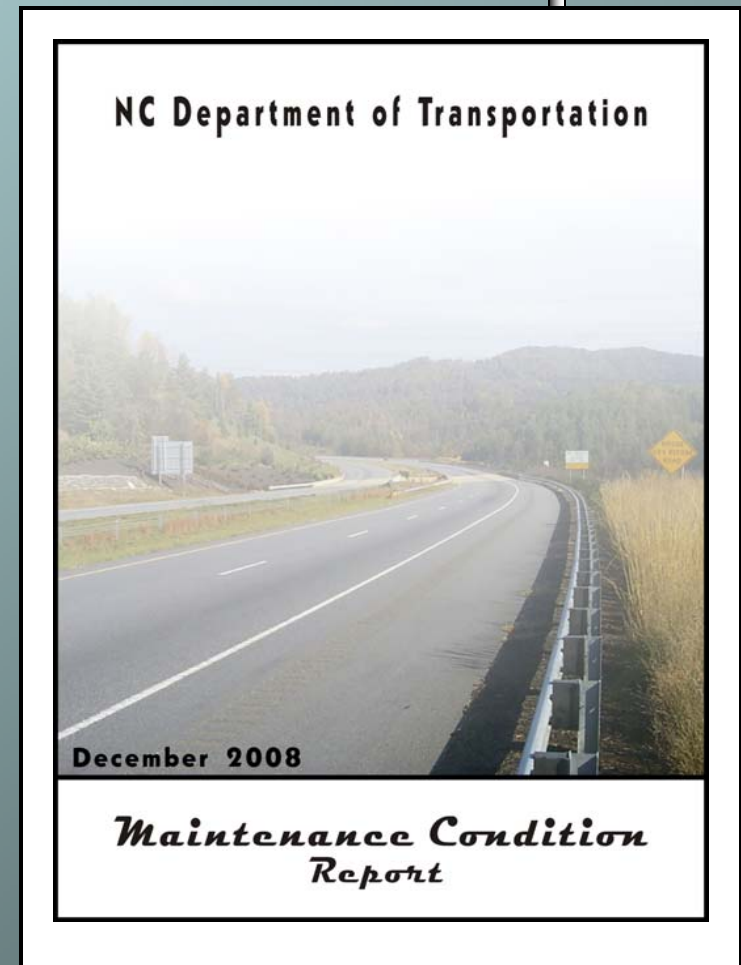


Condition Assessment & Funding Needs for North Carolina's Highway System

Report to the Joint Legislative Transportation Oversight Committee

December 10, 2008

Lacy D. Love, PE



Condition Assessment & Funding Needs For North Carolina's Highway System

- Reporting Requirements
- Overview of the Highway System
- Performance Based Management
- Condition Assessment Results
 - Roads
 - Bridges
 - Pavements
 - Highway Operations
- Conclusions
 - Funding Needs
 - Condition Scenarios

Biennial Report on Maintenance Requirements

G.S. 136-44.3

- Revised in 2007 and Now Requires NCDOT to:
 - Establish Performance Standards
 - Project an annual cost to meet and sustain the performance standards for routine maintenance and operations
 - Develop a cost for Pavement and Bridge Preservation
 - Develop a cost for Pavement and Bridge Rehabilitation
 - Project System Condition at optimal funding for 7 years

North Carolina State Highway System

Since the Highway Trust Fund was enacted:

1989

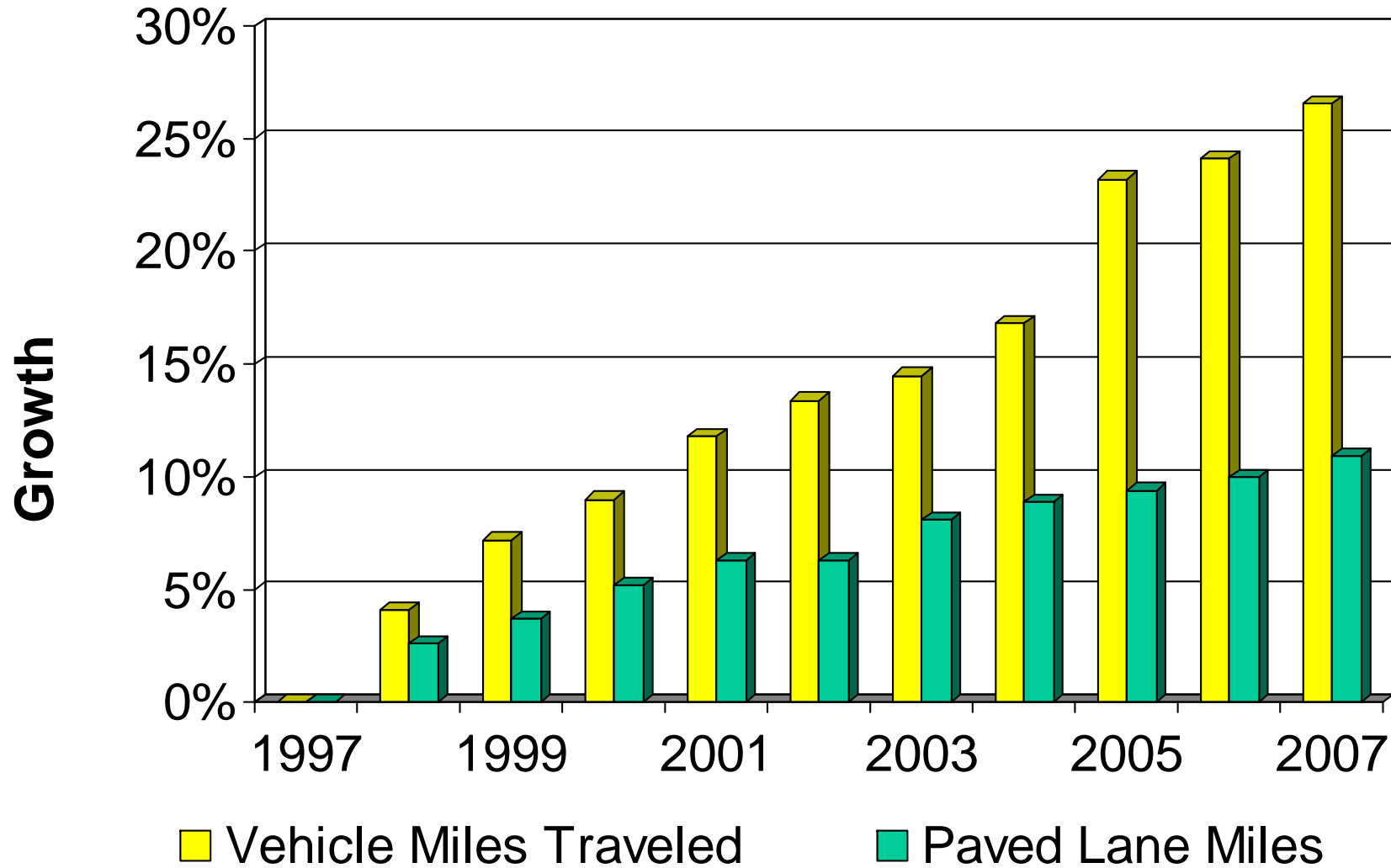
- **76,808 road miles**
- **127,809 paved lane miles**
- **16,104 miles of unpaved roads**
- **16,900 structures**
- **61.1 M sf bridge deck area**

2007

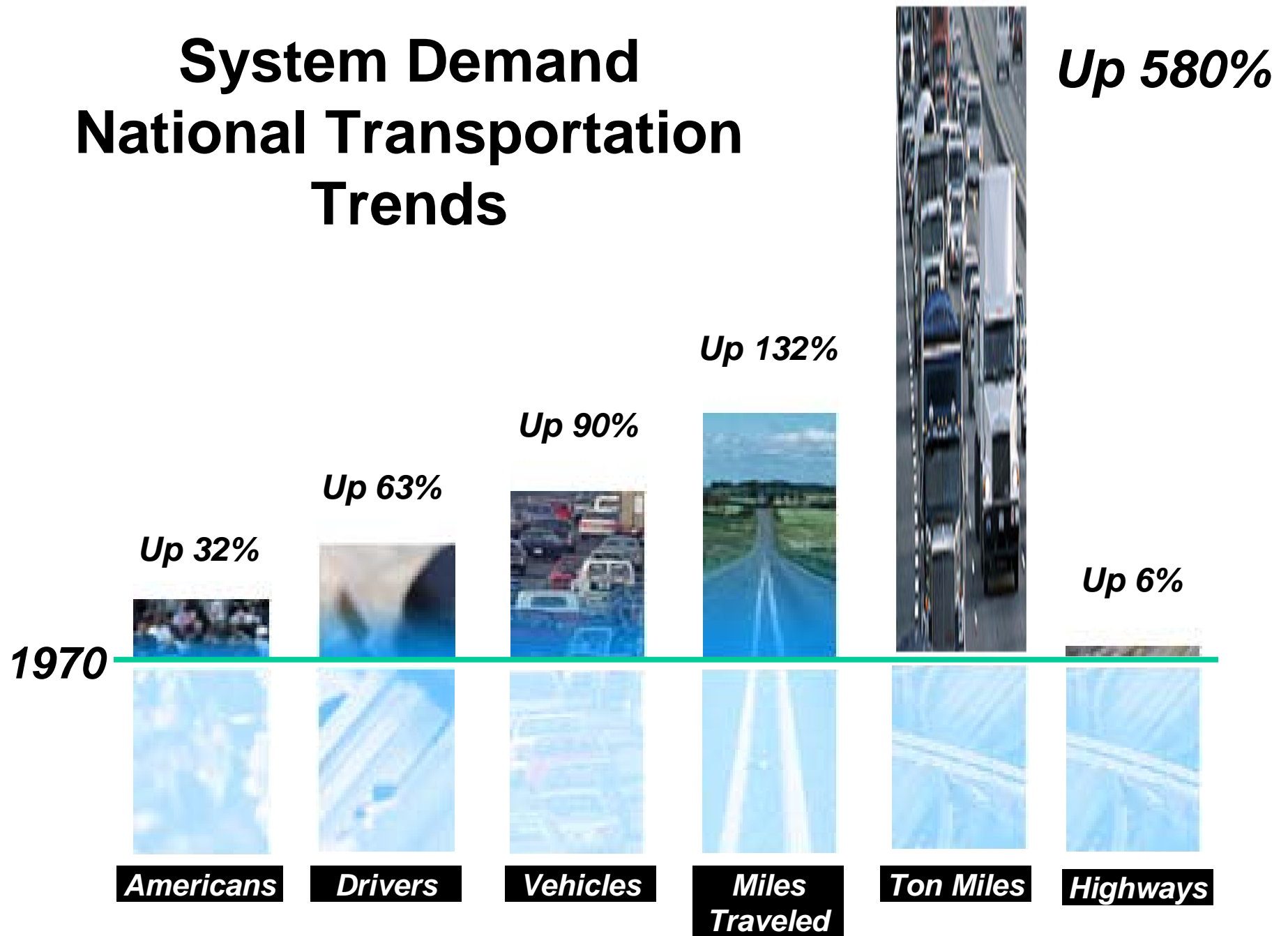
- **79,261 road miles**
- **162,740 paved lane miles**
- **4,876 miles of unpaved roads**
- **18,018 structures**
- **83.5 M sf bridge deck area**

