

Pavement Management

in the City of Laconia

a presentation to the Laconia City Council

by Paul Moynihan, Director of Public Works and Luke Powell, Assistant Director
September 22, 2014

Laconia: 21 square miles of land area

2



82 Centerline miles of asphalt roads

3

306 Paved Roads



Pavement Management in the past

- Prioritized mainly on a “Worst First” basis.
- Citizen complaints
- Political priority

Pavement Management Program

- A philosophy of how to cost-effectively manage street pavements
- A planning tool to aid and support the decision making process
- A methodology that provides data and information for maintenance and rehabilitation (M&R) planning, programming, and budgeting.
- An analysis tool that provides statistical and historical data.
- The Paver™ program performs multiple levels of analysis to show where to best allocate scarce M&R dollars

Inventory -

- each street (branch) is broken down into manageable sections
- each section is measured for Length and width
- a use category (rank) is assigned for each section

6

The screenshot displays the PAVER 7.0.2 software interface. At the top, a menu bar includes File, System Tables and Tools, Preferences, Add-Ins, Window, and Help. Below the menu bar, a toolbar contains icons for Inventory, Reports, Selectors, and Work. A secondary toolbar shows icons for Inspection, PCI Family Models, Cond. Perf. Analysis, M&R Family Models, M&R Work Planning, and Wizards.

The main window features a 'List Selector' dialog box with the following fields:

- NetworkID: Laconia
- Name: City of Laconia
- BranchID: Union Aven
- Name: (empty)
- SectionID: 4
- From: Gilford Ave
- To: Messer St

A 'Close' button is located at the bottom right of the dialog.

The main window also displays a 'Laconia::Union Aven::4' section details window. This window has tabs for Network, Branch, and Section, with the Section tab selected. The details include:

- Section ID: 4
- From: Gilford Ave
- To: Messer St
- Surface Type: AC
- Rank: P
- Last Construction Date: 8/28/2014
- Date was back calculated
- Length: 3,000.00
- Width: 35.00 Ft
- Calculated Area: 105,000.00
- Calculate section: Area Adjustment (0.00 SqFt) True Area (105,000.00 SqFt)
- Comments: (empty text box)
- Descriptive Fields: Grade (0), Lanes (0), Category, Shoulder, StreetType, Zone

At the bottom, there are radio buttons for 'You are editing: Current Values' (selected) and 'Historical Values'. A 'Close' button is at the bottom right. A toolbar at the very bottom includes 'Images (0)', 'New', 'Copy', 'Delete', and 'Close' buttons.

Sampling

Each road section is broken down into several sample units of approximately equal size.

A random section sample unit is inspected with a condition survey in which distress type, severity, and quantity are identified and quantified.

The sample units are between 1,500 sf to 3,500 sf in size.

Court St ✓

① 1 2 3 4 5 6 7 8 9 10 11 12
 (510' x 50') Main St → Academy St
 3 s.u. @ (42' x 50') 24.7%

② 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
 (1125' x 38') Academy St → Fair St
 4 s.u. @ (70' x 38') 24.9%

③ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
 (1510' x 36') Fair St → Dukee Brook Bridge
 5 s.u. @ (75' x 36') 24.8%

④ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 (1935' x 36') Dukee Brook Bridge → Belmont Town Line
 7 s.u. @ (65' x 36') 23.5%

~~⑤ 1 2 3 4 5 6 7 8 9 10 11 12
 (725' x 34') Main St → Mason St
 3 s.u. @ (60' x 34') 24.8%~~

Lake St ✓

① 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 (1890' x 46') Union Ave → Weirs Blvd
 8 s.u. @ (55' x 46') 23.3%

length and width may change from time averaged s.u. size

Gilford Ave ✓

① 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 (3625' x 30') Union Ave → Gilford Town Line
 10 s.u. @ (90' x 30') 24.8%

Weirs Blvd ✓

① 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 (7920' x 28') Lake St → Prescott Ave
 18 s.u. @ (105' x 28') 23.9%

② 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 (7190' x 29') Prescott Ave → Traffic Circle
 16 s.u. @ (110' x 29') 24.5%

Beacon St ✓

① 1 2 3 4 5 6 7 8
 (660' x 36') Pleasant St → Water St
 2 s.u. @ (80' x 36') 24.2%

② 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
 (675' x 29') Water St → Main St
 2 s.u. @ (80' x 29') 23.7%

③ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
 (1310' x 35') Main St → Church St
 5 s.u. @ (80' x 35') 24.4%

Repair and Maintenance notes from DPW records are entered into the work history (2006 Road Improvement Budget = \$1.1 million)

2006 Road Improvements

Maintenance Shims:

