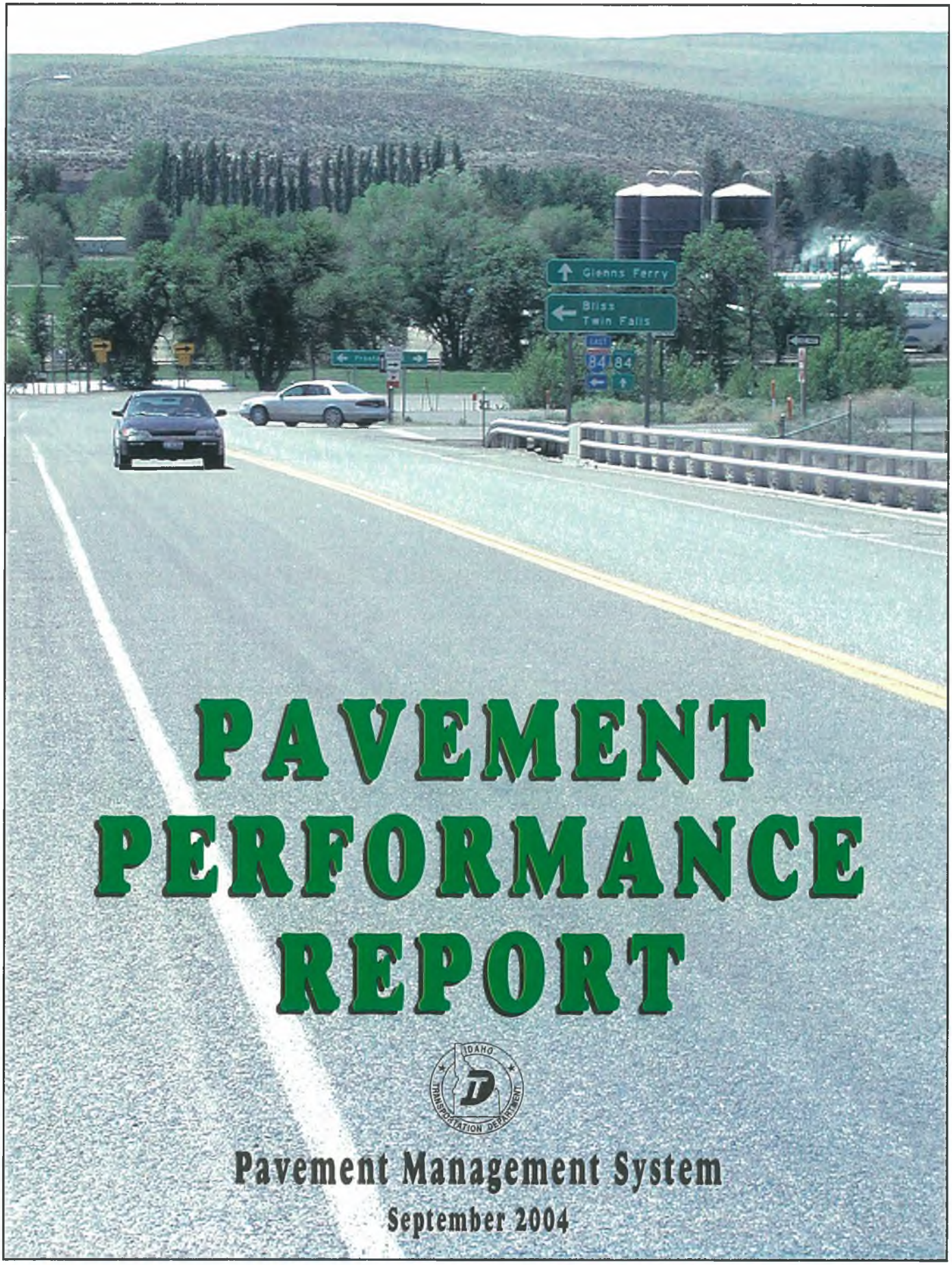


PAVEMENT PERFORMANCE REPORT

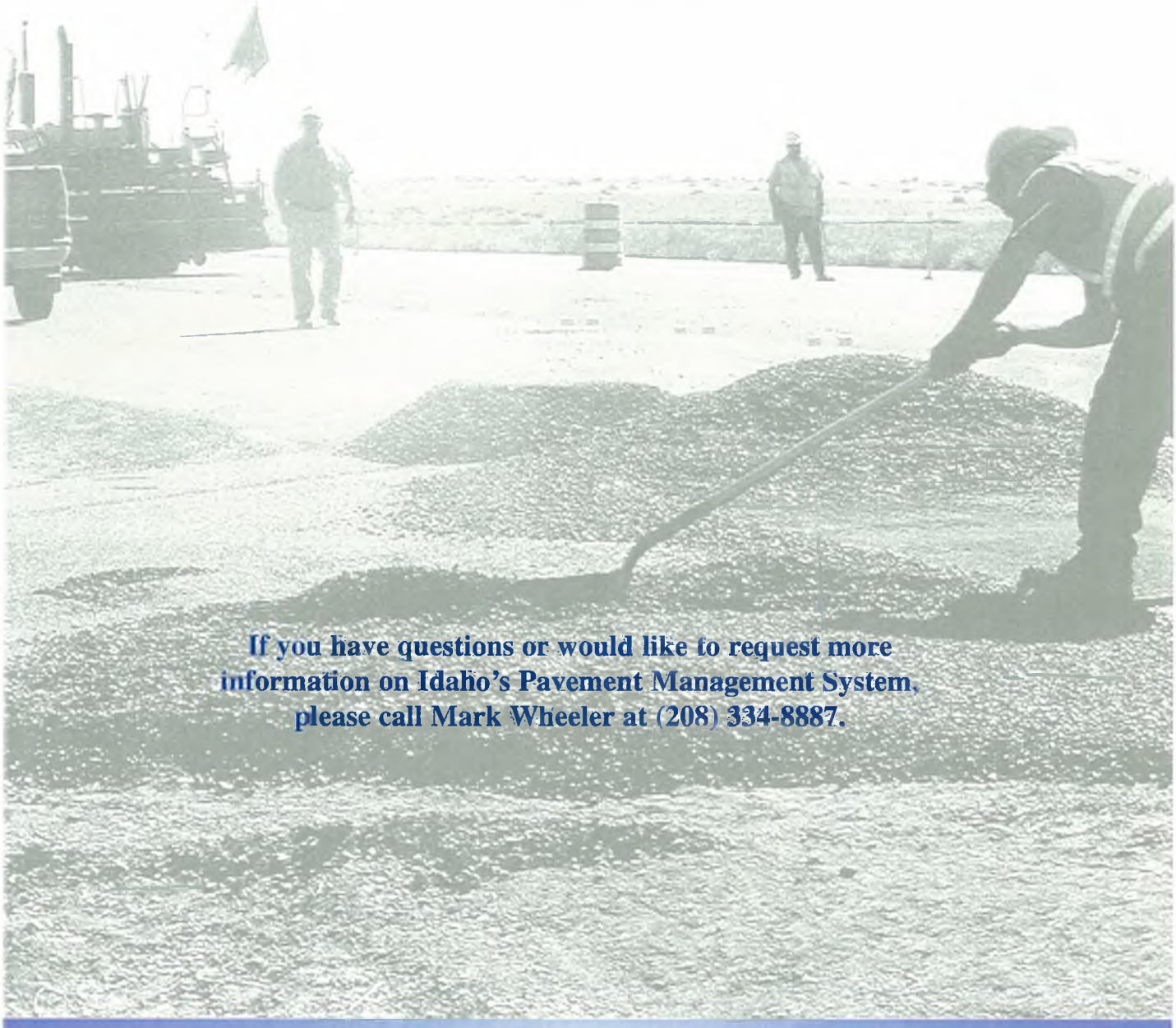
IDAHO TRANSPORTATION DEPARTMENT

Pavement Management System

September 2004

This report was produced by the

Idaho Transportation Department,
Division of Transportation Planning
P.O. Box 7129, Boise, ID 83707-1129



If you have questions or would like to request more information on Idaho's Pavement Management System, please call Mark Wheeler at (208) 334-8887.

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PURPOSE

PURPOSE

This report provides information regarding the condition of pavements on the State Highway System. The following pages contain numerous charts, graphs, and maps of past and present pavement condition based upon cracking, roughness, and rutting. This information was obtained from Idaho's Pavement Management System (PMS).

This report is comprised of the following sections:

- Executive Summary
- Pavement Management - System Overview
- General Information
- Pavement Condition
- Needs Analysis
- Sealcoats
- Summary

EXECUTIVE SUMMARY

ACHIEVEMENTS

The Idaho Transportation Department has made significant progress toward reducing deficient pavements and giving motorists a safer and smoother ride. Pavement deficiencies on the State Highway System have been reduced from almost 40% in 1993 to 16% by the end of calendar year 2003. Reducing pavement deficiencies is a high priority for the department and has been accomplished by:

- The Idaho Transportation Board committing $31 million annually for pavement rehabilitation
- Establishing department efficiency measures
- Consolidating programs and applying the cost savings to pavement-rehabilitation projects
- Partnering with the private sector allowing the department to stretch highway dollars
- Utilizing a successful maintenance / preventative maintenance program which slows the rate of pavement deterioration
- Improving the way we collect, analyze, and report pavement data

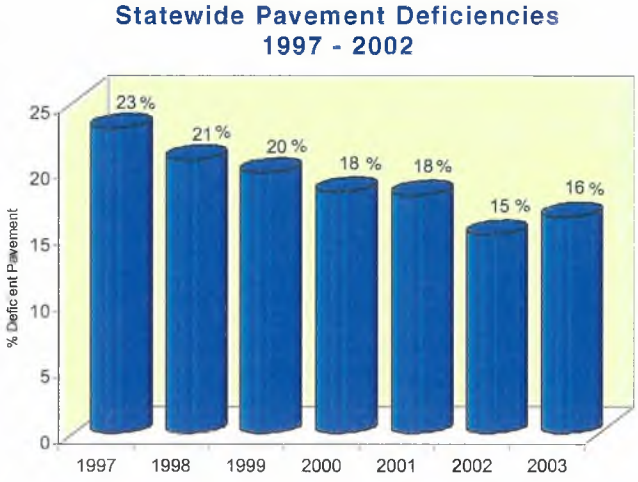


Figure 1.

NEEDS

Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do. Figure 2 below is a summary of current statewide needs by functional class. The estimated repair costs on the state highway system alone total over $280 million and this is just one piece of the total transportation pie. Capacity, congestion, safety, and economic development all compete with pavement-improvement needs for limited funding.

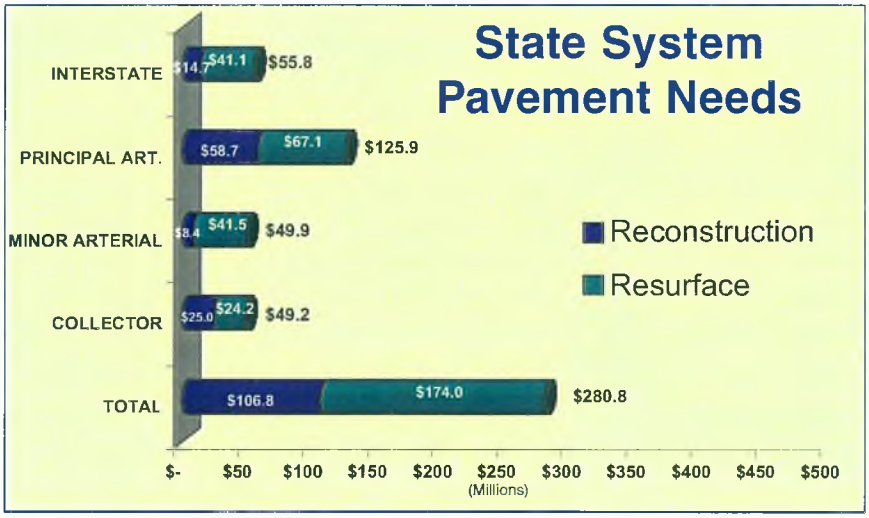


Figure 2.

Because Idaho's growing population and economy are likely to create a demand for more and heavier trucks, the department must continue its commitment to protect and maintain Idaho's investment in pavements on the State Highway System.

Section 1
PAVEMENT MANAGEMENT SYSTEM OVERVIEW

In 1977, the Idaho Transportation Department (ITD) began a review of existing pavement-management programs with the goal of adopting one to fit Idaho's needs. The following year a Pavement Performance Management Information System (PPMIS) was acquired and made operational on ITD's mainframe computer. Since 1978, the PPMIS has been steadily improved and modified to meet conditions in Idaho. It has been tested and refined by ITD and consultant contract, the principal consultant being Pavement Management Systems Ltd., of Ontario, Canada. The last phase, economic analysis and optimization, was completed in July 1986.

Our Idaho State Highway System consists of approximately 5,000 centerline miles of paved highway, including 612 centerline miles of Interstate. For network-level pavement management the system has been divided into about 1,800 sections varying in length from less than one mile to approximately ten miles.

Idaho's Pavement Management System (PMS) covers both the network and project level. Network-level pavement management is performed by the Division of Transportation Planning while project-level pavement management is performed by ITD's Headquarters Materials section. Pavement condition testing conducted at the network level is also split, with Materials overseeing skid testing while Planning Services collects roughness and rutting measurements. Planning Services is also responsible for surveying pavement distress (cracking), analyzing network PMS data,

producing reports, and developing and maintaining computer programs needed for pavement management. Deflection data for project-level pavement management is collected, analyzed, and reported by the Materials section.

PAVEMENT-CONDITION TESTING

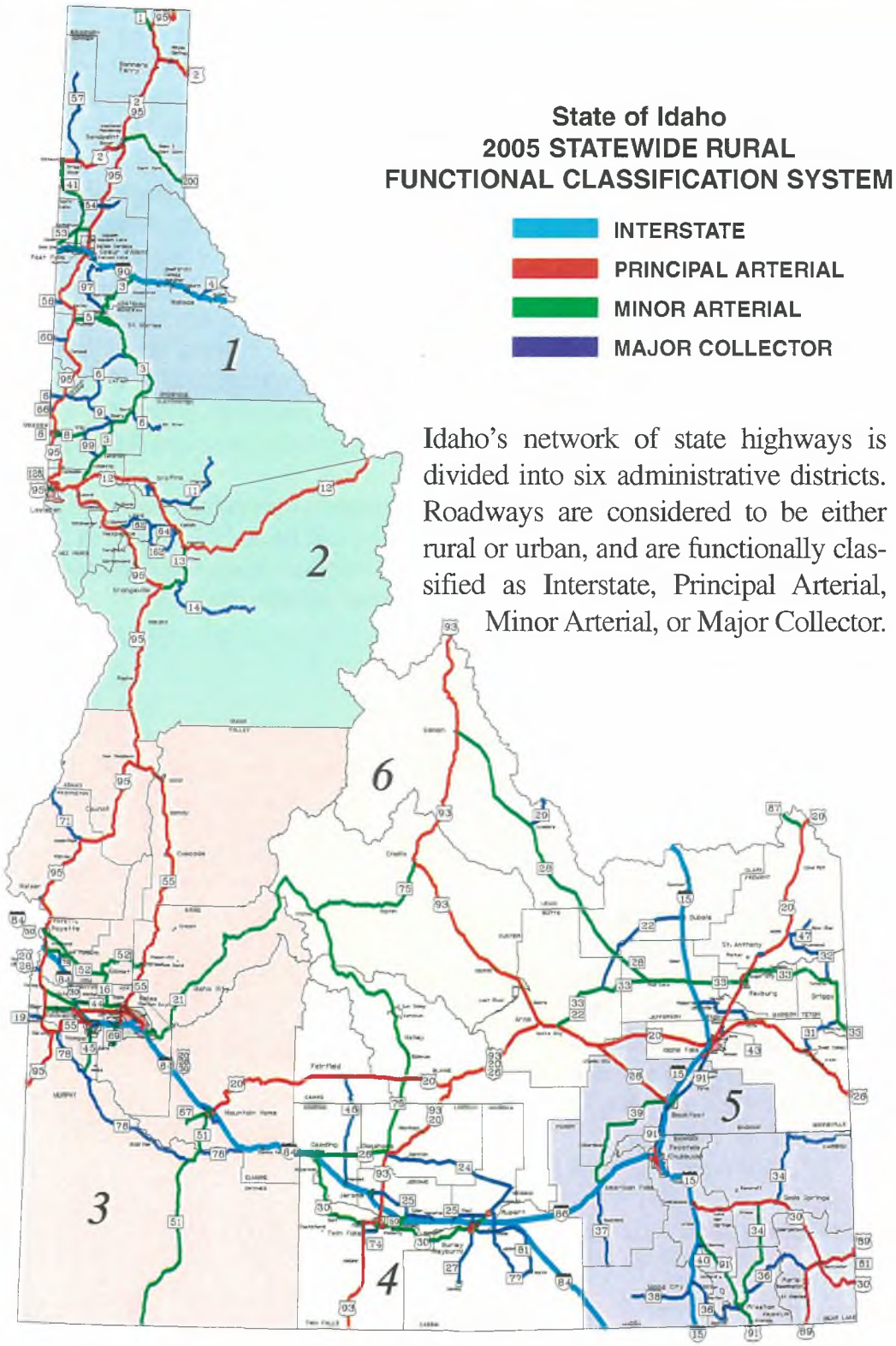
Pavement-condition data is an important component of Idaho's PMS. Two-lane roads are tested in one direction while interstates and divided arterials are tested in both ascending and descending directions. Pavement-condition data elements are collected as follows:

- **Road Roughness -** Roughness is a primary indicator of pavement serviceability; or the ability of a pavement to meet the demands and expectations of motorists. In Idaho, the public's perception of the State Highway System is very important. For that reason, a Roughness Index (RI) was adopted that correlates the longitudinal profile of the road surface to an index based upon the public's perception of road roughness. The (RI) ranges from 0.0 to 5.0 (0.0 being extremely rough and 5.0 being perfectly smooth).

