Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit
for
Introduction to the
Pavement Management Process

July 13, 1993

Kansas Department of Transportation
Materials and Research Laboratory
2300 Van Buren
Topeka, Kansas 66611

KANSAS DEPARTMENT OF TRANSPORTATION
Bureau of Materials and Research, Geotechnical Unit
Materials and Research Center, 2300 Van Buren
Topeka, Kansas 66611-1195 (913)296-3008

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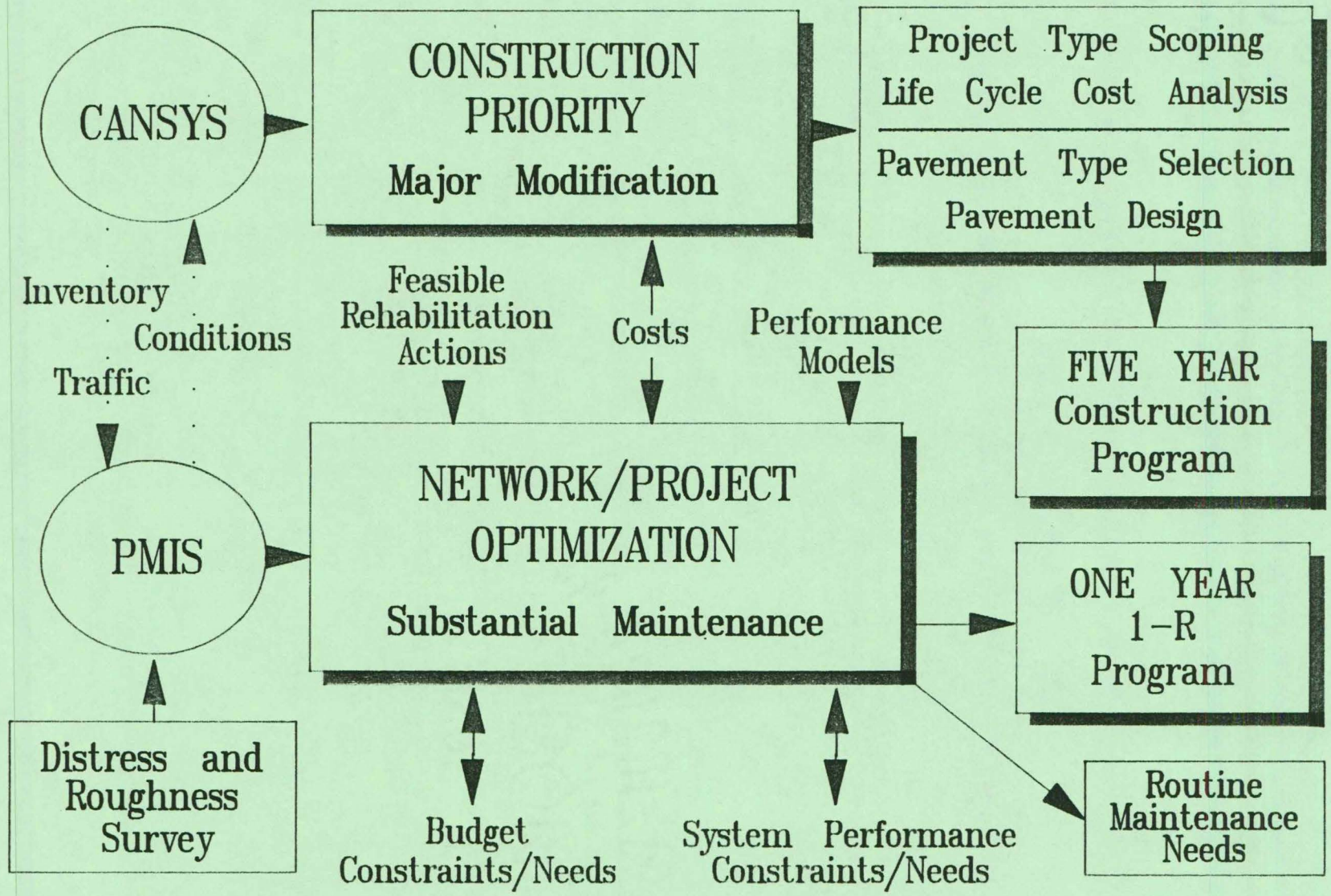
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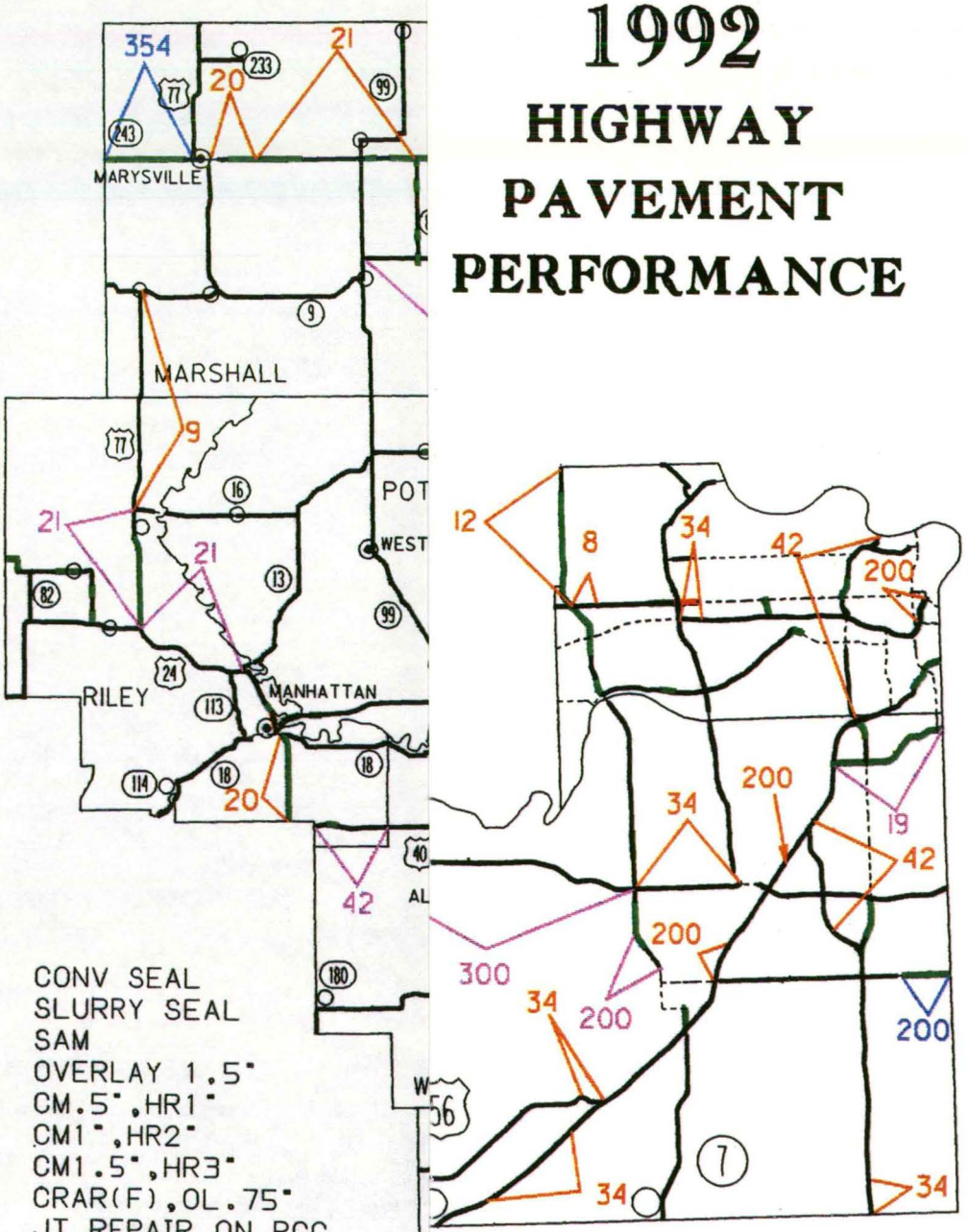

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ISTRICT ONE

Prepared By The

RTMENT OF TRANSPORTATION

MATERIALS AND RESEARCH

y 27, 1992 Using PMIS Database 7-1-92

Iowa Department of Transportation
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Site Visit
for
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Pavement Management Process

Kansas Comprehensive Highway Program
excerpts of the descriptions of
Substantial Maintenance Program
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KANSAS COMPREHENSIVE HIGHWAY PROGRAM

FISCAL YEAR 1993 - 1997 PLAN

FOREWORD

This report, prepared by the Kansas Department of Transportation (KDOT), summarizes planned accomplishments for the fiscal years (FY) 1993-1997 portion of the Kansas Comprehensive Highway Program. Projects which will be let to contract during the first two years of the five-year Program are identified by year. Those to be let in the last three years of the Program, which are under development and subject to funding, design and right-of-way constraints, have been combined into one category.

The Kansas Comprehensive Highway Program is composed of four major work-type categories: (1) Substantial Maintenance, (2) Major Modification, (3) Priority Bridges and (4) System Enhancements.

Substantial Maintenance projects are designed to protect the State's investment in the highway system by preserving existing roadways and bridges.

Major Modification projects go beyond preservation and focus on extending service life and enhancing safety.

Priority Bridge projects target the most deficient bridges on the State Highway System in Kansas for replacement or modernization.

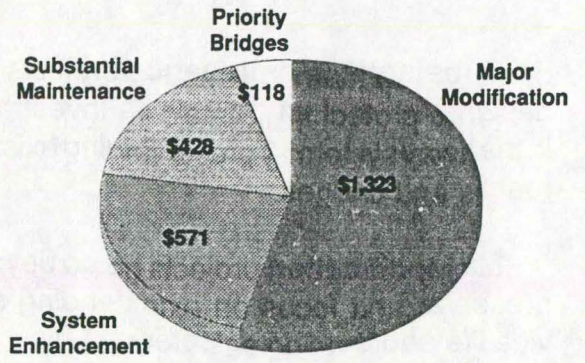
System Enhancement projects substantially improve safety, relieve congestion, improve access or enhance economic development.

KANSAS COMPREHENSIVE HIGHWAY PROGRAM
ESTIMATED CONSTRUCTION COST
FY 1990 - 1997
($ Millions)

	1990*	1991*	1992	1993	1994	1995	1996	1997	Total
Substantial Maintenance	70,635	70,541	74,060	76,329	81,174	85,711	90,167	94,853	643,470
Major Modification	162,792	110,508	196,616	270,909	259,423	362,188	205,110	225,514	1,793,060
Priority Bridges	24,189	29,010	29,197	18,097	48,494	24,047	15,865	11,742	200,641
System Enhancement	0	57,002	40,127	61,551	155,520	149,898	160,630	43,510	668,238
Total	257,616	267,061	340,000	426,886	544,611	621,844	471,772	375,619	3,305,409

*Actual Construction Cost

KANSAS COMPREHENSIVE HIGHWAY PROGRAM
ESTIMATED CONSTRUCTION COST
FY 1993 - 1997 PLAN
($ Millions)



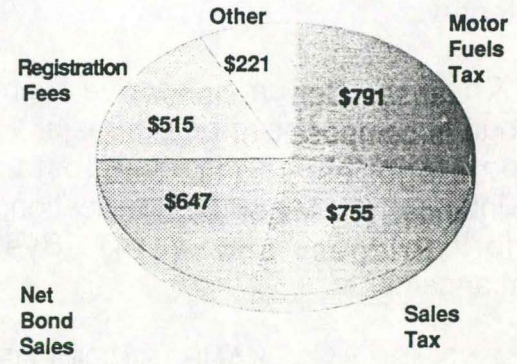
FUNDING

The funding of highway improvements depends on the availability of funds and on criteria established by State and Federal law on the use of those funds. Highway projects can be financed entirely by State funds, by a combination of Federal-aid and matching State funds, or by a combination of Federal-aid or State funds and matching local funds.

STATE FUNDS

State sources of highway funds include motor fuels tax, sales tax, registration fees, and a number of miscellaneous fees such as drivers license fees, mineral royalties and signboard permit fees. In addition, the1989 Legislature authorized up to $890 million in revenue bond sales through FY 1997. $250 million of bonds were sold in March 1992.

ESTIMATED STATE GENERATED REVENUE
STATE HIGHWAY FUND
FY 1993-1997
($ Millions)



STATE HIGHWAY FUND REVENUE
FY 1993 - 1997
($ Millions)

Source	1993	1994	1995	1996	1997	Total
Motor Fuels Taxes	$156.2	$158.6	$158.6	$158.6	$158.6	$790.6
Registration Fees	103.0	103.0	103.0	103.0	103.0	515.0
Sales Tax Transfer	76.3	81.3	84.4	87.5	90.8	420.3
Sales and Comp. Tax	61.9	64.5	66.9	69.4	72.1	334.8
Other Incl. Interest	36.6	50.5	59.8	46.7	27.0	220.6
Subtotal	434.0	457.9	472.7	465.2	451.5	2,281.3
Net Bond Sales	201.0	205.8	200.5	39.5	0.0	646.8
Total	$635.0	$663.7	$673.2	$504.7	$451.5	$2,928.1

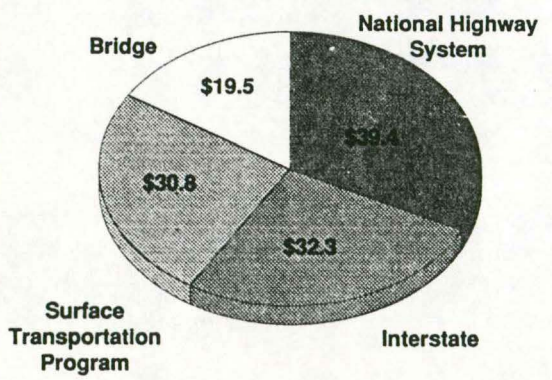
Motor fuels represent an estimated 27.0 percent and sales tax receipts represent an estimated 25.8 percent of the FY 1993-1997 state generated highway revenues. Vehicle registration fees comprise an estimated 17.6 percent, net bond sales 22.1 percent and all other sources 7.5 percent of the total.

The table on the previous page shows the sources and amounts of FY 1993-1997 State Highway Fund revenues. The bond sales and interest are tentative projections and may vary with market conditions and changing agency needs.

FEDERAL FUNDS

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) will provide Federal-aid to the State and local units of government through Federal Fiscal Year (FFY) 1997. The ISTEA established new programs and funding categories that are significantly different from those in previous Federal surface transportation legislation.

FFY* 1992 APPORTIONMENTS
FOR STATE SYSTEM CONSTRUCTION
($ Millions)



*Federal Fiscal Year (October 1- September 30)

The major programs of the Act include the National Highway System (NHS), Surface Transportation Program (STP), Bridge Replacement And Rehabilitation Program, Interstate Maintenance (IM) and Congestion Mitigation and Air Quality (CMAQ). Federal funds used for projects which are eligible under these funding categories must meet specific program objectives. There are numerous new requirements of the ISTEA which will impact the use of Federal funds in the Kansas Comprehensive Highway Program.

The Federal government annually apportions or divides the Federal-aid highway funds authorized by Congress among the states. States receive funding in each of the various program categories as specified in the Federal transportation legislation. Funds for most highway programs in the ISTEA are based on a state's historical share of funds received in past years. Bridge Program and Congestion Mitigation apportionments are distributed based on a state's specific needs for these funds.

Congress annually sets an upper limit, termed an obligation ceiling, on the amount of total obligations that may be incurred by each state. This limit is used as a means of controlling budget outlays to make the Federal-aid highway program responsive to the nation's current economic and budgetary conditions. The obligation limitation is typically less than the amount of Federal-aid apportioned to the states.

The FFY 1992 (October 1, 1991 - September 30, 1992) apportionments to Kansas are shown in the chart on this page. For programming purposes, the FFY 1993-1997 apportionments and obligation ceilings were estimated by KDOT based on data

provided to Congress by the Federal Highway Administration and on historical obligation ceiling/apportionment ratios.

LOCAL FUNDS

The Comprehensive Highway Program has for several years included a number of Local Partnership Programs in which a project's cost is shared by the state and local unit of government. The City Connecting Link (KLINK) Resurfacing, Geometric Improvement and Economic Development Programs are designed to assist local governments in making surfacing and geometric improvements on city connecting links and to finance projects that are needed as a result of rapid economic growth or to spur economic development. As a result of the increased funding provided by the Kansas Comprehensive Highway Program, the amount of State funds available for the Geometric Improvement and Economic Development Set-Aside projects has been doubled beginning in FY 1993.

The KLINK Resurfacing Program requires a minimum 50 percent match in local funds, and State funds are limited to a maximum of $100,000 per project. The Geometric Improvement Program requires local matching funds on a sliding scale based on the city's population. The Economic Development Program requires a minimum of 25 percent in local matching funds.

The System Enhancement Program of projects was established by the 1989 Legislature. These projects did not require local matching funds; however, the priority of the project was increased by the addition of local funds.

SUBSTANTIAL MAINTENANCE PROGRAM

Substantial Maintenance is the first major component of the Comprehensive Highway Program. Projects in this category are intended to protect the public's investment in the State Highway System by preserving the "as built" condition as long as possible, thus extending the life until major improvements are needed. Projects funded with these reserved or set-aside funds include resurfacing projects, minor bridge repair, bridge painting, culvert replacement, emergency repair, sign refurbishing and small safety projects.

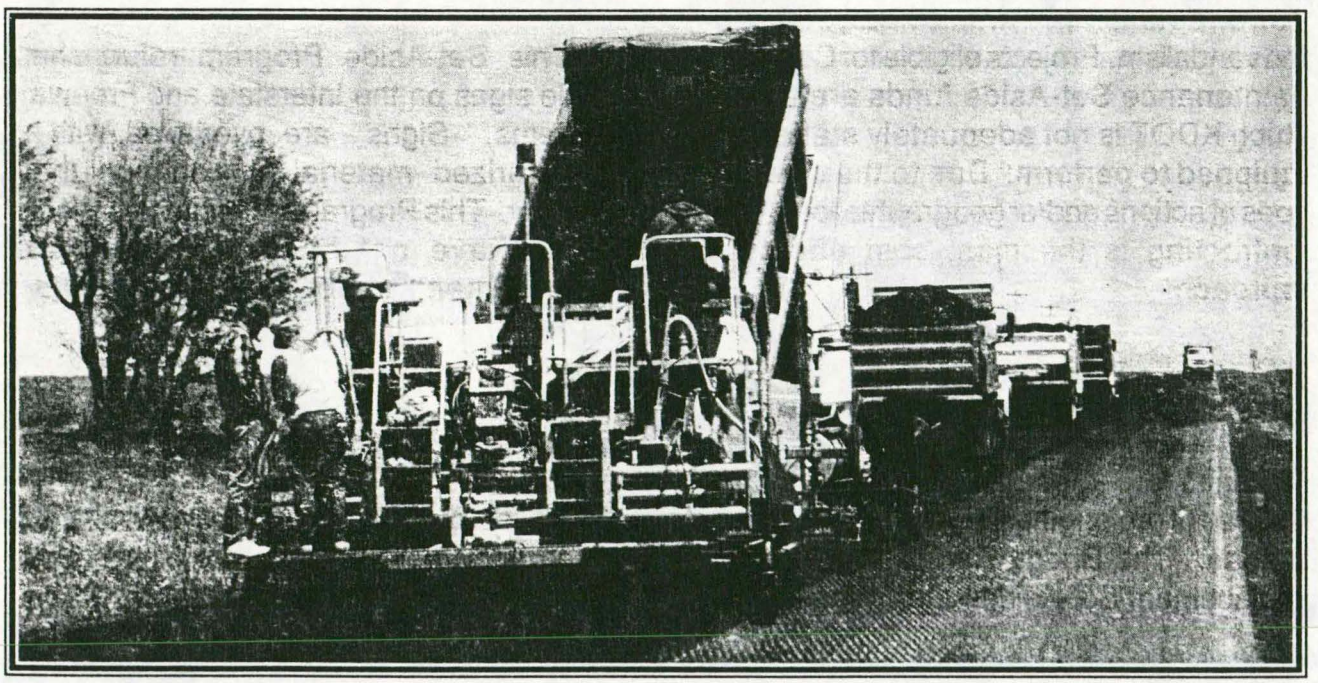
PAVEMENT RESURFACING SET-ASIDE PROGRAMS

Resurfacing is an action that may be used to preserve pavement life. Without proper maintenance, the cost to repair or replace a pavement at a later date can be several times greater than the initial resurfacing cost.

Funds are set-aside annually for three resurfacing programs: Non-Interstate Resurfacing, Interstate Resurfacing and City Connecting Link Resurfacing. The intent of these programs is to preserve and protect pavements in serviceable condition and keep rideability at an acceptable level until major modification work can be programmed.

The **Non-Interstate Resurfacing** projects are selected for improvement by the Pavement Management System (PMS). This comprehensive system analyzes existing pavements and recommends appropriate improvement actions to optimize pavement performance within budget constraints.

The **Interstate Resurfacing Program** targets surface deficiencies on the Interstate system. State funds are set-aside annually to preserve the Interstate system pavements.



The **City Connecting Link (KLINK) Resurfacing** Program is for pavement surfacing projects on city connecting links. A connecting link is a city street that connects two rural portions of State highway. This resurfacing program has assisted cities by providing funds for about 20 projects a year under a 50/50 State/local matching arrangement. State participation is limited to a maximum of $100,000 per project.

OTHER SET-ASIDE PROGRAMS

In addition to pavement resurfacing projects, the Substantial Maintenance Program includes projects in a number of set-aside fund categories for pavement, bridge and culvert repair or replacement, as well as for safety and emergency work.

Contract Maintenance Set-Aside

Maintenance activities are undertaken to offset the effects of weather, organic growth, deterioration, traffic wear, damage and vandalism. Projects eligible for Contract Maintenance Set-Aside funds are those which KDOT is not adequately staffed or equipped to perform. Due to the diverse types of actions and/or geographic location, contracting is the most cost effective approach.

Bridge/Culvert Set-Asides

Funds are reserved annually for the purpose of prolonging the life of bridges and culverts. The Bridge Repair and Culvert Replacement Set-Aside funds supplement the Priority Bridge Program by restoring the structural integrity of bridges and replacing culverts.

Examples of repair work in this category include deck patching and overlay, replacing portions of deteriorating decks, repairing support members and repairing or replacing deteriorating culverts. A portion of the funds is earmarked for bridge painting which counteracts corrosion caused by roadway chemicals and weather.

Safety Set-Aside

Where major improvement is not required, safety is improved at intersections and spot locations through the Safety Set-Aside fund. Safety improvements in this category include adding acceleration, deceleration and turning lanes; pavement marking and signing; and installation of traffic signals.

Sign Overlay Program

This Set-Aside Program refurbishes guide signs on the Interstate and Freeway Systems. Signs are overlayed with a reflectorized material to enhance their visibility. This Program is limited to projects which have not been scheduled for improvement under any other KDOT Program.

Emergency Repair Set-Aside

An amount is set-aside annually for emergency repair projects which may occur as the result of accidents or disasters.

The amount of funds set-aside for each Substantial Maintenance Program is shown in the table below. An inflation factor of 5.2 percent per year is used for project cost estimates.