Daisy Gardner Road (MC Rd to Leighton Ave)	3168'
Butler Street (Walker St to Woodland Ave)	475'
Lyman Street (Butler St to Union Ave)	264'
Woodland Avenue (Butler St to Gilford T/L)	895'
Bridge Street (Union Ave to end)	125'
Pump Station Road (Shore Dr to Lynnewood Rd)	315'
Messer Street (Church St to RR x-ing)	350'
Court Street (Belmont T/L to 1005' East, 1 lane)	500'

$6892' \div 5280 = 1.15$ miles

Shim & Overlays:

Davis Place (Union Ave to end) Complete work	875'
Stafford Street (Union Ave to Bisson Ave)	850'
Severance Road (Parade Road to Hadley Road)	1,600'

$3325' \div 5280 = 0.63$ miles

Reconstitution & Overlays:

Arch/River Street (Union Ave to Jewett St)	675'
Baker Avenue (Centenary Ave to end)	300'
Cherry Street (Gillette St to end)	315'
Gillette Street (Highland St to Paul Ave)	1,165'
Orchard Street (Gale Ave to end)	745'
Simpson Avenue (Weeks St to end)	315'
Union Avenue (Messer St to Elm St)	2,750'
Laurel Street (Union Ave to Mechanic St)	260'

$6525' \div 5280 = 1.24$ miles

Total 2006 Road Improvement Mileage = 3.02 miles

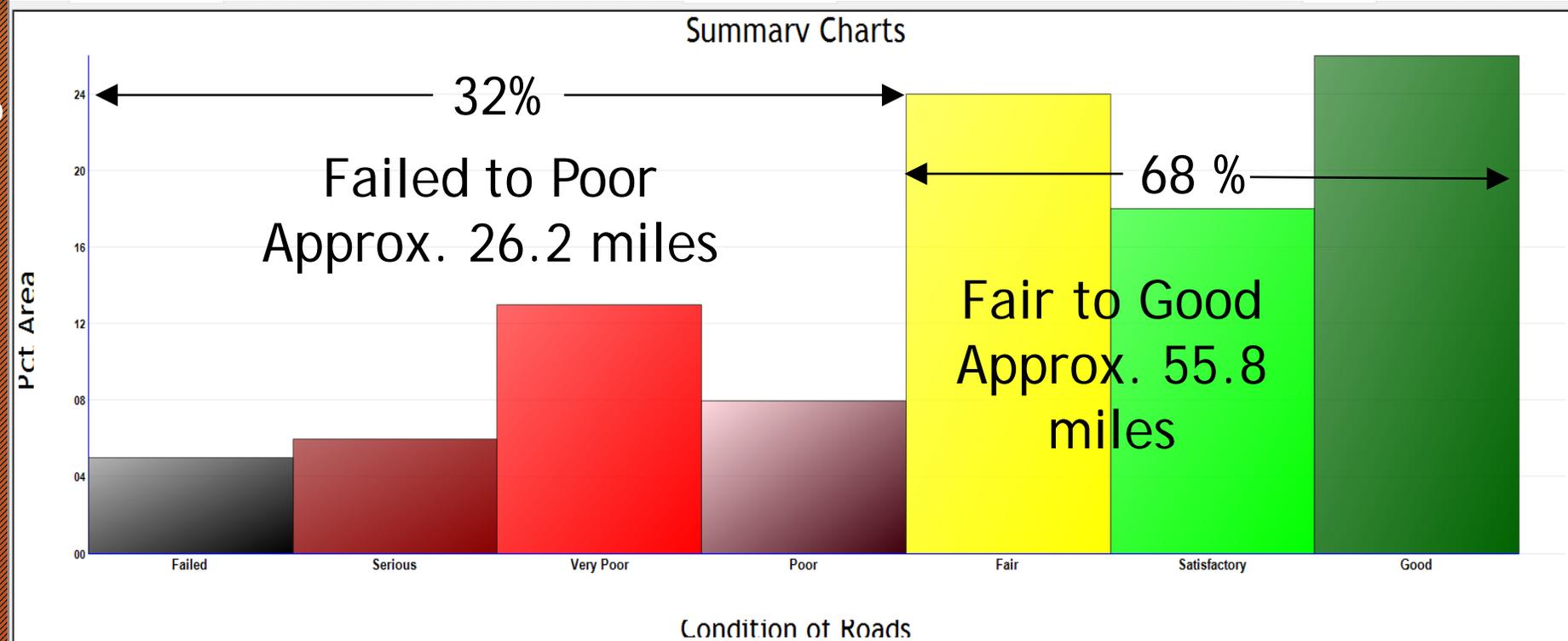
The screenshot displays the PAVER 7.0.2 software interface. The main window shows project details for 'Laconia: Union Aven::5'. A 'List Selector' dialog is open, showing 'NetworkID' as 'Laconia', 'Name' as 'City of Laconia', 'BranchID' as 'Union Aven', and 'SectionID' as '5'. The main window has tabs for 'Network', 'Branch', and 'Section'. The 'Section' tab is active, showing details for 'Sect 5' from 'Messer St' to 'Elm St'. The 'Surf' is 'AC' and 'Last' is '6/1/2006'. The length is '2,600.00' and the width is '4' feet. The calculated area is '106,600.00'. The 'Calculate' section shows 'A' selected with '0.0' and '10' values. The 'Descriptive Families' list includes 'Grade', 'Lanes', 'Category', 'Shoulder', 'StreetType', and 'Zone'. The 'Comments' field contains 'measured 5/28/13 NC'. At the bottom, there are buttons for 'Images', 'New', 'Copy', 'Delete', and 'Close'. A secondary window titled 'Laconia: Union Aven::5' shows a 'Work' table with columns for 'Date', 'PROJECT', 'PHASE', 'Work', 'Work Code', 'Quantity', and 'Quantity Units'. The table contains one entry: '06/01/2006', 'Union Ave', 'Complete Reconstruction - AC', 'CR-AC', '106600.00', and 'SqFt'. Buttons for 'Add', 'Edit', 'Copy', and 'Delete' are at the bottom of this window.