  A South-Dakota-type Profilometer is currently used by ITD to obtain pavement roughness. This instrument uses laser sensors and a personal computer to collect and store road-profile information. The vehicle stores profile and rutting measurements at one-foot intervals traveling at highway speeds, and is mounted in a van operated by Planning Services. Longitudinal profiles of all pavement-management sections statewide are obtained annually.

- **Pavement Distress (Cracking) -** Pavement distress, or cracking, is another important indicator of pavement condition. The video-inspection vehicle used to collect profile information also collects digital images of pavement on the entire State Highway System each year. The Pavement Management Engineer then uses the digital images to determine the type, extent, and severity of cracking within each PMS section. Based on this input a Cracking Index (CI) is calculated for each section. The CI is a rating very similar to the RI with 5.0 corresponding to a section with little or no cracking and 0.0 representing a section with severe cracking.

- **Final Index -** A Final Index (FI), which is the average of RI and CI, is used as a single indicator of Pavement Condition in many PMS reports.



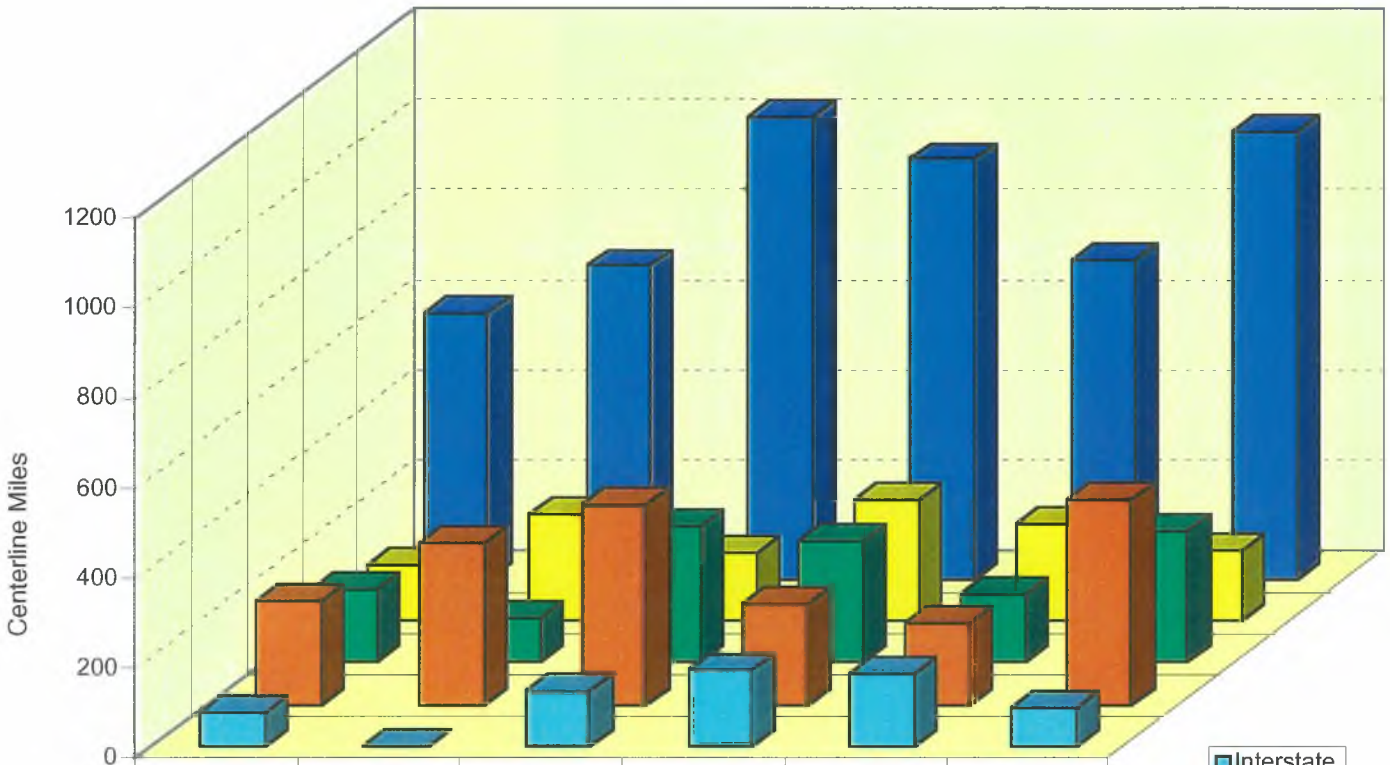
State of Idaho
2005 STATEWIDE RURAL
FUNCTIONAL CLASSIFICATION SYSTEM

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR

Idaho's network of state highways is divided into six administrative districts. Roadways are considered to be either rural or urban, and are functionally classified as Interstate, Principal Arterial, Minor Arterial, or Major Collector.

Map 1

2003 Centerline Miles by District



	District 1	District 2	District 3	District 4	District 5	District 6
Interstate	74	0	125	169	160	84
Prncp Art	229	356	444	223	180	455
Minor Art	165	101	305	271	151	294
Collector	124	239	152	268	218	158
TOTAL	591	696	1026	931	709	992

Figure 3.

Centerline mileage, by district and functional class, is shown in Figures 3, 4, and 5. There are 4,945 centerline miles on the state highway system. District 3 is the largest district with 1,026 centerline miles (20.7% of total statewide miles) and District 1 is the smallest of the six districts with 591 centerline miles (12% of total mileage).

2003 Statewide Centerline Miles

(By Functional Class)

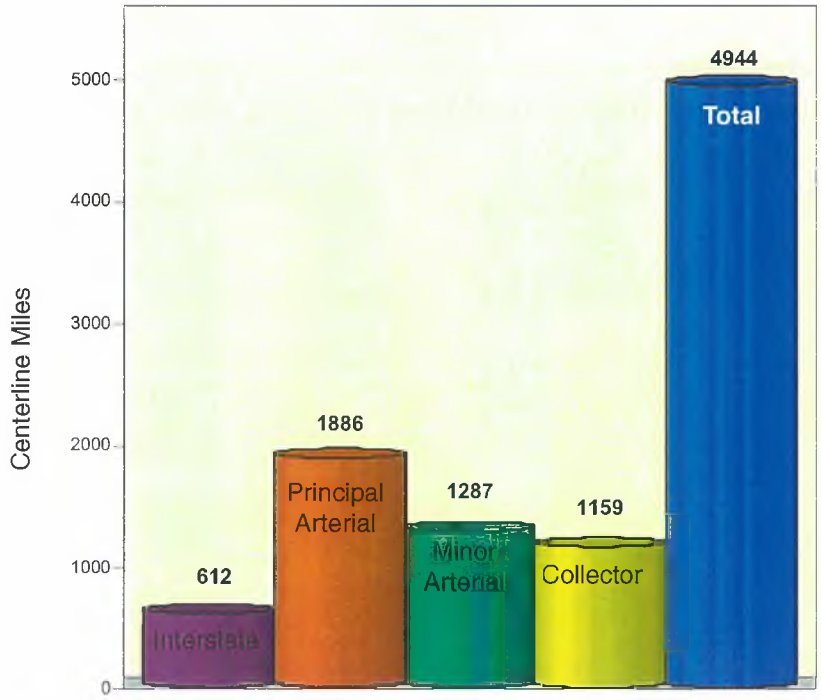


Figure 4.

2003 Centerline Miles by District

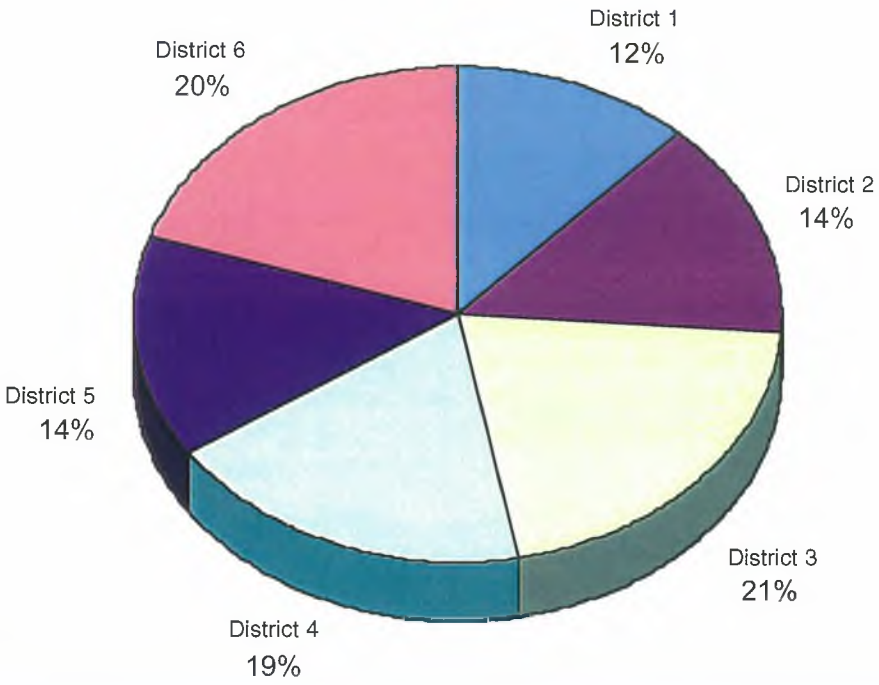
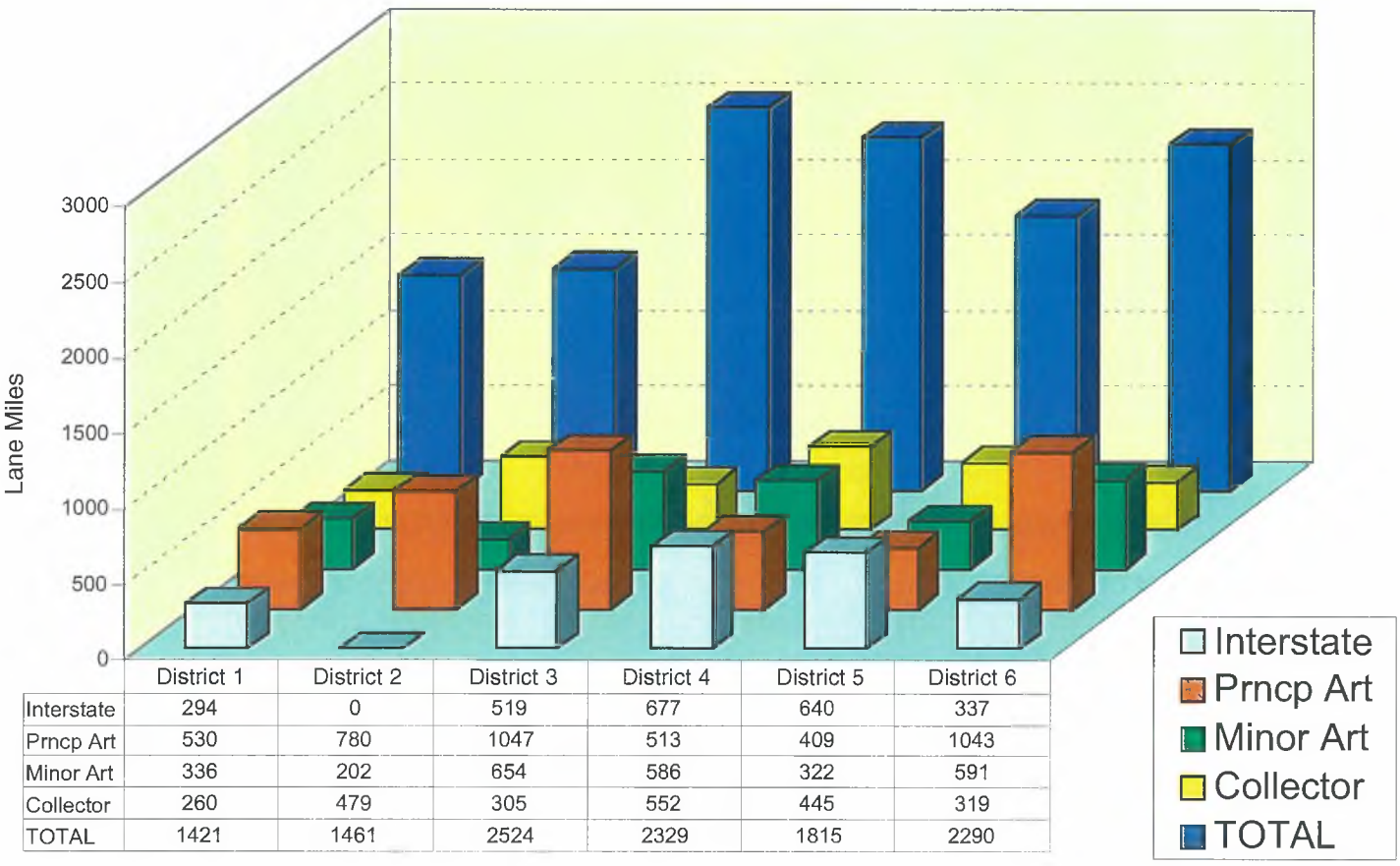


Figure 5.

2003 Lane Miles by District



	District 1	District 2	District 3	District 4	District 5	District 6
Interstate	294	0	519	677	640	337
Prncp Art	530	780	1047	513	409	1043
Minor Art	336	202	654	586	322	591
Collector	260	479	305	552	445	319
TOTAL	1421	1461	2524	2329	1815	2290

Figure 6.

Figure 6 is a summary of lane miles by functional class. Lane miles are calculated by multiplying centerline miles by the number of through lanes. The State Highway System has approximately 11,840 lane miles.