Highway System Usage

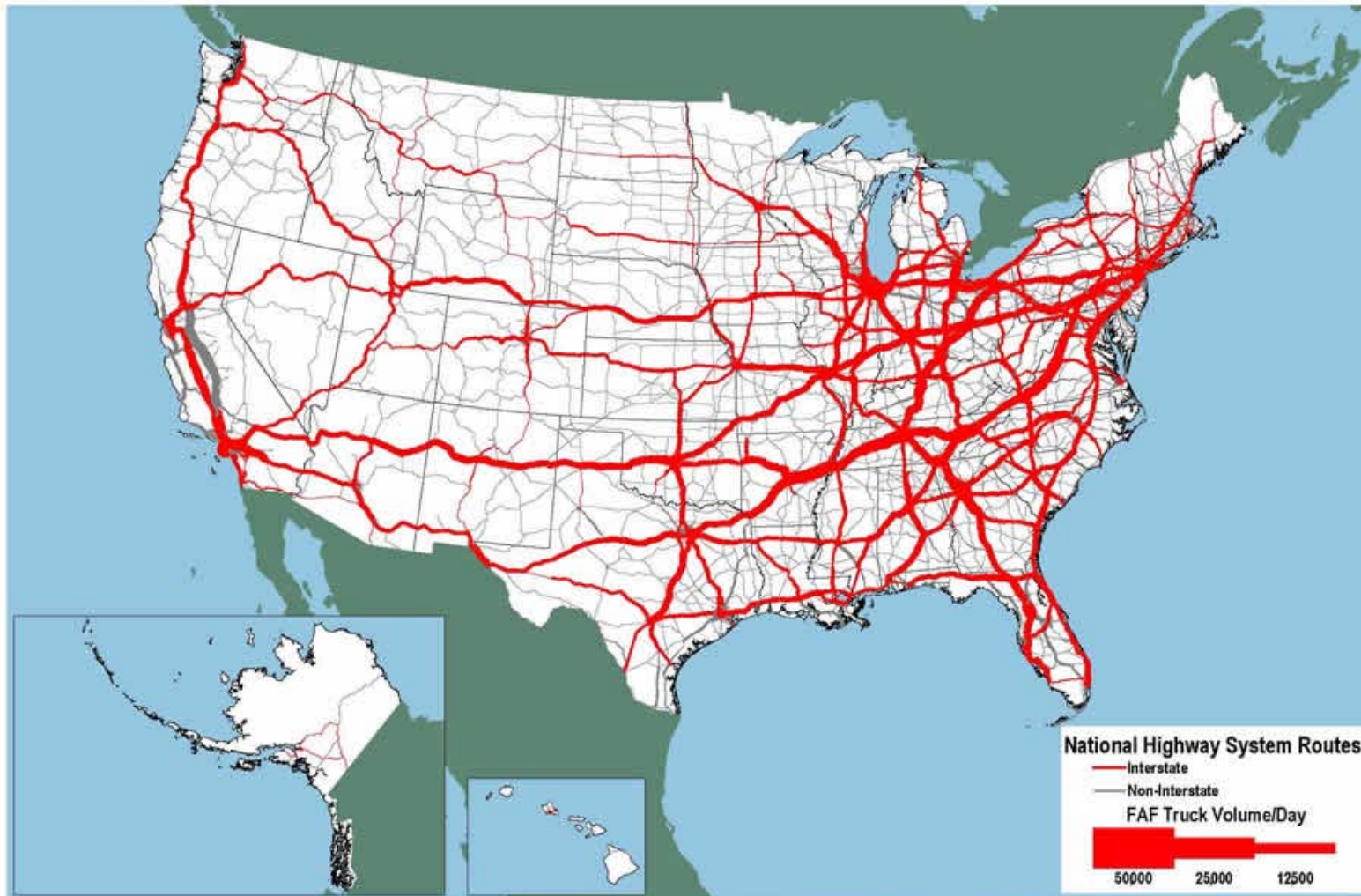
(Vehicle Miles Traveled)



System Demand National Transportation Trends



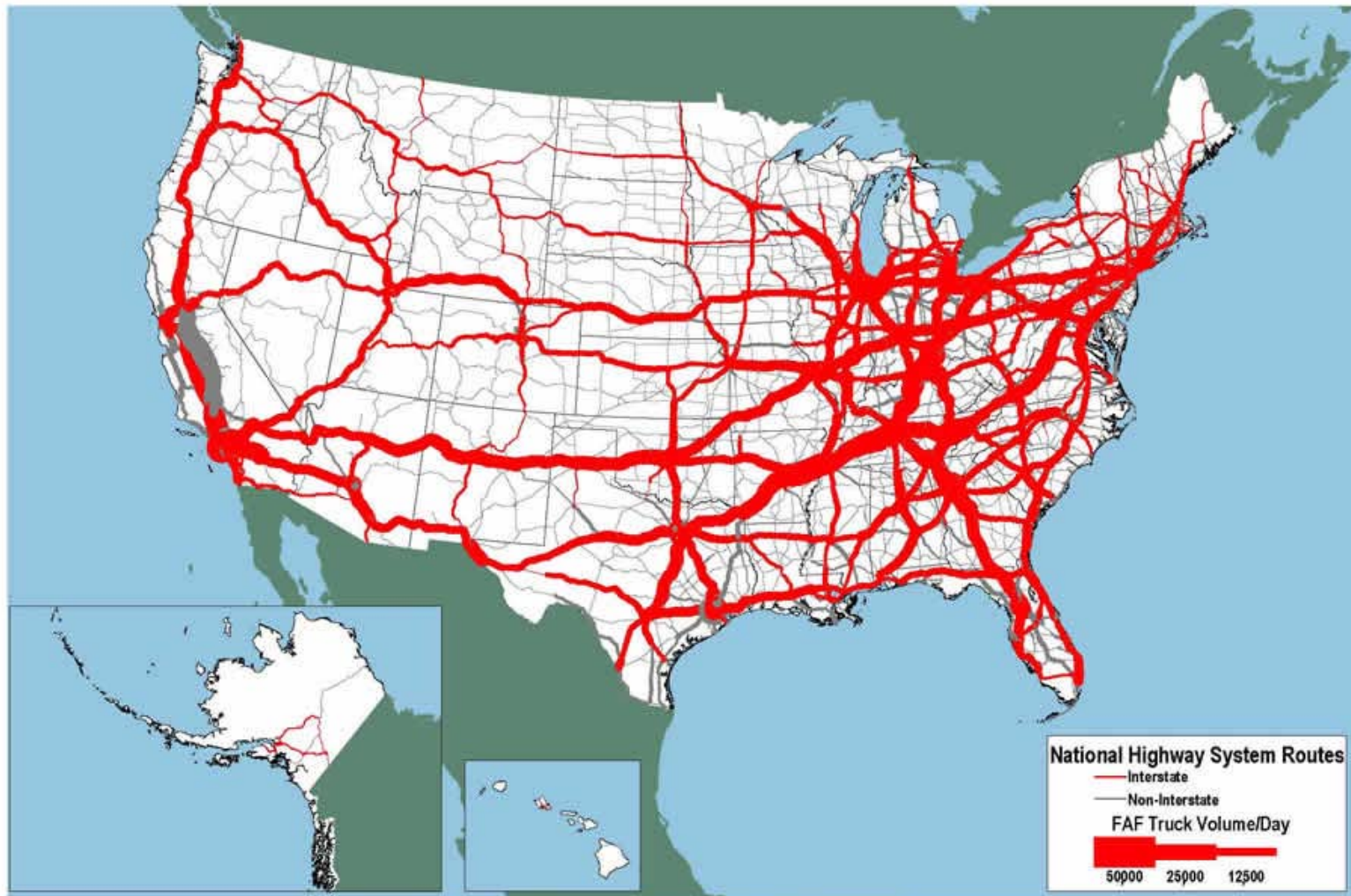
Truck Volumes - NHS - 2002



Note: Long-haul freight trucks serve locations at least 50 miles apart, excluding trucks that are used in intermodal movements.

Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 2.2, 2007.