SUBSTANTIAL MAINTENANCE SET-ASIDE FUNDS
FY 1993-1997
($ Thousands)

CATEGORY	FISCAL YEAR					
	93	94	95	96	97	Total
Non-Interstate Resurfacing	$49,141	$57,787	$60,786	$63,947	$67,270	$298,931
Interstate Resurfacing	11,189	5,704	6,000	6,312	6,640	35,845
*KLINK Resurfacing	2,033	2,139	2,250	2,367	2,490	11,279
Contract Maintenance	3,685	3,897	4,117	4,349	4,593	20,641
Bridge & Culvert Repair	5,533	5,419	5,700	5,996	6,308	28,956
Bridge Painting	1,785	2,282	2,400	2,525	2,656	11,648
Safety Projects	407	428	450	473	498	2,256
Signing Overlay	347	347	347	347	347	1,735
Emergency Repair	612	644	678	713	750	3,397
Total	$74,732	$78,647	$82,728	$87,029	$91,552	$414,688

*Includes only the State funds set-aside. Does not include the local matching amounts.

Substantial Maintenance projects are selected one year at a time. The table below shows the Substantial Maintenance work, by Set-Aside category, planned for FY 1993. FY 1994-97 projects, other than the FY 1994 KLINK Resurfacing projects, have not yet been identified.

The project Location Map on page 19 shows the locations of the FY 1993 - 97 highway improvement projects. The FY 1993 substantial Maintenance projects are displayed in green.

SUBSTANTIAL MAINTENANCE PROGRAM
FY 1993

CATEGORY	MILES	NO. PROJECTS OR BRIDGES
Non-Interstate Resurfacing	1,148	137
Interstate Resurfacing **	70	6
KLINK Resurfacing	14	18
Contract Maintenance **	--	6
Bridge & Culvert Repair	--	38
Bridge Painting	--	18
Safety Projects	--	7
Signing Overlay **	--	--
Emergency Repair **	--	--
Total	1,232	230

** Not all identified

MAJOR MODIFICATION PROGRAM

The Major Modification Program, the second major component of the Comprehensive Highway Program, is designed to improve the safety and service of the existing system.

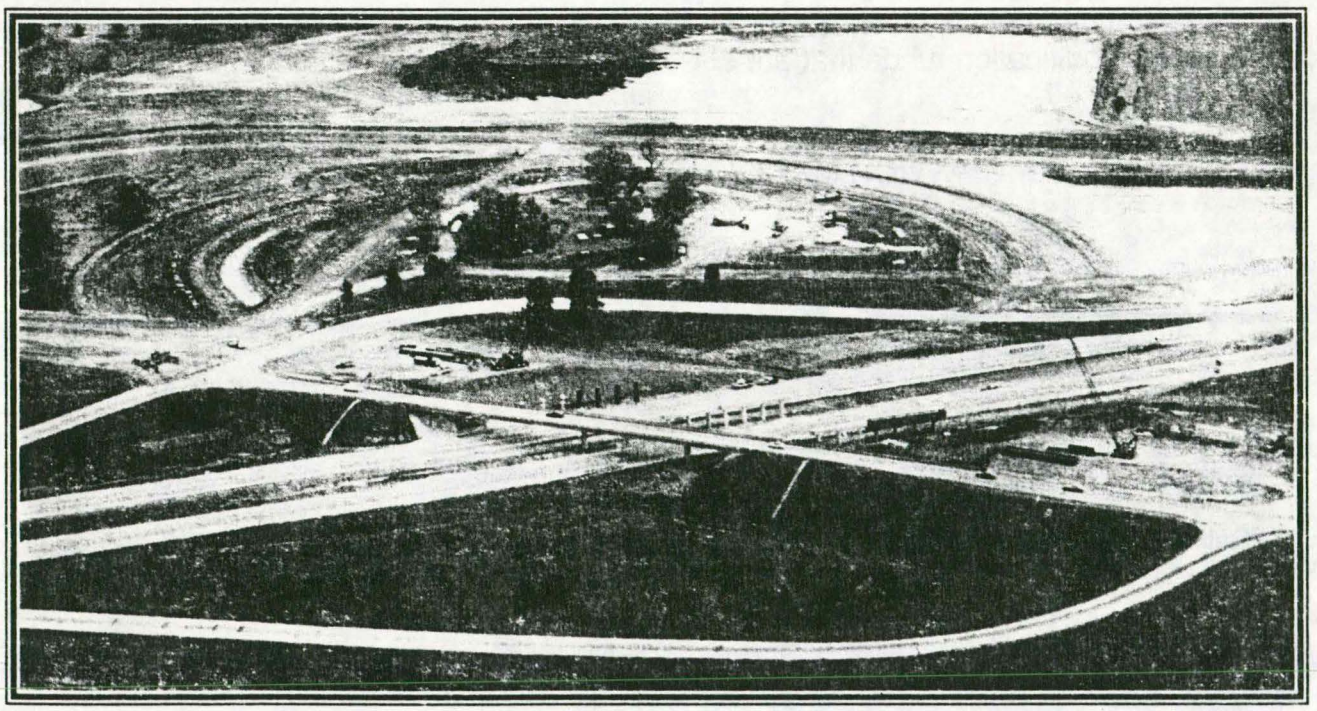
Roadway work in this category includes reconstruction/rehabilitation of pavement, widening traffic lanes, adding or widening shoulders and eliminating steep hills or sharp curves. Associated bridge work includes widening narrow bridges, replacing obsolete bridges, overlaying decks and modernizing bridge rails and guard fences.

Projects in this category are selected for improvement by the Priority System. This system uses a complex mathematical formula that ranks roadway sections according to the seriousness of their deficiencies. Projects with the highest relative need are scheduled for improvement first. Exceptions to this priority order are sometimes necessary to ensure use of all Federal-aid funds or due to design complications or right-of-way acquisition delays.

Approximately 77 percent of the FY 1993-97 Major Modification expenditures will finance non-Interstate projects and 23 percent will finance Interstate projects.

Hazard Elimination (HES)

The new Federal transportation legislation, the ISTEA, requires states to annually set-aside 10 percent of Surface Transportation Program funds for Safety Construction activities, including Hazard Elimination (HES) projects. The funds may be used on any public highway for safety improvements.



KDOT has established four categories of roadway systems for location analysis and funding to ensure that all roadway systems can benefit from Federal-aid safety improvements. The categories are: cities over 50,000; cities between 5,000-50,000; rural State highways and cities of less than 5,000; and county roads and other roadways with area population of less than 5,000. Each of these categories is allotted a portion of the total amount of HES funds available at the beginning of each FFY. The Federal share for the cost of Hazard Elimination projects ranges from 80 to 100 percent with the State or local governments providing the match. The only projects indicated in the Major Modification Program Summary Table are those on the State Highway System.

FY 1993-97 MAJOR MODIFICATION SET-ASIDE PROGRAMS

In addition to the roadway and associated bridge projects selected by the Priority System, a number of projects are financed with Major Modification funds that are set-aside each year. Below is a table showing the amount of funds set-aside in each category and a description of each of the Major Modification Set-Aside funds.

Geometric Improvement of City Connecting Links

Funds are reserved annually to assist cities in making geometric improvements on city connecting links. Geometric improvements are designed to widen pavements, add or widen shoulders or curbs, eliminate steep hills and sharp curves, and add needed turning, acceleration and deceleration lanes. The State funds 75 to 100 percent and the city funds up to 25 percent (based on population) of the cost of these projects.

Economic Development Set-Aside

Economic Development Set-Aside funds finance projects that are needed as a result of rapid localized growth in an area or to spur economic development. Under this Program, a project's cost is shared by the State and a local unit of government.

MAJOR MODIFICATION SET-ASIDE FUNDS
FY 1993-1997
($ Thousands)

CATEGORY	FISCAL YEAR					
	93	94	95	96	97	Total
*Geometric Improvement	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 25,000
*Economic Development	6,000	6,000	6,000	6,000	6,000	30,000
Railroad/Highway Crossing	1,600	1,600	1,600	1,600	1,600	8,000
Total	$12,600	$12,600	$12,600	$12,600	$12,600	$63,000

*Includes only the state funds set-aside. Does not include the local matching amounts.

Railroad/Highway Crossing Set-Aside

As is the case with Hazard Elimination, Railroad-Highway Crossing projects are a component of the Safety Construction set-aside of the new Surface Transportation Program. The funds are used to install protective devices or eliminate hazards at rail-highway grade crossings on public roads. The Federal share for the projects ranges from 80 to 100 percent. KDOT has established a State rail crossing inventory and formula to prioritize the more than 9,000 at-grade crossings in Kansas. The priority formula is used to rate the relative hazard potential for all crossings. The crossings are reviewed and recommendations for improvements are made. The matching funds for local projects are provided by local governments and/or railroad companies. Projects for State Highway crossings are funded with Federal and State matching funds. Only State Highway System projects are noted in the Major Modification Program Summary Table.

SUMMARY

The following tables show the Major Modification work, by category, planned for FY 1993-97. An inflation factor of 5.2 percent per year is used for project cost estimates.

Major Modification projects are displayed on the Project Location Map on page 19. FY 1990-1992 Major Modification projects contracted for construction are displayed in brown. FY 1993 Major Modification projects are displayed in orange, FY 1994 projects in blue and FY 1995-97 projects in violet.

MAJOR MODIFICATION PROGRAM SUMMARY
FY 1993 - 1997

CATEGORY	1993		1994		1995-1997		Total	
	Miles	No. Proj. /Br.	Miles	No. Proj. /Br.	Miles	No. Proj. /Br.	Miles	No. Proj. /Br.
Interstate:								
Roadway	15	4	25	3	34	10	74	17
Associated Bridges	--	29	--	16	--	37	--	82
Non-Interstate:								
Roadway	196	28	234	29	393	50	823	107
Associated Bridges	--	62	--	54	--	159	--	275
Hazard Elimination (HES)	--	12	--	**	--	**	--	12
Set-Aside Programs:								
*Geometric Improvement	4	9	5	10	10	11	19	30
*Economic Development	2	4	3	6	15	4	20	14
Railroad/Highway Crossing	--	2	--	**	--	**	--	2
Total	217		267		452		936	

*Projects for FY 1996 and 1997 have not yet been identified.

** Projects have not yet been identified.

MAJOR MODIFICATION PROGRAM SUMMARY
FY 1993-1997
($ Thousands)

CATEGORY	FISCAL YEAR			
	1993	1994	1995-1997	Total
Interstate:				
Roadway	$60,517	$49,028	$164,915	$274,460
Associated Bridges	6,932	1,926	19,177	28,035
Non-Interstate:				
Roadway	165,404	175,713	493,480	834,597
Associated Bridges	28,178	20,469	64,721	113,368
Hazard Elimination (HES)	1,710	**	**	1,710
Set-Aside Programs:				
Geometric Improvement	3,510	4,632	19,707	27,849
Economic Development	4,258	6,055	26,012	36,325
Railroad/Highway Crossing	400	1,600	4,800	6,800
Total	$270,909	$259,423	$792,812	$1,323,144

**Projects have not yet been identified.

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Kansas Department of Transportation
Standard Operating Manual

1.4.6 Project Selection
1.4.10 Pavement Management System

Kansas Department of Transportation
Standard Operating Manual

		SOM: 1.4.6
SUBJECT: **Project Selection**	VERSION: 1	PAGE: 1 of 7
	EFFECTIVE: 12/01/90	
INFORMATION CONTACT: Bureau of Program Management		
APPROVED: H.B. Edwards, Secretary of Transportation		

POLICY STATEMENT:

Projects shall be selected for improvement on the basis of objective criteria. A detailed explanation of the methods or criteria employed to select projects in the Comprehensive Highway Program shall be included in the Kansas Department of Transportation annual report.

DEFINITIONS:

Comprehensive Highway Program. A highway improvement program composed of the Construction Program and the Substantial Maintenance Program.

Construction Program. The portion of the Comprehensive Highway Program designed to improve and enhance the existing highway system. The Construction Program includes projects from three program categories: Major Modification, Priority Bridge, and System Enhancement.

Substantial Maintenance Program. The portion of the Comprehensive Highway Program designed to protect the investment in the State Highway System by preserving existing roadways and bridges. This work includes surface preservation, bridge repair, bridge painting, culvert replacement, emergency repair, sign refurbishing and small safety projects.

Major Modification. A program of projects intended to improve the service and safety of the existing highway system. Roadway projects in this program include reconstruction/rehabilitation of pavement, adding or widening lanes and/or shoulders and improving alignment. Bridge work includes deck overlays, widening, reconstruction and replacement.

Priority Bridge Program. A program of projects to replace or rehabilitate bridges which have deteriorated or which have

deficiencies in load carrying capacity, width, or traffic service.

System Enhancement Program. A program of projects established for the purpose of relieving congestion, improving access, enhancing economic development or improving safety on major segments of the State Highway System. Eight years of funding was provided for this program by the 1989 Legislature. Projects were selected from candidates submitted by Kansas cities and counties. The selection was published in the 1991-1995 Comprehensive Highway Program report.

Priority System. The system of formulas used to rank Major Modification and Priority Bridge improvement projects. The formulas, two for roads (one for Interstate and one for non-Interstate) and one for bridges, are comprised of a number of characteristics which measure the relative need for improvement.

Pavement Management System (PMS). A comprehensive program of data gathering and analysis used by KDOT to select surface preservation locations and actions. The system is used to determine actions to achieve the best statewide pavement surface at a given funding level.

Local Partnership Programs. Programs in which the State assists local units of government by sharing the cost of projects. The three local partnership program are: City Connecting Link (KLINK) Resurfacing Program, City Connecting Link Geometric Program and Economic Development Program.

Set-Aside Programs. Programs in which funds are reserved annually to be used for projects that address specific objectives. The Substantial Maintenance Program is financed entirely with set-aside funds. Within the Major Modification Program, set-aside funds are used to finance geometric improvement and economic development projects.

Preservation Project Development Committee (PPDC). PPDC monitors the operation of the Pavement Management System to ensure that Substantial Maintenance Program development conforms to KDOT's policy.

Scoping Committee. A multi-disciplinary committee appointed by the State Transportation Engineer for the purpose of reviewing and approving project scopes, and the selecting of the environmental classifications.

PROCEDURAL GUIDELINES:

The Chief of the Bureau of Program Management is responsible for selecting Major Modification roadway and bridge projects. Major Modification set-aside projects and Substantial Maintenance projects are selected by other bureaus within KDOT and compiled into the Comprehensive Highway Program by the Bureau of Program Management. (See responsibility charts on pages 6 and 7). The Chief of the Bureau of Program Management is responsible for coordinating the selection of projects and establishing a time frame within which the activities must be completed.

Responsibilities

Bureau of Program Management. The Chief of the Bureau of Program Management is responsible for the following activities for projects in the Comprehensive Highway Program:

- selecting the Major Modification roadway and associated bridge and Priority Bridge projects;
- managing and coordinating the selection of Local Partnership projects;
- coordinating the selection of Substantial Maintenance projects;
- coordinating the selection of Major Modification and Substantial Maintenance Set-aside Program projects;
- establishing and distributing a program development timetable.

Other Bureaus Responsible for Selecting Projects. Following is a list of the bureaus responsible for selecting projects for the various components of the Comprehensive Highway Program.

Bureau	Projects
Bureau of Construction and Maintenance	-Substantial Maintenance -Contract Maintenance -Bridge Repair & Culvert Replacement
Bureau of Design	-Rail/Highway Crossing -Bridge Painting
Bureau of Traffic Engineering	-Hazard Elimination -Safety Set-Aside

The District Engineer or Bureau Chief (as listed in the table above) shall submit the list of selected projects to the Bureau of Program Management according to the program development schedule issued each year.

Bureau of Local Projects. The Chief of the Bureau of Local Projects is responsible for informing local units of government of available federal funding for projects located off the State Highway System, soliciting a prioritization of candidate projects, and selecting projects for improvement.

Bureau of Transportation Planning. The Bureau of Transportation Planning is responsible for maintaining the State Highway System database and generating the priority listings for Major Modifications and Priority Bridges. The priority listings shall be generated according to the program development schedule.

Scoping Committee. The Scoping Committee is responsible for analyzing and reviewing the preliminary project scopes and recommending the final scope to the Program Review Committee for approval. The Scoping Committee is also responsible for determining the environmental classification of each project based on the criteria in the "Guidelines for Public Involvement and Class of Action Determinations."

Documentation of Selection Criteria in Annual Report to the Legislature

K.S.A. 68-2315 directs the Secretary of Transportation to submit a written report to the Governor and to each member of the Legislature by the 10th day of the regular session. One of the

requirements of this report is the inclusion of a detailed explanation of the methods or criteria used to select construction projects for improvement. (See SOM 1.8.1, "Preparation of the Annual Report to the Legislature").

AUTHORITATIVE REFERENCES:

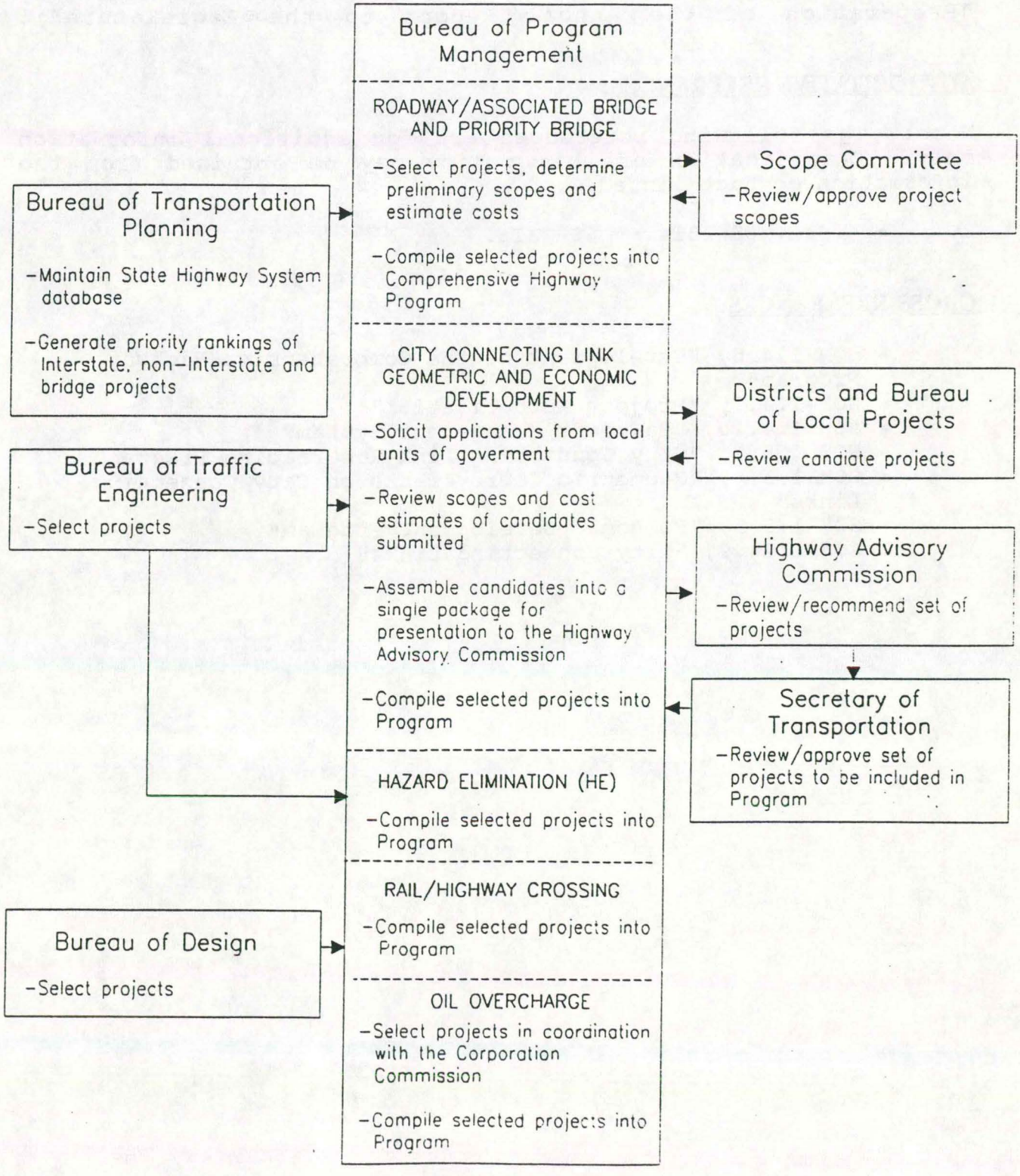
Note: The following references are for additional information only. Clarification of this policy may be obtained from the information contact listed.

- K.S.A. 68-2314 -- 68-2316.

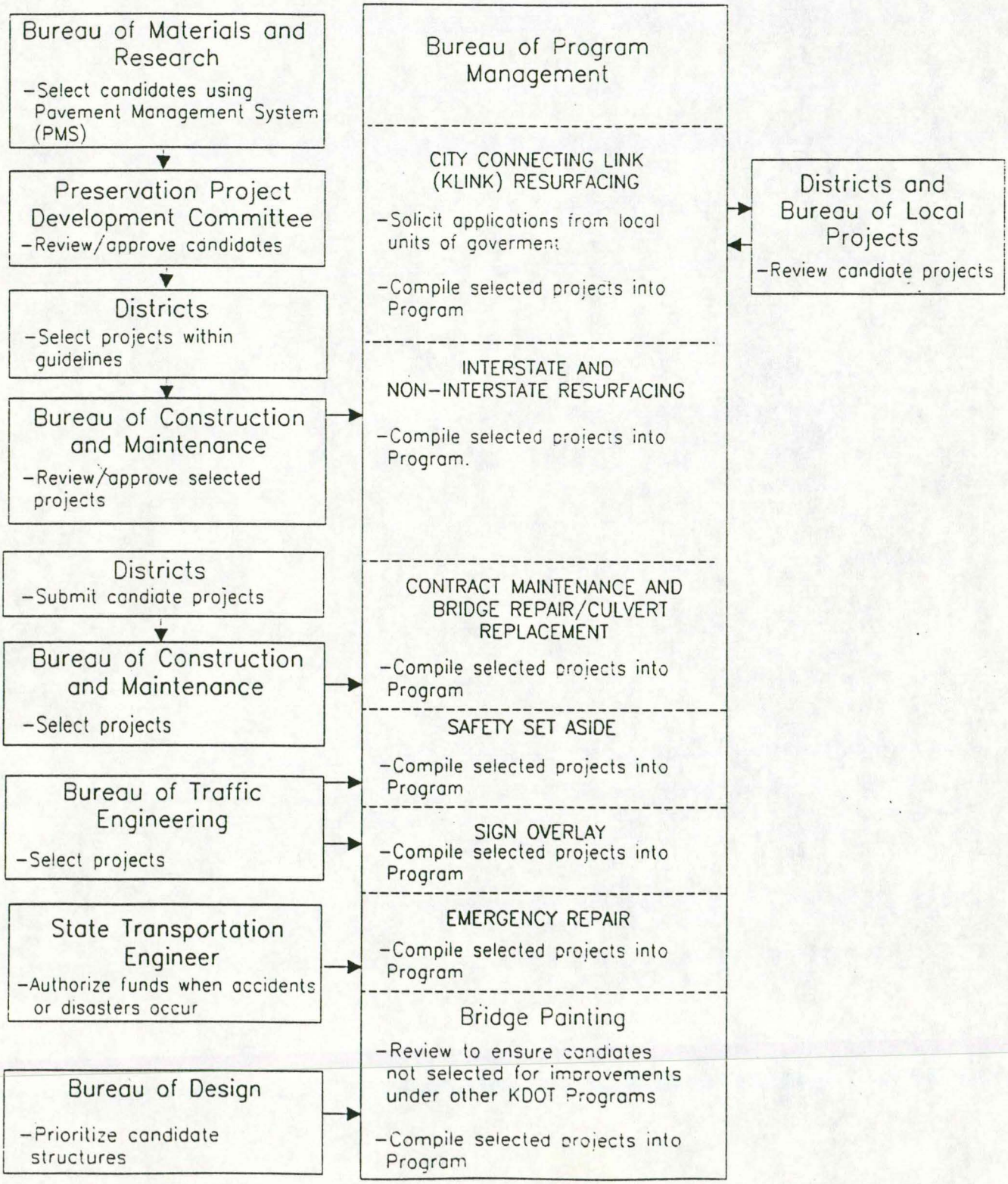
CROSS-REFERENCES:

- SOM 1.4.5, "Development of the Comprehensive Highway Program"
- SOM 1.4.7, "Project Authorization"
- SOM 1.4.10, "Pavement Management System"
- SOM 1.5.3, "City Connecting Link Resurfacing Program"
- SOM 1.5.4, "Geometric Improvements on City Connecting Links"
- SOM 1.5.5, "Economic Development Program"
- SOM 1.14.9, "City Connecting Links"

SELECTION OF MAJOR MODIFICATION PROJECTS



SELECTION OF SUBSTANTIAL MAINTENANCE PROJECTS



Kansas Department of Transportation
Standard Operating Manual

		SOM: **1.4.10**
SUBJECT: **Pavement Management System**	VERSION: 2	PAGE: 1 of 3
	EFFECTIVE: 06/01/91	
INFORMATION CONTACT: Division of Operations		
APPROVED: Gary Stotts , Secretary of Transportation		

POLICY STATEMENT:

The Pavement Management System (PMS) consists of the Network Optimization System (NOS), the Project Optimization System (POS), and Pavement Management Information System (PMIS), as defined below. PMS in conjunction with the Priority System (PS) shall be used to develop a Comprehensive Highway Program which provides a mix of substantial maintenance projects and major modification projects. In addition, PMS should maximize system performance (benefits) from the funds allocated to the Substantial Maintenance Program.