Section 3
PAVEMENT CONDITION

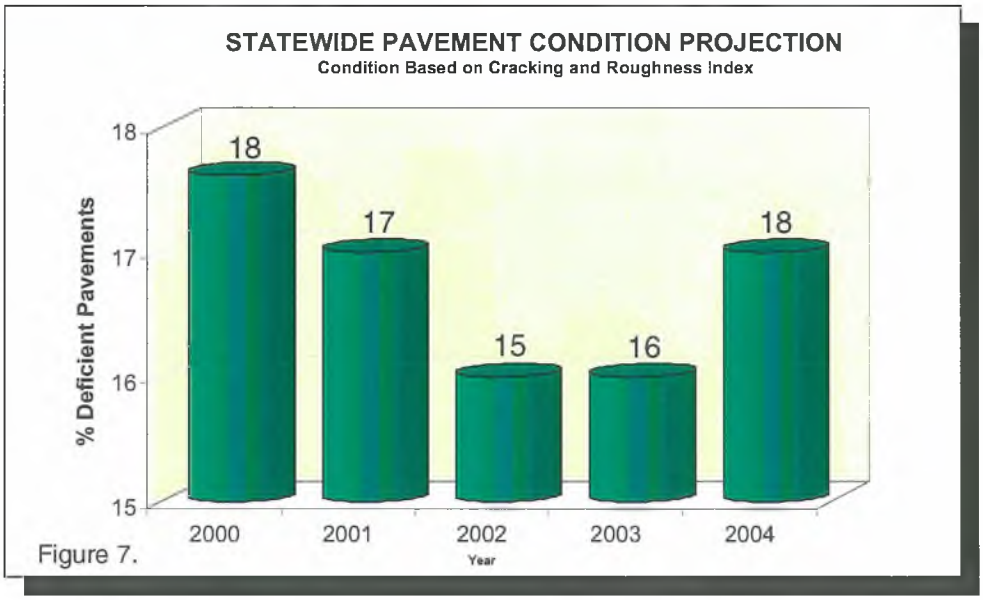


Figure 7.

PAVEMENT CONDITION

Pavement condition assessment is highly dependent upon functional classification and is divided into two categories: (1) interstates and arterials, (2) collectors.

- Pavements on interstates, arterials, and collectors are classified as good if the lower of the Cracking Index (CI) or Roughness Index (RI) is greater than 3.0;
- Interstate and arterial pavements are considered fair if the lower of CI or RI is between 2.5 and 3.0 (2.0 to 3.0 for collectors);
- Poor pavements exhibit indices between 2.0 and 2.5 (1.5 to 2.0 on collectors);
- Interstate and arterial pavements considered to be very poor are those with the lower of the two indices falling below 2.0, or a CI or RI rating below 1.5 for collectors.
- Pavement sections are considered deficient if they are classified as poor or very poor.

The current statewide distribution of good, fair, poor, and very poor pavements, based upon roughness and cracking, is shown on page 10 in Figures 8 and 9.

Pavement Condition	Interstates and Arterials	Collectors
	Lower Index of Cracking (CI) or Roughness (RI)	
Good	(CI or RI) > 3.0	(CI or RI) > 3.0
Fair	2.5 ≤ (CI or RI) ≤ 3.0	2.0 ≤ (CI or RI) ≤ 3.0
Poor	2.0 ≤ (CI or RI) < 2.5	1.5 ≤ (CI or RI) < 2.0
Very Poor	(CI or RI) < 2.0	(CI or RI) < 1.5

Distribution of Cracking and Roughness Indices

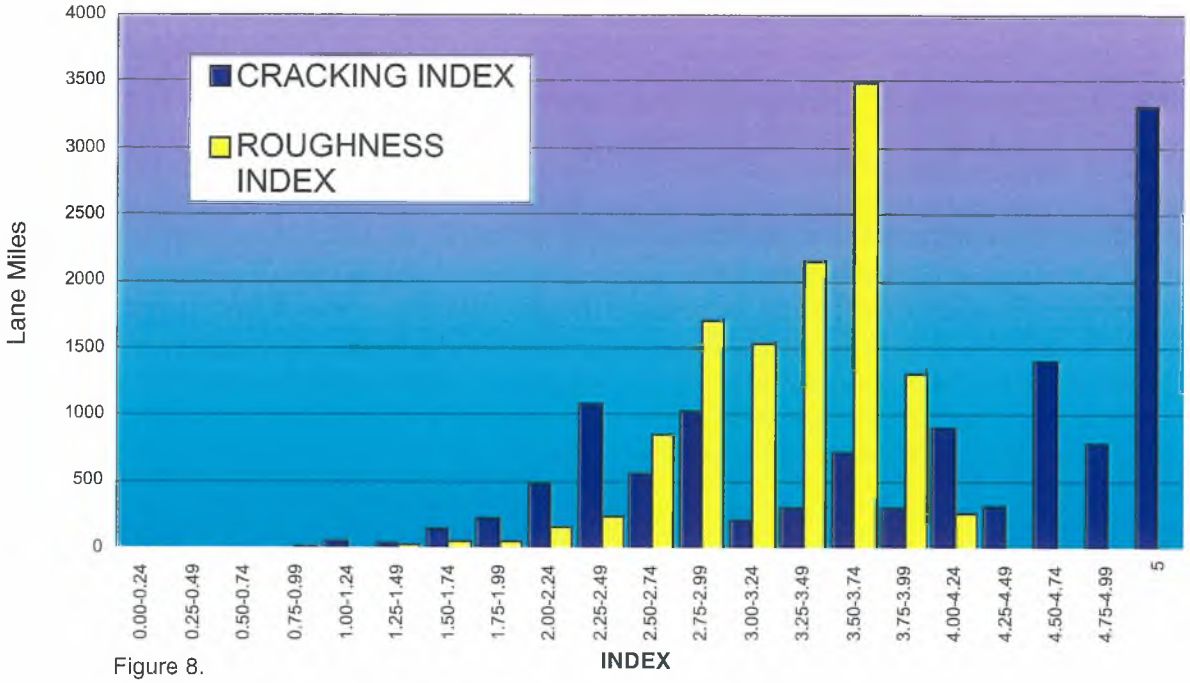


Figure 8.

Distribution of Lowest Index (Cracking or Roughness)

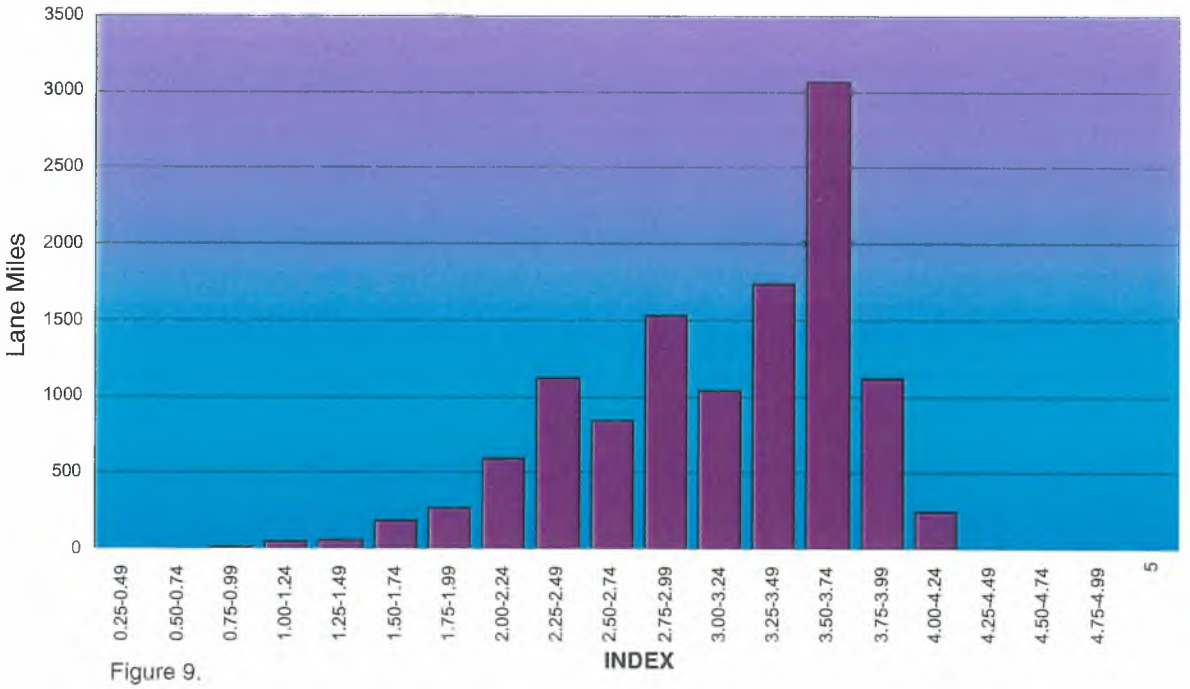


Figure 9.

PAVEMENT CONDITION (continued)

Figures 10 and 11 are summaries of pavement conditions from 1999 through 2003. The percentage of pavements considered good has risen from a statewide low of about 18.7% in 1994 to approximately 61% as shown for the end of calendar year 2003. Fair pavements have declined from approximately 44% in 1994 to 23% for 2003. The percentage of pavements considered poor or very poor has declined from a maximum of almost 38% in 1994 to 16% at the end of calendar year 2003.

Figure 12 is a pie chart representing current pavement condition on the State Highway System in terms of percent "good," "fair," "poor," and "very poor."

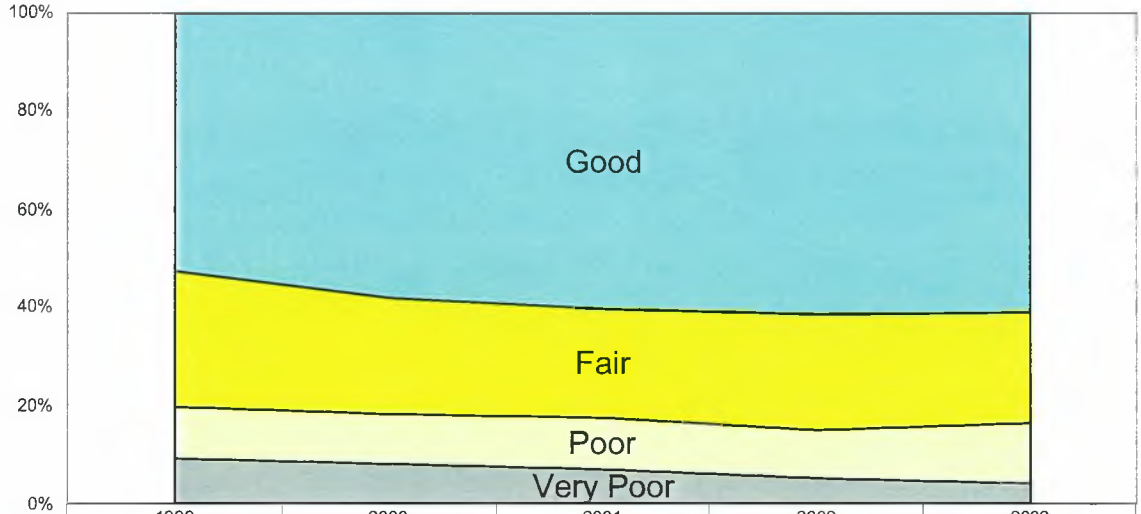
Current pavement condition by district is shown in Figure 13. The percentages in Figure 13 are based on statewide lane miles. For example, 12% of all pavements statewide considered good, and 6% of all pavements considered very poor are located in District 1.

Figure 14 is also a summary of pavement condition based on total lane miles in each district, as opposed to statewide mileage. For example: 2% of District 1 roadways are considered very poor; and 62% of District 5 roadways are considered good.

STATEWIDE PAVEMENT CONDITION

By Lane Miles

Condition based on Cracking and Roughness Index



	1999	2000	2001	2002	2003
Good	6,201	6,833	7,094	7,267	7,196
Fair	3,243	2,777	2,610	2,801	2,691
Poor	1,254	1,176	1,255	1,170	1,435
Very Poor	1,062	970	820	593	497

Figure 10.

District Pavement Condition

by Lane Miles

Condition based on cracking and roughness indices

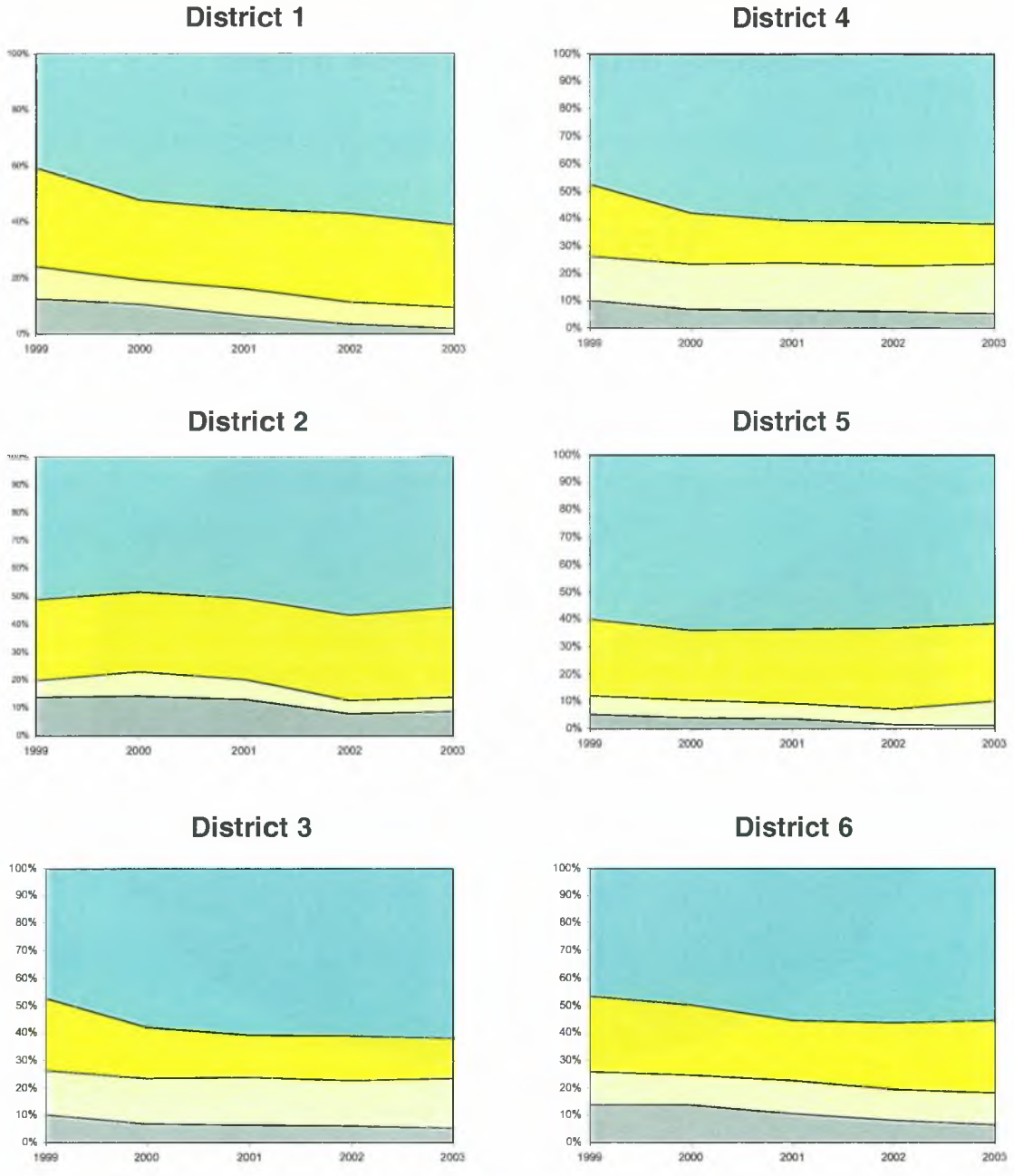


Figure 11.