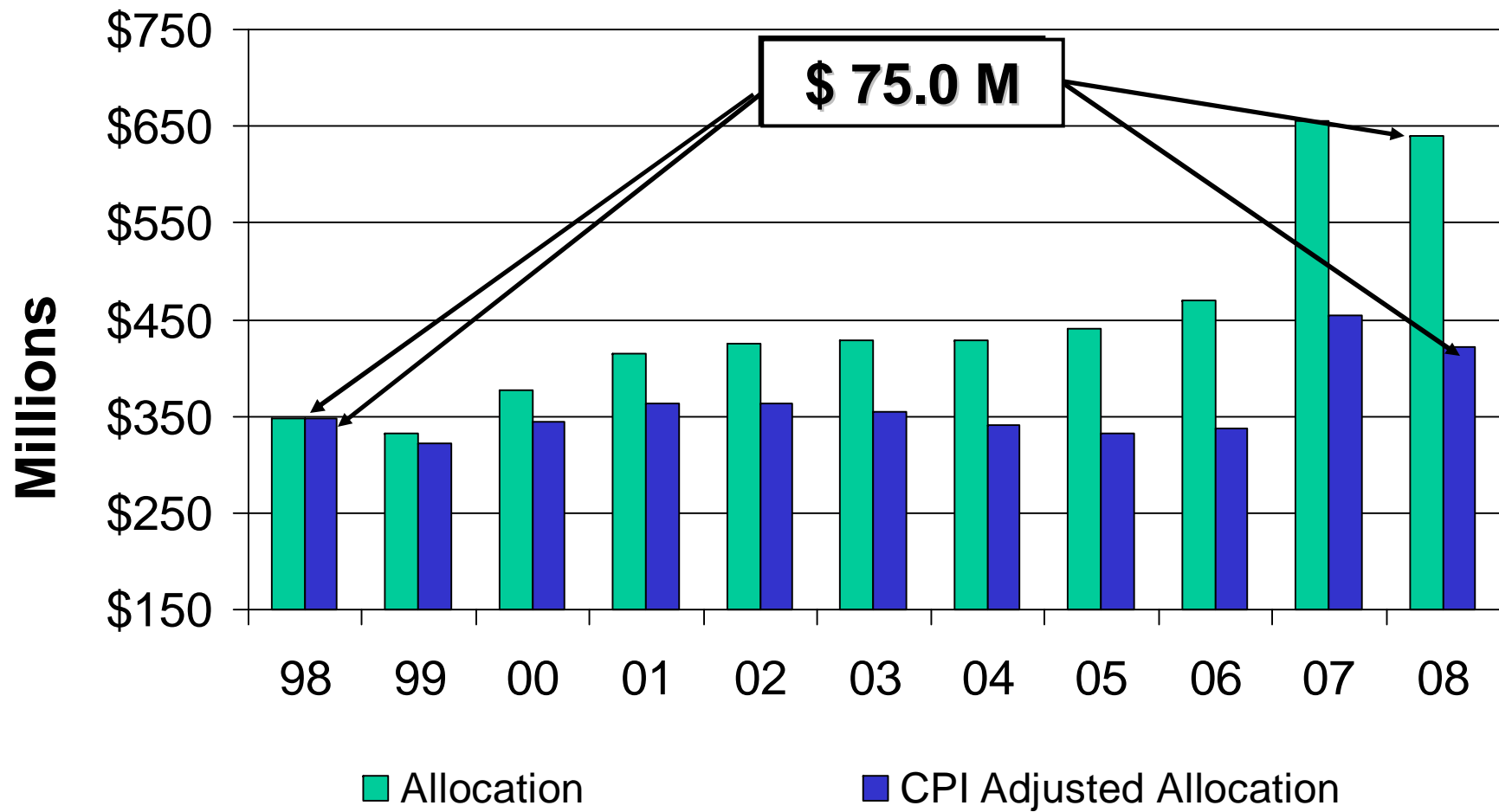
Truck Volumes - NHS - 2035



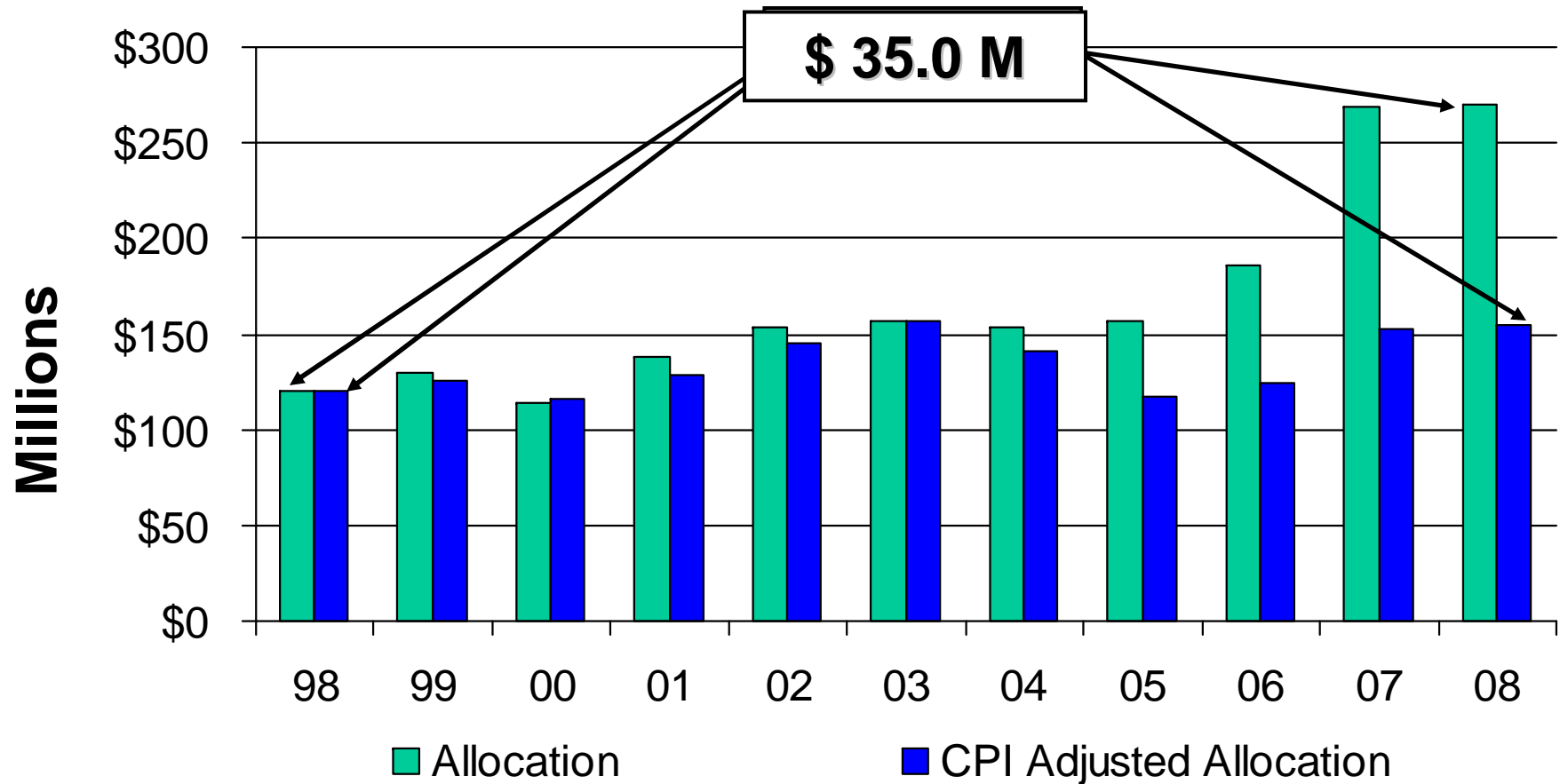
Note: Long-haul freight trucks serve locations at least 50 miles apart, excluding trucks that are used in intermodal movements.

Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 2.2, 2007.

History of Routine Maintenance Funding



History of Resurfacing Funding



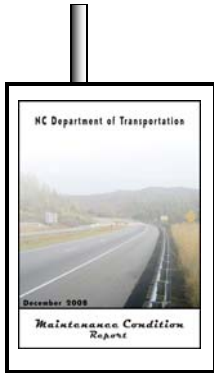


Performance Based Management

- Initiative began in 2005

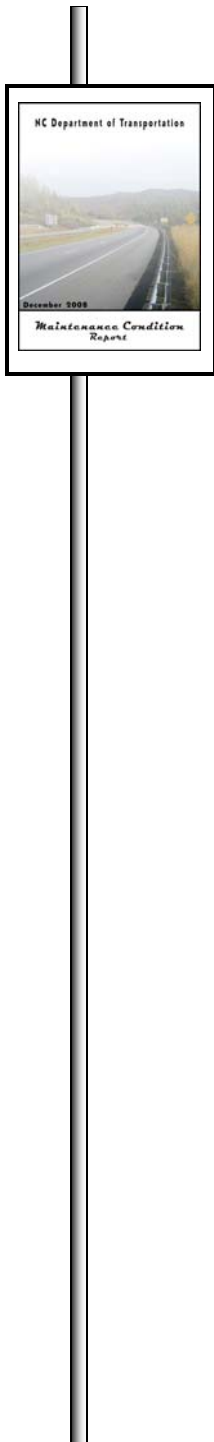
Goals:

- Move from reactive to outcome based operations
- Clear mission & expectations for operations
- Strategies consistent with the Statewide Long Range Plan
- Establish Performance Measures and Targets
- Implement management tools/systems to measure outcomes & performance
- Sustainable performance over the long term
- Management flexibility with accountability



Performance Measures

- Clearly defined outcomes
such as:
 - No unsealed cracks in pavements
 - Bridge decks rating greater than 6
 - No pipes blocked or damaged
 - Pavement markings visible at night
- Uses data to determine progress toward outcomes
- Measures effectiveness of programs and operations
- Simple, understandable, logical, repeatable



Performance Measures - Example

Functional Work Group Worksheet					T-1
Element:	Traffic & ITS				
Asset:	Long Line Pavement Markings				
Activities:	Present, visible and reflective				
Condition Indicator:	Visible				
Performance Measure:	Linear feet that are visible at night				
LOS Category	LOS Description				
A	Less than 5% are not visible				
B	5-10% are not visible				
C	11-20% are not visible				
D	21-30% are not visible				
F	More than 30% are not visible				
		Interstate	Primary	Secondary	
Performance Target		A	B	C	