DEFINITIONS:

Network Optimization System (NOS). NOS models the highway network and determines the action for each one mile segment of the entire system that will produce the optimal Statewide benefit. The system can operate in either a "desired performance" mode or a "fixed budget" mode. In the "fixed budget" mode, the system selects the set of actions on all road segments that produce the "best" total system performance for the fixed budget level. In the "desired performance" mode, the system selects actions that will achieve the selected performance level at the lowest cost.

Project Optimization System (POS). POS serves two functions. First, it is a comprehensive design system for pavement structural sections on new grades. Second, it utilizes site specific cost and materials parameters to revise tentative project scopes from the NOS. Alternative rehabilitation strategies for a single project or for groups of projects which meet cost and performance constraints from the NOS are further evaluated. The POS selects the strategy which minimizes the need for further maintenance.

Pavement Management Information System (PMIS). PMIS consists of a database operated by the Division of Operations which contains network and project level survey results and information downloaded from several data sources. The downloaded information includes geometric features, traffic, and truck load information from the Control Section Data Collection and Analysis System (CANSYS) database operated by the Bureau of Transportation Planning; output from the Priority System (PS) operated by the Bureau of Program Management; and financial data such as inflation estimates and revenue forecasts prepared by the Bureau of Management and Budget. Data is regularly transferred between these multiple data sources.

Priority System (PS). The system of formulas used to rank Major Modifications and Priority Bridge improvement projects. The formulas, two for roads (one for Interstate and one for non-Interstate) and one for bridges, are comprised of a number of characteristics which measure the relative need for improvements.

Preservation Project Development Committee (PPDC). PPDC monitors the operation of the Pavement Management System (PMS) to ensure that Substantial Maintenance Program development conforms to KDOT's policy.

PROCEDURAL GUIDELINES:

The Director of Planning and Development is responsible for providing support for the NOS. This support includes establishing funding for the Substantial Maintenance Program. The Chief of the Bureau of Program Management shall serve as the chairman of the PPDC. The committee members shall include the Chief of Materials and Research and the Chief of Construction and Maintenance. The Geotechnical Engineer and the Pavement Management Engineer from the Bureau of Materials and Research will serve as advisors to the committee.

The responsibilities of the PPDC include:

- Analyzing and approving the annual NOS runs for the Substantial Maintenance Program development.
- Reviewing the "raw" candidate project lists from PMS for years two, three, and four, in conjunction with the

Substantial Maintenance Program mileage allocations to the Districts.

- Adjusting the mileages as established by policy and releasing the figures along with the "raw" candidate project lists for the final year two program development by the Division of Operations.

The Director of Operations is responsible for operational control of the Pavement Management System. These responsibilities include:

- Providing resources, including manpower with technical expertise, computer hardware and software, and field data collection equipment necessary to operate the PMS.
- Conducting annual network and project level surveys necessary to support the PMS.
- Providing information from NOS to the Director of Planning and Development, and the Director of Administration to support funding requests to the legislature for the Substantial Maintenance Program and for routine maintenance by KDOT forces; and for use in resource allocation.
- Providing information to the PPDC and NOS for Substantial Maintenance Program development.
- Operating POS to provide information to develop project scopes for the year one Substantial Maintenance Program Projects.

AUTHORITATIVE REFERENCES:

Note: The following references are for additional information only. Clarification of this policy may be obtained from the information contact listed.

- FHPM 6-4-2-1
- 23 CFR 626

CROSS-REFERENCES:

- SOM 1.4.6, "Project Selection"

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Development of
KDOT's State Funded
Substantial Maintenance Program
Utilizing NOS/POS
October 25, 1989

REVISED October 25, 1989

DEVELOPMENT OF KDOT'S STATE FUNDED SUBSTANTIAL MAINTENANCE PROGRAM UTILIZING NOS/POS

The present concept for development of the Substantial Maintenance Program includes a joint effort by the Preservation Project Development Committee (PPDC) and organizations within the Division of Operations, utilizing the Network Optimization System (NOS) and the Project Optimization System (POS) from the Pavement Management System (PMS) as tools.

This concept is consistent with procedures specified in Division of Operations Directive 0701.00/01 titled Pavement Management System. The concept was approved April 18, 1988, following a meeting including W.M. Lackey, State Transportation Engineer; James D. Jones, Director of Operations; [1]Dean M. Testa, Chief of Construction and Maintenance; [1]Robert R. Jones, Chief of Program Management; [1]D.L. Jarboe, Chief of Materials & Research, and [2]G.N. Clark, Pavement Management Task Force Leader.

Development activities presuppose that program funding has been determined as part of the Pavement Management Process, and that all appropriate inputs to PMS including action costs, inflation, and discount rates have been selected.

Program Development is in two parts. Part I utilizes POS operating under NOS constraints, and deals with developing scopes for firm rehabilitation projects in the FY-1 program. These locations will have been selected in the previous year. Part II utilizes NOS and deals with selection of firm "locations only" for contract rehabilitation projects to be let to contract in FY-2.

Data developed in Part II will also be used as a guide in budgeting contract maintenance funds for the Substantial Maintenance Program. These funds will be distributed on a statewide need basis and are to be used as follows:

(a) Fund a signing repair program.

(b) Fund concrete joint sealing as needed.

(c) Fund projects that are beyond the capacity of the maintenance forces and which require maintenance attention, or are beyond the scope of the contract action projects.

The District will propose projects to the PPDC through the Bureau of Construction and Maintenance prior to the Fiscal Year in which the funds are budgeted, and during the budget year.

The time reference used in the following discussion and

[1]Members of PPDC

[2]Advisor to PPDC

on the attached time schedule titled SUBSTANTIAL MAINTENANCE PROGRAM DEVELOPMENT is from fiscal year beginning to fiscal year end. In this reference frame, FY-0 is the year of the current NOS Survey. Information from this survey contributes to next fiscal year's (FY-1) project scopes, and the following fiscal year's (FY-2) project locations, and contract maintenance budget projections. Part of the POS information necessary to develop FY-1 scopes is obtained from NOS runs made in the fiscal year prior to that of the current survey (FY-(-1)).

PART I - DETERMINE SCOPES FOR THE "FY-1 PORTFOLIO" OF CONTRACT TYPE PROJECTS

Locations for these projects will have been selected from the previous year's NOS runs and were previously the "FY-2 firm program". Steps to be followed in Part I are as follows:

A. The Chief of Construction and Maintenance and the Chief of Materials and Research (or their delegates) representing the Division of Operations will review all "FY-1" projects with district personnel during March and April of the year preceding letting (FY-0). They will consider tentative scopes from the previous year's NOS runs, and may specify project scopes to be "frozen" when feasible alternatives are not available, or when data collection requirements prohibit consideration of alternates.

   For all other projects in the "portfolio" they will determine a "minimum feasible scope" and a "desirable scope". These tentative scopes will be combined with the "dominant" scope from the previous year's NOS run and will be utilized by POS during the scope selection phase.

   For projects originating from the NOS policy, the scopes selected by the review team should "bracket" the dominant NOS scope.

B. When any of the tentative scopes in I-A include recycling, the district should immediately began data collection activities necessary to complete the recycle mix design and to verify existing thicknesses of bituminous layers.

C. The Division of Operations representatives may also review locations and scopes from proposed contract maintenance projects selected by the districts following the criteria stated above.

D. The Division of Operations representatives will supply information collected in Step A to the Pavement Design Section of the Bureau of Materials and Research by May 15 of FY-0 to allow for completion of the "Alternate Scope" file for POS.

E. The Pavement Design Section will utilize POS survey data collected previously and complete the alternate scope input file (POSIN) for POS. This file will be delivered to the PMS Section of the Bureau of Materials and Research by August 15 of FY-1. It will contain scopes described in I-A and appropriate alternates generated by the Pavement Design Section after consultation with the district.

Projects with "frozen" scopes (see I-A) will not be considered by POS. The appropriate costs for these projects will be subtracted from the available POS portfolio funds before running POS.

F. The PMS Section will use the Alternate Scope input file (POSIN) to determine the optimum strategy (project by project scopes) for the "FY-1" contract action portfolio. This optimum strategy maximizes time in NOS Performance Level 1, and will be determined through POS constrained by:

1. The budget for the contract action portfolio determined from the NOS runs made in FY-0. (This budget will be adjusted for projects with "frozen" scopes as described in Step E.)

2. NOS Performance requirements from NOS runs made in FY-1.

The "Optimum" strategy for the portfolio will be returned to the representatives of the Division of Operations (see 1-A) for final review by September 1 of FY-1.

G. The Division of Operations will provide the total rehabilitation program, including projects with "frozen" scopes, to the districts for final review by September 5 of FY-1.

H. The districts will complete 402's and return them to the Bureau of Construction and Maintenance by October 1 of FY-1.

PART II - SELECT FIRM FY-2 CONTRACT PROGRAM

The FY-2 firm program will include "locations only" for contract rehabilitation projects. Steps to be followed in PART II are as follows:

A. The PMS Section of the Bureau of Materials and Research will initiate NOS Steady State and 5-period runs following completion (June 1± of FY-0) of the annual network survey by the Pavement Section of the Bureau of Materials and Research.

NOTE: Under present funding, Steady State Performance will be set at the level described as "adequate". This level requires a minimum of 72% of the system to be in Performance Level 1 and allows a maximum of 5% to be in Performance Level 3. NOS Runs will attempt to match the available budget in years one and two, and provide a linear transition to the steady state budget in years three and four.

B. The PPDC will analyze the NOS runs and approve them for Substantial Maintenance Program Development considering:

1. The statewide "mix" of NOS actions in the rehabilitation policy and their cost.

2. The projected performance to be achieved.

Only contract type actions will be considered part of the NOS rehabilitation policy.

C. The PMS Section of the Bureau of Materials and Research will develop candidate lists of "raw" contract projects for FY-2,3, and 4; and contract maintenance projects for FY-2 and 3 from the approved NOS 5-period run. These projects will consider minimum lengths, adjacent rutting, and reported heavy maintenance. They will not consider "logical" beginning and end points. Spurs and connecting links adjacent to the "raw" projects will not be considered unless they are both in the survey, and justify an action on their own merit.

D. The PPDC will review the "raw" project lists by district in conjunction with specified minimum mileage limits as follows:

1. No district shall receive less than 8% of the statewide contract mileage.

2. The PPDC will "adjust" the mileages proportionately for other districts to compensate for additional mileage needed to make minimums.

E. By November 1 of FY-1 the PPDC will transmit the following information to each district:

1. Contract Rehabilitation Project Information Including:

(a) Total contract project miles for FY-2, 3, & 4.

(b) "Raw" candidate project lists for FY-2, 3, and 4 including dominant NOS scopes. [Note: District must not assume these actions associate dollars with the mileage in 1(a)].

2. Contract Maintenance Project Information Including:

(a) "Raw" candidate contract maintenance project location lists for FY-2 and 3, including dominant NOS scopes.

F. The Districts will review the information from Step E and select the firm FY-2 "contract" rehabilitation program locations (to be let in Jan./Feb. of FY-2) subject to:

1. Minimum portions of the program mileage must be selected from the candidate contract project "lists" as follows:

(a) 40% from FY-2.
(b) 60% from FY-2 & 3 combined.
(c) 75% from FY-2, 3, & 4 combined.

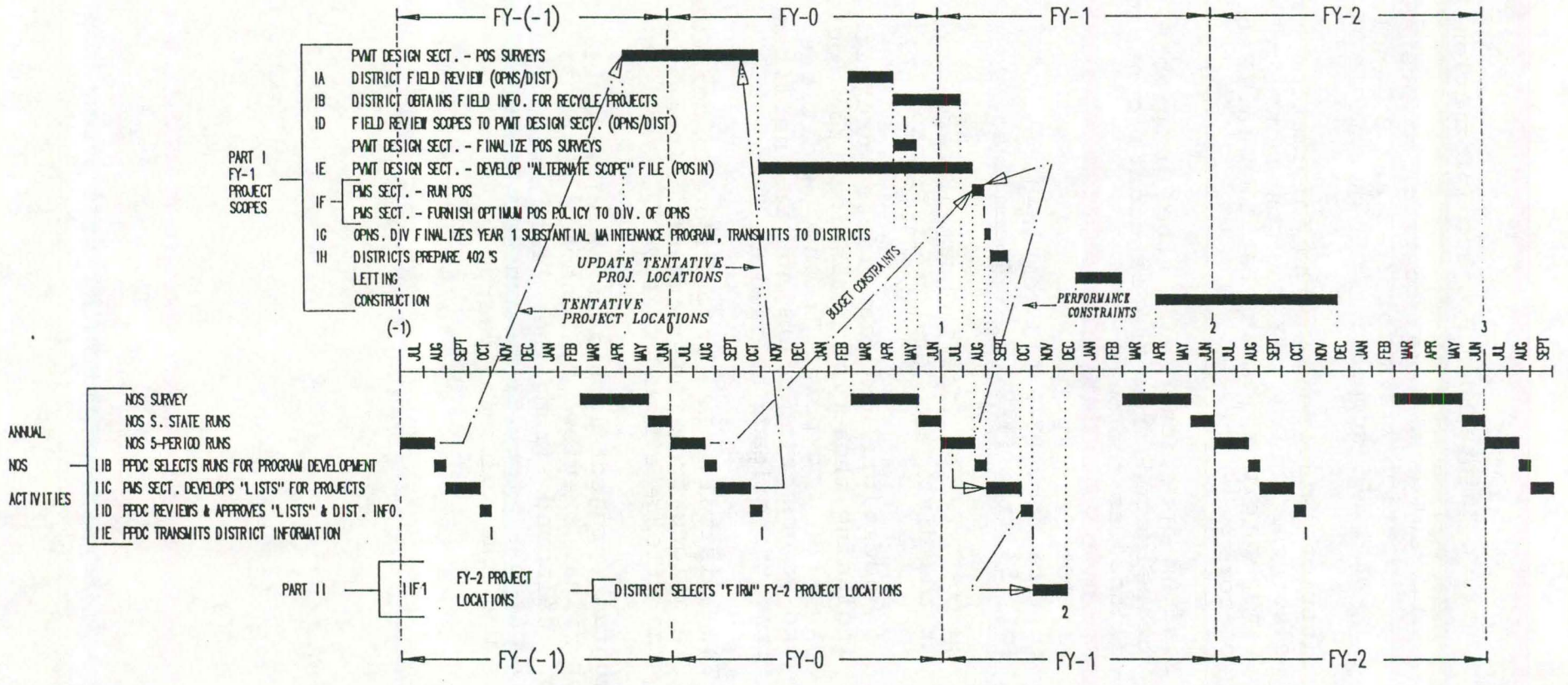
2. Up to 25% of the program mileage can be selected at the discretion of the district.

3. All additions to candidate project locations including those for extensions to "logical beginning and end points"; and additions of spurs and connecting links not in the lists must come from the mileage allowed in F-2.

4. The district is encouraged to consider project locations from the contract maintenance lists for the mileage allowed in F-2.

The FY-2 program (project locations only) will be returned to the PPDC for final review by December 15 of FY-1. Project locations not selected from the lists will be considered "tentative" locations for FY-3 and 4. However, the process will be regenerated the following year.

SUBSTANTIAL MAINTENANCE PROGRAM DEVELOPMENT



Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Kansas Department of Transportation
Weights of Attributes and Adjustment Factors
In The
Priority Formula For Rehabilitation Projects
On Interstate and Non-Interstate Roadways

March 8, 1988

KANSAS DEPARTMENT OF TRANSPORTATION

WEIGHTS OF ATTRIBUTES AND ADJUSTMENT FACTORS IN THE PRIORITY FORMULA FOR INTERSTATE ROADWAYS

In order to determine the priorities of roads and bridges on the State Highway System, KDOT contracted with Woodward-Clyde Consultants to develop a system to rank roads and bridges by priority of need for improvement. The system developed originally consisted of two formulas, one for roads and one for bridges, that use input from KDOT's planning data base to measure the relative need for improvement of all roads and bridges. In July 1987 the Bridge Formula was modified by KDOT and in January 1988, a separate formula was developed by KDOT for Interstate Roadway Rehabilitation (I4R) projects.

The priority ranking that results from the use of these formulas is used to select projects for further consideration. Programming is accomplished in priority order selecting the project with the highest need rating.

The following is a summary of the attributes and adjustment factors contained in the priority formulas which are used to measure the priority of need for improvement of Interstate roadways.

ATTRIBUTES

1. Attributes which measure the need for rehabilitation of Interstate roads and their associated relative weights are shown below:

Attribute	Relative Weight*
Commercial traffic index	.140
Rideability	.189
Pavement structural evaluation	.447
Observed condition	.224
	1.000

*Assumes no adjustments for type of facility, or shoulder type.

ADJUSTMENT FACTORS

1. Factors which affect all items of the priority formulas for roads.

State Transportation Plan Classification: An adjustment that accounts for the relative importance of a road to the state highway system.

Classification	Weight
A	1.00
B	.90
C	.70
D	.50
E	.30

Traffic Volume: An adjustment that gives more weight to roads with higher amounts of traffic.

The traffic volume used to determine the traffic adjustment factor will be the total traffic on the roadway adjusted for the number of lanes on the roadway. The "adjusted" traffic will be computed by dividing the actual traffic by the appropriate factor from the following table:

Lane Class	Multilane Traffic Adjustment Factor*
1 - Two-lane undivided	1.00
2 - Four-lane undivided	2.86
3 - Four-lane divided	1.43**
4 - Six-lane undivided	4.28
5 - Six-lane divided	2.14**
6 - Eight-lane and over undivided	5.72
7 - Eight-lane and over divided	2.86**
8 - Three-lane undivided	1.22
9 - Five-lane undivided	3.57
10 - One-lane, one-way	0.50
11 - Two-lane, one-way	1.43
12 - Three-lane, one-way	2.14
13 - Four-lane, one-way	2.86
14 - Two-lane divided	0.50

* This factor was developed on the basis of the capacity relationships between 2-lane facilities and multilane facilities as shown in the highway capacity manual. A 2-lane facility has a basic capacity of 2,800 vph, while a multilane facility has a basic capacity of 2,000 vph per lane. For example for a four-lane undivided facility, the factor is (4-lanes X 2,000 vph per lane)/2,800 vph, which is 2.86.

** Based on one side of divided facility.

The value for the traffic adjustment factor varies from 0.85 for zero traffic to 1.000 for 20,000 adjusted traffic on one side of a divided facility. Examplesof the new traffic adjustment factors are as follows:

Adjusted Traffic	Adjustment Factor
0	0.850
2,000	0.865
4,000	0.880
6,000	0.895
8,000	0.910
10,000	0.925
15,000	0.962
20,000	1.000

2. Factors that affect only parts of the priority formula for roadways.

Type of Facility: This adjustment gives more weight to undivided roads since they were determined to be generally in more need than divided highways. This adjustment only affects the formula for roads. The attribute commercial traffic is adjusted for the type of facility by the following factor:

Attribute	Adjustment Undivided	Divided
Commercial traffic	1.000	0.376

Shoulder Type: This adjustment assigns more weight to roads with unstabilized shoulders than those with stabilized shoulders. This adjustment also only affects the formula for priority of roads. The attributes shoulder width and commercial traffic are each adjusted for shoulders type by the following factors:

Attribute	Adjustment Unstabilized Shoulders	Stabilized Shoulders
Shoulder width	1.000	0.607
Commercial traffic	1.000	0.519

TABLE SHOWING ATTRIBUTES AND ADJUSTMENTS USED IN THE INTERSTATE ROADWAY PRIORITY FORMULA

Attribute	Rel. Wt.	ADJUSTMENT FACTORS* Facility : Div.	Facility : Undiv.	Shoulders : Stab.	Shoulders : Unstab.
Roads:					
Commercial traffic	.065	.376	1.000	.519	1.000
Rideability	.088				
Pavement structural evaluation	.208				
Observed condition	.104				

*In addition, roadways are adjusted for classification and AADT.