2003
Statewide
Pavement Condition

Condition Based on
Cracking and Roughness Index

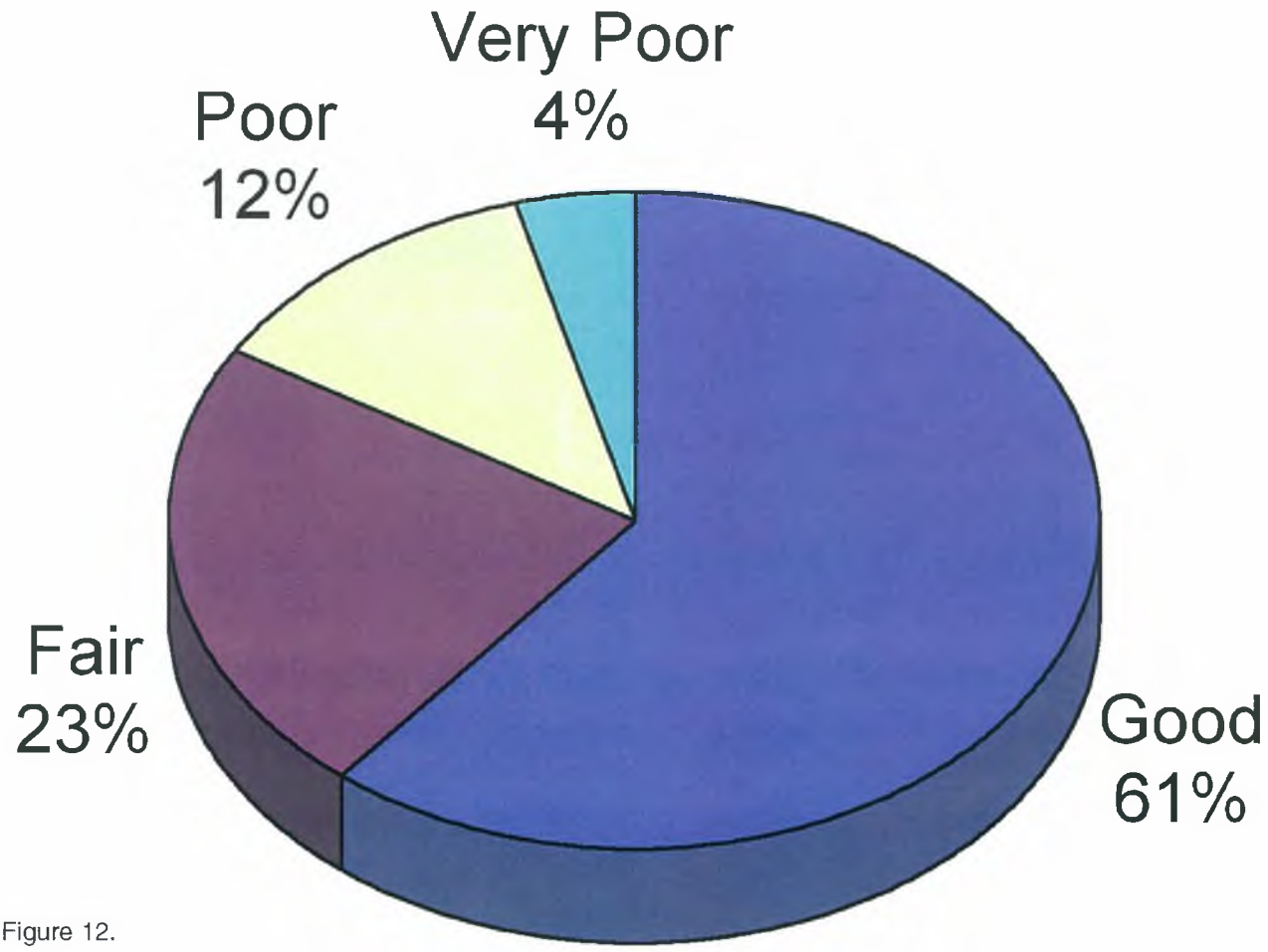


Figure 12.

2003 Pavement Condition
(District Percentage of Statewide Total)

Condition Based on Cracking and Roughness Indices

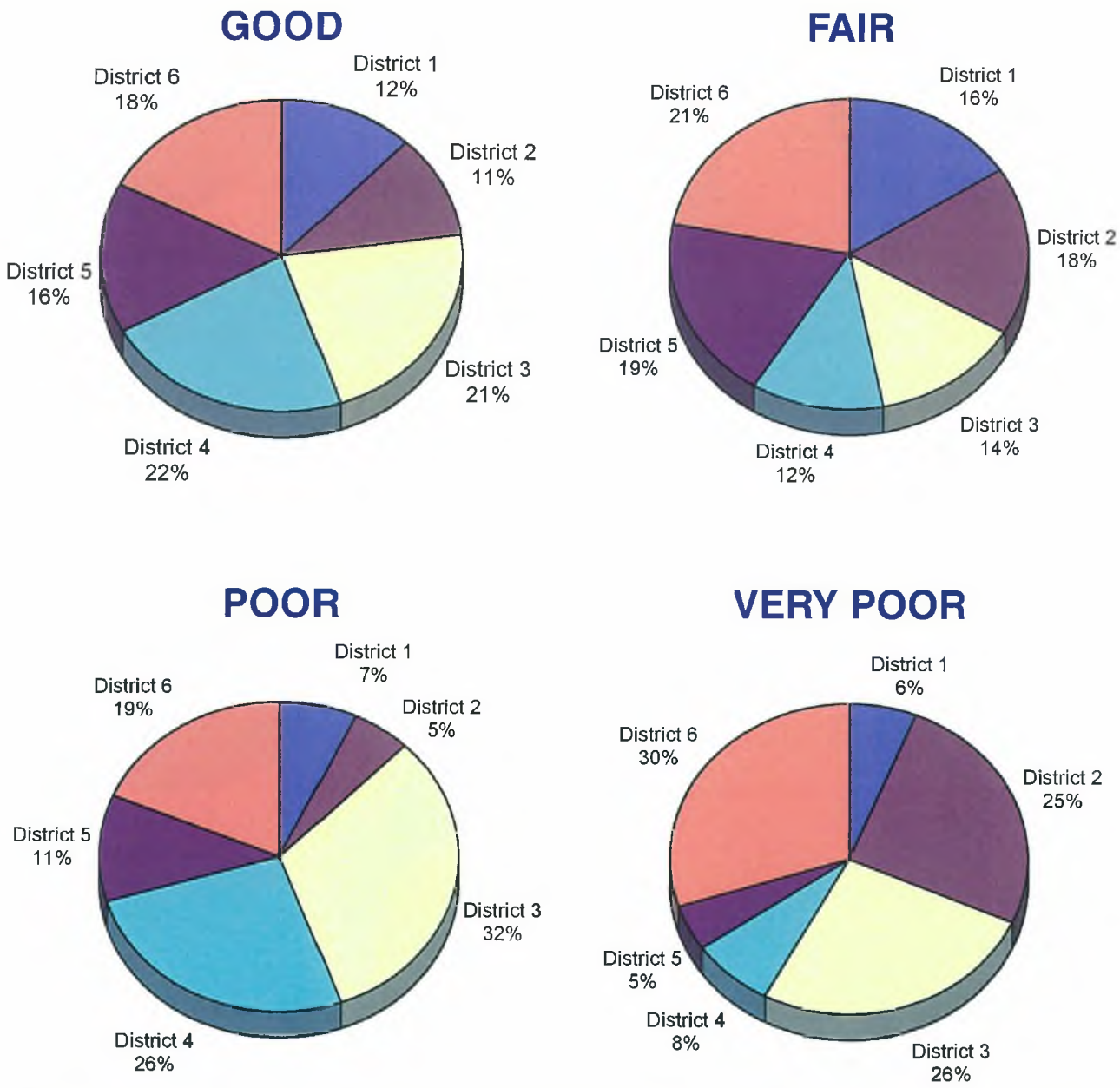


Figure 13.

2003
District Pavement Condition
Condition Based on Cracking and Roughness Indices

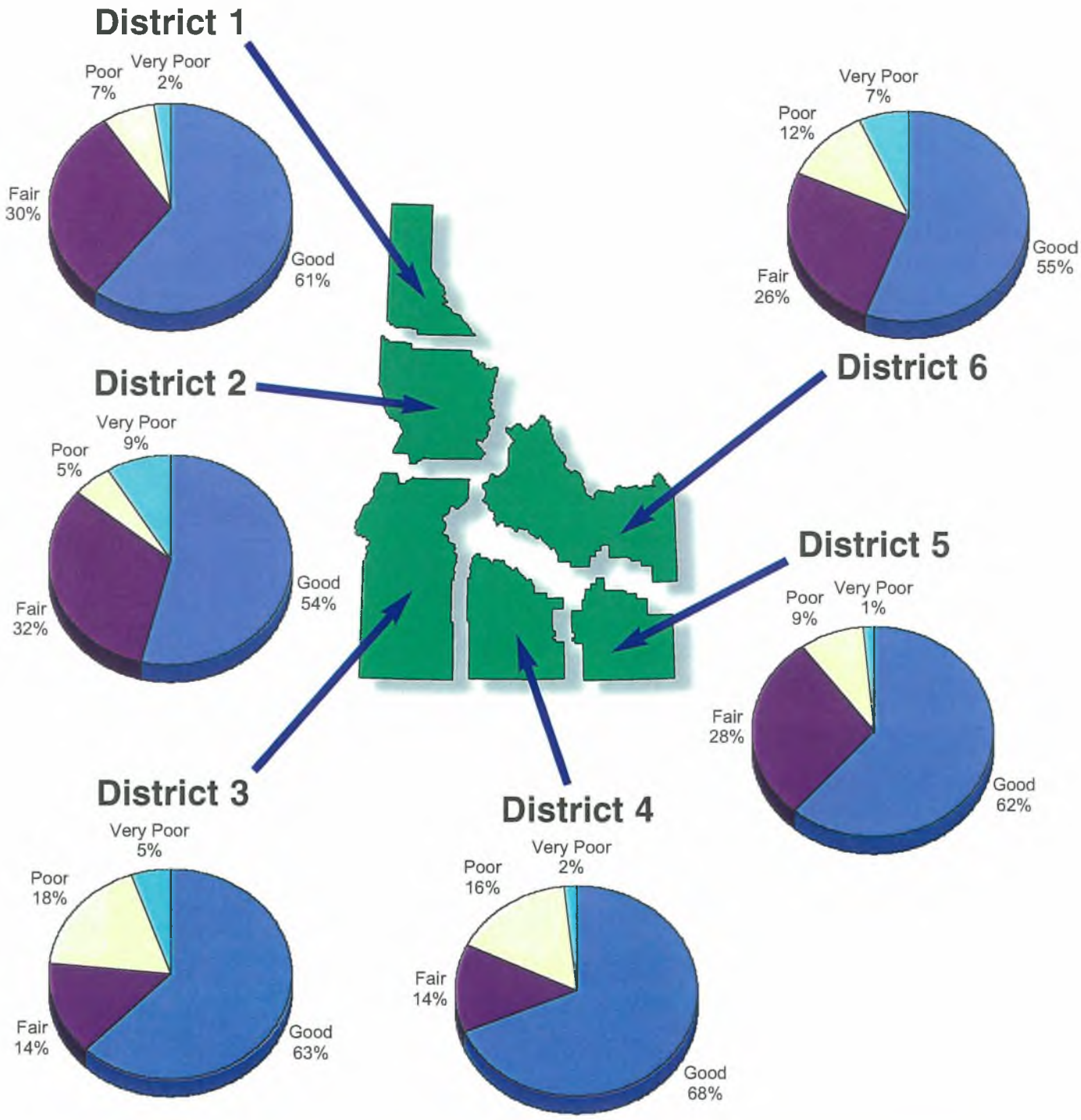


Figure 14.

PAVEMENT DEFICIENCIES BY SYSTEM

The following graphs represent a summary of Idaho's six-year pavement performance on interstates, remaining National Highway System (NHS), and Non National Highway System (Non-NHS) routes.

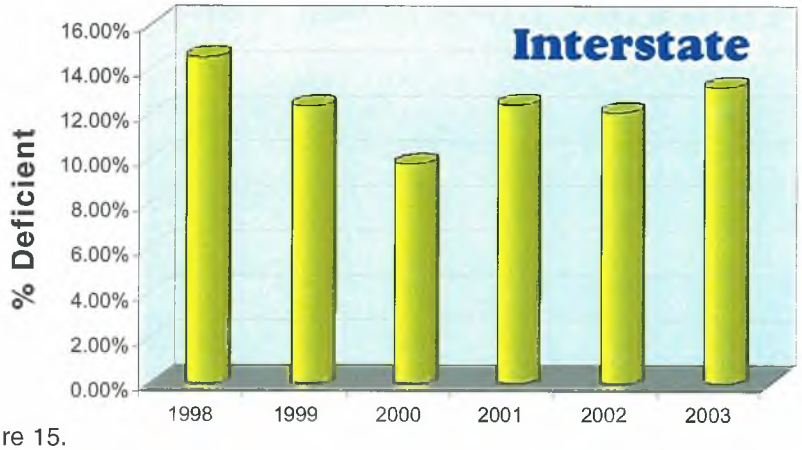


Figure 15.

Interstate highways in Idaho have improved from 23% deficient in 1994 to 13% deficient in 2003, a reduction of 10%.

The remaining (Non-Interstate) NHS routes have improved from 38 percent deficient in 1994 to approximately 18% deficient in 2003, a reduction of 20%.

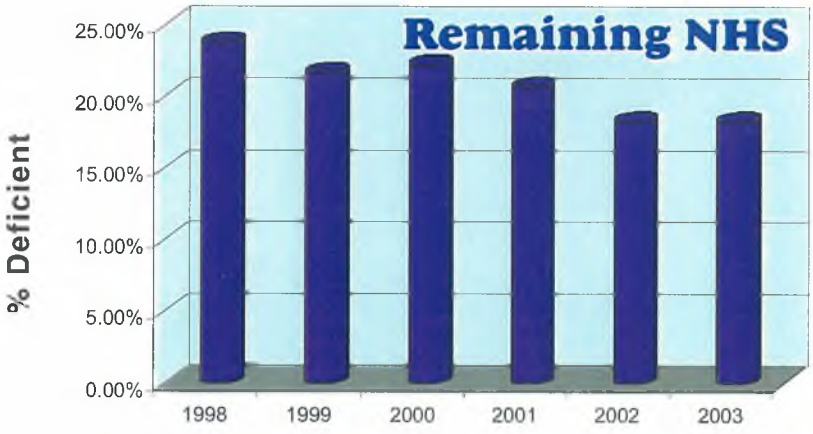


Figure 16.

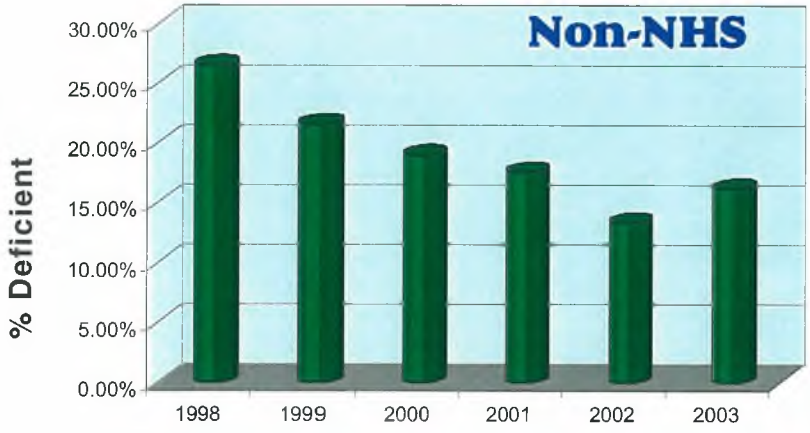


Figure 17.