During the summers of 2012 and 2013 the city hired an engineering student from UNH to conduct sampling. *Condition Snapshot*

Avg. PCI = 63

- Failed to Poor = 32%
- Fair to Good = 68%

Condition	PCI
Good:	86 - 100
Satisfactory:	71 - 85
Fair:	56 - 70
Poor:	41 - 55
Very Poor:	26 - 40
Serious:	11 - 25
Failed:	0 - 10

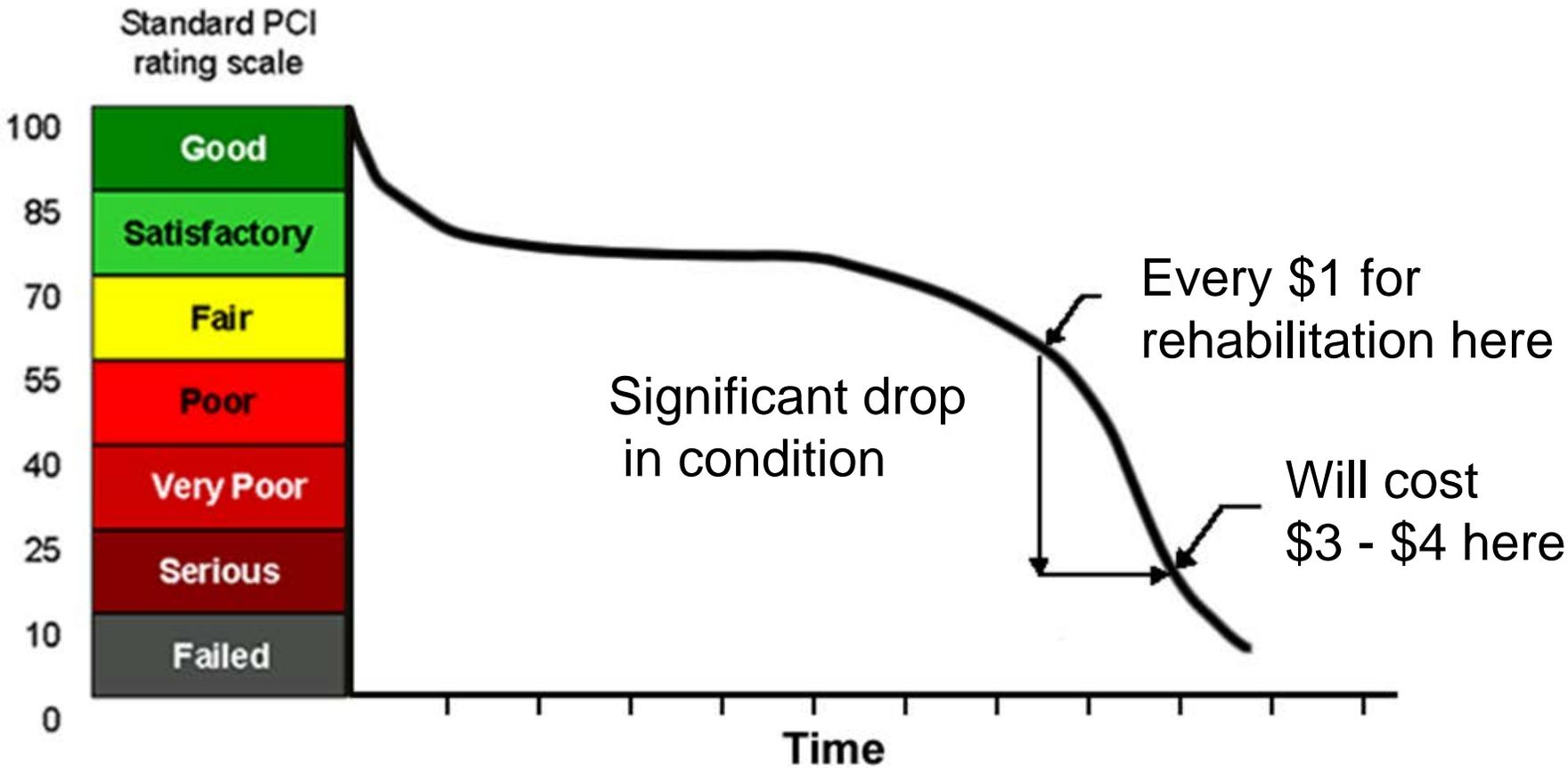


Condition Category	Pct Area	Pavement Area	Unit	Num Sections	Pct Sections	Age at Report	Wt Age	Avg Age at Insp	Wt Avg Age at Insp	Avg Condition	Wt Avg Condition
Failed	5	552,970	SqFt	31	8	111	113	109	111	4.97	5.89