PRIORITY FORMULA FOR INTERSTATE ROADWAYS •

TOTAL ADJUSTED NEED

=

STATE TRANSPORTATION PLAN CLASSIFICATION ADJUSTMENT FACTOR
X
ADJUSTMENT FACTOR FOR TRAFFIC (ADJ. FOR NO. OF LANES)

X

DIVIDED OR UNDIVIDED ADJUSTMENT FACTOR
X
ADJUSTMENT FACTOR FOR STABILIZED SHOULDERS
X
ATTRIBUTE RELATIVE WEIGHT (Ø.14Ø)
X
COMMERCIAL TRAFFIC INDEX

+

ATTRIBUTE RELATIVE WEIGHT (Ø.189)
X
RIDEABILITY

+

ATTRIBUTE RELATIVE WEIGHT (Ø.447)
X
PAVEMENT STRUCTURAL EVALUATION

+

ATTRIBUTE RELATIVE WEIGHT (Ø.224)
X
OBSERVED CONDITION

• SEPERATE FORMULA DEVELOPED JANUARY 1988

3-8-88

October 26, 1988

KANSAS DEPARTMENT OF TRANSPORTATION

WEIGHTS OF ATTRIBUTES AND ADJUSTMENT FACTORS IN THE PRIORITY FORMULA FOR REHABILITATION PROJECTS ON NON-INTERSTATE ROADWAYS

In order to determine the priorities of roads and bridges on the State Highway System, KDOT contracted with Woodward-Clyde Consultants to develop a system to rank roads and bridges by priority of need for improvement. The system developed originally consisted of two formulas, one for roads and one for bridges, that use input from KDOT's planning data base to measure the relative need for improvement of all roads and bridges. In July 1987 the Bridge Formula was modified by KDOT and in January 1988, a separate formula was developed by KDOT for Interstate Roadway Rehabilitation (I4R) projects. In September 1988 the Bridge Formula was further modified by KDOT and the Non-Interstate Roadway Formula was modified by KDOT.

The priority ranking that results from the use of these formulas is used to select projects for further consideration. Programming is accomplished in priority order selecting the project with the highest need rating.

The following is a summary of the attributes and adjustment factors contained in the priority formulas which are used to measure the priority of need for rehabilitation projects on non-Interstate roadways.

ATTRIBUTES

1. Attributes which measure the need for rehabilitation of roads and their associated relative weights are shown below:

Attribute	Relative Weight*
Number of narrow structures per mile	.086
Shoulder Width	.089
Number of substandard stopping sight distances (SSSD) per mile	.069
Lane Width	.101
Substandard horizontal curves (SSHC) per mile	.099
Volume/Capacity ratio	.091
Commercial traffic index	.065
Rideability	.088
Pavement structural evaluation	.208
Observed condition	.104
	1.000

*Assumes no adjustments for accident rate, posted speed limit, type of facility, or shoulder type.

ADJUSTMENT FACTOR

1. Factors which affect all items of the priority formulas for roads.

State Transportation Plan Classification: An adjustment that accounts for the relative importance of a road to the state highway system.

Classification	Weight
A	1.00
B	.90
C	.70
D	.50
E	.30

Traffic Volume: An adjustment that gives more weight to roads with higher amounts of traffic.

The traffic volume used to determine the traffic adjustment factor will be the total traffic on the roadway adjusted for the number of lanes on the roadway. The "adjusted" traffic will be computed by dividing the actual traffic by the appropriate factor from the following table:

Lane Class	Multilane Traffic Adjustment Factor*
1 - Two-lane undivided	1.00
2 - Four-lane undivided	2.86
3 - Four-lane divided	1.43**
4 - Six-lane undivided	4.28
5 - Six-lane divided	2.14**
6 - Eight-lane and over undivided	5.72
7 - Eight-lane and over divided	2.86**
8 - Three-lane undivided	1.22
9 - Five-lane undivided	3.57
10 - One-lane, one-way	0.50
11 - Two-lane, one-way	1.43
12 - Three-lane, one-way	2.14
13 - Four-lane, one-way	2.86
14 - Two-lane divided	0.50

* This factor was developed on the basis of the capacity relationships between 2-lane facilities and multilane facilities as shown in the highway capacity manual. A 2-lane facility has a basic capacity of 2,800 vph, while a multilane facility has a basic capacity of 2,000 vph per lane. For example for a four-lane undivided facility, the factor is (4-lanes X 2,000 vph per lane)/2,800 vph, which is 2.86.
** Based on one side of divided facility.

The value for the traffic adjustment factor varies from 0.85 for zero traffic to 1.000 for 20,000 adjusted traffic on one side of a divided facility. Examples of the new traffic adjustment factors are as follows:

Adjusted Traffic	Adjustment Factor
0	0.850
2,000	0.865
4,000	0.880
6,000	0.895
8,000	0.910
10,000	0.925
15,000	0.962
20,000	1.000

2. Factors that affect only parts of the priority formulas for roads.

Accident Rate: An adjustment that assigns more weight to roads which have a higher observed accident rate. This adjustment only affects those attributes that are determined to measure the safety of a road (narrow structures per mile, shoulder width, substandard stopping sight distances per mile, lane width and substandard horizontal curves per mile).

Accident Rate	Adjustment
High	1.000
Medium	0.858
Low	0.734

Posted Speed Limit: An adjustment that assigns more weight to roads which have a higher posted speed limit. This adjustment affects the same attributes as the adjustment factor for accident rate. This adjustment varies from 0 to 1.00 as the posted speed limit increases from 5 to 55 mph. Examples of some posted speed limit adjustments are:

Posted Speed Limit	Adjustment
20 mph	0.191
30 mph	0.360
40 mph	0.573
55 mph	1.000

Type of Facility: This adjustment gives more weight to undivided roads since they were determined to be generally in more need than divided highways. This adjustment only affects the formula for roads. The attributes shoulder width, lane width, and commercial traffic are each adjusted for the type of facility by the following factors:

Attribute	Adjustment	
	Undivided	Divided
Shoulder width	1.000	0.540
Lane width	1.000	0.500
Commercial traffic	1.000	0.376

Shoulder Type: This adjustment assigns more weight to roads with unstabilized shoulders than those with stabilized shoulders. This adjustment also only affects the formula for priority of roads. The attributes shoulder width and commercial traffic are each adjusted for shoulders type by the following factors:

Attribute	Adjustment	
	Unstabilized Shoulders	Stabilized Shoulders
Shoulder width	1.000	0.607
Commercial traffic	1.000	0.519

TABLE SHOWING ATTRIBUTES AND ADJUSTMENTS USED IN THE NON-INTERSTATE ROADWAY REHABILITATION PRIORITY FORMULA

Attribute	Rel. Wt.	ADJUSTMENT FACTORS* Accident Rate High	Med.	Low	Posted Speed	Facility Div.	Undiv.	Shoulders Stab.	Unstab.
Roads:									
No. of narrow structures per mile	.086	1.000	.858	.734	0to1				
Shoulder width	.089	1.000	.858	.734	0to1	.540	1.000	.607	1.000
No. of SSSD per Mi.	.069	1.000	.858	.734	0to1				
Lane width	.101	1.000	.858	.734	0to1	.500	1.000		
No. of SSHC per Mi.	.099	1.000	.858	.734	0to1				
Volume/Capacity ratio	.091								
Commercial traffic	.065					.376	1.000	.519	1.000
Rideability	.088								
Pavement Structural evaluation	.208								
Observed condition	.104								

*In addition, roadways are adjusted for classification and AADT.

PRIORITY FORMULA FOR NON-INTERSTATE ROADWAYS •

TOTAL ADJUSTED NEED

=

STATE TRANSPORTATION PLAN CLASSIFICATION ADJUSTMENT FACTOR
X
ADJUSTMENT FACTOR FOR TRAFFIC (ADJ. FOR NO. OF LANES)

X

POSTED SPEED ADJUSTMENT FACTOR
X
ACCIDENT RATE ADJUSTMENT FACTOR

X

ATTRIBUTE RELATIVE WEIGHT (Ø.Ø86)
X
NUMBER OF NARROW STRUCTURES PER MILE

+

DIVIDED OR UNDIVIDED ADJUSTMENT FACTOR
X
ADJUSTMENT FACTOR FOR STABILIZED SHOULDERS
X
ATTRIBUTE RELATIVE WEIGHT (Ø.Ø89)
X
SHOULDER WIDTH

+

ATTRIBUTE RELATIVE WEIGHT (Ø.Ø69)
X
NUMBER OF SUBSTANDARD STOPPERS PER MILE

+

DIVIDED OR UNDIVIDED ADJUSTMENT FACTOR
X
ATTRIBUTE RELATIVE WEIGHT (Ø.1Ø1)
X
SURFACE LANE WIDTH

+

ATTRIBUTE RELATIVE WEIGHT (Ø.Ø99)
X
NUMBER OF SUBSTANDARD HORIZONTAL CURVES PER MILE

+

ATTRIBUTE RELATIVE WEIGHT (Ø.Ø91)
X
VOLUME CAPACITY RATIO

+

DIVIDED OR UNDIVIDED ADJUSTMENT FACTOR
X
ADJUSTMENT FACTOR FOR STABILIZED SHOULDERS
X
ATTRIBUTE RELATIVE WEIGHT (Ø.Ø65)
X
COMMERCIAL TRAFFIC INDEX

+

ATTRIBUTE RELATIVE WEIGHT (Ø.Ø88)
X
RIDEABILITY

+

ATTRIBUTE RELATIVE WEIGHT (Ø.2Ø8)
X
PAVEMENT STRUCTURAL EVALUATION

+

ATTRIBUTE RELATIVE WEIGHT (Ø.1Ø4)
X
OBSERVED CONDITION

• FORMULA MODIFIED SEPTEMBER 1988

:D-26-88

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

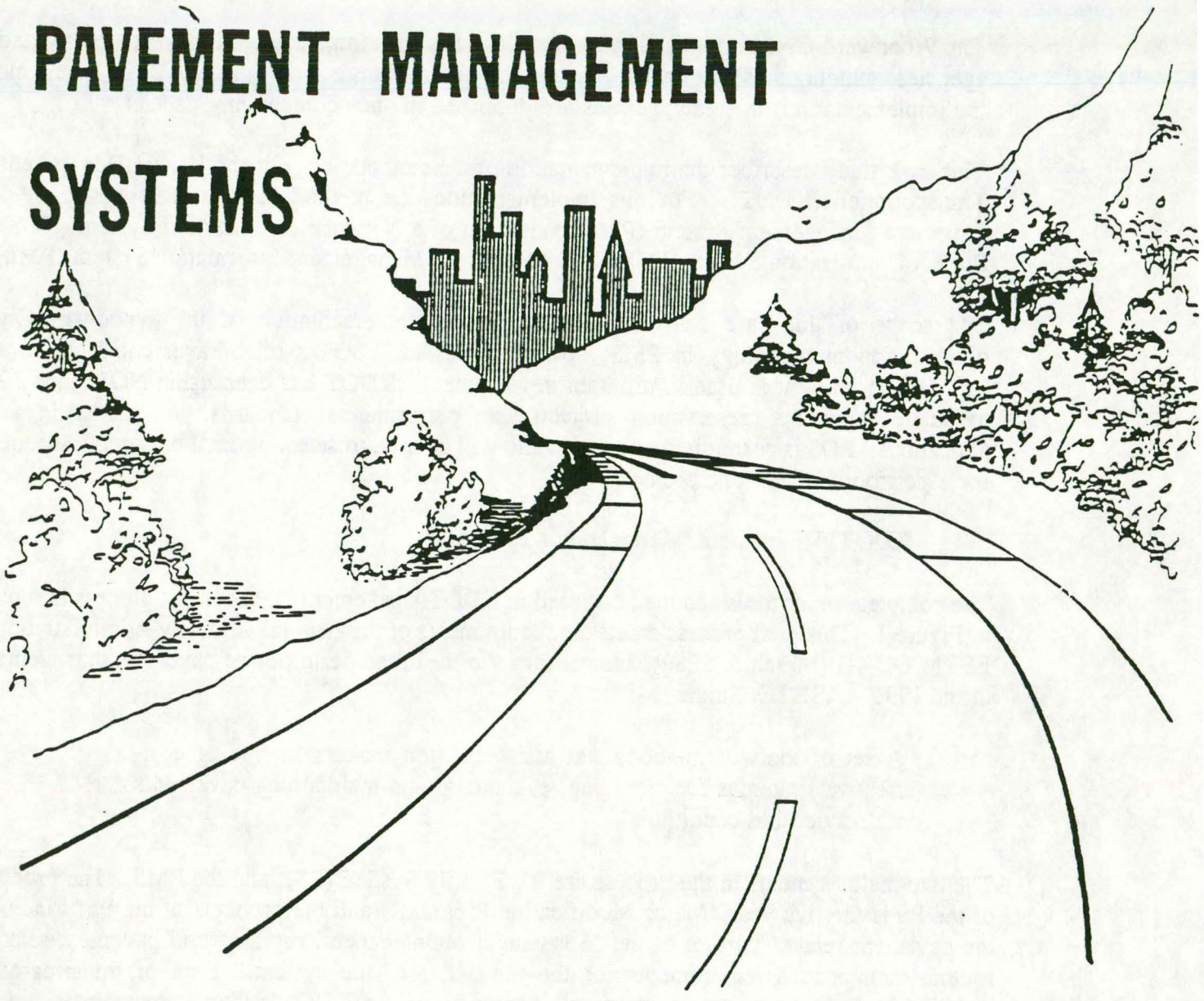
Pavement Management Process

Kansas Department of Transportation
Case Study in Optimization
from
An Advanced Course In
PAVEMENT MANAGEMENT SYSTEMS

AN ADVANCED COURSE

IN

PAVEMENT MANAGEMENT SYSTEMS



U.S. Department of Transportation

Federal Highway Administration

AASHTO 1914

TRB

3.0 KANSAS DEPARTMENT OF TRANSPORTATION CASE STUDY IN OPTIMIZATION

3.1 Introduction

The Woodward-Clyde optimization methodology has been implemented in several transportation agencies including those in Alaska, Arizona, Colorado, Kansas, and Finland. Differences among the implementations in these agencies are described in an accompanying paper.

This case study describes the implementation of the methodology for the Kansas Department of Transportation (KDOT). For this implementation, the methodology is used in a three-part Pavement Management System (PMS) consisting of a Network Optimization System (NOS), a Project Optimization System (POS), and a Pavement Management Information System (PMIS).

The scope of this case study is to describe the implementation of the Woodward-Clyde optimization methodology in PMS, how it relates to KDOT's total Pavement Management Process, and how it is used in program development. KDOT has been using NOS since 1986 to select candidate preservation projects, set performance standards, and assist in fund allocations. POS is currently being tested and will be used to select optimal preservation actions for a portfolio of year one projects.

3.2 KDOT'S Pavement Management Process

The complete set of tools and methods used in KDOT's pavement management process is shown in Figure 1. This total process meets the requirements of the Federal Highway Administration's FHPM 6-2-4-1 (March 6, 1989), and conforms to the broad definition of pavement management in the 1990 AASHTO Guide:

> "A set of tools or methods that assist decision makers in finding cost-effective strategies for providing, evaluating, and maintaining pavements in a serviceable condition."

The two major systems in the process are the Priority System (PS), and the PMS. The product of the PS is the five year "Major Modification Program", and the products of the PMS include the pavement related portion of the "Substantial Maintenance Program" and pavement related routine maintenance requirements for the remainder of the system. Both of the programs included in these products are major sub-programs within KDOT's Comprehensive Highway Program.

The Major Modification Program is designed to improve the safety and service of the existing highway system. Roadway work in this category includes reconstruction/rehabilitation of pavements, widening traffic lanes, adding or widening shoulders, and eliminating sharp curves and steep hills. Associated bridge and guard fence work is also included. Pavement design in this program is done through the "new design mode" of the POS. Other tools in the total pavement management process including scoping procedures, life cycle cost analysis, and surface type selection procedures apply in this program. By policy, the initial pavement design terms are ten years for flexible pavements and twenty years for rigid pavements.

The Substantial Maintenance Program is intended to protect the traveling public and the public's investment in it's highway system by preserving the "as built" condition as long as possible, thus minimizing the need for major improvements. This program includes resurfacing projects, minor bridge repair and painting, culvert replacement, emergency repairs, sign refurbishing, and small safety projects. The "optimal resurfacing policy" selected by the PMS is intended to maintain pavements on the system at a selected "performance level" at minimum cost. Projects in this policy have variable design lives consistent with the optimal policy. Through this program, 1,200 or more two lane miles are resurfaced annually.

Another major sub-program in the Comprehensive Highway Program is the System Enhancement Program. This program includes system additions and special projects that substantially improve safety, relieve congestion, improve accesses, or enhance economic development. Pavement design procedures for projects in this program are similar to those for the Major Modification Program.

The KDOT uses the PS and the PMS as decision support tools in its total Pavement Management Process for managing pavements on the existing highway network. Both systems are supported by information systems (data bases) which share data. Performance data shared by the two data bases is obtained from network and project level surveys supporting the PMS. The PS is driven by both geometrics and pavement condition. The PMS "manages" the remainder of the existing system not in the Major Modification Program by establishing the optimal policy to maintain acceptable performance at minimum cost. A Pavement Structural Evaluation (PSE) parameter in the PS can trigger a project in the Major Modification Program even when the geometrics are satisfactory. PSE is the connecting link between the two systems allowing projects to be reconstructed when it is no longer feasible to maintain them with routine maintenance and/or actions produced by PMS for the Substantial Maintenance Program.

3.3 KDOT Environment for Pavement Management

The PMS operates on a 10,017 mile portion of the highway system under maintenance by state forces. The distribution of this mileage by pavement type is as follows:

Portland cement concrete	728 miles
Composite	1,084 miles
Full design bituminous	2,814 miles
Partial design bituminous	5,391 miles

The location reference system used for PMS evaluation is the County/Route/Milepost system. For the PMS, the highway system is divided into one mile ($\pm$) long segments to facilitate modeling using the Markov technique.

Prior to PMS implementation, Present Serviceability Rating (PSR) was used as the measure of pavement performance. PSR was derived from two subjective components of the Rural Sufficiency Rating, "Observed Pavement Condition" and "Rideability". Since implementation of the PMS, pavement performance is evaluated in terms of "Performance Levels 1, 2, or 3", which are subsets of the set of all possible Distress/Condition States" of a pavement section. These "states" are discussed in later sections.

The equipment used by KDOT to collect pavement-related data includes the following:

- 2-KJ Law Surface Dynamics Pavement Surface Friction Testers
- 2-Dynaflect Systems
- Photolog Equipment
- 3-Mays Meters (trailer-mounted)
- 3-Network-Level Survey Vans (with computerized equipment for data collection)
- South Dakota Profilometer

The Kansas Triaxial Procedure developed in the 1940's and Bradbury's method were used for design of new flexible and rigid pavements prior to PMS implementation. Rehabilitation (overlay) design utilized district engineers' experience, with limited use of the Benkelman Beam and the Dynaflect. Currently, KDOT uses the 1986 AASHTO Guide for new design of both pavement types. The Asphalt Institute MS-17 method (interim, pending further study of Part III of the 1986 AASHTO Guide), and the POS are used for rehabilitation design.

Prior to PMS implementation, pavement rehabilitation funds were allocated among six districts using a formula. The district engineer for each district would then select rehabilitation projects and strategies for the district subject to the allocated funds. Currently, KDOT uses PMS to develop "optimal" lists (by district) of candidate projects, and to allocate the total mileage in the rehabilitation program to the districts. District engineers implement the rehabilitation program by selecting projects within constraints imposed by agency policy relative to the lists and the allocated miles. When implemented, the POS will determine the scopes for projects in the statewide "portfolio" of rehabilitation projects.

3.4 Implementation Decisions and Organization for PMS

In 1979, KDOT prepared an "Issue" paper in which alternative approaches to PMS development were evaluated. The approach selected from this paper called for a feasibility study by a consultant and presented a five year budget for development and implementation. The recommended system was to include formal performance prediction and optimization capabilities. A Phase I feasibility study was conducted by Woodward-Clyde Consultants (Kulkarni and Finn, 1981). This study recommended a system consisting of three major components for implementation in two additional phases over a 5-year period. The system was to be based on modeling the highway network as a Markov decision process. Following is a description of Development Phases II and III:

3.4.1 Phase II - Develop NOS and PMIS

A set of computer programs was developed in this phase to implement NOS and PMIS. The NOS included interim prediction models which were primarily based on engineering judgments. The development and testing of NOS are described in "Development of a Pavement Management System" (Kulkarni, et al., 1983).

3.4.2 Phase III - Develop POS and Finalize NOS Prediction Models

POS models and software were developed in this phase, which was completed in 1988. Also, the interim NOS prediction models, which were primarily based on engineering judgment, were revised by combining with field observations of pavement condition over a period of five years.

A Steering Committee representing top management was appointed to provide the overall direction for PMS implementation, and a Pavement Management Task Force was organized to supervise and assist with system development by the consultant. The Task Force is comprised of members from the Bureaus of Materials and Research, Construction and Maintenance, and Planning and Development. The highway districts are also represented.

At the present time, PMS responsibilities are split between the Division of Operations and the Division of Planning and Development. A policy directive establishes responsibilities, procedures, and guidelines for administration of PMS. The Division of Planning and Development controls the use of PMS relative to establishing funding levels for rehabilitation, considering other agency programs. After funding levels are established, the Division of Operations has the responsibility to develop a pavement rehabilitation program based on PMS recommendations. A Preservation Project Development Committee (PPDC) comprised of the Chief of Program Management, the Chief of Construction and Maintenance, and the Chief of Materials and Research is set up to monitor PMS operation. The Director of Operations provides manpower, computer hardware and software, and field data collection equipment necessary for PMS operation. This is provided through the Geotechnical Unit of the Bureau of Materials and Research.

3.5 KDOT'S Pavement Management System

A brief description of NOS, POS, and PMIS, the three components of KDOT's pavement management system follows.

3.5.1 Network Optimization System

This system is designed to identify pavement rehabilitation and maintenance policies which would minimize total costs subject to meeting desired performance standards, or maximize performance standards for a fixed budget. For computational convenience, the statewide highway network is divided into a total of 23 road categories which are defined using the following factors (see Figure 2):

- Functional classification
- Pavement type
- Roadway width
- Traffic loading

The major output of NOS includes:

- Annual "minimum" rehabilitation budgets over a selected planning horizon (such as 5 years)
- Locations of candidate rehabilitation projects
- Minimum performance requirements for a fixed budget
- Optimal rehabilitation actions

3.5.2 Project Optimization System

The primary purpose of POS is to identify the optimal rehabilitation action or initial design for each project in a portfolio of candidate projects. POS is specifically designed to address engineering and technical decisions in pavement management and hence, is distinct from NOS which addresses management and administrative decisions. For major projects identified using NOS output, POS identifies optimal rehabilitation actions or initial designs using site specific actions, costs, and engineering data. POS operates in two distinct modes--rehabilitation and new design.

In the rehabilitation mode, POS evaluates alternative rehabilitation strategies for a portfolio of projects. These projects have been identified as candidates for rehabilitation based on NOS recommendations for individual segments which have been packaged to form projects of practical length. The target budget for the portfolio and performance levels for individual project segments are constrained by the optimal policies identified by NOS. POS performance prediction models utilize site-specific information and mechanistic response variables (such as deflection, stress, and strain). The objective function for the POS model is to maximize user benefits subject to meeting target budget and performance levels. User benefits are evaluated in terms of a subjective value function related to pavement condition. At this time, the POS maximizes system mileage in Performance Level 1 over time which is equivalent to "minimizing maintenance by State forces".

In the new design mode, POS uses the 1986 AASHTO Guide to select a structural design for a specified reliability level. In the future, mechanistic procedures may be used for new design.

3.5.3 Pavement Management Information System

The Pavement Management Information System (PMIS) provides the necessary information for NOS and POS models. Relational database management (RDBM) software running under Unix is used. The system is designed for "user friendly" operations to sort, query, and process data. Capabilities for both standard and "ad hoc" queries are provided.