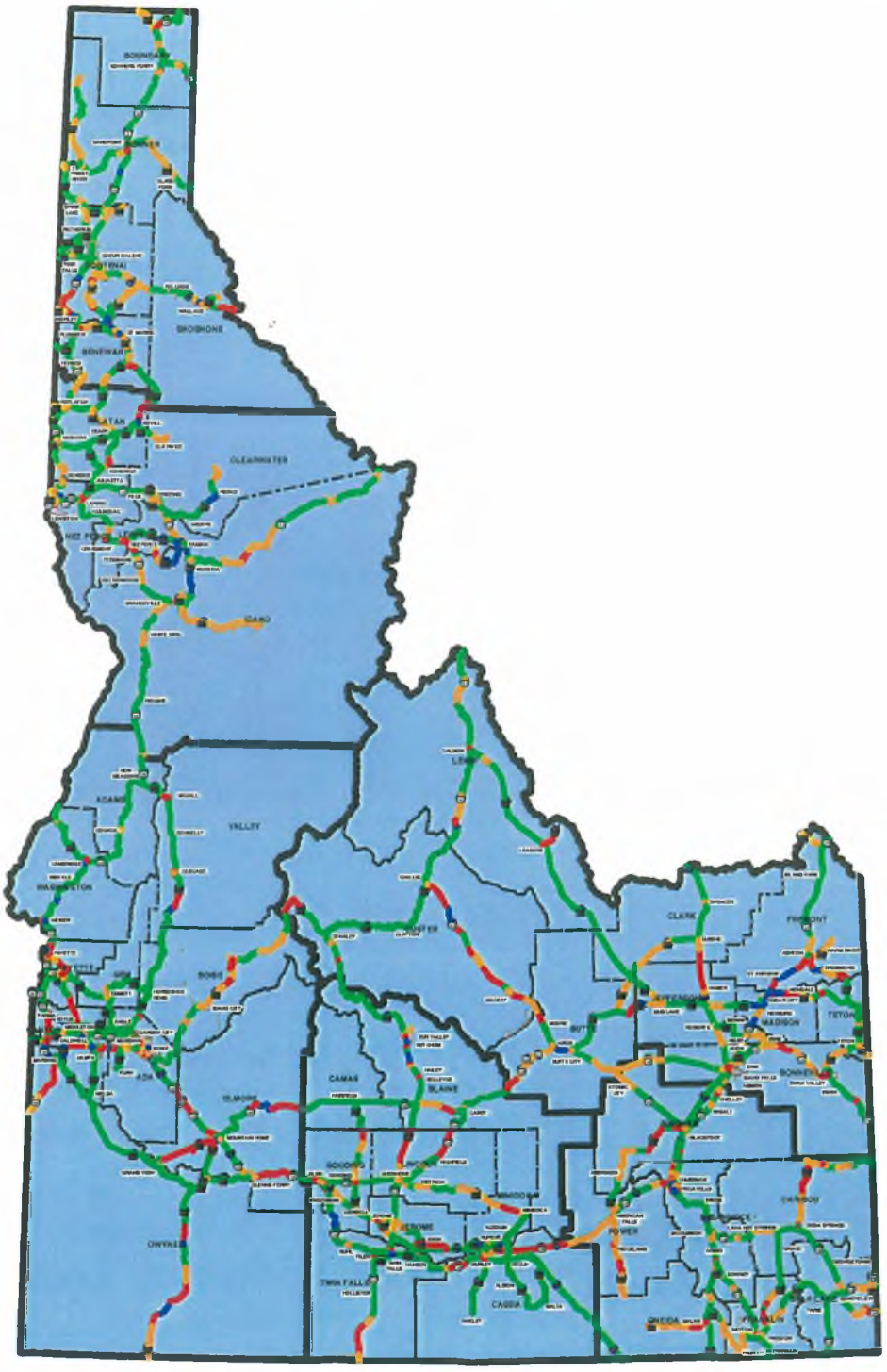
Non-NHS route deficiencies have also been reduced from over 44% in 1994 to 16% in 2003, a reduction of 28%.

State of Idaho

Pavement Condition Map

(11,819 Lane Miles)

Good	Fair	Poor	Very Poor
(7,196 Lane Miles)	(2,691 Lane Miles)	(1,435 Lane Miles)	(497 Lane Miles)



Map 2.

District 1

Pavement Condition Map

(1,419 lane miles)

Good	Fair	Poor	Very Poor
(861 Lane Miles)	(427 Lane Miles)	(102 Lane Miles)	(30 Lane Miles)

Map 3.

District 2

Pavement Condition Map

(1,461 lane miles)

Good	Fair	Poor	Very Poor
(787 Lane Miles)	(472 Lane Miles)	(76 Lane Miles)	(127 Lane Miles)

Map 4.

District 3

Pavement Condition Map

(2,525 lane miles)

Good	Fair	Poor	Very Poor
(1,571 Lane Miles)	(364 Lane Miles)	(460 Lane Miles)	(130 Lane Miles)

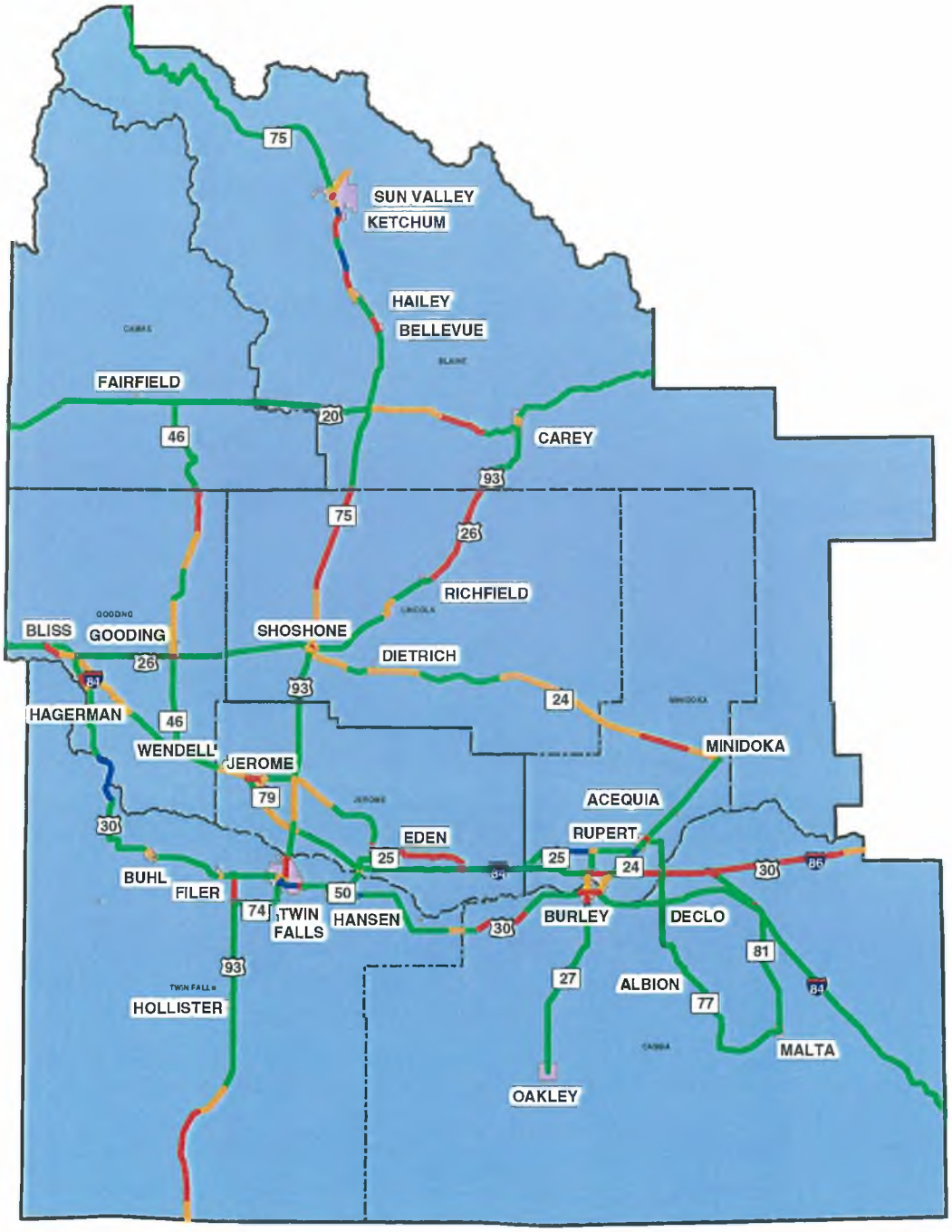
Map 5.

District 4

Pavement Condition Map

(2,329 lane miles)

Good	Fair	Poor	Very Poor
(1,596 Lane Miles)	(322 Lane Miles)	(373 Lane Miles)	(38 Lane Miles)



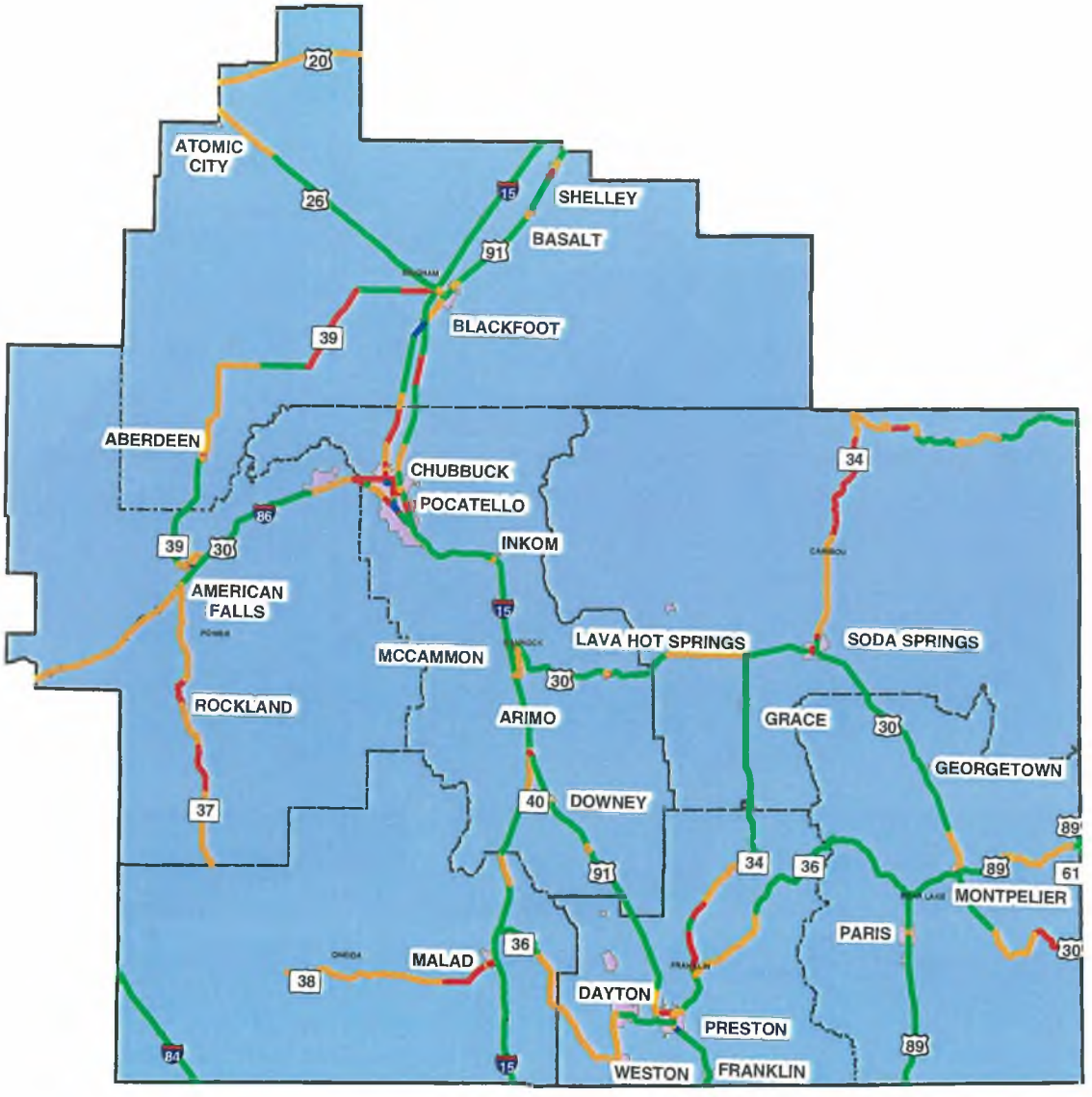
Map 6.

District 5

Pavement Condition Map

(1,815 lane miles)

Good	Fair	Poor	Very Poor
(1,115 Lane Miles)	(517 Lane Miles)	(159 Lane Miles)	(23 Lane Miles)



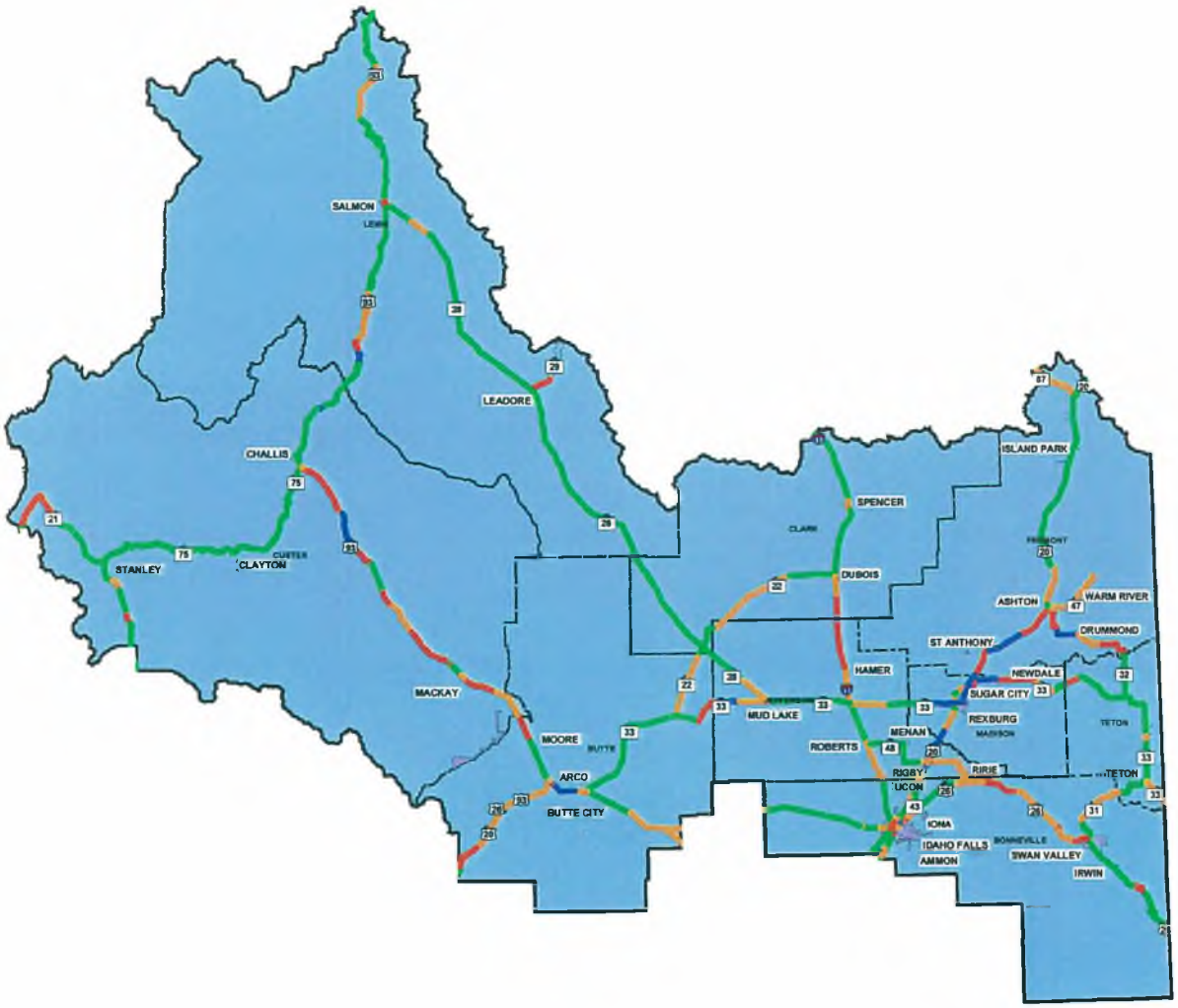
Map 7.