Performance Measures - Summary

SHEET NO.	ASSET	PERFORMANCE MEASURE	Interstate		Primary		Secondary	
			SCORE	LOS	SCORE	LOS	SCORE	LOS
P-1	Paved Shoulders	Pavement failures are repaired	90	A	85	B	80	C
P-2	Asphalt Pavement	Potholes fixed, rut depths <.25", cracks >.5" sealed	95	A	90	B	85	C
P-3	Concrete Pavement	Patching done on punchouts, sealed cracks	95	A	90	B	85	C
B-2	Bridge Deck	% of decks rating greater than or equal to 6	85	A	80	B	75	C
B-3	Superstructure	% of superstructure rating greater than or equal to 6	90	A	85	B	80	C
B-4	Substructure	% of substructure rating greater than or equal to 6	90	A	85	B	80	C
B-5	NBIS Culvers	% of Culverts rating greater than or equal to 6	90	A	85	B	80	C
B-6	Non-NBIS Culvers	% of culverts in good condition	80	A	70	B	60	C
B-7	Overhead Signs Structures	% of overhead sign structures in good condition	95	A	92	B	88	C
B-8	Drawbridge Maintenance	Condition Rating > =6	100	B	100	B	100	B
B-9	Tunnel	Tunnel Condition Rating >= 6	100	B	100	B	100	B
RM-1	Unpaved Shoulders (Low Shoulder)	No dropoff's greater than 2 inches	95	B	95	B	92	C
RM-2	Unpaved Shoulders (High Shoulder)	No shoulders higher than 1 inch	95	B	95	B	92	C
RM-3	Ditches (Lateral Ditches)	No blocked, eroded or non functioning ditches	95	B	95	B	92	C
RM-4	Crossline Pipes (Blocked)	Greater than 50% diameter open	95	A	90	B	85	C
RM-5	Crossline Pipes (Damaged)	No damage or structural deficiency	95	A	90	B	85	C
RM-6	Curb & Gutter (Blocked)	No obstruction greater than 2 inches for 2 feet	95	B	92	C	92	C
RM-7	Curb & Gutter (Damaged)	No damage	95	B	92	C	92	C
RM-8	Drop Inlets, Catch Basins etc. (Blocked)	Grates and inlets not blocked greater than 50%	98	A	95	B	92	B
RM-9	Drop Inlets, CB's etc. (Damaged)	Inlets and outlets are not damaged	98	A	95	B	92	C
RM-10	Guardrail/Cable Rail/Conc Median Rail	Rail is functional	99	A	97	B	95	C
RM-11	Impact Attenuators	Properly functioning as designed and operational	99	A	97	B	97	B
R-1	Vegetation (Mowing)	Grass height not to exceed 15 inches	90	A	85	B	80	C
R-2	Vegetation (Brush & Tree Management)	of ditch or shoulder point	90	A	85	B	80	C
R-3	Vegetation (Turf Condition)	Free of bare, dead, diseased, distressed, or weedy areas	90	A	85	B	80	C
R-4	Vegetation (Uncontrolled Growth)	bottom of rail, and uniform with roadside at signs	70	A	65	B	60	C
R-5	Litter & Debris	Less than 100 pieces of litter or debris	90	A	85	B	80	C
R-6	Storm Water Devices (NPDES)	Functioning as designed	90	B	90	B	90	B
R-7	Landscape Plant Beds	mulch, unwanted vegetation	90	B	90	B	90	B
R-8	ROW Fence	Functioning as designed and undamaged	94	B	94	B	94	B
T-1	Long Line Pvm. Markings	Present, visible and reflective at night	95	A	90	B	80	C
T-2	Words and Symbols	Present, visible and reflective at night	95	A	90	B	80	C
T-3	Pavement Markers	Present and reflective	95	A	85	B	80	C
T-4	Ground Mounted Signs (including lights)	Visible and legible	92	A	85	B	85/77*	B/C*
T-5	Overhead Signs	Visible and legible	92	A	85	B	85/77*	B/C*
T-6	Roadway lighting	Operational	90	A	85	B	NA	NA
T-7	Traffic Signal Systems	Composite score (Operations)	90	B	90	B	80	C
T-8	Traffic Signals	Composite score (Routine Maintenance)	90	B	90	B	80	C
T-9	Traffic Signals	Composite score (Emergency Response)	90	B	90	B	80	C
T-12	Dynamic Message Sign	Composite score	90	B	NA	NA	NA	NA

Performance Based Management

Benefits in 2008 include:

- Moving towards uniformly constructed, maintained & operated Highway System
- Data driving decision making
- Increased focus on preventive maintenance
- Targeting LOS by tier
- Highest & best use of resources
- Challenging and rewarding workplace

Rating the Condition of the Highway System

Bridge Condition Survey



Maintenance Condition Survey



Pavement Condition Survey



Maintenance Condition Survey Results

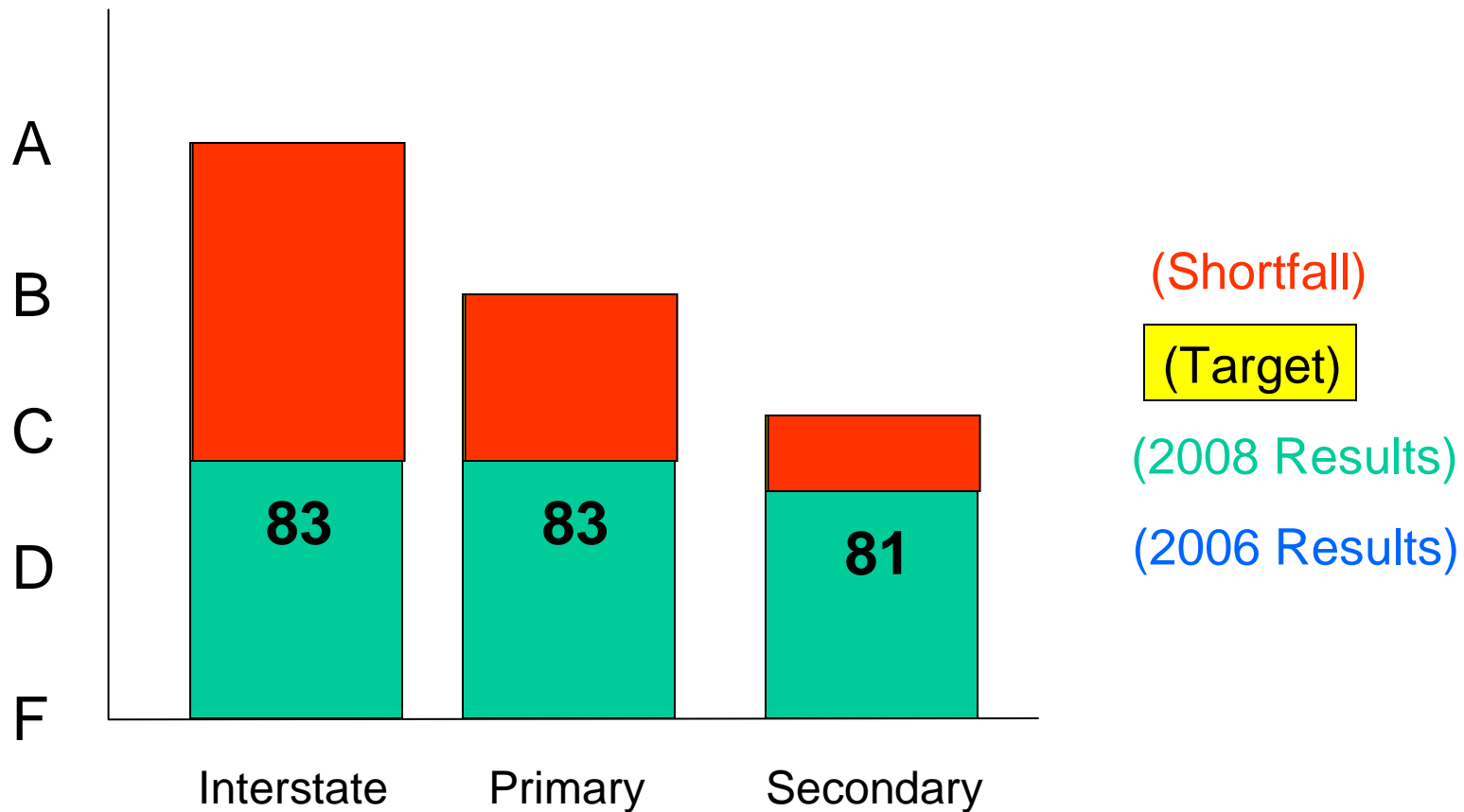
Roadway			Interstate		Primary		Secondary	
	ELEMENT		2008	State Avg.	2008	State Avg.	2008	State Avg.
		PERFORMANCE MEASURE	Target	Score	Target	Score	Target	Score
SHLD & DITCH	Low Shoulder	No dropoff's greater than 2 inches	95	90	95	86	92	90
	High Shoulder	No shoulders higher than 1 inch	95	82	95	92	92	93
	Lateral Ditches	No blocked, eroded or non functioning ditches	95	93	95	93	92	92
DRAINAGE	Crossline Pipe (Blocked) < 54"	Greater than 50% diameter open	95	97	90	87	85	86
	Crossline Pipe (Damaged) < 54"	No damage or structural deficiency	95	99	90	96	85	93
	Curb & Gutter (Blocked)	No obstruction greater than 2 inches for 2 feet	95	94	92	94	92	96
	Curb & Gutter (Damaged)	No damage	95	99	92	98	92	98
	Drop Inlets, CB's, etc (Blocked)	Grates and inlets not blocked greater than 50%	98	86	95	90	92	91
	Drop inlets, CB's, etc (Damaged)	Inlets and outlets are not damaged	98	93	95	95	92	96
ROADSIDE APPURT	Guardrail/Cable/Median Barrier/Conc	Rail is functional	99	100	97	99	95	99
	ROW Fence	Functioning as designed and undamaged	94	96	94	98	N/A	N/A
	Stormwater Devices	Functioning as designed	90	89	N/A	N/A	N/A	N/A
	Impact Attenuators	Properly functioning as designed and operational	99	98	97	94	N/A	N/A