PMIS is currently supported by a Plexus P/60 Minicomputer running Unify Version 3.2 RDBM software. The system is being converted to an Intergraph Interserve 3005 running INGRES Version 6.2 RDBM software. The Intergraph system also provides

communications with the IBM mainframe necessary to use the linear programming software system required for NOS.

The PMIS stores performance data collected from network and project level surveys of the system, and also records of actions which have taken place. This information is uploaded for use by the CANSYS system, the database which supports the Priority System. In turn, geometric and traffic data is downloaded to PMIS from the CANSYS System.

3.6 Pavement Monitoring Program for NOS

At the network level, distresses of individual, mile-long segments are monitored yearly. Because of computational limitation of the linear programming algorithm used in NOS, the number of distresses selected for a given pavement type was limited to three. For this reason, only those distresses which were judged most important in triggering rehabilitation actions are identified for NOS evaluation. The distresses selected for the different pavement types, PCCP, Composite, Full Design Bituminous (FDBIT), and Partial Design Bituminous (PDBIT), are shown below:

Pavement Type	Distress Types
PCCP	Roughness, joint distress, faulting
Composite	Roughness, transverse cracking, block cracking
FDBIT	Roughness, transverse cracking, block cracking
PDBIT	Roughness, transverse cracking, fatigue cracking

In addition to the distress types listed above, rutting is monitored on all pavement types and used in safety evaluations.

The Markov model in NOS uses "condition states" to evaluate cost and performance. Condition states are defined as specific combinations of distress levels and levels of variables that influence the rate of pavement deterioration. Two influence variables are used in KDOT's PMS--index to first distress and rate of change in the distress. A total of 216 possible condition states are defined for each pavement type. The network-level monitoring program determines the current condition state of each individual segment. "Distress States" are subsets of the sets of condition states and are defined as combinations of the three levels of each distress type. This total of 27 distress states is used to simplify assignment of feasible rehabilitation actions, costs, and prediction models.

3.6.1 Monitoring of roughness

Three roughness levels are defined based on Mays Meter data:

- Level 1 - Less than 60 inches/mile.
- Level 2 - 60 to 125 inches/mile.
- Level 3 - Greater than 125 inches/mile.

KDOT is currently considering converting to the International Roughness Index (IRI).

3.6.2 Monitoring of surface distress levels

For each distress, codes are established to define severity and extent. These codes are then combined to define distress levels.

To illustrate this process, consider transverse cracking as a typical example. The following severity codes are defined:

- Code 1 - 1/4" or wider, no roughness or secondary cracking.
- Code 2 - Any width with noticeable roughness due to depression or bump, or wide cracks (1"+). Also, cracks that have secondary cracking but no roughness.
- Code 3 - Any width with significant roughness due to depression or bump. Secondary cracking greater than Code 2

The extent code is defined as the number of equivalent full width cracks per 100' test section.

The severity and extent codes are combined to define the following distress levels:

- Distress Level 1- Less than 3 Code 1 cracks, and no Code 2 or 3 cracks per 100' test section.
- Distress Level 2- Three or more Code 1 cracks and/or some but less than 3 Code 2 cracks, and/or some but less than 2 Code 3 cracks.
- Distress Level 3- Any number of Code 1 cracks, and 3 or more Code 2 cracks, and/or 2 or more Code 3 cracks.

KDOT uses four 2-man crews and four equipment spreads for distress surveys. The four distress survey vans were equipped with PCR 2000 data collection equipment in 1982. In 1988/89, the vans were retrofitted with MDR 4000 series data collection equipment. The surveys are conducted annually during late spring and require three calendar months to complete. The 1989 survey cost is about $11 per mile. A Field Operations Manual has been prepared with detailed instructions and pictures to identify severity and extent codes for different distresses. Pictures from the manual displaying severity codes of transverse cracking are shown in Figure 3a-d. To assure uniformity and repeatability of the distress surveys, the field crews are trained annually and cross checks are made on the information recorded by each crew.

3.7 Pavement Monitoring Program for POS

For POS, detailed site-specific data are collected for the candidate projects scheduled for rehabilitation in the planning year. The data collected include deflection measurements, detailed distress data, and laboratory test data from cores and/or disturbed samples of the pavement and subgrade.

The POS data collection equipment includes Dynaflects, pavement coring equipment, and miscellaneous pavement/soils sampling equipment. Two 3-man crews and two equipment

spreads are used for the POS surveys, which are conducted during May-October each year. The 1989 survey cost was about $68 per mile.

3.8 Reports and Information from PMS

3.8.1 Network-Level Surveys

The database management software provides capabilities to sort and print pavement condition data in different ways. Typical examples are shown in Figures 4 through 7. The report in Figure 4 displays segment ID (in terms of county/route/milepost) and summarizes roughness and distress level information. Figure 5 shows the breakdown of all miles of each pavement type by three performance levels in a specified year. Figure 6 contains similar information over a five-year period. Figure 7 displays the number of miles with Code 2 (½" - 1") and Code 3 (> 1") rutting in each of the six KDOT districts.

3.8.2 NOS Output

Figures 8 and 9 show portions of typical optimal policy reports from NOS. Figure 8 lists the percentage of all miles in a given road category recommended for each of three categories of rehabilitation actions--routine maintenance, light rehabilitation (e.g., thin overlay), and heavy rehabilitation (e.g., thick overlay). Results are given for each year of a multi-year planning horizon and also for "steady state" (i.e., long- term) conditions. Figure 9 gives the breakdown of the optimal policy for a given year by condition states, the optimal action for each state, the proportion of the total mileage in each condition state, and the unit cost for each recommended action. An average unit cost (in $/square yard) and the total cost are also printed for the specified period and road category.

Figure 10 shows a typical "Future Condition" report. It lists for each PMS segment and for each of the future planning years, the most probable rehabilitation action, the probability of requiring that specific action, and the probability that any rehabilitation action would be required. The information in this report is used as input to the "project packaging" process described later.

Figure 11 identifies locations where routine maintenance is recommended in NOS evaluation and lists the type and cost of the recommended routine maintenance activity.

3.8.3 Project Packaging Process

NOS identifies optimal actions for individual roadway segments. For practical purposes, several contiguous segments must be combined to form a single project. Figure 12 shows information generated by the PMS software which is used to package segments into a project. Segments recommended for rehabilitation in each of the planning years are identified. Projects are selected and marked manually in the computer file considering the following factors:

- NOS action year
- Distress information outside of optimization

- Maintenance information from districts
- Minimum project length
- Other programmed projects
- Miscellaneous information

An example of a marked computer file is shown in Figure 13.

Using the marked computer files, the software generates a "candidate project list" by district for years 2, 3, and 4. A typical example is shown in Figure 14.

3.8.4 POS Output

POS is currently being tested. The system generates an "optimal action strategy" (e.g., action for each project in a portfolio of candidate projects) for year 1 project locations. The optimal strategy at a given location is constrained by budget and performance requirements from NOS. Actions outside of NOS action set can be considered to take advantage of local materials and local field conditions.

3.9 Rehabilitation (Substantial Maintenance) Program Development

Figure 15 shows the sequence of the major steps involved in developing a rehabilitation program. The steps can be divided into two major groups:

- Use of NOS to select a portfolio of candidate rehabilitation projects
- Use of POS to finalize the rehabilitation program

The individual steps in each of these two groups are described below.

3.9.1 Use of NOS to Select a Portfolio of Candidate Rehabilitation Projects

1. The NOS Survey is conducted during March, April, and May.

2. NOS runs are made during June, July, and August to identify optimal short- and long-term rehabilitation policies.

3. A portfolio of candidate rehabilitation projects is identified during September and October.

4. The Preservation Program Development Committee reviews the project lists during October and releases them for program development. The lists only identify the locations (and not the specific action planned) of candidate projects. These projects are scheduled for rehabilitation in the second year.

5. Districts develop their individual rehabilitation programs from the lists released by the committee under constraints set by Department policy.

3.9.2 Use of POS to Finalize the Rehabilitation Program

1. POS surveys are conducted from May through October of the previous year at candidate project locations identified in the "lists" from previous years.

2. NOS results are used to identify target actions. Using these actions as guides, a field review by the PPDC and the district engineer with input from the Pavement Design Section identifies alternative scopes for the candidate projects during March and April.

3. The PMS section runs POS in August using NOS performance and cost results as constraints. The resulting optimal action policy is furnished to the Division of Operations.

4. The Division of Operations reviews and finalizes the program in September and releases it to the districts.

5. The Districts prepare 402's (plans) in September.

6. The projects are let to contract in January and February.

3.10 Future Enhancements to PMS

The following enhancements to KDOT's PMS are planned:

3.10.1 NOS operation in fixed budget mode

The current NOS version is directly used to identify the minimum cost policies for all road categories in the network. An iterative procedure is needed to identify policies that maximize benefits subject to a fixed total network budget. The planned enhancement will provide the capability to operate NOS directly in either of two modes: minimize costs subject to performance constraints or maximize benefits subject to a budgetary constraint.

3.10.2 Add rutting to NOS distress set

Currently, rutting is measured in the NOS survey, but used as a safety consideration outside of NOS analysis. The planned enhancement will include rutting in the NOS optimization.

3.10.3 Improve prediction models

Both NOS and POS prediction models will be improved using the data accumulated in the NOS and POS surveys and recent advances in mechanistic prediction models.

3.10.4 Enhance graphics capabilities

The current NOS output is primarily text-oriented tables and lists. The planned enhancement will display NOS results in graphical form. Simple business graphics in the form of pie charts, bar charts, histograms, etc. will be prepared. Also, map oriented graphics using Geographic Information System (GIS) technology will be developed.

3.11 Summary -- KDOT PMS

The KDOT PMS is one major part of the Department's overall pavement management process. The PMS is a fully integrated network and project level optimization system. The major advantages of the system include the following:

- Estimates annual rehabilitation budgets over a specified planning horizon (such as 5 years).
- Identifies project locations for rehabilitation.
- Gives "statewide perspective" to the rehabilitation program resulting in optimal use of a fixed network budget.
- Assists in the development of project pavement design.
- Incorporates common modes of pavement failure.

Some of the disadvantages of the system are:

- Requires the use of a complex methodology.
- Is computer intensive.
- Requires an annual network survey.

In conclusion, the KDOT PMS is consistent with one of the Department's missions: "Design, build, and preserve pavements."

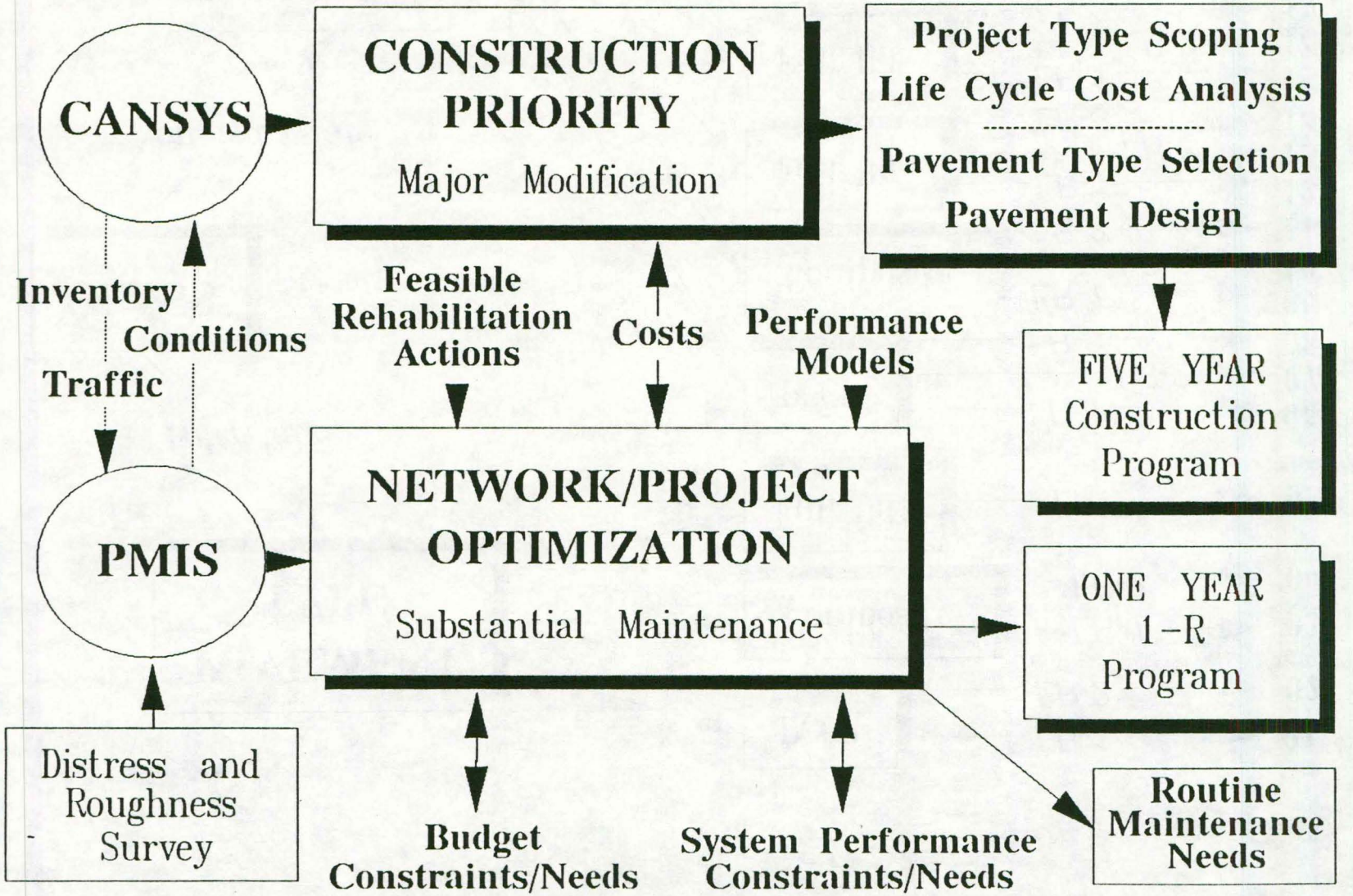


Figure 1. Tools and Methods in KDOT PMS

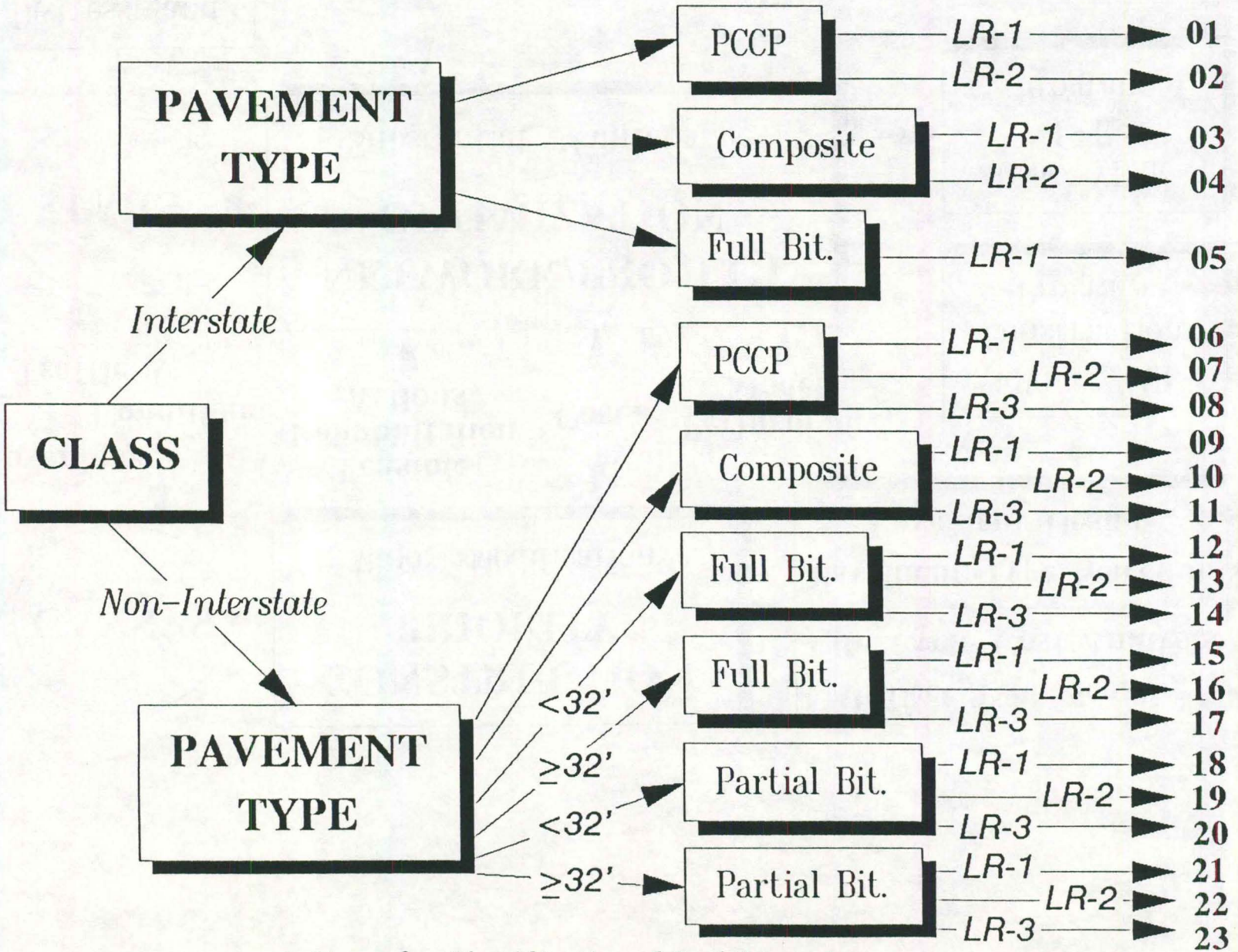
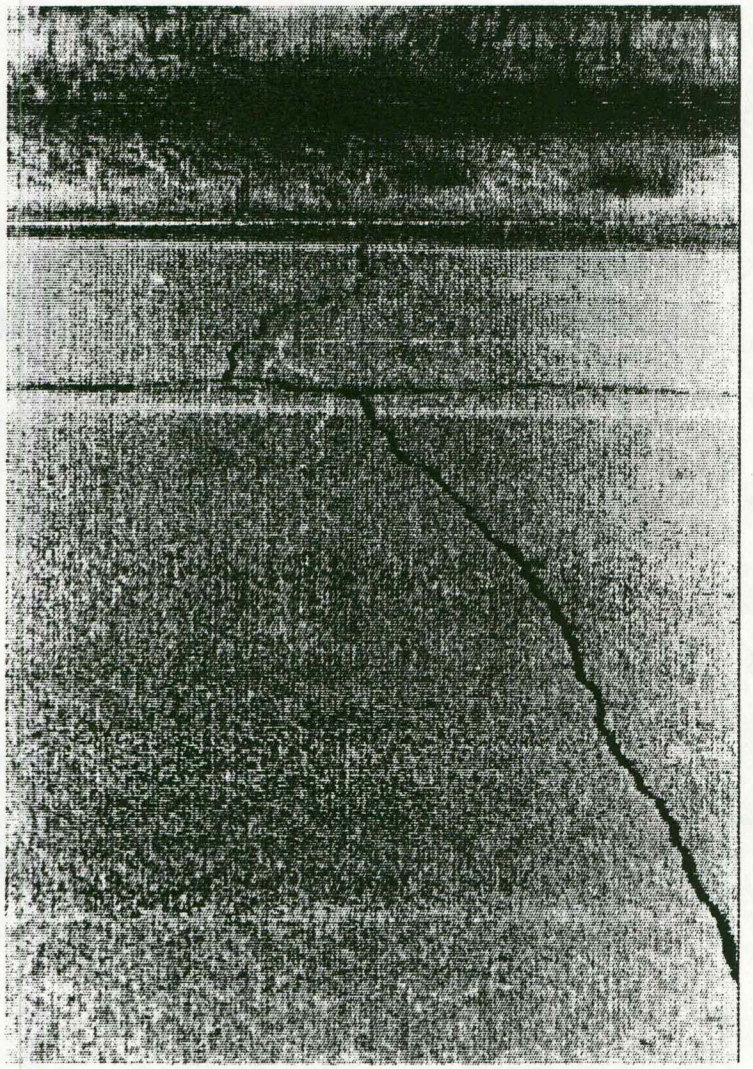
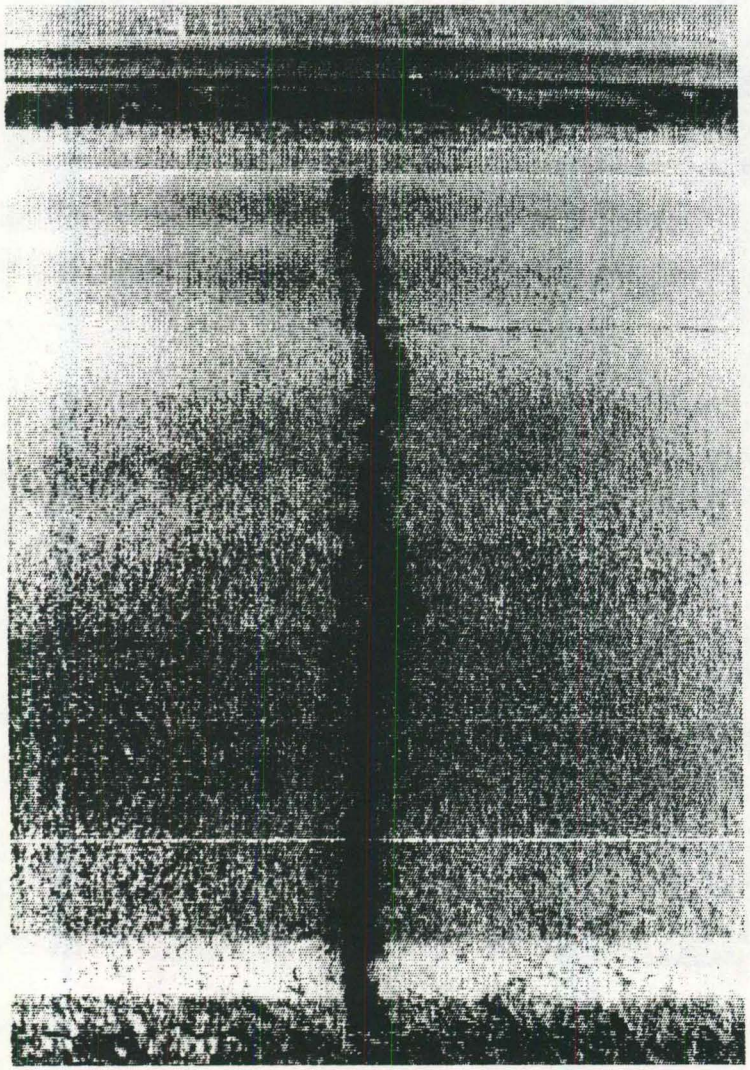


Figure 2. Identification of Road Categories



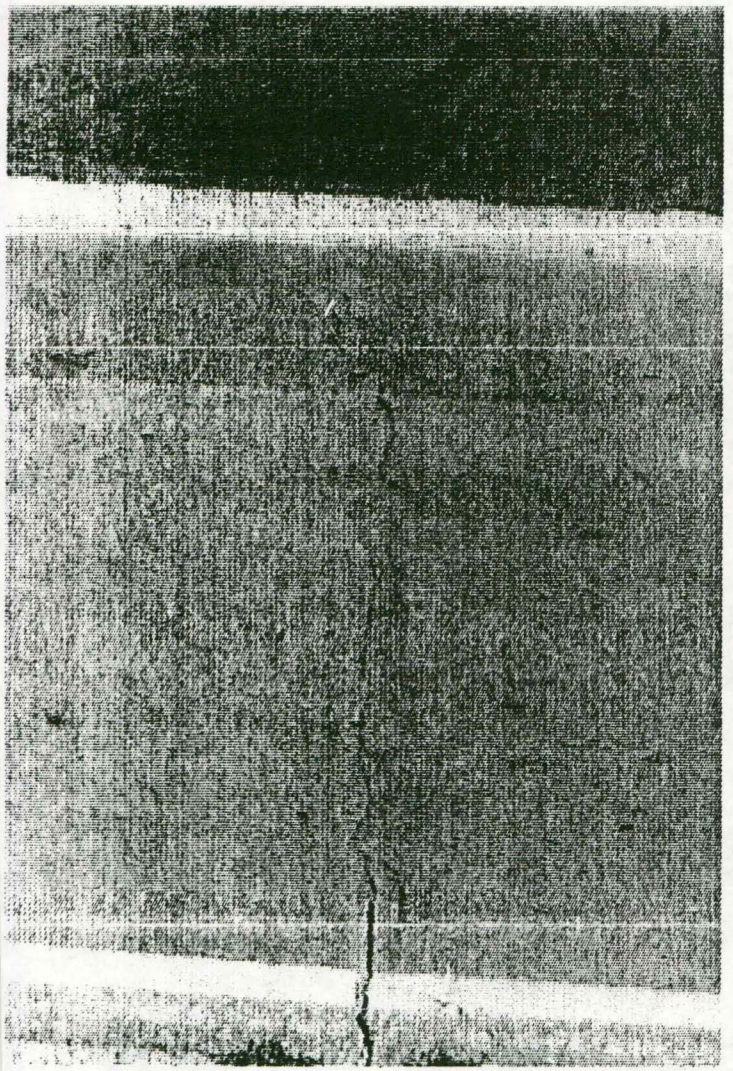
Picture 9. Code 1 Transverse Cracking. Crack width is greater than 1/4" with no roughness.