Serious	6	708,975	SqFt	40	10	99	101	97	99	17.8	18.8
Very Poor	13	1,415,650	SqFt	61	15	86	75	84	73	34.15	34.62
Poor	8	851,930	SqFt	37	9	71	57	69	55	47.7	46.24
Fair	24	2,687,745	SqFt	61	15	57	45	55	44	63.1	63.19
Satisfactory	18	1,966,511	SqFt	65	16	44	53	42	52	78.28	76.95
Good	26	2,816,362	SqFt	116	28	29	27	23	23	95.71	95.83

PCI: Pavement Condition Index

Pavements should be managed, not simply maintained!

10



PCI Factors

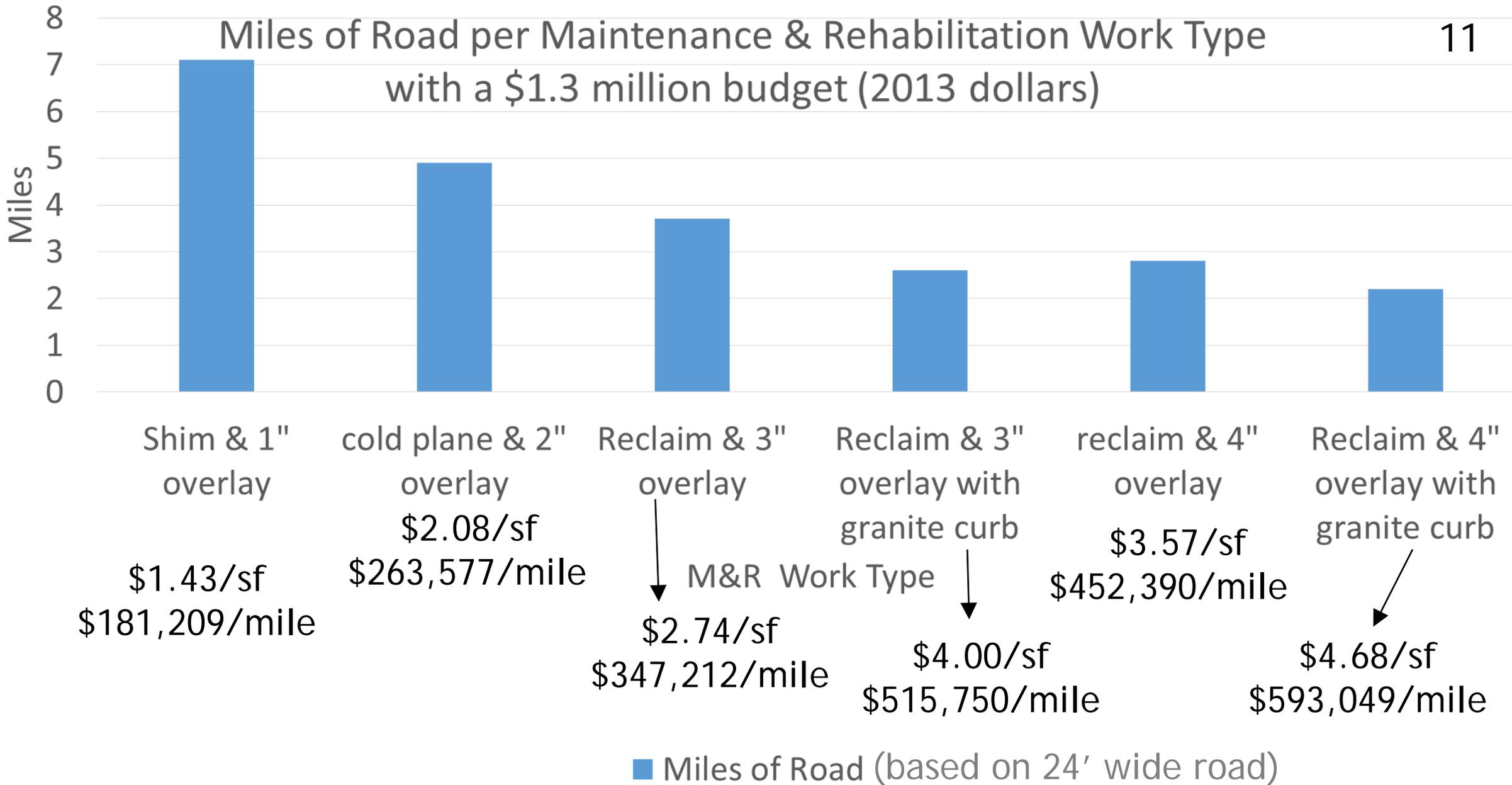
- Distress Type
- Distress Severity
- Distress Quantity