Maintenance Condition Survey Results

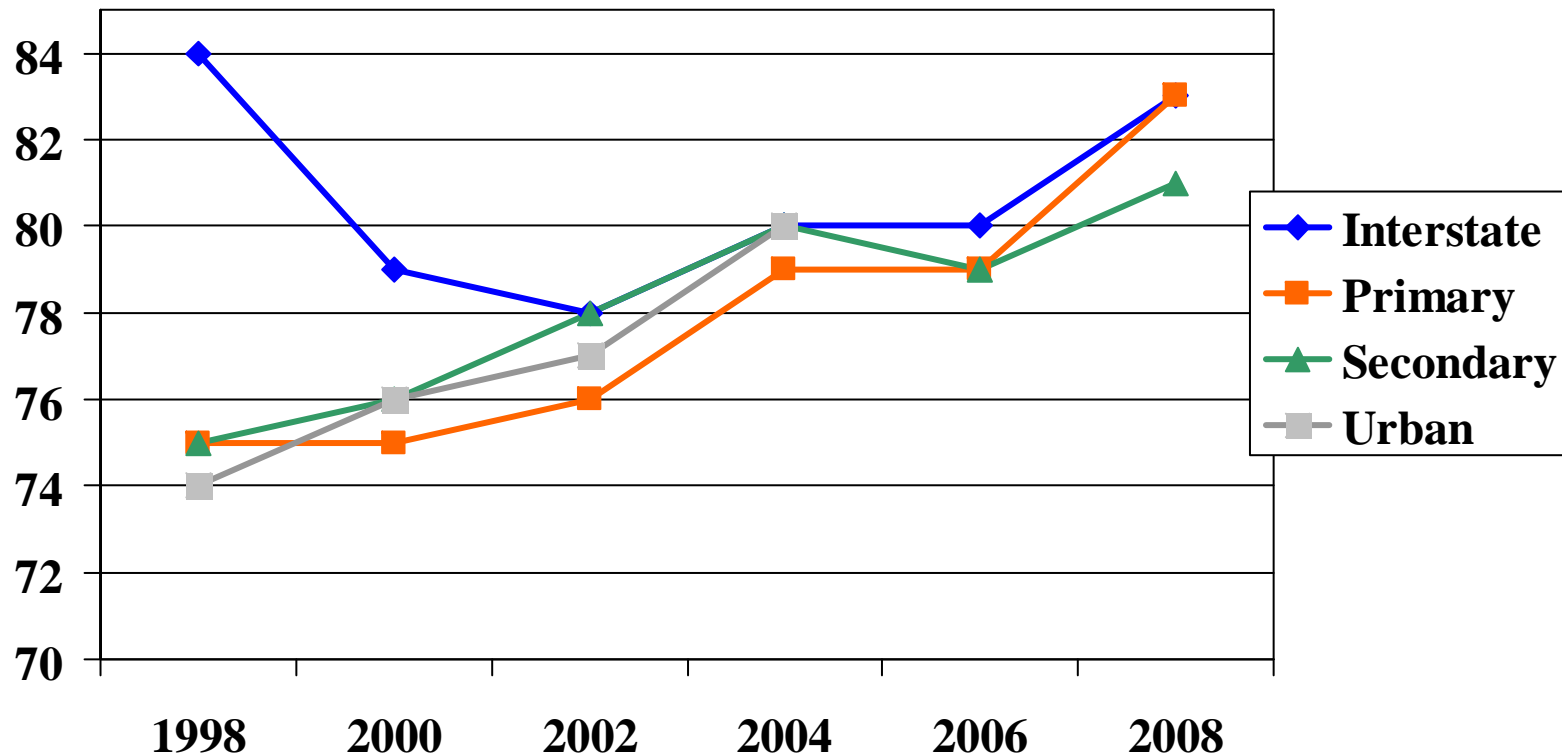
Roadway			Interstate		Primary		Secondary	
	ELEMENT		2008	State Avg.	2008	State Avg.	2008	State Avg.
		PERFORMANCE MEASURE	Target	Score	Target	Score	Target	Score
ROADSIDE	Mowing	Grass height not to exceed 15 inches	90	59	85	65	80	69
	Brush & Tree Control	Vertical clearance of 15 feet over roadway and 10' back of ditch or shoulder point	90	85	85	71	80	67
	Turf Condition	Free of bare, dead, diseased, distressed, or weedy areas	90	73	85	83	80	88
	Uncontrolled Growth	Vegetation height around guardrail does not exceed bottom of rail, and uniform with roadside at signs	70	71	65	47	60	43
	Litter & Debris Control	Less than 100 pieces of litter or debris	90	45	85	72	80	84
	Landscape Beds	Free of dead or damaged plant material, decomposed mulch, unwanted vegetation	90	79	90	80	N/A	N/A
	Rest Areas & Welcome Center	Condition Rating	90	91	90	92	N/A	N/A
TRAFFIC/ITS	Long line pavement markings	Present, visible and reflective at night	95	58	90	69	80	52
	Words % Symbols	Present, visible and reflective at night	95	92	90	83	80	76
	Pavement Markers	Present and reflective	95	37	85	50	N/A	N/A
	Signs ground	Visible and legible	92	94	85	89	85	86
	Overhead Signs	Visible and legible	92	99	85	95	N/A	N/A
PVMT	Pvm't Shoulder Condition	Pavement failures are repaired	90	79	85	83	80	71
	Asphalt pavement repair	Potholes fixed, rut depths <.25", cracks >.5" sealed	95	73	90	68	85	62
	Total		93	83	90	83	86	81

Maintenance Condition Survey Results

Level of Service



Performance Measure Trends (Maintenance Condition Survey Results)



Pavements



Pavement Management Comprehensive Strategy

- Pavement Preservation
 - For pavements in good to fair condition
- Contract Resurfacing
 - For pavements in fair to poor condition
- Rehabilitation
 - For pavement in very poor condition



Pavement Preservation

- Seals off pavement surface
- Reconditions underlying asphalt
- Refreshes driving surface
- Treatments include:
 - Crack sealing
 - Chip seals
 - Slurry pavement
 - Microsurfacing



Contract Resurfacing

- Provides renewed driving surface
- Improves ride quality
- Reduces patching and frequent maintenance

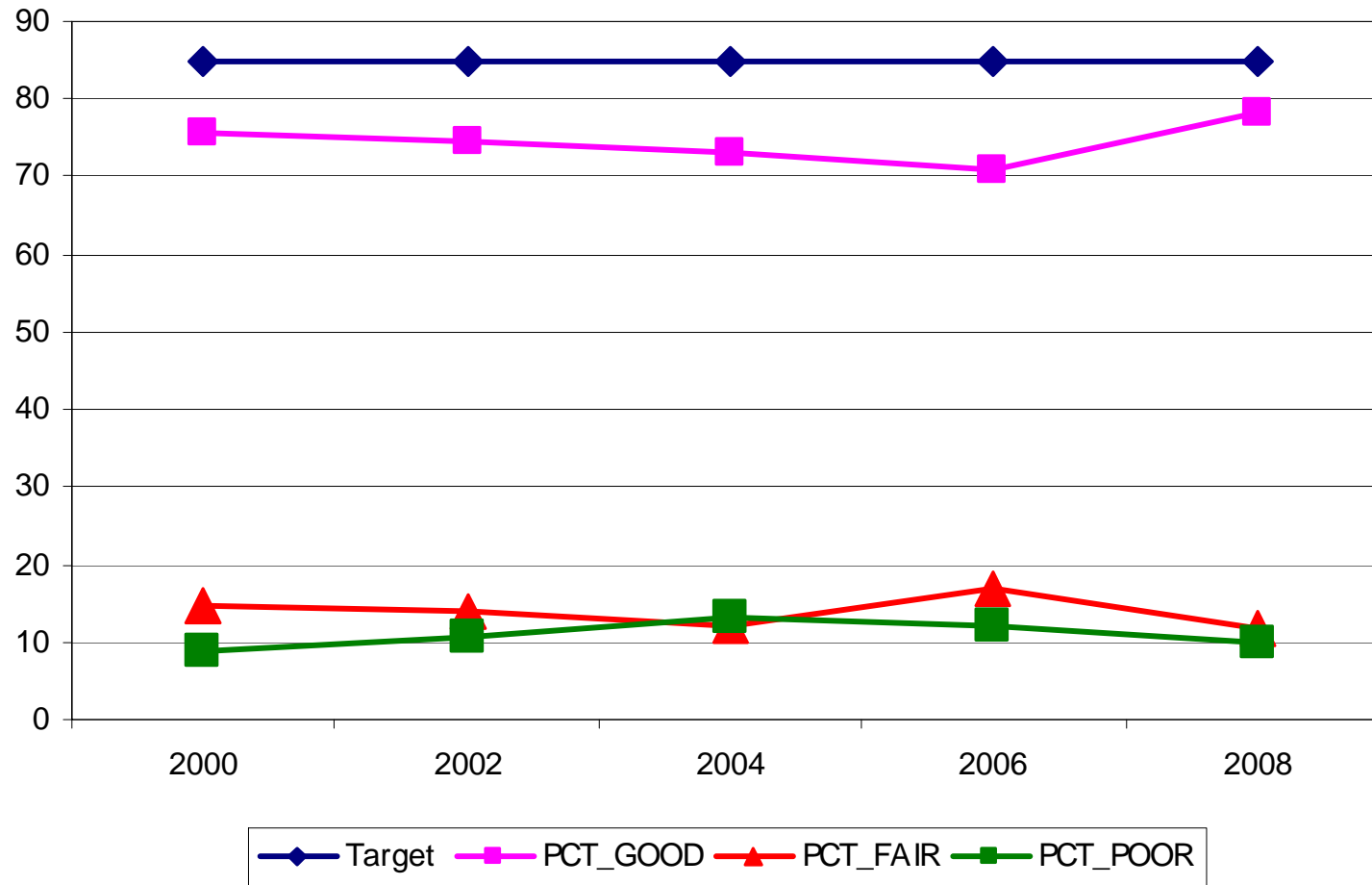


Pavement Rehabilitation

- Restores pavement condition
- Increases pavement structure
- Treatments include:
 - Mill and replace
 - Overlay with thicker lifts