Figure 3a. Severity Code 1 for Transverse Cracking



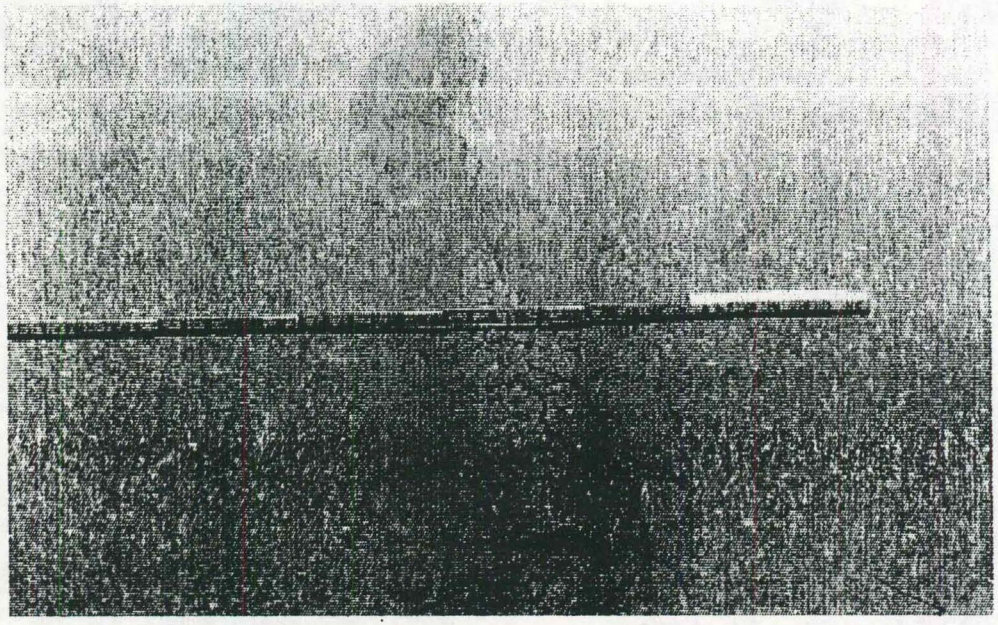
Picture 10. Code 2 Transverse Cracking. Transverse cracks which are not depressed but are at least one inch wide should be assigned to this code because of the noticable roughness.

Figure 3b. Severity Code 2 for Transverse Cracking



Picture 11. Code 2 Transverse Cracking in near lane. Note depression and the commencement of secondary cracking and noticeable roughness.

Figure 3c. Severity Code 2 (another condition) for Transverse Cracking



Picture 13. Code 3 Transverse Cracking. Note advanced deterioriation of the crack as evidenced by secondary cracking and depression

Figure 3d. Severity Code 3 for Transverse Cracking

1989 Condition Survey Report

<-PMS Seg. ID No.->			Milepost		Dis	P
Co.	<Route>	iMP<L>	Beg	End	State	L
023	(U-056-0)	11-12(0)	11.000	12.000	221	2

...

Pr		Pvmt			<Mays>		<----- Flexible		
Yr	RC	Type	ADT	EAL	Date	Ride	Date	Rut	F1
89	13	FDBIT	798	30	03/13	76	03/21	14	40

...

Distress ---------->							<--- Rigid Distress --->				
F2	F3	F4	T1	T2	T3	BC	Date	F	J1	J2	J3	J4
20	00	00	09	23	00	00	*N/D*	00	00	00	00	00

Figure 4. Example of NOS Condition Survey Report

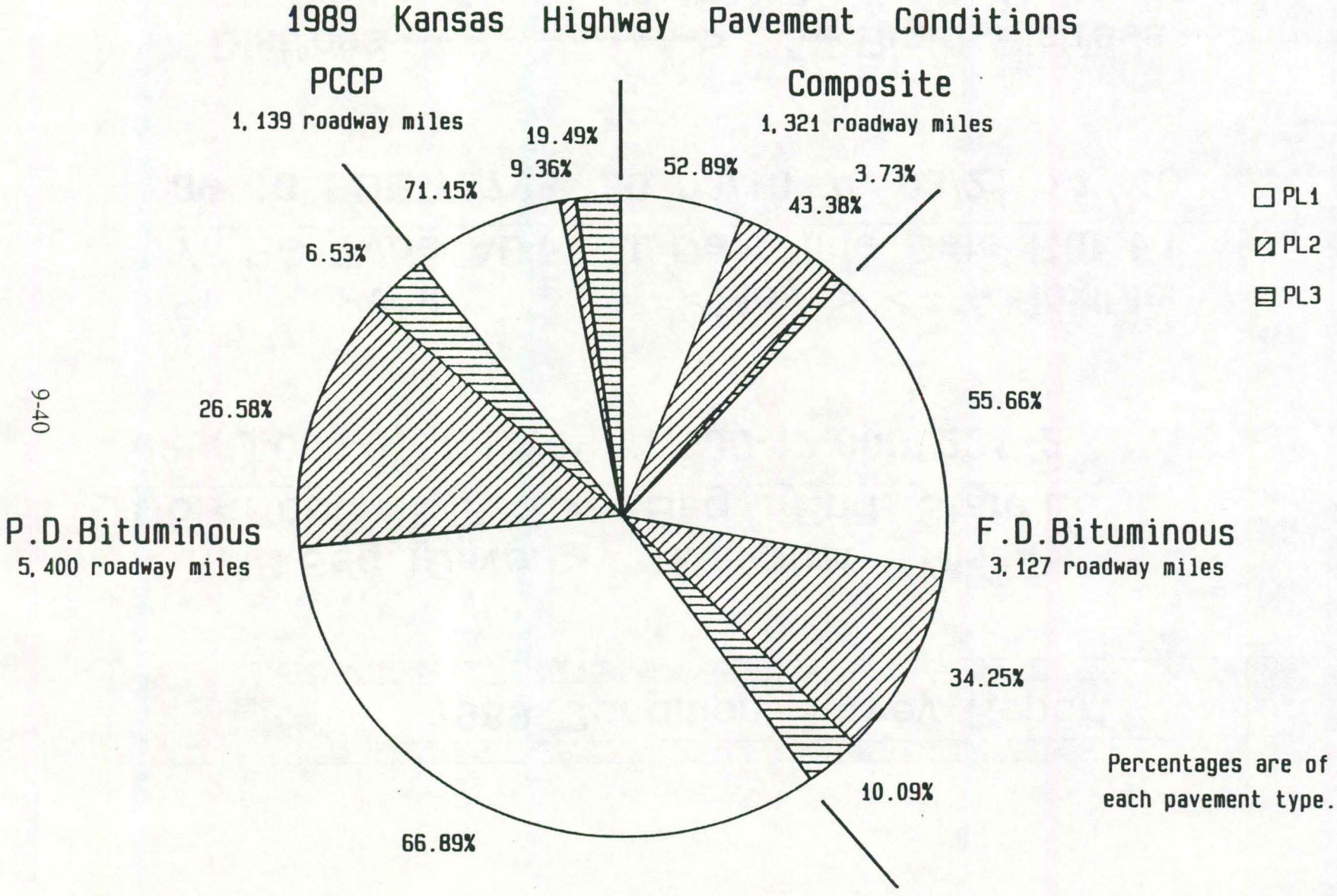


Figure 5. Distribution of Roadway Miles by Performance Levels

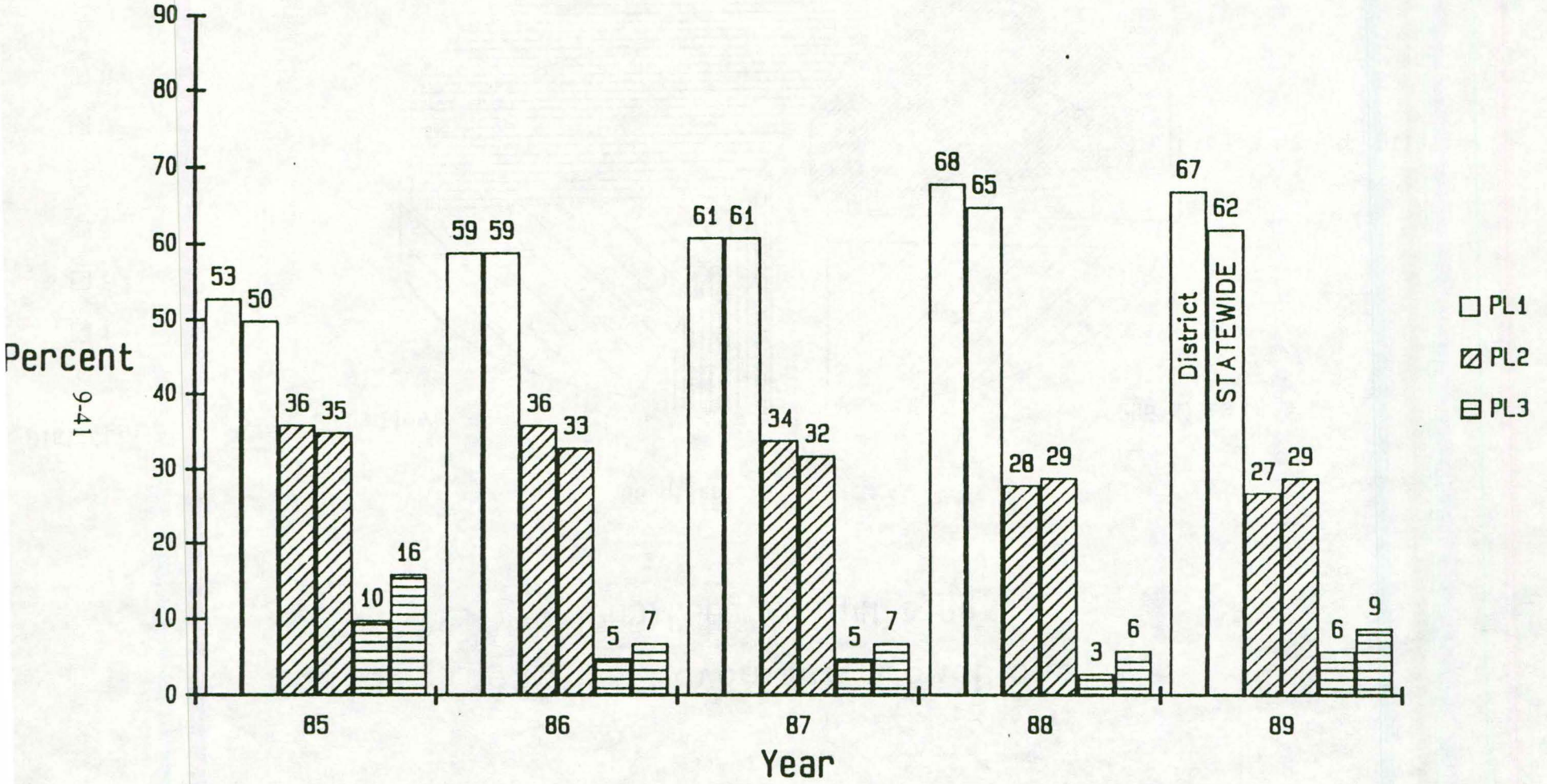


Figure 6. Historical Distribution of Roadway Miles by Performance Levels

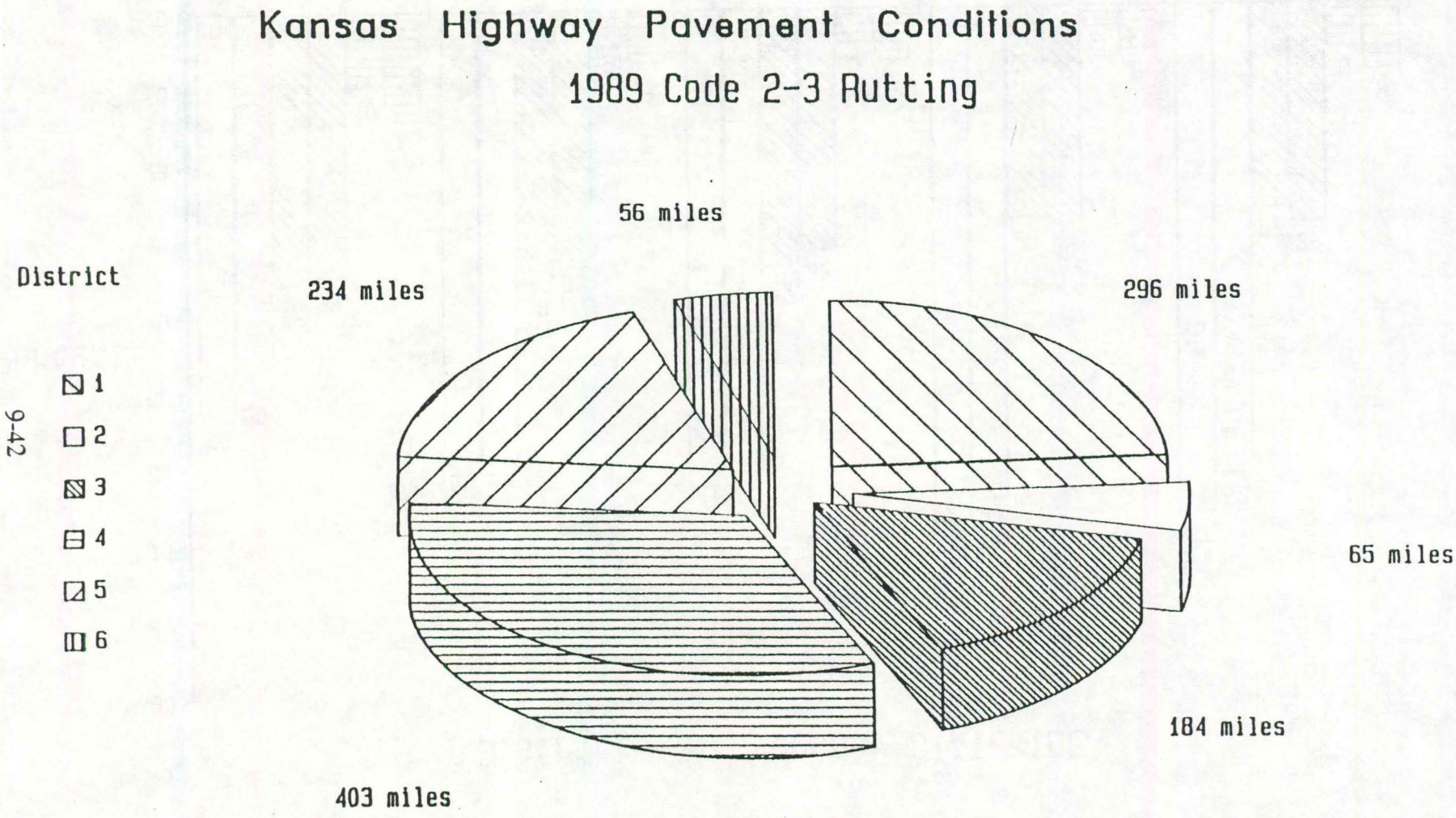


Figure 7. Distribution of Miles with Rutting by Districts

Optimal Policy Report - Road Category 5

Interstate .. all roadway widths .. F.D.Bit .. all E18/day

Year	Routine Maint.	Light Rehab.	Heavy Rehab.	Achieved Performance
1	72.8%	06.3%	20.9%	64.7 | 1.7
2	47.7%	28.7%	23.6%	66.0 | 2.8
3	42.0%	31.8%	26.2%	67.8 | 4.2
4	50.2%	31.1%	18.7%	70.2 | 4.6
SS	52.8%	31.8%	15.4%	72.0 | 4.7

Specified Performance: 72.0 | 5.0

Figure 8. Summary of Optimal NOS Policy

Policy for Period 1 - Road Category 12

Non-Interstate ... <32' roadway ... F.D.Bit ... <23 E18/day

State	Action	Proportion	Cost
001	Routine Maintenance	50.9%	0.01
004	Routine Maintenance	09.6%	0.23
022	(F) CR, .75" OL	11.5%	1.77
025	(F) CR, .75" OL	05.7%	1.77
031	Routine Maintenance	05.7%	0.59
181	Cold Mill, 1"	05.7%	0.47
184	(F) CR, .75" OL	05.9%	1.77
199	Cold Mill, 1"	05.0%	0.47

Average cost: $0.52 per square yard

Total cost: $128,340

Figure 9. Details of Optimal NCS Policy for Given Road Category and Y

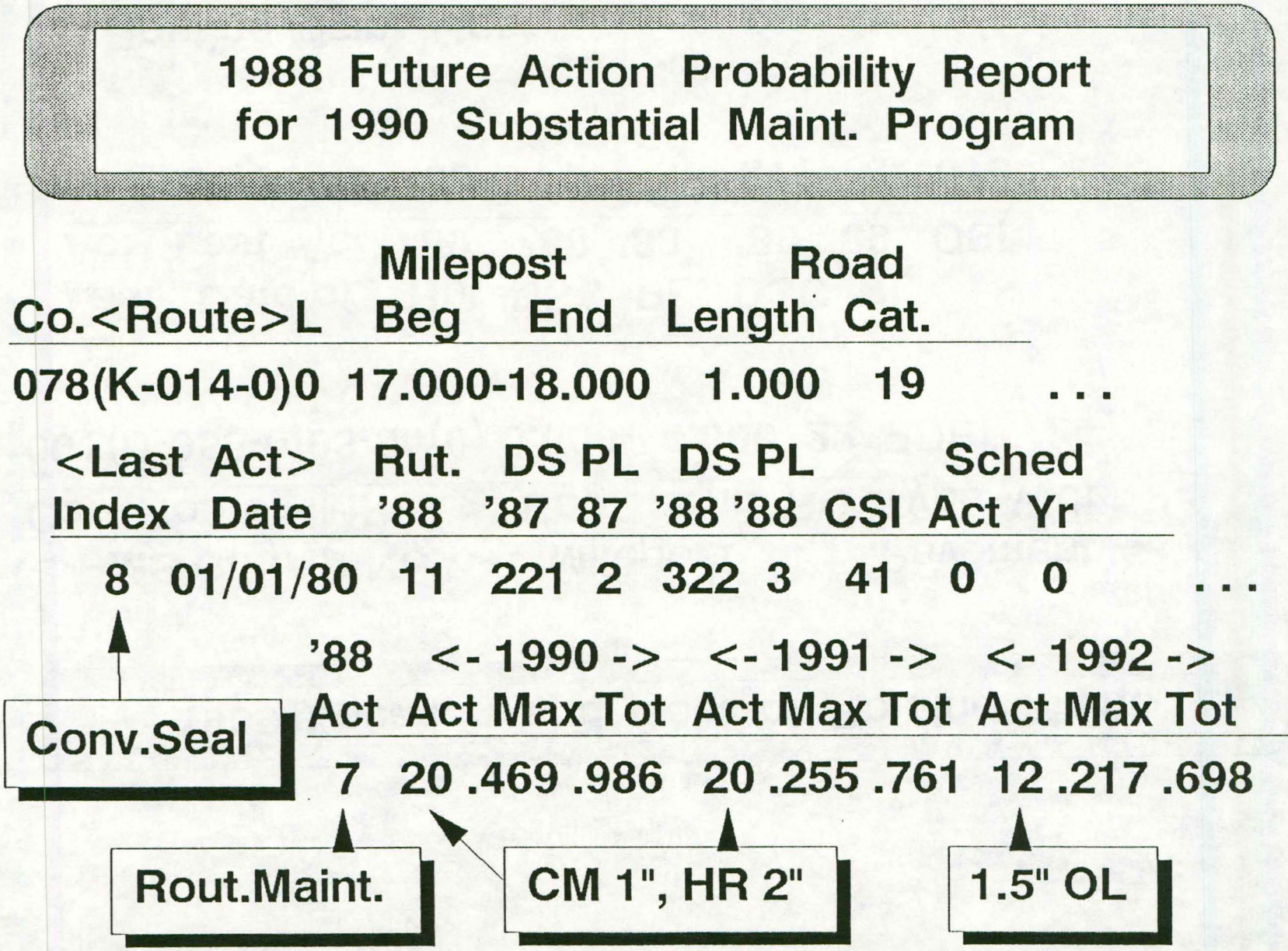


Figure 10. Future Action Probability Report

1989 Location and Cost of Routine Maint.

<-PMS Seg. ID No.-> Co.	<Route>	iMP	<L>	Milepost Beg	End	RC	Pavement Type	Wdt	
001	(U-059-0)	03-04	(0)	3.000-	4.000	22	PDBIT	24	...

Last Act	Date of Last Act	Rut '89	DSC '88	PL '88	DSC '89	PL '89	CSI	
011	01/01/82	00	111	1	211	1	019	...