District 6

Pavement Condition Map

(2,271 lane miles)

Good	Fair	Poor	Very Poor
(1,267 Lane Miles)	(589 Lane Miles)	(266 Lane Miles)	(149 Lane Miles)



Map 8.

Section 4
NEEDS ANALYSIS

PAVEMENT NEEDS

The pavement-condition needs identified on the following pages were obtained through the Highway Performance Monitoring System - Analytical Package (HPMS-AP).

The HPMS-A/P is a model developed by the Federal Highway Administration (FHWA) to analyze data furnished to them by the states. The results of the analysis are used by the FHWA in policy development and for their bi-annual reports to Congress on the status and performance of the Nation's highways. This model has been adapted in-house and by consultant contract for ITD's use so that we may apply the same types of analysis to Idaho's pavement-management data.

The A/P's function is to analyze highway inventory data and to develop relationships between various levels of capital investment, and the resulting condition of the State Highway System. It is a tool to help predict the effects of any proposed level of capital investment and the corresponding condition, safety, and service characteristics of the highway system. It responds to a variety of questions regarding the levels of investment necessary to accomplish desired objectives.

The Planning Services section has enhanced the program by modifying it to reflect:

- Idaho's costs (based on ITD project history files)
- The department's design standards
- Our minimum tolerable conditions

(continues on next page)

PAVEMENT NEEDS (continued)

The analytical package analyzes data related to:

- pavement condition,
- geometrics,
- roadway cross section,
- operation, and
- access control.

Among its many reports, the program produces a prioritized list of pavement-management sections, year of need, and the type and cost of rehabilitation.

Figure 18 is a graphical representation of pavement needs by district.

The table on page 27 is a summary of current pavement needs by district and functional class. Deficiencies are defined as very poor and poor pavements (based on roughness and cracking).

Deficient pavement is classified as needing either resurfacing or reconstruction, depending on the level and type of deficiency identified for individual pavement sections. Costs are based on the average project costs for Idaho over the last ten years.

The district maps on pages 28 through 33 identify the specific locations of pavement deficiencies and programmed highway projects in each district.

Pavement-management data allows the department to effectively prioritize highway projects across the state.

2003
Pavement Needs
(Lane Miles)

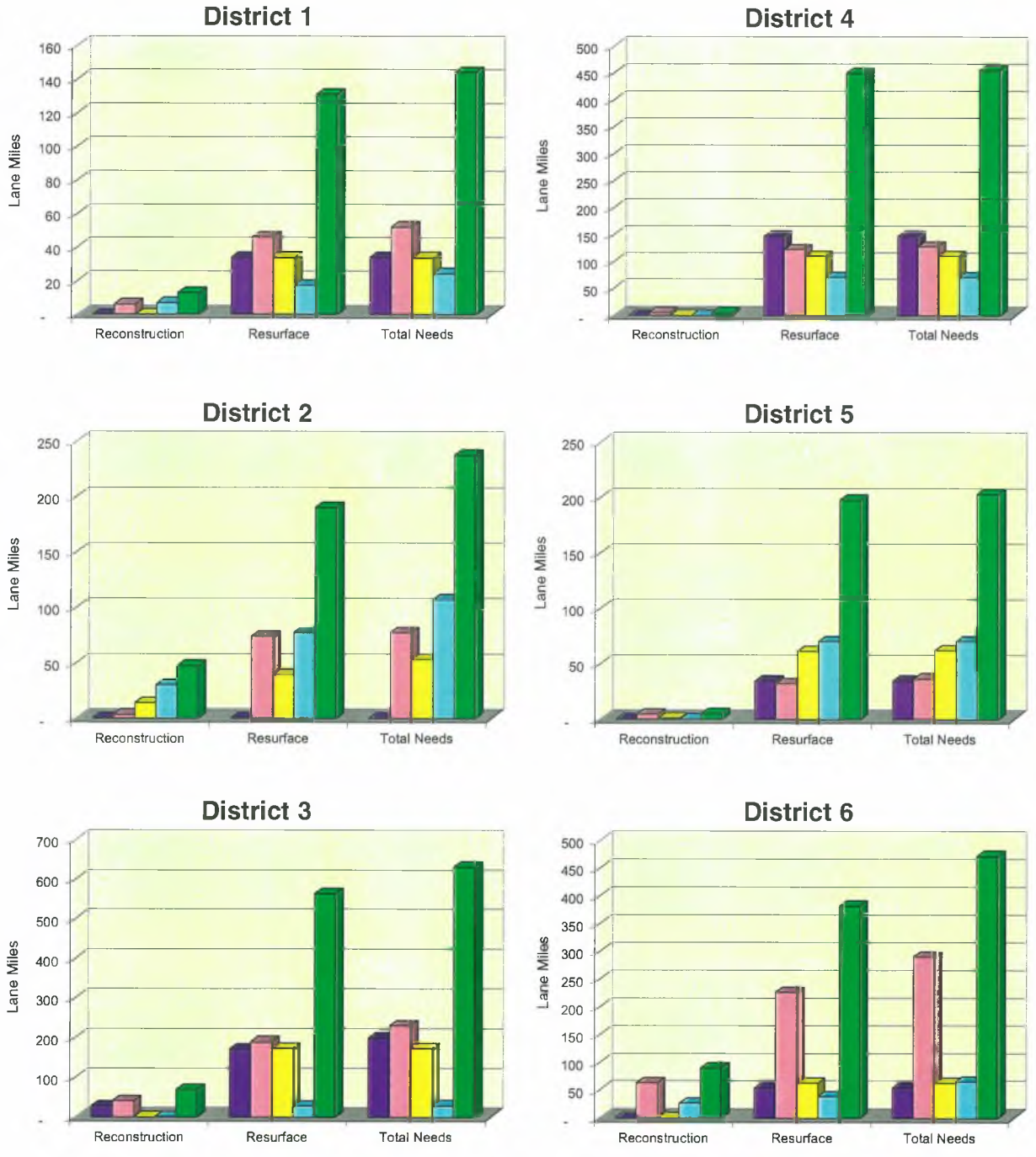


Figure 18.

2003 Pavement Needs
(State Highway System)

DISTRICT 1	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	34	4,033	34	4,033
PRINCIPAL ART.	6	3,137	46	4,508	52	7,645
MINOR ARTERIAL	-	-	34	3,228	34	3,228
COLLECTOR	7	2,881	17	1,895	24	4,776
TOTAL	13	6,018	131	13,664	144	19,682

DISTRICT 2	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	-	-	-	-
PRINCIPAL ART.	3	2,078	74	8,406	77	10,484
MINOR ARTERIAL	14	8,099	39	3,508	53	11,607
COLLECTOR	30	11,607	77	7,411	107	19,018
TOTAL	47	21,784	190	19,325	238	41,109

DISTRICT 3	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	27	14,686	172	15,720	199	30,406
PRINCIPAL ART.	41	20,112	190	19,545	231	39,657
MINOR ARTERIAL	-	-	174	14,945	174	14,945
COLLECTOR	1	223	28	1,924	29	2,147
TOTAL	69	35,021	563	52,134	632	87,155

DISTRICT 4	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	146	13,089	146	13,089
PRINCIPAL ART.	5	3,295	122	11,201	128	14,496
MINOR ARTERIAL	-	-	111	10,212	111	10,212
COLLECTOR	-	-	71	4,832	71	4,832
TOTAL	5	3,295	450	39,334	456	42,629

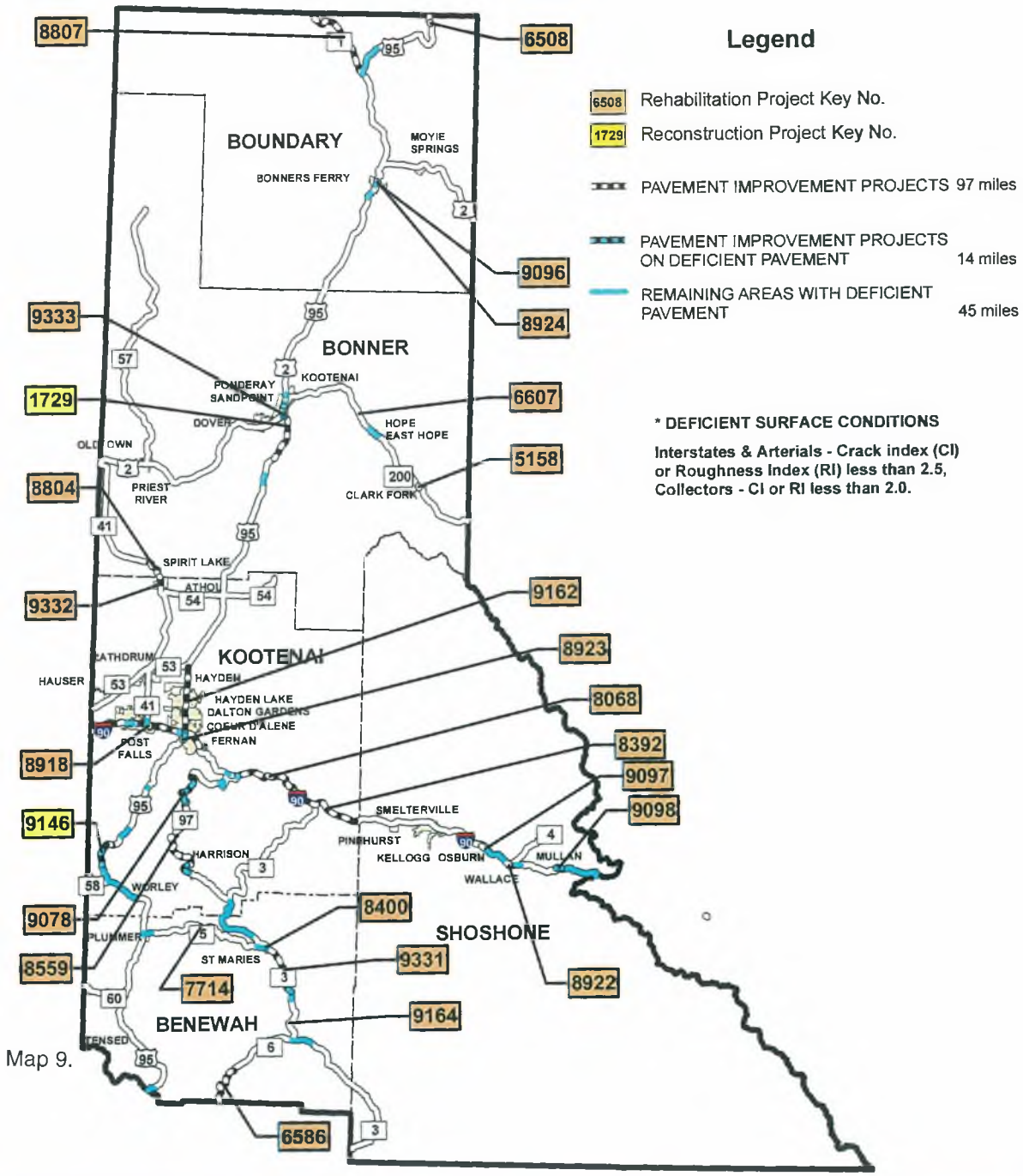
DISTRICT 5	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	35	3,398	35	3,398
PRINCIPAL ART.	4	2,598	32	3,855	37	6,453
MINOR ARTERIAL	1	289	61	4,895	62	5,184
COLLECTOR	-	-	70	5,163	70	5,163
TOTAL	5	2,887	198	17,311	203	20,198

DISTRICT 6	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	54	4,835	54	4,835
PRINCIPAL ART.	63	27,512	227	19,607	290	47,119
MINOR ARTERIAL	-	-	63	4,727	63	4,727
COLLECTOR	26	10,281	39	3,024	65	13,305
TOTAL	90	37,793	383	32,193	473	69,986
GRAND TOTAL	230	106,798	1,915	173,961	2,145	280,759

District 1

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

FY2004 — FY2008

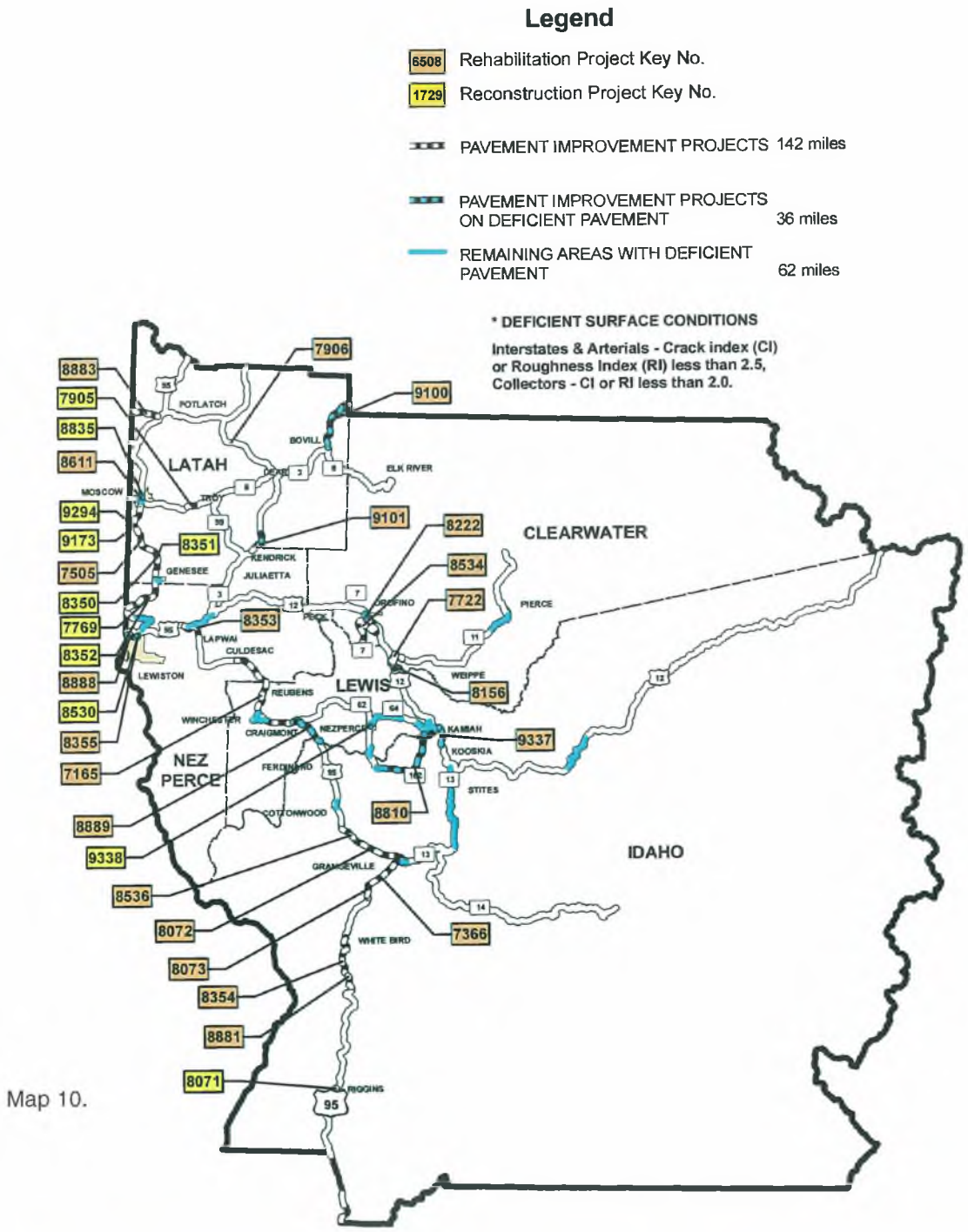


Map 9.