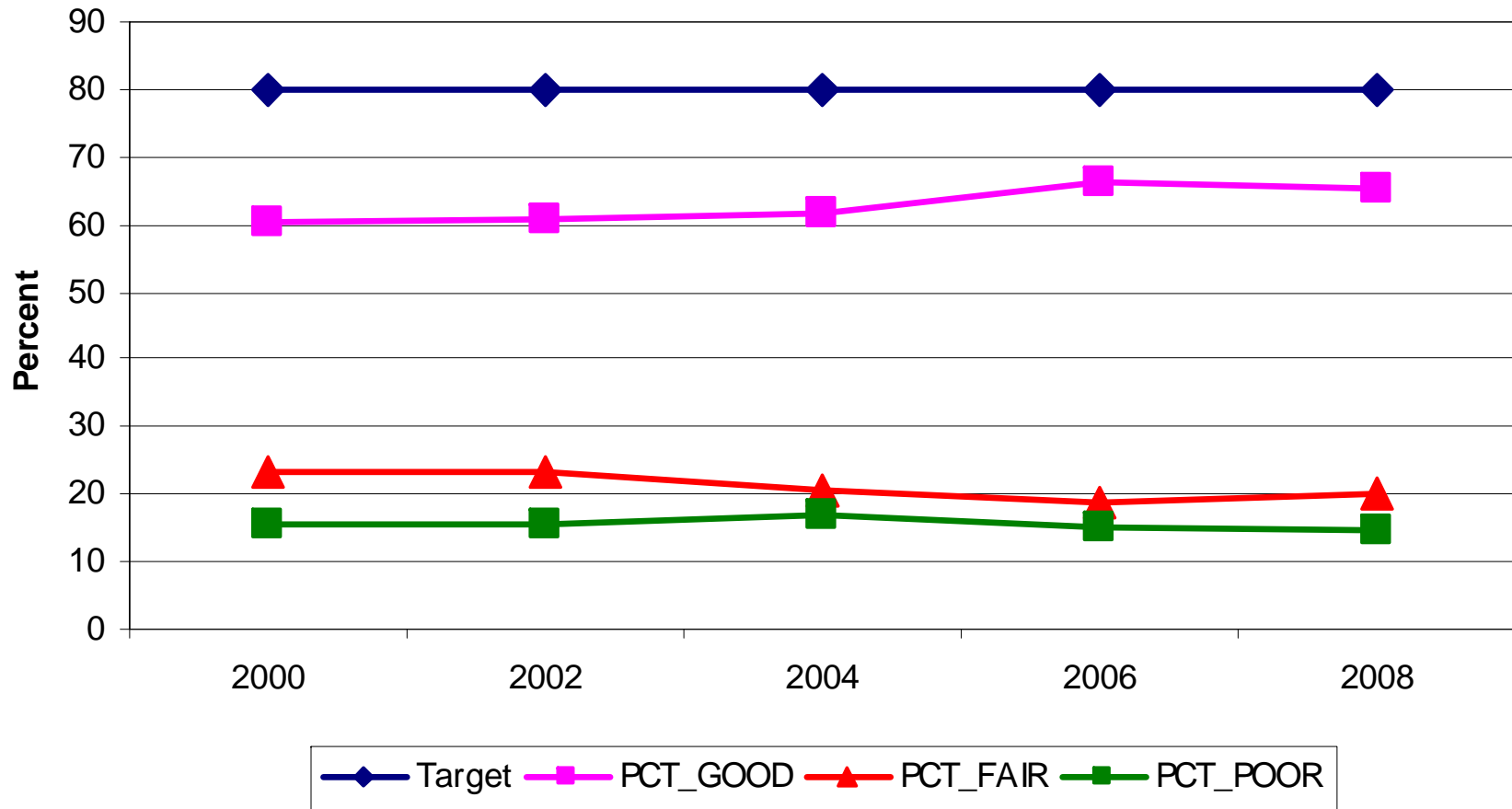


Interstate Pavement Condition



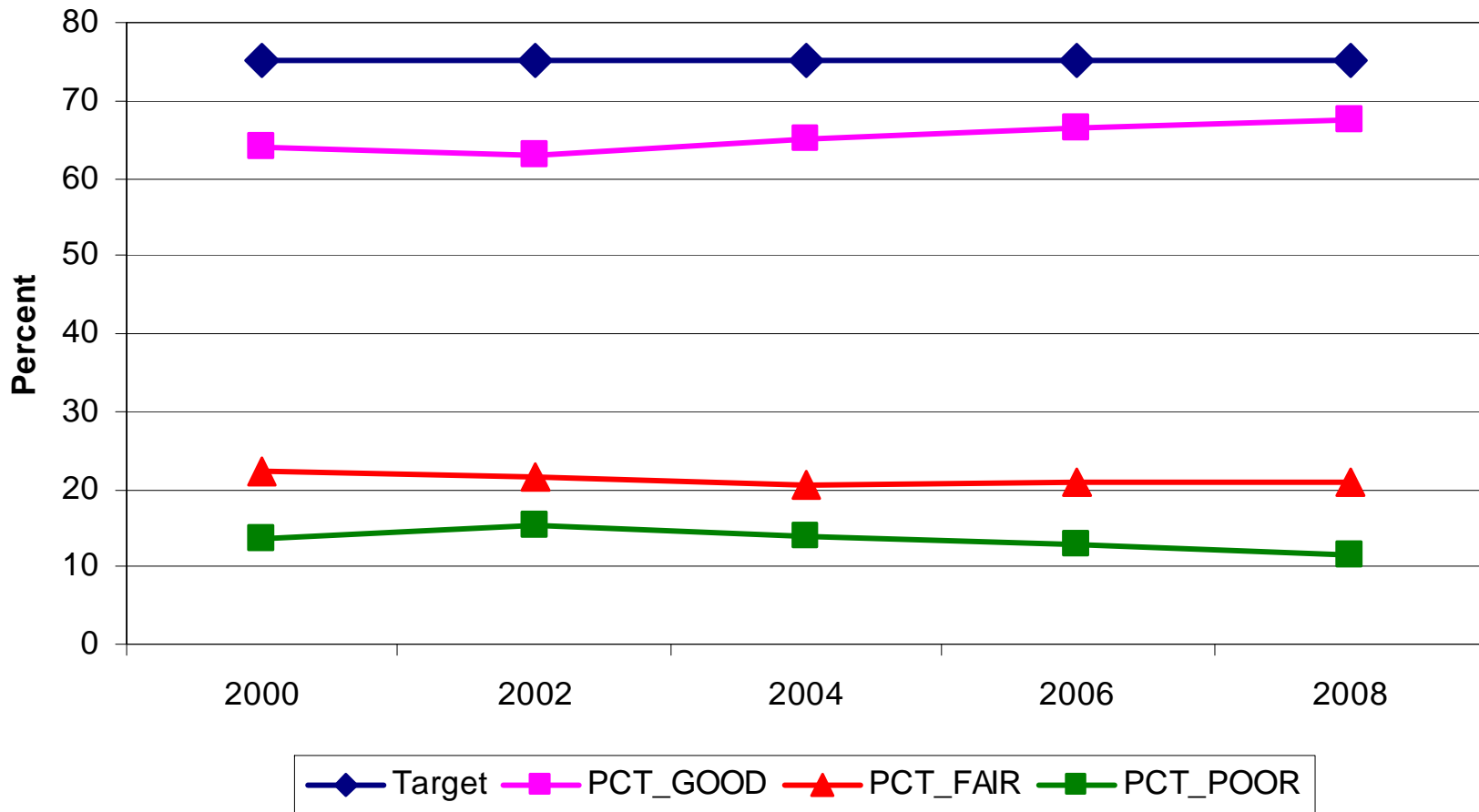
Years 2000 - 2008

Primary Pavement Condition



Years 2000 - 2008

Secondary Pavement Condition



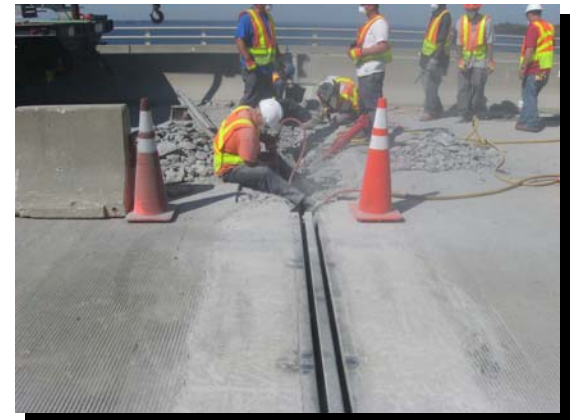
Years 2000 - 2008

Bridges



Bridge Preservation

- Painting Structural Steel
- Cleaning Bearings
- Repair and Replace Expansion Joints
- Apply Material to Slow Corrosion
- Waterproofing and Resurfacing Decks



Bridge Rehabilitation

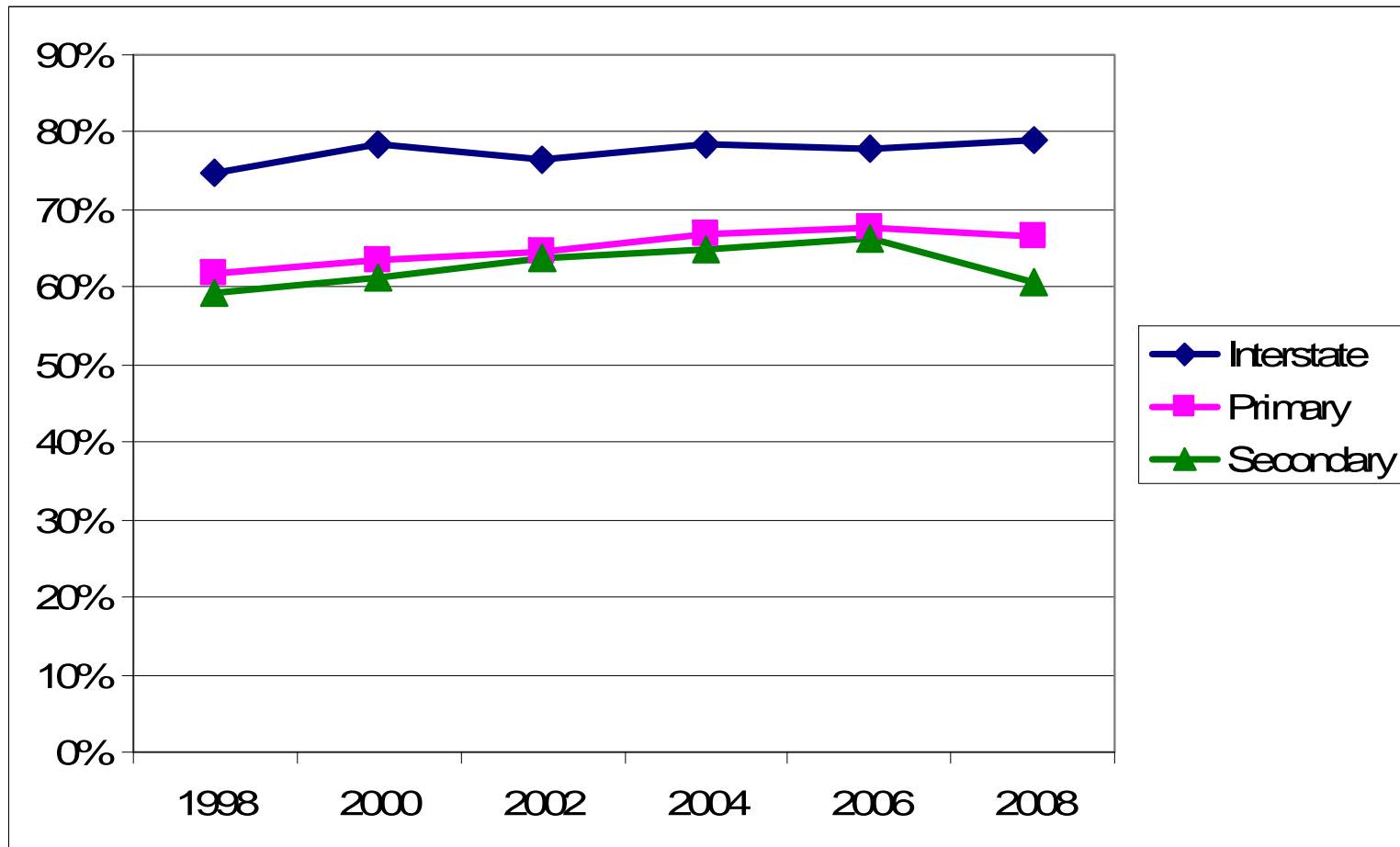
- Restore Bridge Components
- More Expensive than Preservation
- Cost effective on some bridges