Routine Maint. Cost $/sq.yd	$/segment	Description
0.23	3238	crack fill, patch

Figure 11. Location and Cost of Routine Maintenance

1988 Project Packaging Process
Route Information Listing

Co.<Route>L	Individual segment selection codes
078(K-014-0)0	0300000100340011221222 44RR0010
078(K-096-0)0	11112R3331111{3}44443444433333

{x}	Route skips "x" miles (eg: route through city).
0	No action selected (selection criteria not met).
1	1989 action that is not already scheduled.
2,3,4	1990, 1991 or 1992 action.
R	Non-selected segment with 0.5" or more rutting.

Figure 12. Routine Information Listing for Project Packaging

1988 Project Packaging Process
Candidate Project Marking

Co.<Route>L Individual segment selection codes

078(K-014-0)0 0300000 *10034001122122244RR0010*

078(K-096-0)0 *11112R3331111* | *444434444333333*

*	Candidate project termini.
K-14	1990 project (52% year 1, 2 and rutting).
K-96	1990 project (77% year 1, 2 and rutting).
	1992 project (57% year 4).

Figure 13. Marking of Candidate Projects

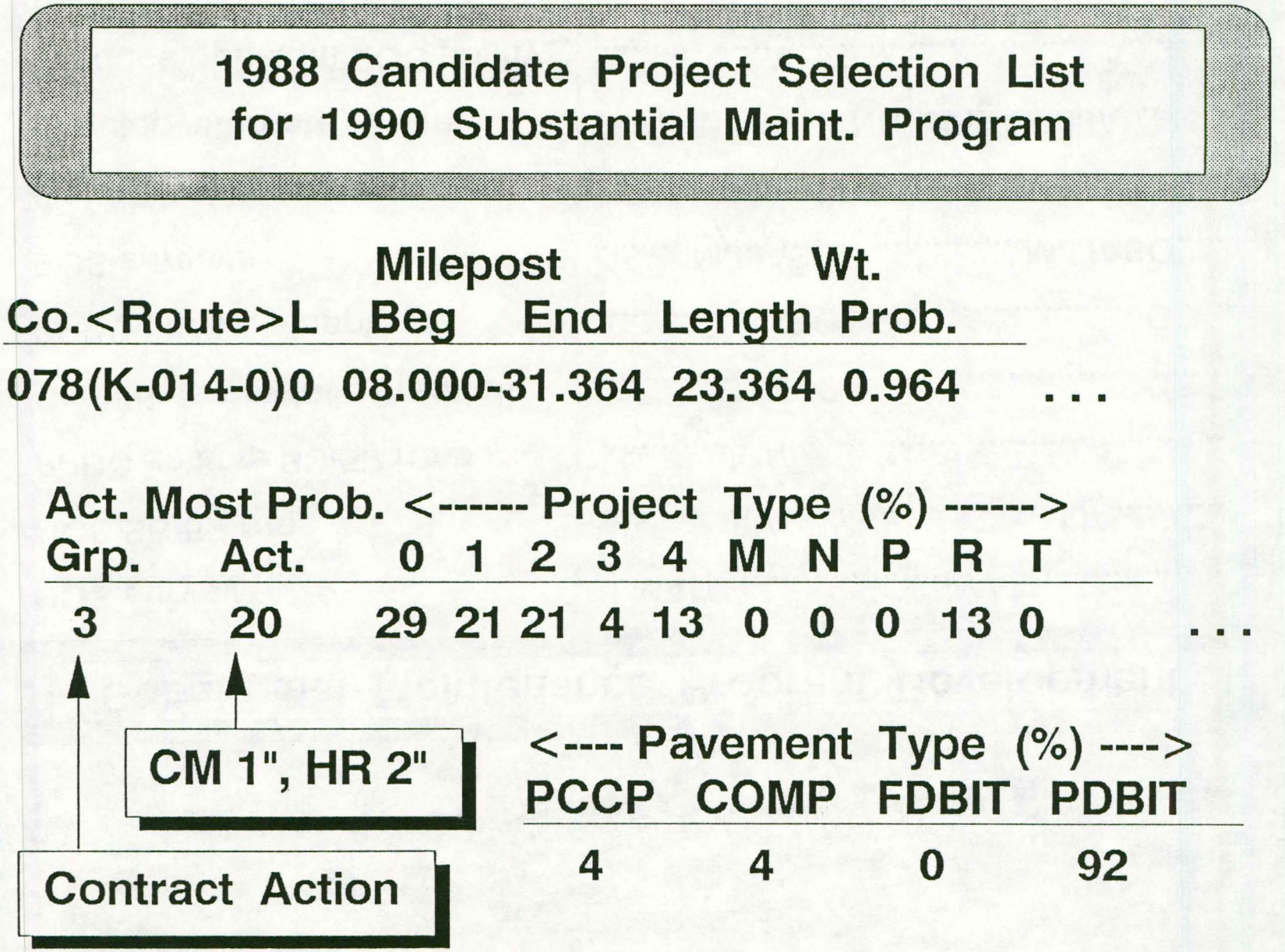


Figure 14. Candidate Project Selection List

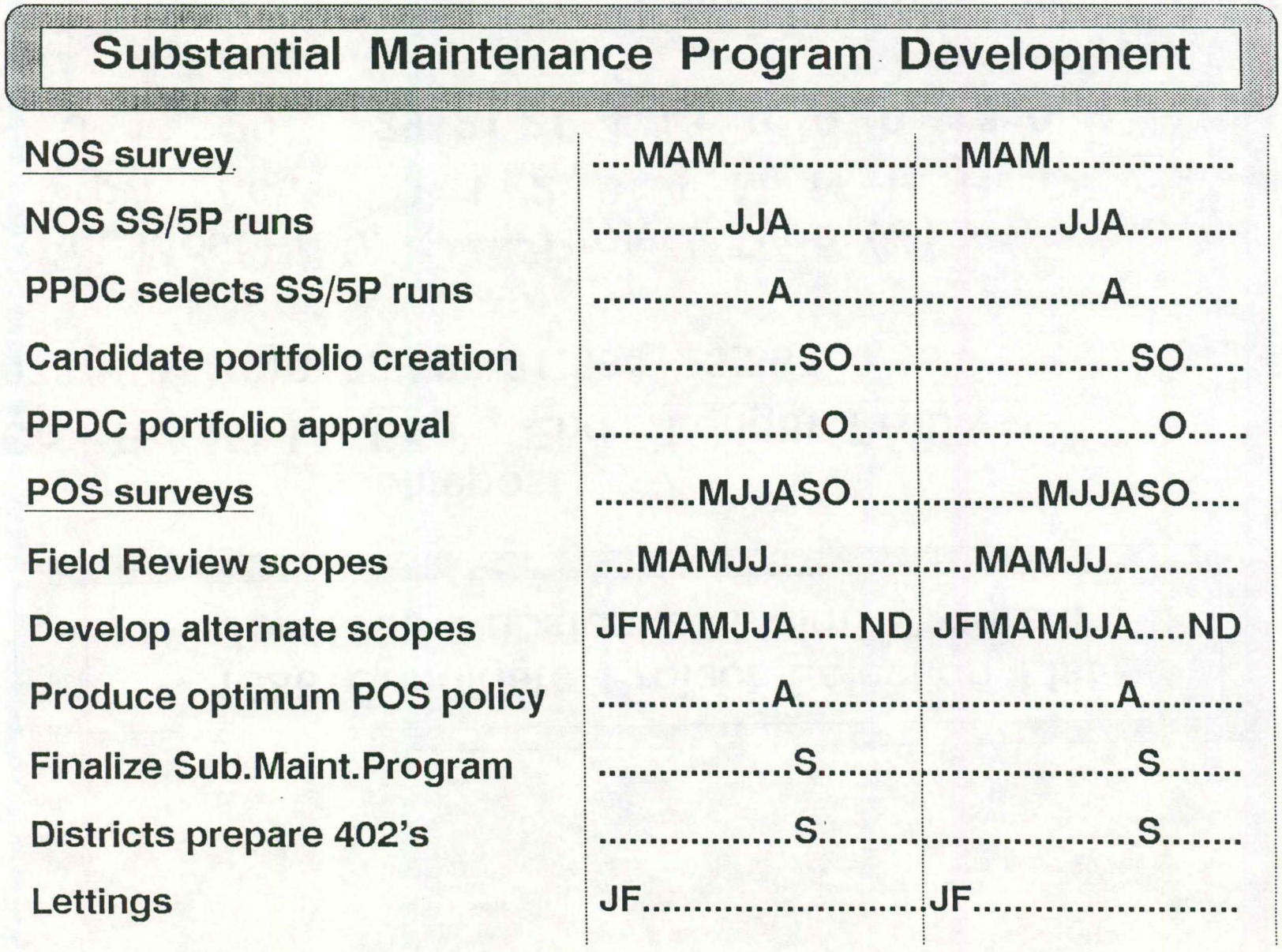


Figure 15. Sequence of Steps in D[illegible]loping Rehabilitation Program

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit
for
Introduction to the
Pavement Management Process

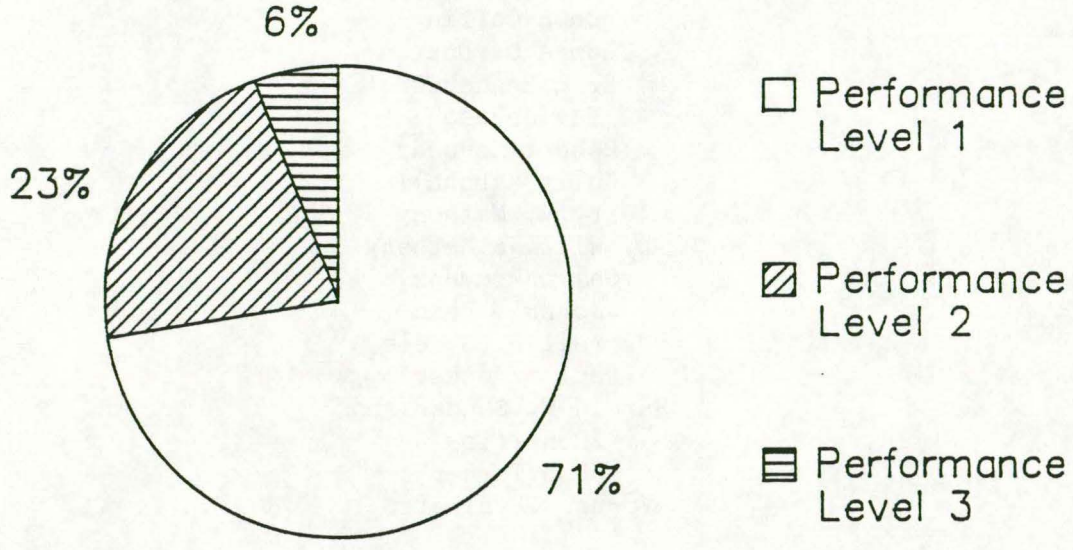
Bureau of Materials and Research
1993 Kansas NOS
Condition Survey Report

(Excerpt of original currently in reproduction)

Bureau of Materials and Research

1993 Kansas NOS Condition Survey Report

August 2, 1993



1993 Kansas Highway Pavement Conditions

G. N. Clark

PMS Task Force Leader

MAJOR CONTRIBUTORS

Wilbur F. Anschutz
Larry K. Cavender
Dawn Coffin
Thomas O. Dutton
Eric Henderson
Tom Johnson
Robert Kennedy
Kelly Marshall
Gary V. Matheny
D. William Metheny
Galen Mommens
Johnnie Razo
Darrell D. Steele
Paul Strecker
Harold W. Sunderland
Ron Tripp
Bob Turner
Verne R. Walrafen

KANSAS DEPARTMENT OF TRANSPORTATION
Bureau of Materials and Research, Geotechnical Unit
Materials and Research Center, 2300 Van Buren
Topeka, Kansas 66611-1195 (913)296-3008

August 2, 1993

MEMORANDUM TO: W. M. Lackey, State Transportation Engineer
James Jones, Director of Operations
Deb Miller, Director of Planning and Development
Dean M. Testa, Chief of Construction and Maintenance
G. David Comstock, Chief of Program Management
District Engineers
Area and Metro Engineers

SUBJECT: 1993 NOS Condition Survey Report

The results of the 1993 condition survey have been entered into the database and reports showing pavement conditions for all road segments surveyed have been printed. The PMS database presently includes data on 10,971 roadway miles of the State highway system. Excluded are non-State maintained city connecting links; short miscellaneous rural sections and State maintained city connecting links less than 0.445 mile long; and bridges over 750 feet long.

The following guides, attachments, graphs, and printouts are included:

1. PRINTOUT I GUIDE...SUMMARY OF PAVEMENT CONDITION AS SURVEYED.

2. PRINTOUT II & III GUIDE...DISTRESS DATA, DISTRESS STATE AND PERFORMANCE LEVEL.

3. ATTACHMENT I...Distress Levels per 100 foot Sample Location.

4. ATTACHMENT II...GUIDE FOR RATING PAVEMENT DISTRESS.

5. GRAPHS...Kansas Highway Pavement Condition - 1989-1993.

6. PRINTOUT I...SUMMARY OF PAVEMENT CONDITION AS SURVEYED.

7. PRINTOUT II...1993 Distress State, Performance Level and Distress Data Listing.

8. PRINTOUT III...1993 Segments with Code 2 or 3 Rutting but No Action Scheduled.

The summary and distress data listings were printed using the same format as last year. The reference post with a plus or minus distance equivalent to the county milepost is included on each reference line.

The pavement condition data does not reflect preservation actions which occurred after the date of the surveys. The date of the survey on each segment is furnished in printout II so that any maintenance or contact actions occurring this year can be related to them. Note that the roughness survey date and the distress survey date are different because separate surveys were conducted for each.

This year we have introduced one significant change such that all I35 in Osage County is now listed in District 4 rather than in District 1 because District 4 has maintenance responsibility.

We have continued the special features introduced last year:

1. When a segment has transverse cracks with no noticeable roughness, it is a candidate for crack sealing and has the word "**Crack**" following the Code 1 transverse cracking data value.
2. When a segment has significant rutting, the words "**Rutting**" (0.5"-1.0") or "**RUTTING**" (more than 1.0") follows the FLEXIBLE DISTRESS data values.
3. Behind each district's full condition data listing is a reference listing consisting of all segments which have 0.5" or more of rutting and no action scheduled on them.

Distress state data from the 1992 and 1993 surveys adjusted for contract actions are used to develop condition states which are used to input the current condition into the Network Optimization System (NOS) software. In conjunction with cost data and interim prediction models for specified feasible actions, an optimum rehabilitation strategy can be developed for each road category. Computer runs to develop the optimum policy are currently in progress.

Special reports utilizing different formats and listing any data available in the database will be prepared upon request. Color plots from the CADD/CAM system showing the performance level for each segment and programmed project locations are currently being prepared.

If you have any questions concerning these reports, please contact a PMS Task Force member or myself. We will be happy to meet with you concerning this data if you desire.

L. S. Ingram, P.E., Chief
Bureau of Materials and Research

pc: Task Force Members:
W. Dennis Gamble
Andrew J. Gisi
Richard L. McReynolds
Gary N. Plumb
Verne R. Walrafen

G. N. Clark, P.E.
PMS Task Force Leader

PRINTOUT I GUIDE

SUMMARY OF PAVEMENT CONDITION AS SURVEYED

***** DESCRIPTION OF TERMS *****

ROAD CATEGORY

The PMS stratifies the highway network into twenty-three road categories by function, pavement type, traffic, and width.

CLASS. I/O

Classification:

- I for interstate.

- O for all others.

PVMT TYPE

Pavement Types are defined as follows:

- PCCP Portland cement concrete pavement.

- COMP Composite pavement, PCC pavement or brick that has been overlaid with asphaltic concrete.

- FDBIT Full depth bituminous pavement, designed and constructed to carry expected traffic.

- PDBIT Partial design bituminous pavement, not designed or constructed to carry expected traffic (Par Value < 20).

WDT

Width of roadway including shoulders. The first eleven road categories include all pavement widths. Other road categories are separate according to width: 32 feet or wider, and less than 32 feet. In the tabulation take >32 to mean "32 feet wide or wider".

TRAFFIC RANGE

These are EAL (Equivalent Axle Load) values for one direction only. The values are expressed in equivalent 18 kip axle loads which take into account axle weight and type and the load carrying capacity of the pavement.

TOTAL MILES

Total roadway miles in each road category. Roadway miles count divided facilities twice.

MILES IN LEVEL 1

Total roadway miles that appeared to require no corrective action at the time of the survey.

MILES IN LEVEL 2

Total roadway miles that appear to require at least routine maintenance on the date of the survey.

MILES IN LEVEL 3

Total roadway miles that require a rehabilitative action beyond routine maintenance on the date of the survey.

PRINTOUT II & III GUIDE

DISTRESS DATA, DISTRESS STATE AND PERFORMANCE LEVEL

***** DESCRIPTION OF TERMS *****

PMS SEG. ID NO.

PMS segment identification number. Each of the segments in the network has a unique ID number. It contains the county number, route classification letter, route number, route suffix number, segment integer mileposts, and lane number.

- **CO.**
  The number (1-105) of the county the PMS segment is in.
- **ROUTE**
  - Route classification letters are "I", "U" and "K".
  - Route number is the assigned number of the route.
  - Route suffix numbers are:

"0" for no suffix,	"5" for Alternate,
"1" for North,	"6" for Spur,
"2" for East,	"7" for Connector,
"3" for South,	"8" for Business, and
"4" for West,	"9" for Special.

- **iMP**
  Segment integer mileposts are created using the format of "99-99" by simple truncation of the fractional portions of both the beginning and ending mileposts of the PMS segment.
- **L**
  Lane numbers are:
  "0" for undivided,
  "1" for north lanes (west bound),
  "2" for east lanes (north bound),
  "3" for south lanes (east bound), and
  "4" for west lanes (south bound).

MILEPOST

County milepost mileage normally begins with zero where:

- the route enters a county at the west or south county line.
- the route begins inside the county.

- **BEG**
  Beginning of the segment with reference to county mileposts.
- **END**
  Ending of the segment with reference to county mileposts.

DIS ST

Distress State. Condition of the segment at the time of the survey. This is a three digit number:

- First digit. An indicator of roughness based upon the IRI value calculated from the right wheelpath profile for all road categories.
  - "1" indicates an IRI value of less than 114 inches per mile on all pavement types.
  - "2" indicates an IRI value of 114 to 162 inches per mile on all pavement types.
  - "3" indicates an IRI value of more than 162 inches per mile on all pavement types.

  Based on a study of the variability of Mays Ridemeter (MRM) readings, a statistical procedure using the standard deviation of MRM readings was developed to lessen the annual change

DIS ST (continued)

between distress levels. In order for a distress level to change from one year to the next, an IRI value must exceed the distress level range division by +/- 5 inches per mile.

92PL	93IRI	93PL	92PL	93IRI	93PL	92PL	93IRI	93PL
1	<119	1	2	<109	1	3	<114	1
1	119-161	2	2	109-166	2	3	114-156	2
1	>161	3	2	>166	3	3	>156	3

- Second digit. Distress type varies with pavement type.
  - PCCP: An indicator of joint distress. See ATTACHMENT I for definition of levels 1, 2 & 3.
  - Full and Partial design bituminous and Composite: An indicator of transverse cracking distress. See ATTACHMENT I for definition of levels 1, 2 & 3.
- Third digit. Distress type varies with pavement type.
  - PCCP: Indicates faulting distress level. See ATTACHMENT I for definition of levels 1, 2 & 3.
  - Full design bituminous and Composite: An indicator of block cracking distress. See ATTACHMENT I for definition of levels 1, 2 & 3.
  - Partial design bituminous: An indicator of fatigue cracking distress. See ATTACHMENT I for definition of levels 1, 2 & 3.

P L

Performance Level. There are three performance levels, 1, 2 & 3.

- "1" denotes those segments appeared to require no corrective action at the time of the survey. Formerly denoted as "Good" or "Acceptable" condition.
- "2" denotes those segments appeared to require at least routine maintenance at the time of the survey. Formerly denoted as "Deteriorating" or "Tolerable" condition.
- "3" denotes those segments required a rehabilitative action beyond routine maintenance at the time of the survey. Formerly denoted as "Deteriorated" or "Unacceptable" condition.

PR YR

Project Year. Three years are shown 93, 94 and 95.

- "93" designation includes all projects completed or expected to be completed in calendar year 1993 regardless of letting date as well as all projects let during FY-93 which will be completed in later years. "M" projects are included.
- "94" designation includes all projects expected to be let in FY-94 (except those completed during calendar year 1993) that are currently in the firm program.
- "95" designation includes all projects expected to be let during FY-95 that are currently in the firm program.

RC

Road category. The highway network is separated into 23 categories based on functional class, pavement type, roadway width, and traffic (EAL).

See the road category table on following page.

Road Category Number	Functional Classification	Pavement Type	Roadway Width	Design Lane ADL Range in E18/day
1	Interstate	PCC	All	0-749
2	"	"	"	750-9999
3	"	Composite	"	0-749
4	"	"	"	750-9999
5	"	Full Design Bituminous	"	0-9999
6	Other	PCC	"	0-87
7	"	"	"	88-162
8	"	"	"	163-9999
9	"	Composite	"	0-87
10	"	"	"	88-162
11	"	"	"	163-9999
12	"	Full Design Bituminous	<32'	0-22
13	"	"	"	23-50
14	"	"	"	51-9999
15	"	"	>=32'	0-22
16	"	"	"	23-50
17	"	"	"	51-9999
18	"	Partial Design Bituminous	<32'	0-22
19	"	"	"	23-50
20	"	"	"	51-9999
21	"	"	>=32'	0-22
22	"	"	"	23-50
23	"	"	"	51-9999

PVMT TYPE

Pavement Type.

- PCCP Portland cement concrete pavement.
- COMP Composite pavement, PCC pavement or brick that has been overlaid with asphaltic concrete.
- FDBIT Full depth bituminous pavement, designed and constructed to carry expected traffic.
- PDBIT Partial design bituminous pavement, not designed or constructed to carry expected traffic (Par Value < 20).

AADT

Annual Average Daily Traffic. (one direction only)

EAL

Equivalent Axle Loads. Expressed in daily equivalent 18 kip axle loads (one direction only).

ROUGHNESS

Results of roughness survey.

- **DATE**

  Shown are the date of the survey as follows:
  - "01/01" indicates estimated roughness.
  - "01/02" indicates roughness based on an average of adjacent segments.
  - "01/03" indicates that roughness based on a subjective rating made during the survey.

ROUGHNESS (continued)

- **MAYS**

  The Mays Ridemeter equipment has been retired. Mays Ridemeter roughness in inches per mile is now based on a regression analysis of 1992 IRI values calculated from left wheelpath profile collected with a South Dakota profilometer.

- **IRI**

  International Roughness Index roughness in inches per mile calculated from the right wheelpath profile collected with a South Dakota profilometer. Roughness ranges are now based on IRI values for the determination of distress states and performance levels. See **DIS ST** for a detailed discussion.

FLEXIBLE DISTRESS

Normally three 100-foot test sections were randomly selected to determine the expected condition for any 100-foot portion of the segment.

- **DATE**

  Date of condition survey.
  - "**N/D**" indicates no flexible distress survey made.
  - "****/****" indicates flexible distress was rated on previous surveys but not this one.
  - "**01/01**" indicates estimated data.
  - "**01/02**" indicates an average of the distress on adjacent segments.