District 2

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

FY2004 — FY2008

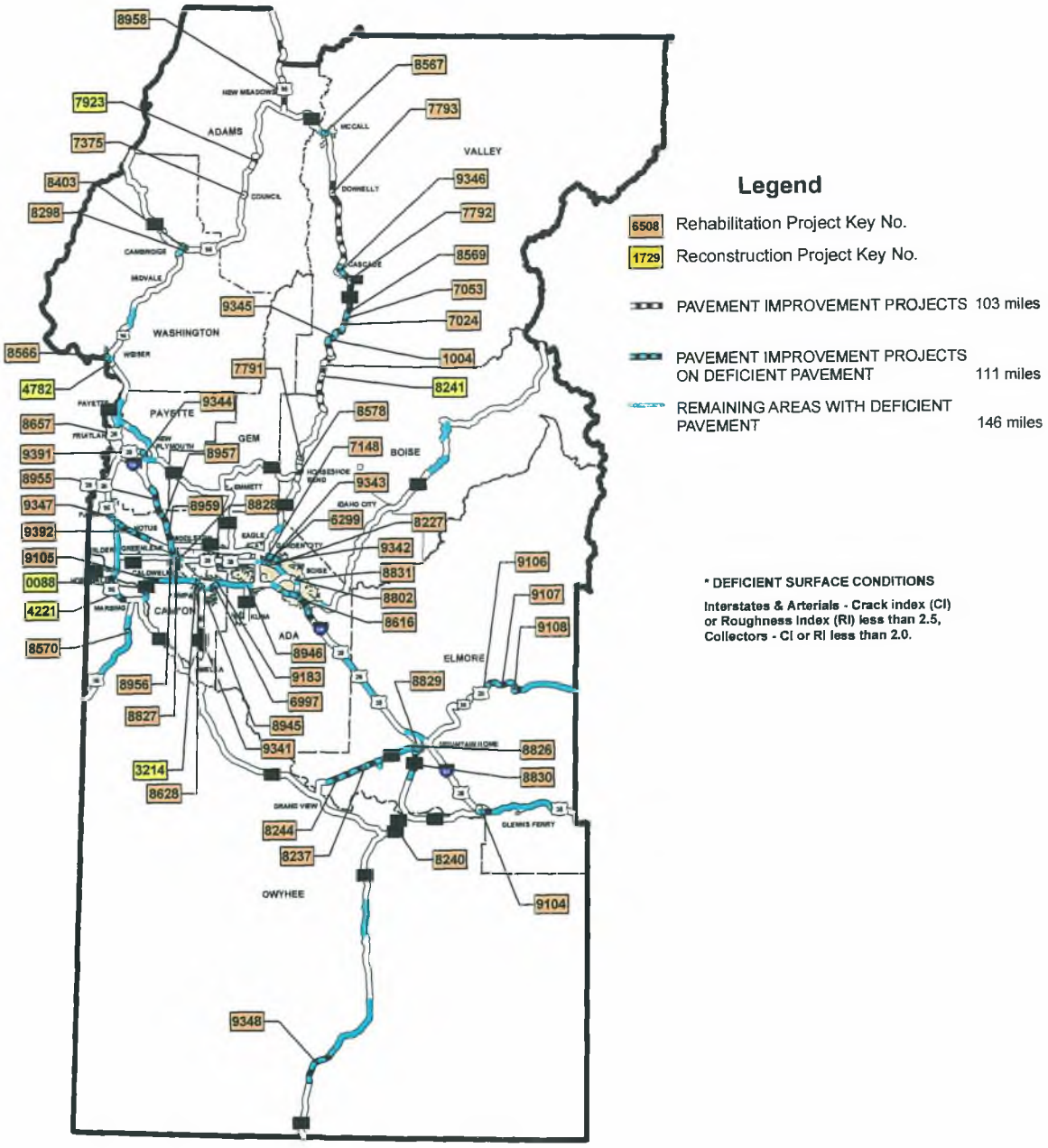


Map 10.

District 3

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

FY2004 — FY2008

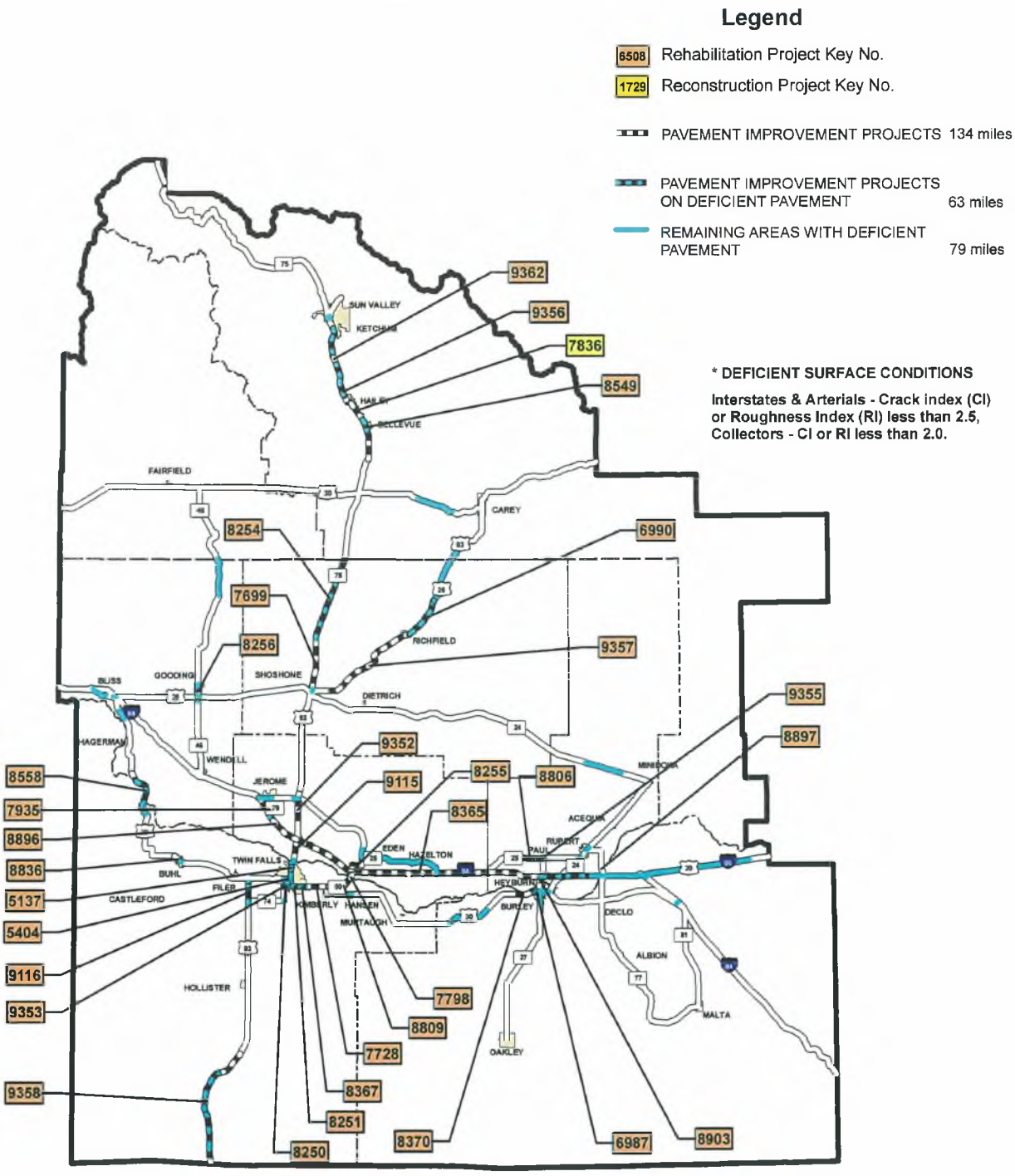


Map 11.

District 4

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

FY2004 — FY2008

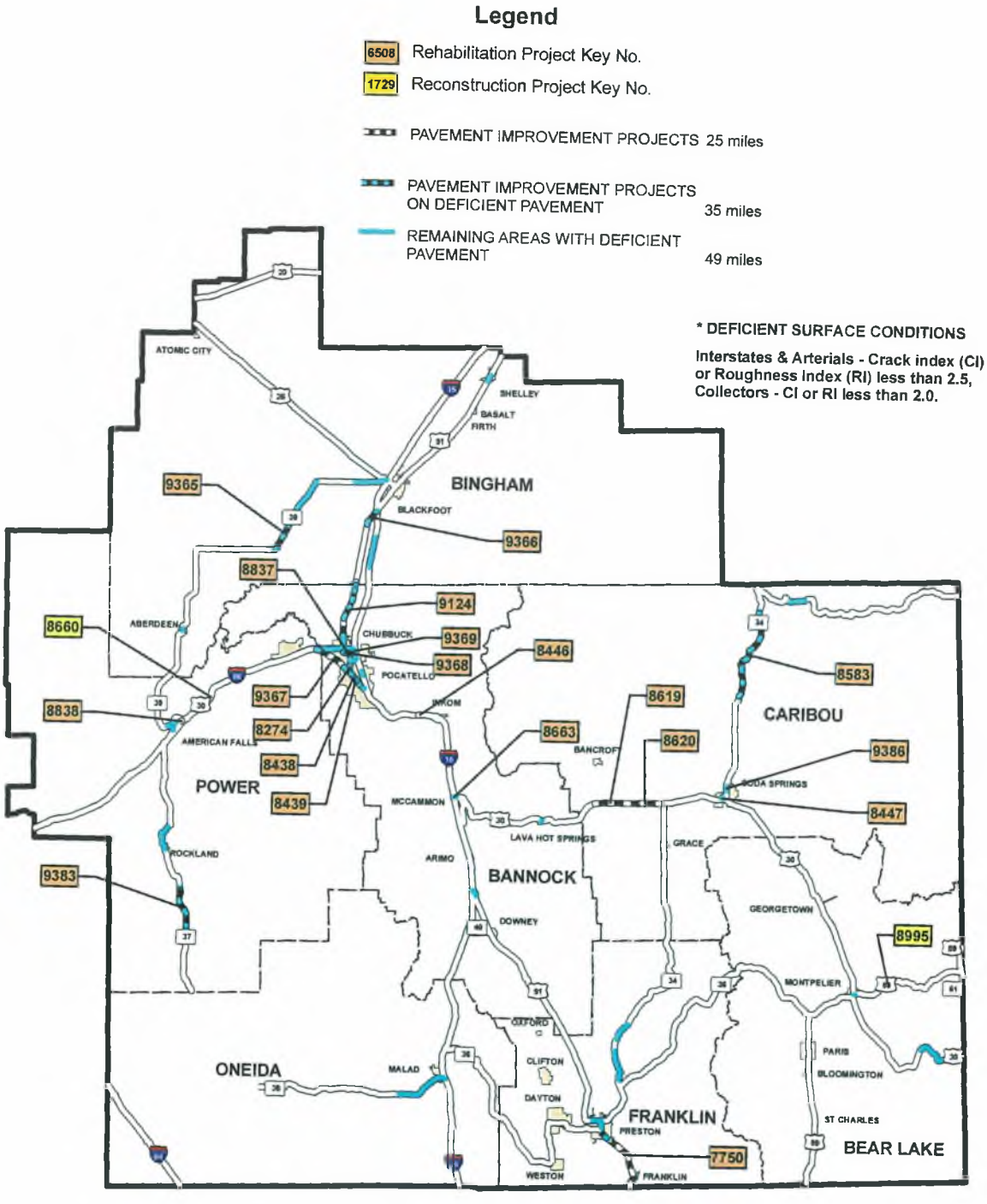


Map 12.

District 5

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

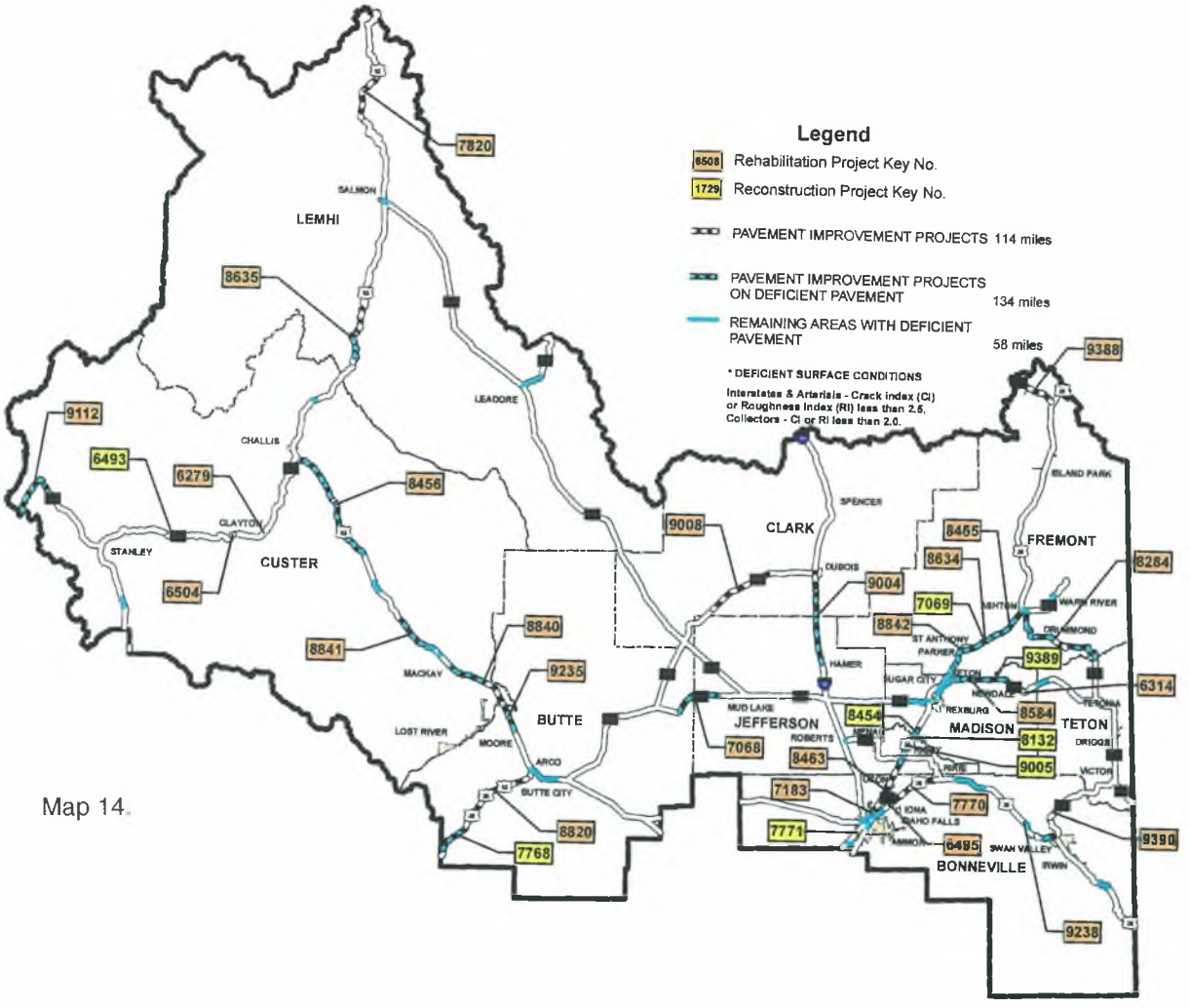
FY2004 — FY2008



District 6

Programmed Pavement Improvement Projects vs. Pavement Deficiencies

FY2004 — FY2008



Map 14.

Section 5
SEALCOATS

The distributor truck above is spraying liquid asphalt on a roadway. This vehicle will be followed by a chip spreader applingy a layer of crushed rock on top of the asphalt. Rubber tired rollers will then follow the chip spreader to seat the rock into the liquid asphalt, completing the sealcoating process.

Sealcoats are an important part of the department's preventative-maintenance program. Preventative maintenance slows the rate of pavement deterioration which increases the service life of our highway system. Sealcoats help protect our pavements by reducing damage caused by oxidation and moisture and improve skid resistance.

Figures 19 and 20 provide a five-year look at sealcoats from a statewide perspective. Centerline and lane miles of sealcoat projects are tabulated for years 1999 through 2003.