PCI is

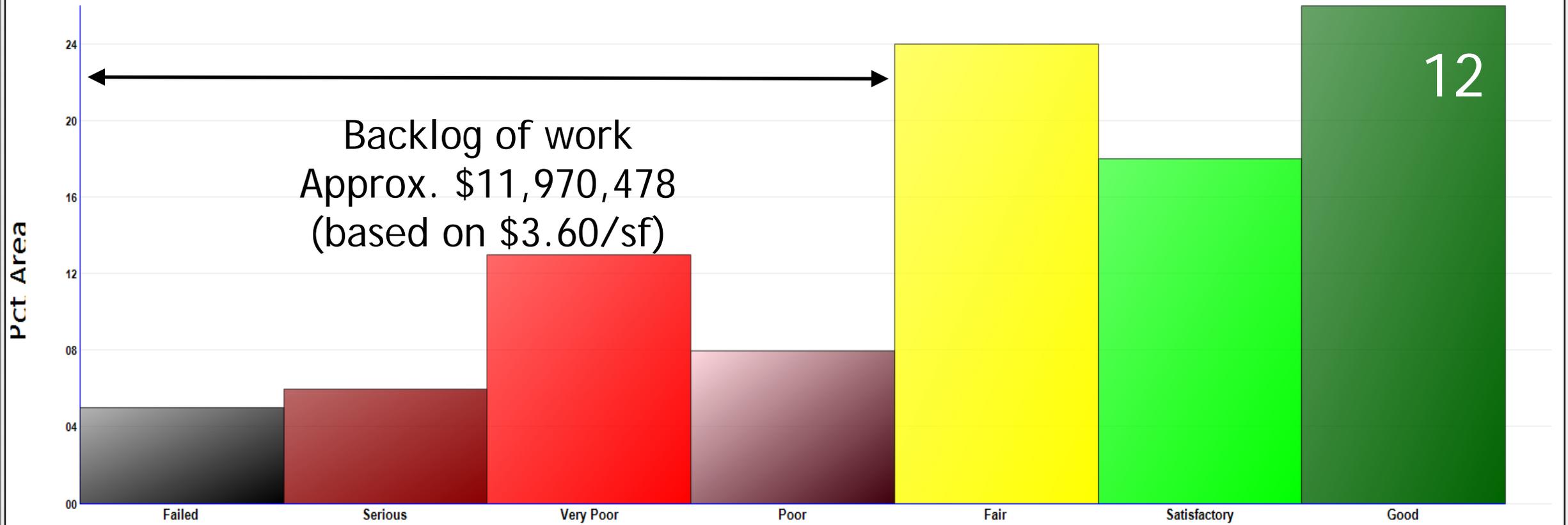
- ASTM standard
- Complies with GASB
- Used in over 600 cities, counties, and towns worldwide
- Recommended by APWA

Miles of Road per Maintenance & Rehabilitation Work Type with a \$1.3 million budget (2013 dollars)

11



Summary Charts



Condition of Roads

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Pavement Distresses

13

Cottage Street

Alligator (Fatigue) Cracking
high severity

Section PCI = 33

Cause: fatigue failure of
surface under repeated
traffic loading.



Baldwin Street

14

Transverse Cracking
low severity

Section PCI = 59

Cause:

- shrinkage of asphalt due to temperature extremes
- Reflective cracking from below.



