maintenance	Maintenance	Predicted OCI	
			Initial	Improved
0	0	New Construction	100	
2	2 Years After New Construction	Initial Crack Seal	92	100
4	2 Years After Crack Seal	2nd Crack Seal	92	100
		Chip Seal		
18 - 22	14 - 18 Years After Chip Seal	1.5" Mill & Overlay	59	83
20 - 24	2 Years after Overlay	Initial Crack Seal	78	86
22 - 26	2 Years after Chip Seal	2nd Crack Seal	81	97
		Chip Seal		
36 - 44	14 - 18 Years After Chip Seal	1.5" Mill & Overlay	58	81
38 - 46	2 Years after Overlay	Initial Crack Seal	77	85
40 - 48	2 Years after Chip Seal	2nd Crack Seal	80	96
		Chip Seal		
50 - 60	10 - 20 Years After Chip Seal	Rehabilitate/Reconstruct	35	100

Pavement Management Concerns

- Cartegraph reports should be used as a tool to make decisions, not as your decision maker
- Pavement Distress and OCI values are only part of a truly effective pavement management system
- Outcomes are only as good and reliable as the data used to populate them. Quality of data is critical!

Lakeville - 20 Year Budgeting Scenarios



General “What If” Scenarios?

- What if I increase my annual budget, how does that affect my OCI?
- What would it cost to maintain my current average OCI?
- What if I continue my current budget for the next 5 years and then increase the budget 10% going forward, how will that affect my OCI?
- What if I spent more money on preventive maintenance?
- What if I used a different PG Grade of Asphalt?
- What if I change my typical pavement section?
- What if I put in a concrete road vs bituminous?
- What if I stopped doing preventive maintenance?
- What if I do nothing?

General Pavement Management Recommendations

- Rate every segment a minimum of once every three years. In critical stages of a pavements life, monitor roads more closely
- Incorporate pavement forensics into the pavement management process
- Include past construction history and typical section information in the database

General Pavement Management Recommendations

Increase pavement data collection to include:

- Roadway section including:
  - Pavement thickness and type
  - Asphalt binder type
  - Subgrade Materials
- Traffic Volumes
- Curb and Gutter
- Trails/Sidewalk

Future Prediction Model Optimization

- Performance Curves
- Pavement Section
- Bituminous Binder
- Performance

Trail and Sidewalk Pavement Management

Lakeville - Trail and Sidewalk Pavement Management Summary

- Existing trail and sidewalk conditions
- Current trail pavement management practices
- Budget recommendations
- Proposed modification to program practices

East Lake

Trail and Sidewalk Pavement Management Overview

Factors that influence OCI value:

- –Trail or sidewalk design/typical section
- –Type, number and severity of pavement distresses
- –Maintenance
- –Structures
- –Location
- –Age
- –Faulting
- –***Events***

Ipava Avenue and 167th Street

Lakeville - Trail Classification

- Major: Trail segments with high usage
- Minor: Trail segments with lower usage
- Park / Greenway / Connector:
- Located within parks or public areas
- Other: Aggregate Surfaced Trails

Lakeville Trail and Sidewalk Summary

- Trail and sidewalk pavement management is a dynamic system, should be re-evaluated every 3 years
- Policy decisions are required to establish the network condition goals
- Recommend to revise pavement management practices
- Existing funding is not adequate to maintain the existing network condition
- An annual budget of a minimum of $164,500 would be recommended

What Do We Do?

- Link GIS data to Cartegraph
- Establish Roadway Design Segments
- Perform Field Distress Surveys
- Budget Models
- Maintenance and Rehabilitation Strategies
- Develop CIPs
- Analyze Data/Generate Reports
- Feasibility Studies
- Identify New Preventative Maintenance Techniques
- Pavement Performance Prediction Models
- Remaining Service Life Evaluations
- **Pavement Coring/Pavement Forensics**

Pavement Forensics

Questions?