Figure 21 shows the five-year average of lane miles sealcoated and the percentage of lane miles sealcoated by district.

District 6 has the highest "percentage" of lane miles sealcoated annually (15.6% or 322 lane miles).

Figures 22 through 27 show the miles sealcoated from 1999 to 2003 in each of ITD's six districts.

STATEWIDE FIVE-YEAR SEALCOAT HISTORY
(1999 - 2003)

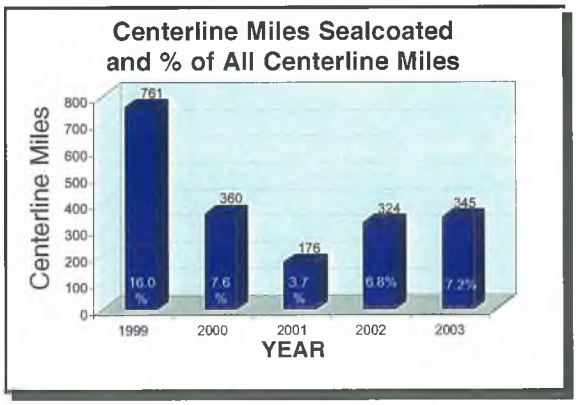


Figure 19

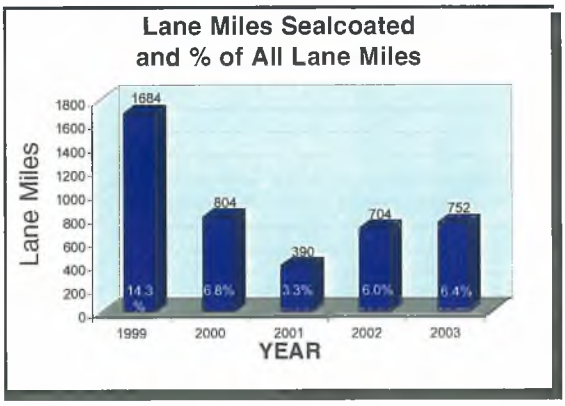


Figure 20

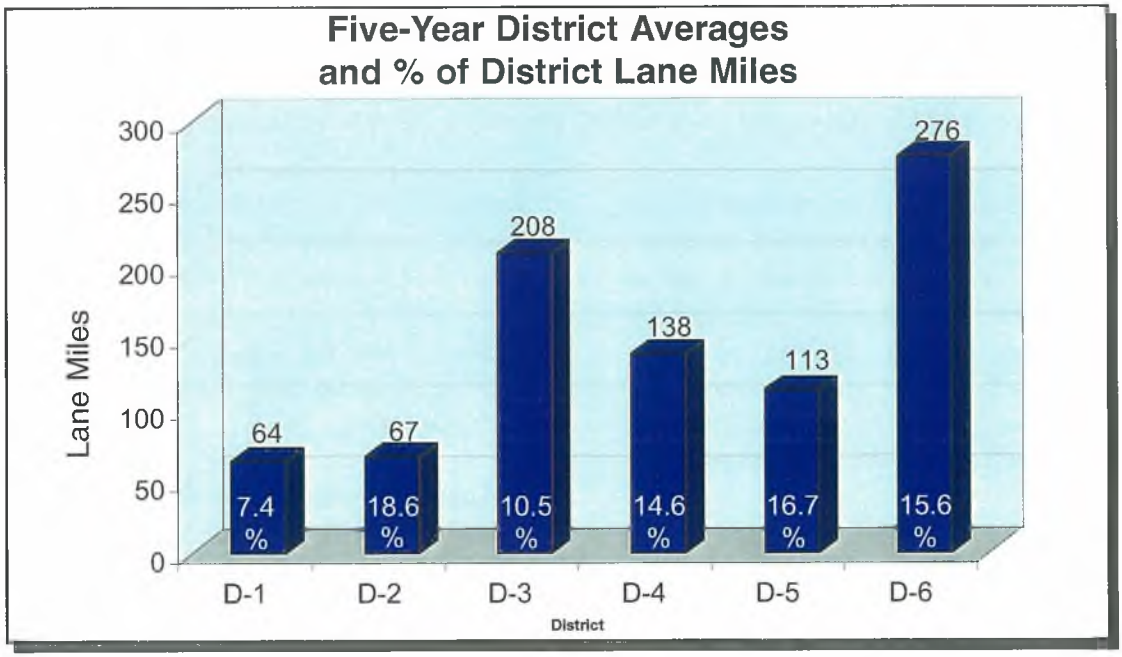
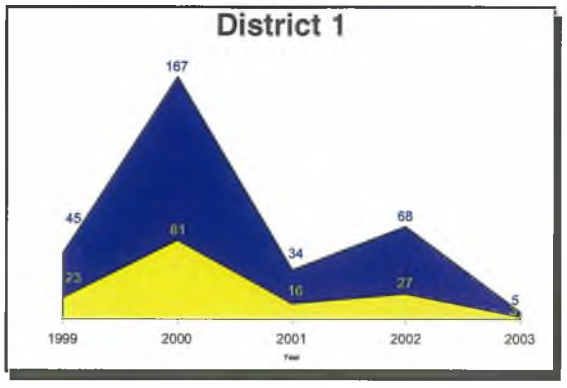
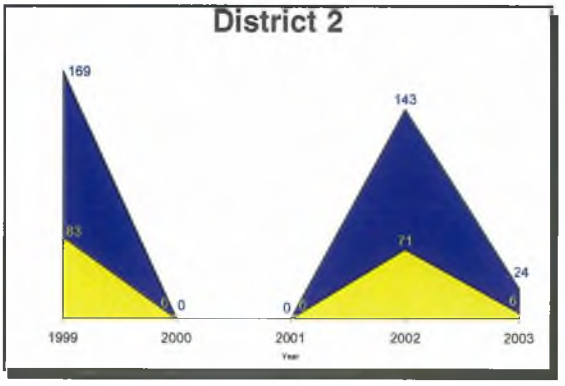


Figure 21

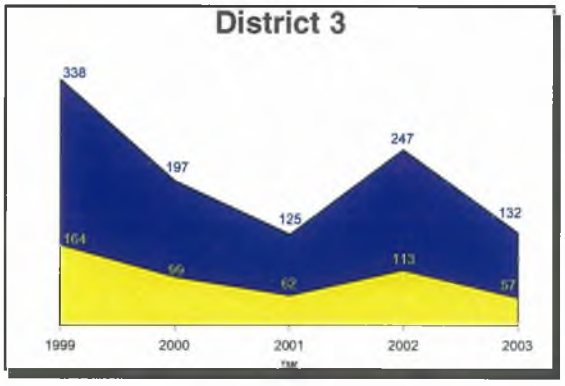
STATEWIDE FIVE-YEAR SEALCOAT HISTORY BY DISTRICT
(1999 - 2003)



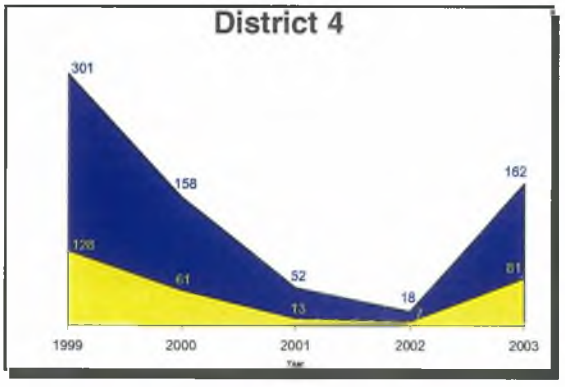
5-Year Lane Mile Average = 64



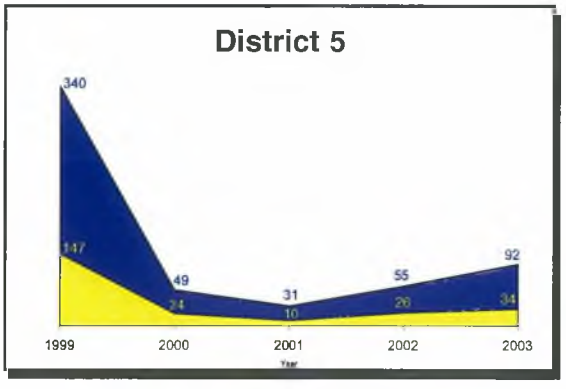
5-Year Lane Mile Average = 67



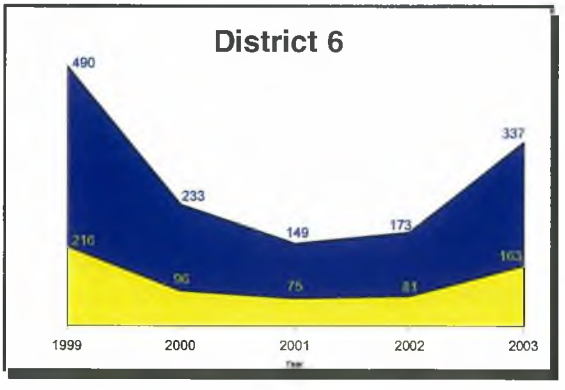
5-Year Lane Mile Average = 208



5-Year Lane Mile Average = 138



5-Year Lane Mile Average = 113



5-Year Lane Mile Average = 277

Lane Miles Centerline Miles

Figures 22 through 27

Section 6
SUMMARY

MAINTENANCE, REHABILITATION, AND RECONSTRUCTION

Idaho is making significant progress in the reduction of pavement deficiencies on the State Highway System. Pavements that are considered deficient have declined from nearly 40% in 1993 to 16% by calendar year 2003.

This reduction in deficiencies can be attributed to:

- **Maintenance:** Sealcoats and other activities slow the rate of deterioration. The result of a strong maintenance program is that fewer deficiencies come on the system each year.

- **Rehabilitation:** The minor rehabilitation program has reduced pavement deficiencies. Under this program, pavements are resurfaced before they deteriorate to the point that reconstruction is necessary. The program allows us to keep our pavements in good condition.

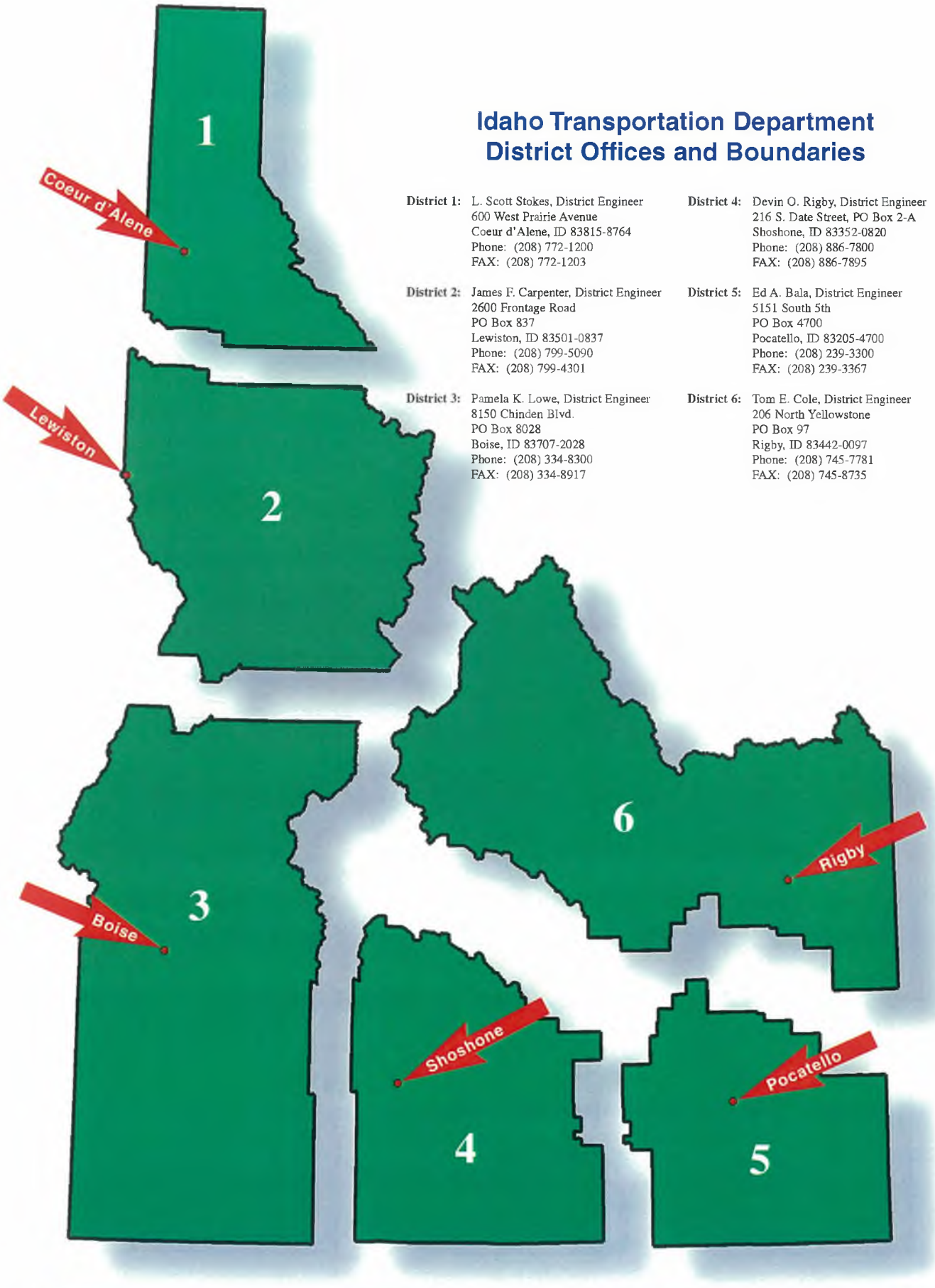
- **Reconstruction:** When pavements have reached the end of their service life an effective reconstruction program is necessary.

Maintenance, rehabilitation, and reconstruction are all appropriate tools that need to be used at different times in the life of a section of pavement. It is important to select the proper tool to use at the appropriate time. Wise future project selections will allow Idaho to continue:

- spending its limited roadway dollars wisely, and

- reducing roadway deficiencies and the rate at which roadways become deficient.

Idaho Transportation Department
District Offices and Boundaries



District 1: L. Scott Stokes, District Engineer
600 West Prairie Avenue
Coeur d'Alene, ID 83815-8764
Phone: (208) 772-1200
FAX: (208) 772-1203

District 2: James F. Carpenter, District Engineer
2600 Frontage Road
PO Box 837
Lewiston, ID 83501-0837
Phone: (208) 799-5090
FAX: (208) 799-4301

District 3: Pamela K. Lowe, District Engineer
8150 Chinden Blvd.
PO Box 8028
Boise, ID 83707-2028
Phone: (208) 334-8300
FAX: (208) 334-8917

District 4: Devin O. Rigby, District Engineer
216 S. Date Street, PO Box 2-A
Shoshone, ID 83352-0820
Phone: (208) 886-7800
FAX: (208) 886-7895

District 5: Ed A. Bala, District Engineer
5151 South 5th
PO Box 4700
Pocatello, ID 83205-4700
Phone: (208) 239-3300
FAX: (208) 239-3367

District 6: Tom E. Cole, District Engineer
206 North Yellowstone
PO Box 97
Rigby, ID 83442-0097
Phone: (208) 745-7781
FAX: (208) 745-8735

VISIT OUR WEBSITE!

WWW.STATE.ID.US/ITD/PLANNING

The Division of Planning provides a variety of useful highway data, maps, reports, software, and transportation-related links on our web site. Listed below is a sample of the information available at www.state.id.us/itd/planning.

HIGHWAY DATA

Choose from a variety of tabular data about Idaho's state highway infrastructure.

SOFTWARE

The division has developed it's own software that you can download from our site to simplify the process of viewing Idaho's transportation-planning data.

PLANNING TOPICS AND RELATED SITES

Other topics and sites that may have useful transportation planning-related information.

If you need information about transporation in Idaho, our site is just a click away!

Notes

Pavement Management System