Longitudinal Crack
medium severity

Section PCI = 60

Cause: Shrinkage due to
temperature fluctuation or
hardening of asphalt

Shore Drive

15



Lynnewood Road

16

Edge Cracking, rutting, and alligator cracking

high level of severity

Section PCI = 37

Cause: weakened base or sub-grade.



Court Street

17

Pothole
medium severity

Section PCI= 23

Cause: Severe alligator cracking often progresses to pothole formation. Load stress and freeze/thaw related.



Union Avenue

18

Rutting / Alligator Cracking
high severity

Section PCI = 62

Cause:

- Load stress
- Retaining wall stress



Delamination
medium severity

Section PCI = 75

Cause: In discussion

North Main Street

19



Utility Cut Patching

Road Section PCI = 78
medium severity

A patch is considered a defect no matter how well it is performing.

Mechanic Street

20



Weirs Boulevard - Good - PCI 100)

21



Academy St. - Good - PCI 95

22



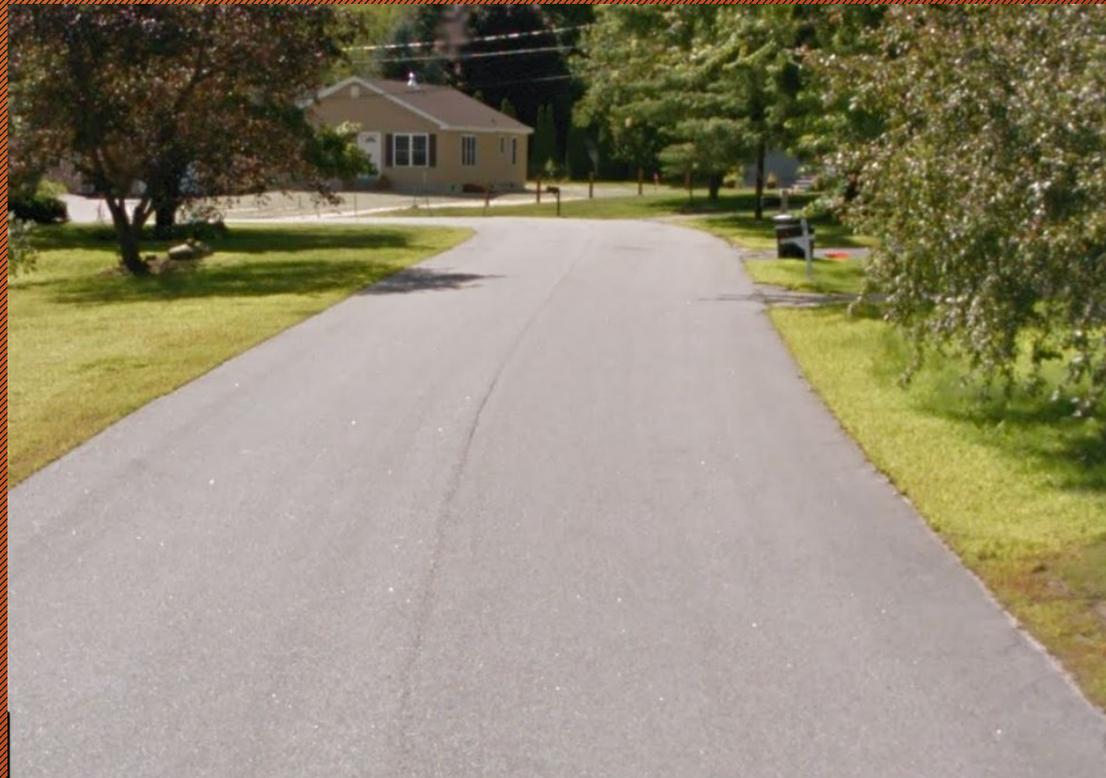
Garfield St. - Good - PCI 88

23



Elizabeth Terr. - Satisfact. - PCI 85

24



Fair St. – Satisfactory – PCI 71

25



Primrose Dr. So. - Satisf. - PCI 70

26