Bridge Condition Survey Results

Bridges			Interstate		Primary		Secondary	
			2008	State Average	2008	State Average	2008	State Average
	ELEMENT	PERFORMANCE MEASURE	Target	Score	Target	Score	Target	Score
Bridge Deck	Concrete	% of decks rating greater than or equal to 6	85	84	80	79	75	83
	Timber		85	N/A	80	83	75	86
	Steel Planks		85	N/A	80	69	75	85
	Open Grid Steel		85	N/A	80	55	75	0
Super-structure	Concrete	% of superstructure rating greater than or equal to 6	90	84	85	63	80	66
	Steel Planks		90	90	85	83	80	82
	P/S Concrete		90	97	85	96	80	93
	Timber		90	N/A	85	52	80	65
Sub-structure	Timber	% of substructure rating greater than or equal to 6	90	N/A	85	23	80	45
	Concrete Pile		90	85	85	79	80	84
	Steel Pile		90	92	85	90	80	92
	Concrete Piers		90	92	85	81	80	87

Overall Bridge Health



Years 1998 - 2008

Highway Operations

- 8800 traffic signals statewide
- Signal maintenance provides:
 - Improved safety
 - Reduction in delays
 - Reduced fuel consumption
 - Improved air quality





Highway Operations

- Overhead dynamic message boards
- Camera systems
- Speed detection devices





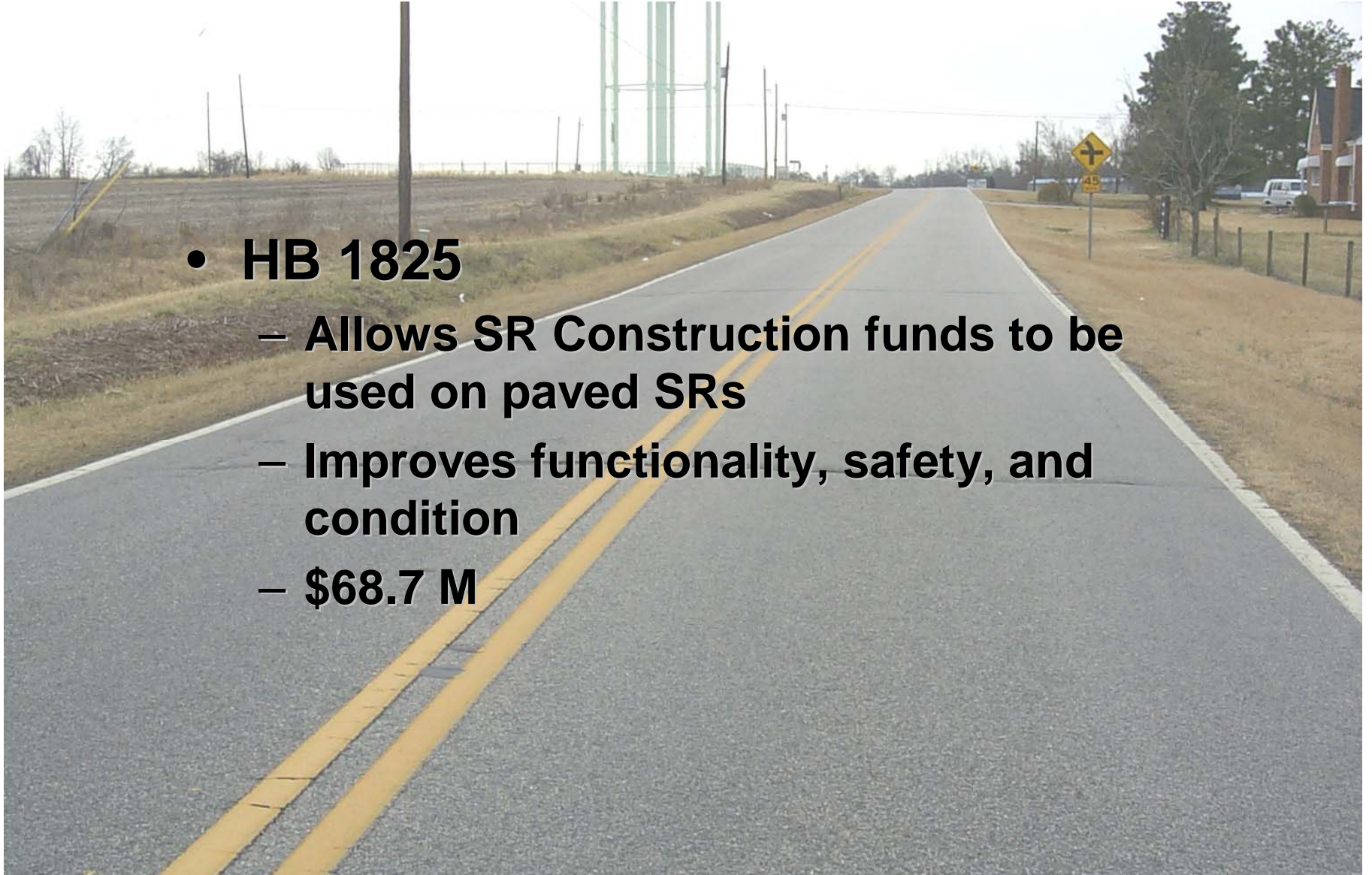
Alternate Funding

- TIP Funds
 - Signal Preventive Maintenance Program
 - Intelligent Transportation System/Incident Response Program
 - Positive Guidance
 - \$41.5 M



Alternate Funding

- **HB 1825**
 - Allows SR Construction funds to be used on paved SRs
 - Improves functionality, safety, and condition
 - \$68.7 M



Alternate Funding

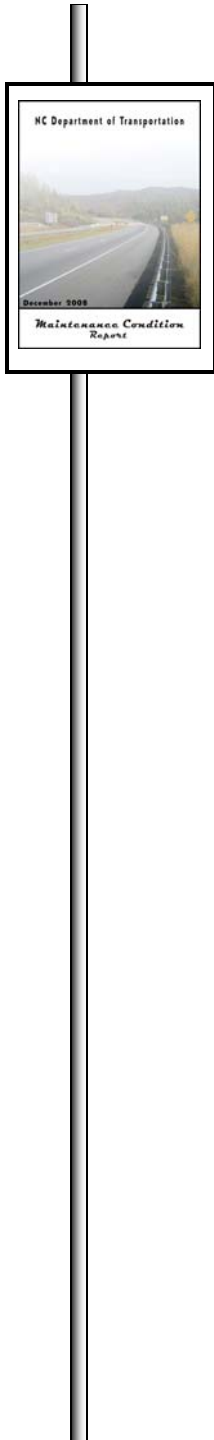


- **Bridge Preventative Maintenance Program**
 - Address bridge preservation needs
 - Deck and joint repair
 - Bridge painting
 - \$5 M

Maintenance Operational Improvements

- LED replacement for signal bulbs
- Signal preventive maintenance
- ITS (IMAP) initiatives
- Incentive pay programs
- DOC litter pickup program
- Winter anti-icing operations





Conclusions

Level of Service

<u>System</u>	<u>Target</u>	<u>Current</u>
Interstate	A	C
Primary	B	D
Secondary	C	D

Maintenance Funding Needs (Millions)