Sanborn St. - Fair - PCI 65

27



Roller Coaster Rd. - Fair - PCI 57

28



Dixon St. - Poor - PCI 42

29



Wentworth Cv. Rd. – Poor – PCI 43

30



Lucerne Ave. -- Very Poor – PCI 34

31



Monroe St. – Very Poor – PCI 26

32



Cole St. - Serious - PCI 13

33



Bell St. - Failed - PCI 9

34



Frank Beane Rd. - Failed - PCI 4

35



Cleveland Place - Failed - PCI 0

36



Recap of Points Considered

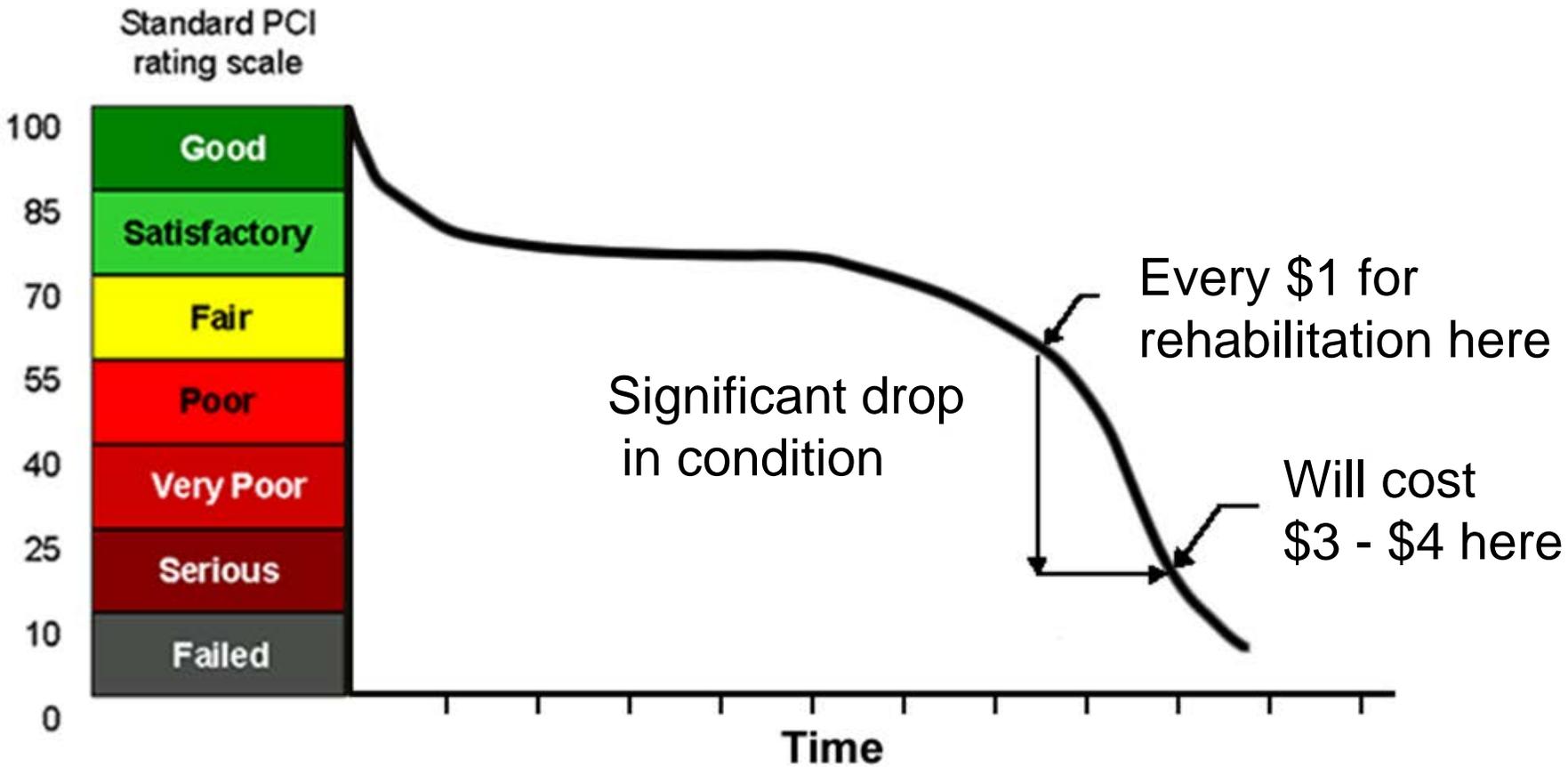
37

- Field Inventory completed (2012-2013)
- PCI's for each road section determined
- Average PCI for Laconia roadways is 63
- Deterioration (Condition Prediction) Curves

PCI: Pavement Condition Index

Pavements should be managed, not simply maintained!

38



PCI Factors

- Distress Type
- Distress Severity
- Distress Quantity

PCI is

- ASTM standard
- Complies with GASB
- Used in over 600 cities, counties, and towns worldwide
- Recommended by APWA

Recap Continued

39

- Time Line for Reconstructed (Reclaim & Pave) roadways to reach the PCI 70 threshold is 8 to 12 years.
- Time Line for Re-surfaced (Shim & Overlay) roadways to reach the PCI 70 threshold is 7 to 10 years.

Laconia Appropriations for Road Improvements (2004 thru 2012)

40

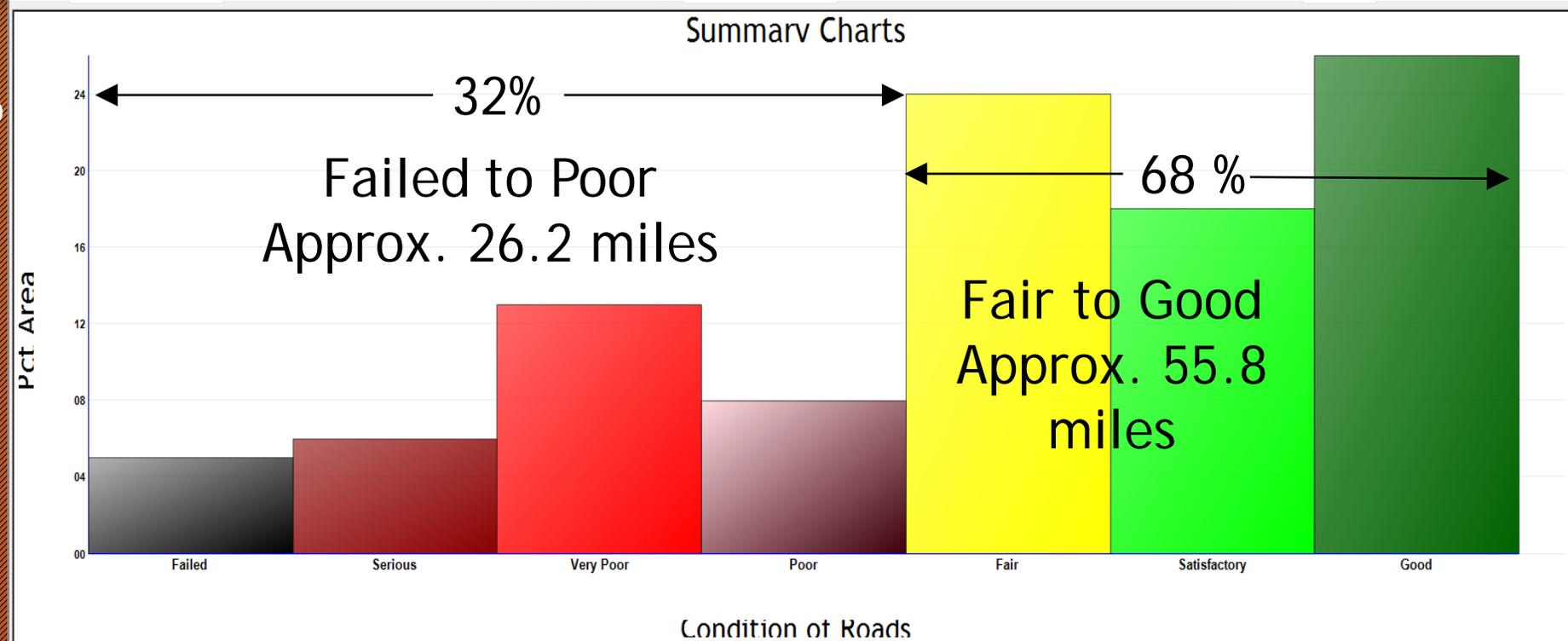
- \$ 9.9 Million - Total
- 2004-2006 - \$ 3.5 M - 16.1 Miles of Upgrade
- 2007-2009 - \$ 3.1 M - 8.24 Miles of Upgrade
- 2010-2012 - \$ 3.3 M - 7.02 Miles of Upgrade
- 31.36 Miles - Total

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Backlog of Work (2013 Unit Prices)

42

- Failed, Serious, Very Poor & Poor Roads
- \$ 3.60/SF x 0.32 x 82 Mi. x 5280 ft. x 24 ft.
= \$ 11,970,478.

-
- Fair, Satisfactory & Good Roads
 - \$ 1.60/SF x 0.68 x 82 Mi. x 5280 ft. x 24 ft.
= \$ 11,305,451.

Total - \$ 23.3 Million

DPW Goals in Progressing with the PAVER Program

43

- Move away from being driven by “Worst-First” road repair philosophy to a “Pavement Management Philosophy”.
- Level Funding will result in drop in Average PCI.
- Request Program Funding at levels that will allow for early intervention on the roads in the PCI 60+ category.

DPW Request for 2015 - 2016 Road Improvement Program.

44

- \$ 1.3 Million for road upgrades in the Poor through Failed category (PCI 55 and below)
- \$ 500 K for road upgrades in the Fair through Satisfactory category (PCI 56 through 85)
- Total = \$1.8 million

Other Considerations

- Administer Pavement Protection Ordinance
- Utility Factor / Water, sewer, drain, gas, telephone, electric.
- Three Year List
- Gravel Roads - approximately 6 miles