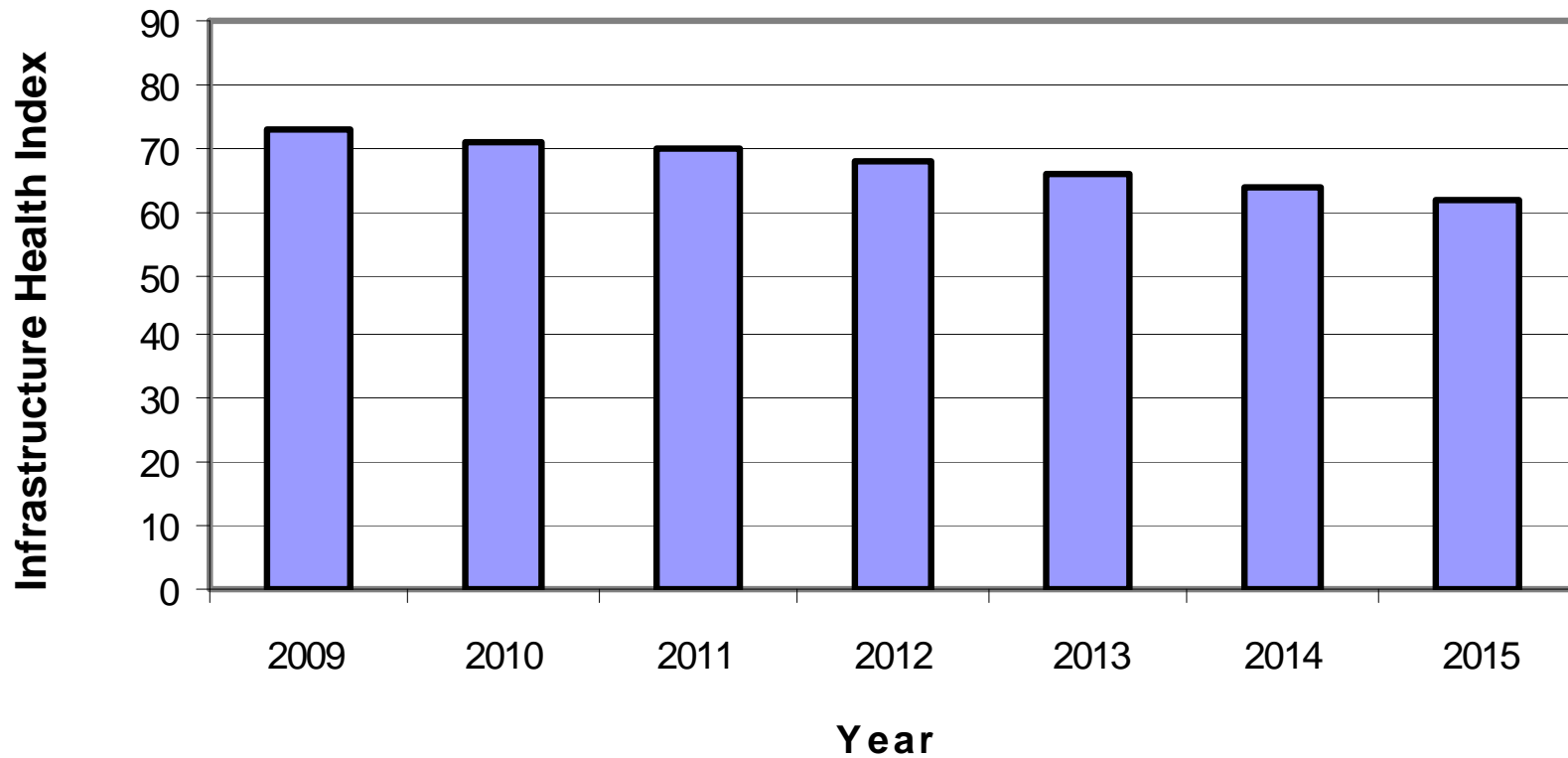
	FY '09 -'10 <u>Needs</u>
Maintenance Operations	\$ 907.6
Disasters	\$ 15.0
Contract Resurfacing	\$ 443.9
Pavement & Bridge Preservation	<u>\$ 309.0</u>
Total Maintenance & Preserv. Needs	\$1,675.5
Alternate Maintenance Funds	<u>\$ 115.2</u>
Adjusted Maintenance Funding Needs	\$1,560.3
System Rehabilitation Needs	\$407.5

Statewide Annual Maintenance Funding Plan

Fiscal Year (\$ Millions)					
Maintenance Programs	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Maintenance & Operations	907.61	944.60	983.14	1023.29	1065.14
Disasters/Emergencies	15.00	15.00	15.00	15.00	15.00
Contract Resurfacing	443.85	462.49	481.92	502.16	523.25
Pavement & Bridge Preserv	308.96	321.94	335.46	349.55	364.23
Total Maint. Funding Needed	1,675.42	1,744.03	1,815.52	1,890.00	1,967.62
Supplemental Maint. Funds	115.20	115.20	115.20	115.20	115.20
Estimated Maint. Fund Alloc.	943.42	943.42	943.42	943.42	943.42
Shortfall	(616.80)	(685.41)	(756.90)	(831.38)	(909.00)

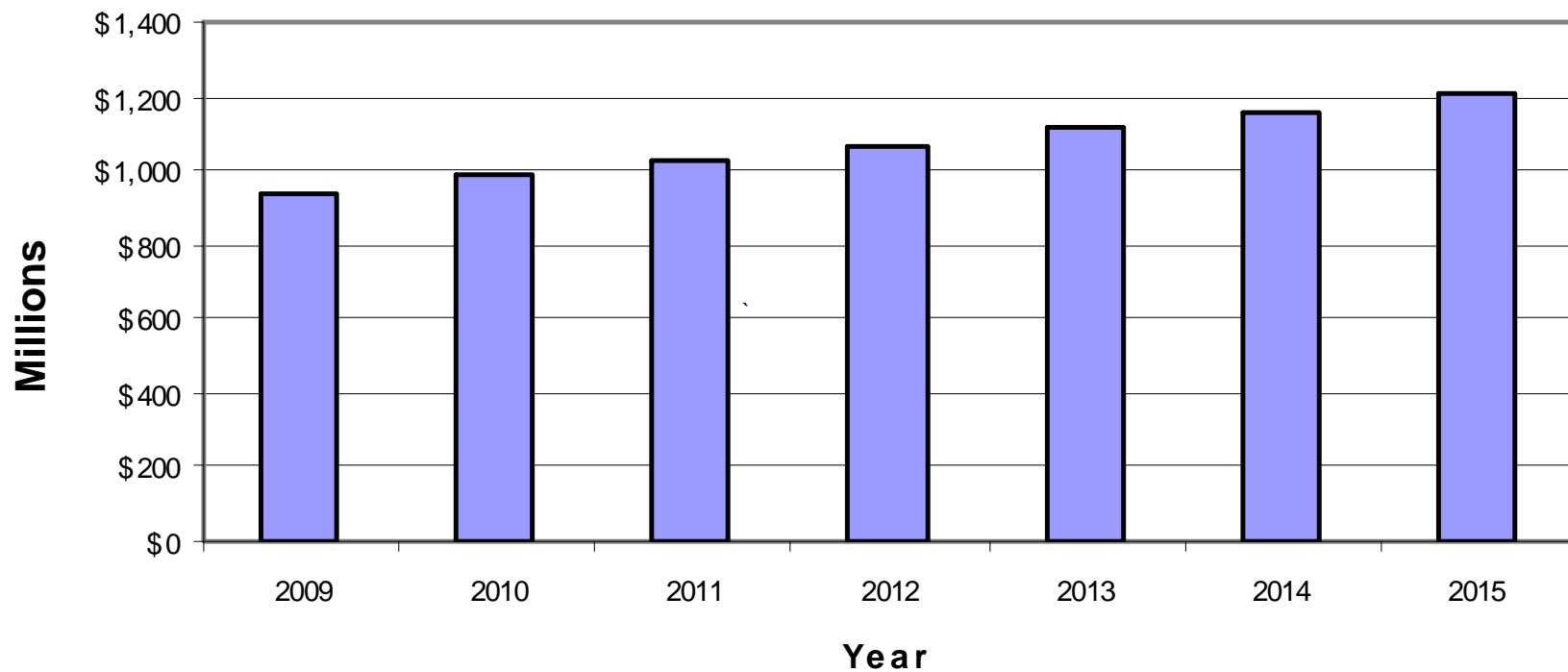
Condition Scenario 1

(LOS at Current Funding Level)



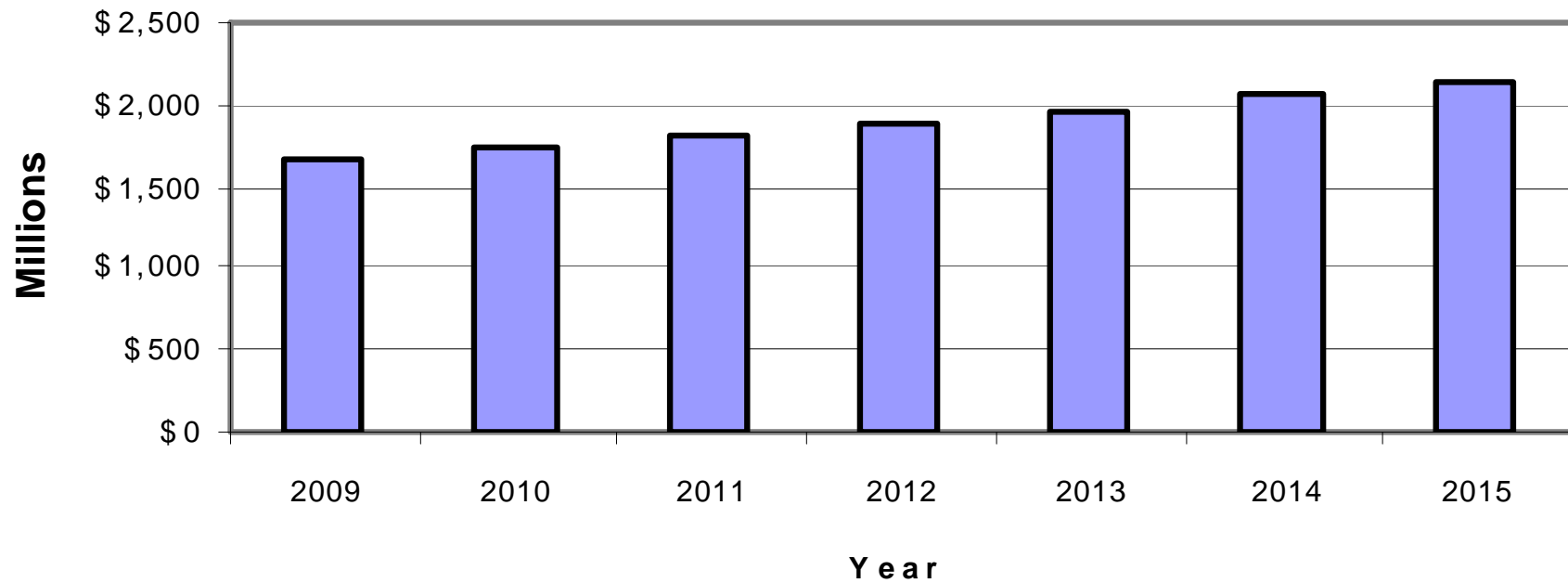
Condition Scenario 2

(Estimated Dollars to Maintain Current LOS)



Condition Scenario 3

(Funding Needed to Meet Target LOS)



Questions?

NC Department of Transportation



*Maintenance Condition
Report*