- **RT**

  Condition of rutting in wheelpaths. This is a two digit number and represents the average of data from the three 100-foot test sections in the segment.
  - The first digit denotes severity of rutting and can be code 1 (0.25" - 0.5"), code 2 (0.5" - 1") "**Rutting**" or code 3 (>1") "**RUTTING**". See ATTACHMENT II for code description.
  - The second digit indicates extent of rutting as an average of the three 100-foot test sections in the segment.
    - "**1**" indicates one wheelpath rutted most of the way through the sections.
    - "**2**" indicates two wheelpaths exhibiting such rutting, and so forth.
    - A two lane facility could go as high as "**4**", since there are four wheelpaths.
    - "**0**" indicates an average extent value of less than 0.5.

- **FC1 FC2 FC3 FC4**

  Condition of fatigue cracking in the wheelpaths as as average of the three test sections. The **FC1** header denotes code 1 cracking severity, **FC2** denotes code 2 cracking severity, and so forth. The extent can be up to a three digit number, and represents the linear feet of fatigue cracking expected in any 100-foot sample on a two-lane roadway. See ATTACHMENT II for description of the four codes.

- **T1 T2 T3**

  Condition of transverse cracking as an average of the three 100-foot test sections. The **T1** header denotes code 1 transverse cracking severity, **T2** denotes code 2, and **T3** denotes code 3. The extent can be a one or two digit number and

FLEXIBLE DISTRESS (continued)

represents the number of equivalent full width cracks expected in any 100-foot sample of the segment, to the nearest 0.1 cracks. For example, the number "13" in any of the three columns indicates 1.3 equivalent cracks of that code could be expected in any 100-foot sample of the segment. See ATTACHMENT II for description of the codes.

When the word "**Crack**" appears below the **T2** and **T3** headers the segment was recorded as having only code 1 transverse cracking severity and thus is a candidate for crack sealing.

- **BC**

Condition of block cracking. Block cracking is not coded unless it covers 50% or more of the test section. The extent represent the three test sections and is a one digit number. The number shown denotes the code of block cracking exhibited, code 1, 2, 3 or 4. For example, a "3" indicate code 3 block cracking is present in 50% or more of the average section. The worst condition found in the three test sections is used to represent the segment. See ATTACHMENT II for description of the codes.

RIGID DISTRESS:

Normally three 100-foot test sections were randomly selected to determine the expected condition for any 100-foot portion of the segment.

- **DATE**

Date of condition survey.

- "**N/D**" indicates no rigid distress survey made.
- "****/****" indicates rigid distress was rated on previous surveys but not this one.
- "**01/01**" indicates estimated data.
- "**01/02**" indicates an average of the distress on adjacent segments.

- **F**

Condition of faulting as an average of the three 100-foot test sections in the segment. This is a one digit number indicating the most frequent faulting severity case which can be expected to occur in any 100-foot sample of the segment. If an equal number of faulted joints occurs in two different severity codes, the worst was listed. There are three severity codes: 1 (<0.25"), 2 (0.25"-0.5") and 3 (>0.5"). See ATTACHMENT II for description of codes.

- **J1J2J3J4**

Condition of joints in the segment as determined from the average of three 100-foot test sections. This is a one digit number indicating the number of distressed joints of a given severity code which can be expected to occur in any 100-foot sample of the segment. Averages between 0.01 and 1.49 were rounded to 1. There are four severity codes: 1, 2, 3, and 4 corresponding to the column headings. See ATTACHMENT II for description of codes.

ATTACHMENT I -- Distress Levels per 100 foot Sample Location

Distress Type	Level 1 (Good)	Level 2 (Deteriorating)	Level 3 (Deteriorated)
Joint Distress (Up to four codes per sample location)	Any number of Code 1 joints **and** less than three Code 2 joints **but** no Code 3 or 4 joints.	Any number of Code 1 joints **and** three or more Code 2 joints **and/or** five or less Code 3 joints **but** no Code 4 joints.	Any number of Code 1 and Code 2 joints **and** more than five Code 3 joints **and/or** some Code 4 joints.
Faulting (One code per sample location)	Most frequent fault height less than 0.25".	Most frequent fault height from 0.25" to 0.5".	Most frequent fault height greater than 0.5".
Transverse Cracking (Up to three codes per sample location)	Less than three Code 1 cracks, **and** no Code 2 or Code 3 cracks.	Three or more Code 1 cracks, **and/or** some **but** less than three Code 2 cracks, **and/or** some **but** less than two Code 3 cracks.	Any number of Code 1 cracks, **and** three or more Code 2 cracks, **and/or** two or more Code 3 cracks.
Block Cracking (One code per sample location)	No block cracking, **or** Code 1 block cracking over at least 50% of the area.	Code 2 or Code 3 block cracking over at least 50% of the area.	Code 4 block cracking over at least 50% of the area.
Fatigue Cracking (Up to four codes per sample location)	No more than 200 lin.ft of wheel path exhibiting Code 1 cracking **and** no Code 2, 3, or 4 cracking.	More than 200 lin.ft of Code 1 **and/or** no more than 200 lin.ft of Code 2, **and/or** no more than 75 lin.ft of Code 3, **and/or** no more than 25 lin.ft of Code 4 cracking in the wheelpaths.	Any extent of Code 1 cracking **and** more than 200 lin.ft of Code 2, **and/or** more than 75 lin.ft of Code 3, **and/or** more than 25 lin.ft of Code 4 cracking in the wheelpaths.
Rutting	Safety Related Distress.		
Friction Number	Optional Safety Related Distress.		

Note: See **ATTACHMENT II** for definition of codes.

ATTACHMENT II -- GUIDE FOR RATING PAVEMENT DISTRESS

Flexible Rating System

RUTTING (Distress type 1)

- o Deepest rut depth is used to pick condition code.
- o Extent is the total number of wheelpath rutted 0.25" or more.
- o Severity Codes:
  - 1: Less than 0.5" rutting in deepest rut (0.25" min.).
  - 2: 0.5" to 1" rutting in deepest rut.
  - 3: Greater than 1" rutting in deepest rut.
- o Only one severity level may be coded per test section.

Note: At least 50% of a wheelpath must be rutted to be counted.

FATIGUE CRACKING (Distress type 2)

- o Extent is lineal feet of wheelpath that is affected by each condition.
- o Severity Codes:
  - 1: Hairline alligator cracking, pieces not removable.
  - 2: Alligator cracking, pieces not removable, cracks spalled.
  - 3: Alligator cracking, pieces are loose and removable, pavement may pump.
  - 4: Pavement has shoved forming a ridge of material adjacent to wheelpath.
- o More than one severity level may be coded per test section.

Note: Fatigue cracking must exceed 5' to be counted (in any code).

TRANSVERSE CRACKING (Distress type 3)

- o Extent is measured in equivalent roadway width cracks.
- o Severity Codes:
  - 1: No roughness, 0.25" or wider with no secondary cracking; or any width with secondary cracking less than 4'per lane.
  - 2: Any width with noticeable roughness due to depression or bump. Also cracks that have greater than 4' of secondary cracking but no roughness.
  - 3: Any width with significant roughness due to depression or bump. Secondary cracking will be more severe than Code 2.
- o Cracks must be lane width to count (Centerline to edge on 2 lane).
- o More than one severity level may be coded per test section.

BLOCK CRACKING (Distress type 4)

- o Block cracking must cover 50% of test section area. Maximum block size 12'. Do count construction joints. Do not count cracking in wheelpath as secondary cracking. Code it as fatigue cracking.
- o Severity codes:
  - 1: Block size greater than 4' with no secondary cracking.
  - 2: Block size less than 4' with no secondary cracking.
  - 3: Block size greater than 4' with secondary cracking.
  - 4: Block size less than 4' with secondary cracking.
- o Only one severity level may be coded per test section.

Rigid Rating System

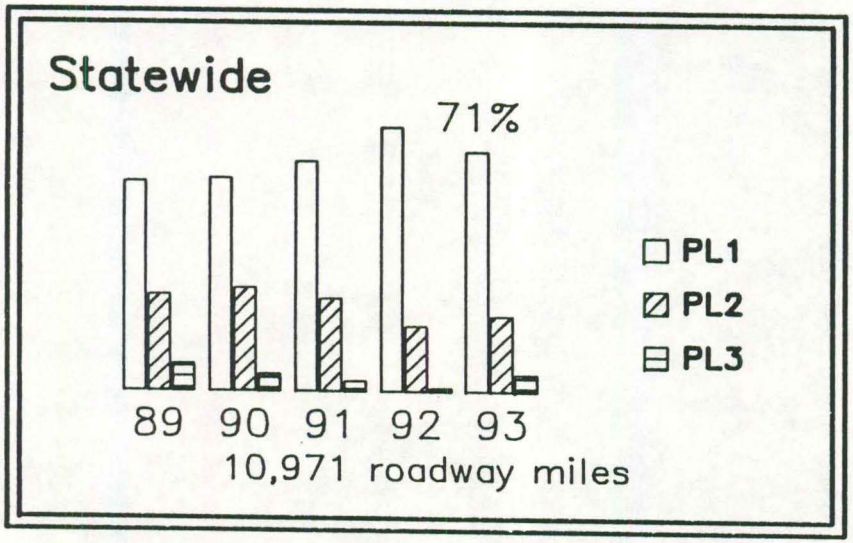
FAULTING (Distress type 6)

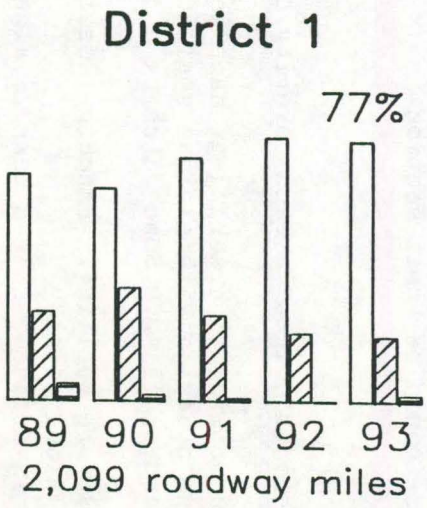
- The most frequent faulting in the test section is used to pick the severity code. If an equal number of faults in two severity codes, code the worst.
- Severity Codes:
  - 1: Faulted but less than 0.25" faulting.
  - 2: 0.25" to 0.5" faulting.
  - 3: Greater than 0.5" faulting.
- Only one severity level may be coded per test section.

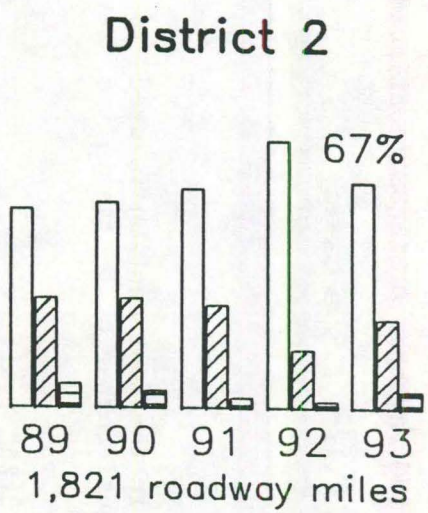
JOINT DISTRESS (Distress type 7)

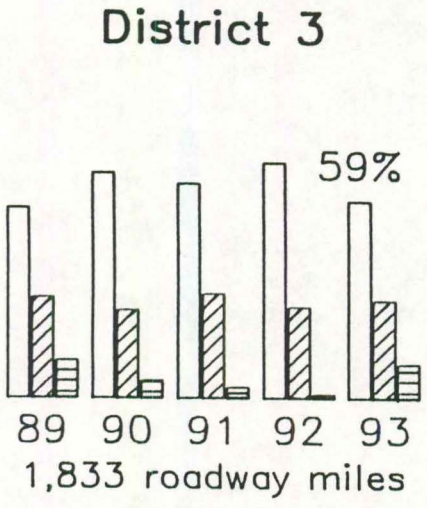
- Extent is the number of full width joints in each severity code.
- Severity Codes:
  - 1: Noticeable staining and/or minimal cracking at each joint.
  - 2: Staining and/or hairline cracking with minimum spalling.
  - 3: Significant cracking and spalling. Some patching done or necessary.
  - 4: Advanced cracking and severe spalling. Patching deteriorated and 2' to 3' wide along joint.
- Minimal cracking or spalling is defined as less than 2' along the joint length.
- Significant cracking or spalling is defined as more than 2' along the joint length.
- More than one severity level may be coded per test section.

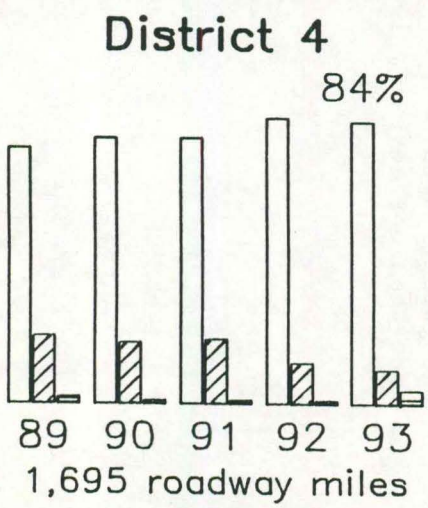
1989–1993 Kansas Highway Pavement Conditions

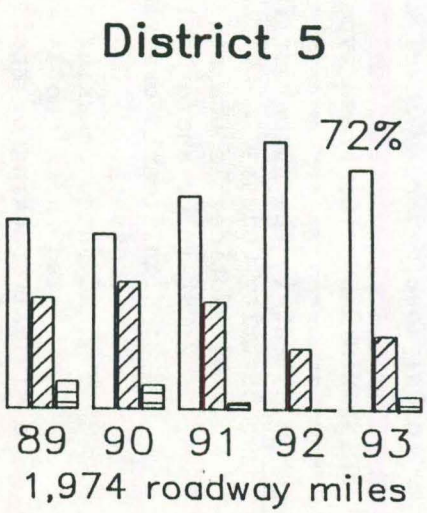


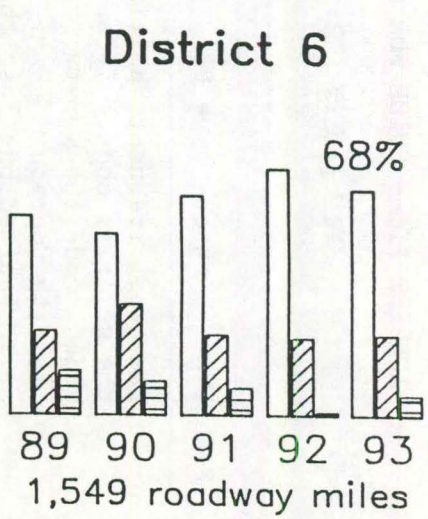






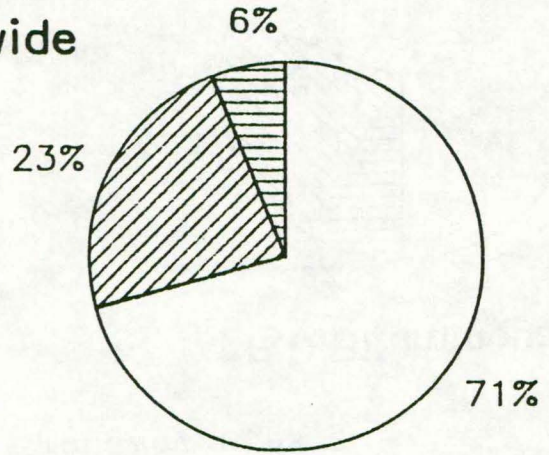






1993 Kansas Highway Pavement Conditions

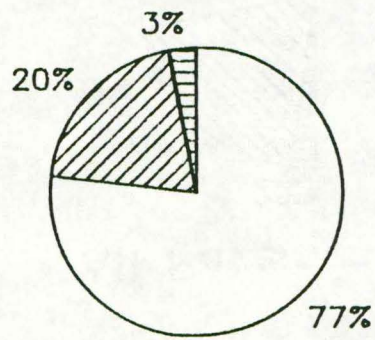
Statewide



PL1
PL2
PL3

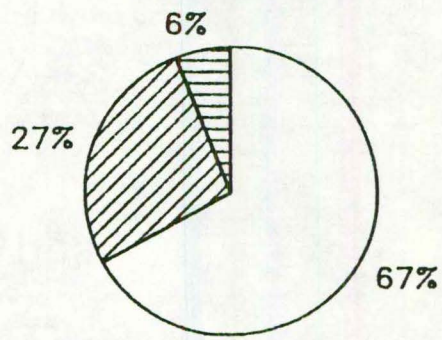
10,971 roadway miles

District 1



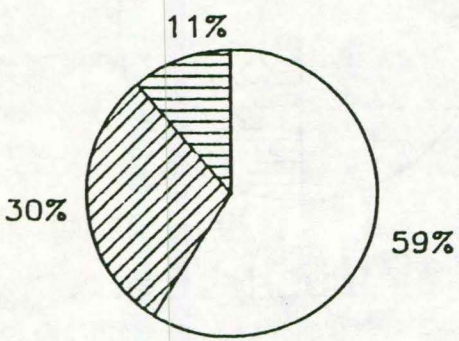
2,099 roadway miles

District 2



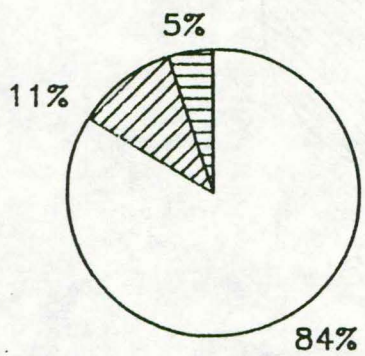
1,821 roadway miles

District 3



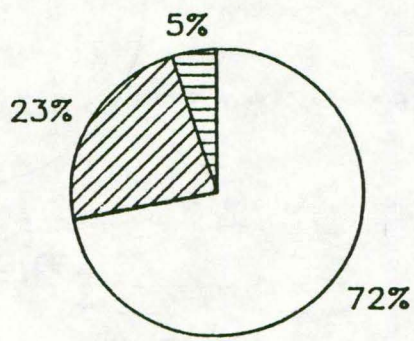
1,833 roadway miles

District 4



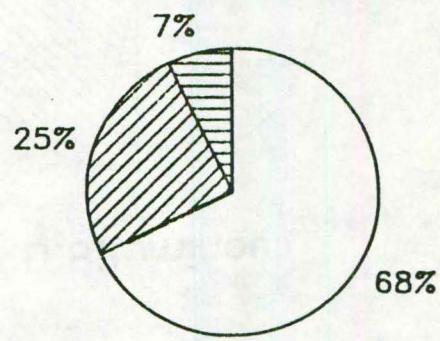
1,695 roadway miles

District 5



1,974 roadway miles

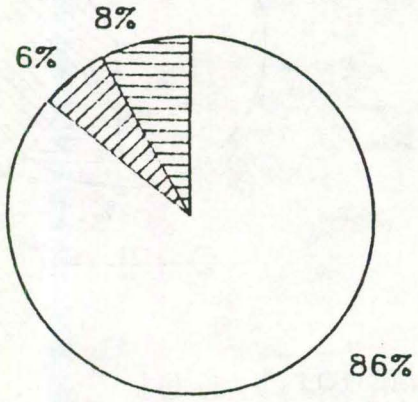
District 6



1,549 roadway miles

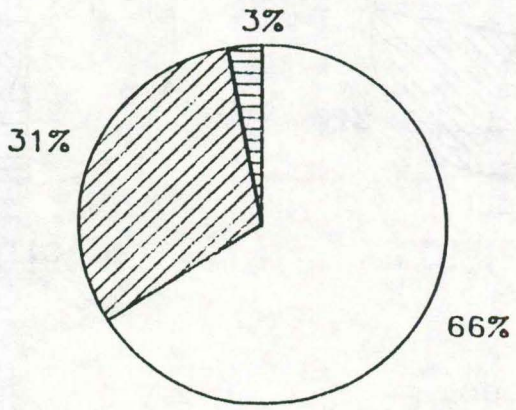
1993 Kansas Highway Pavement Conditions

PCCP



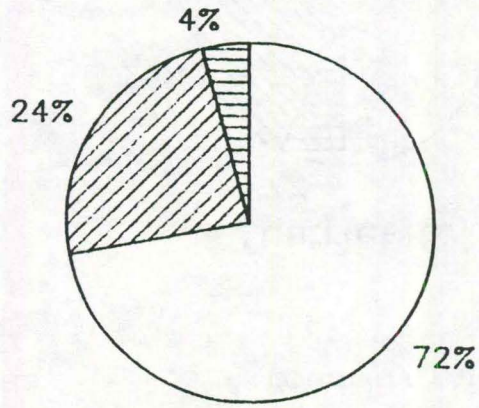
1,044 roadway miles

Composite



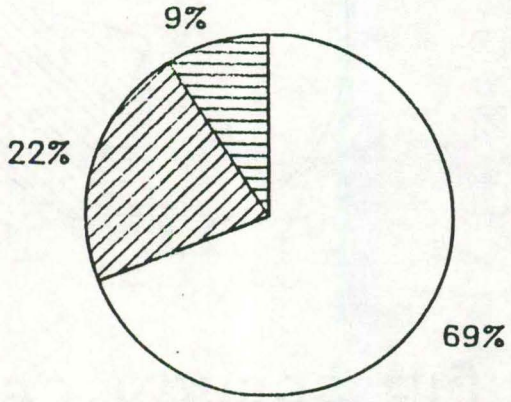
1,399 roadway miles

F.D.Bituminous



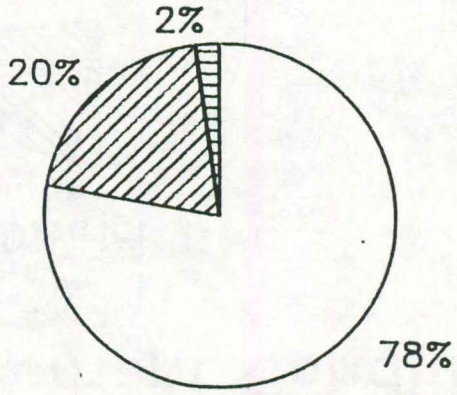
3,649 roadway miles

P.D.Bituminous

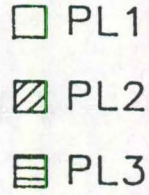


4,879 roadway miles

All Pavement Types

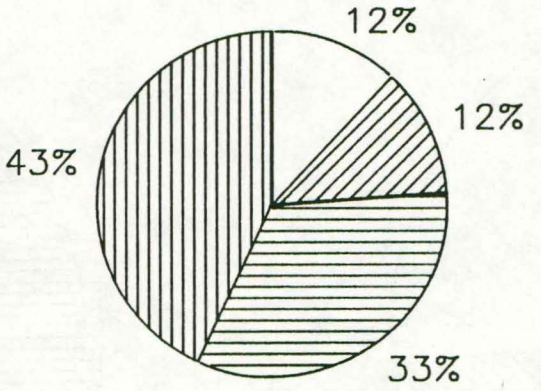


10,971 roadway miles



1993 Kansas Highway Pavement Conditions

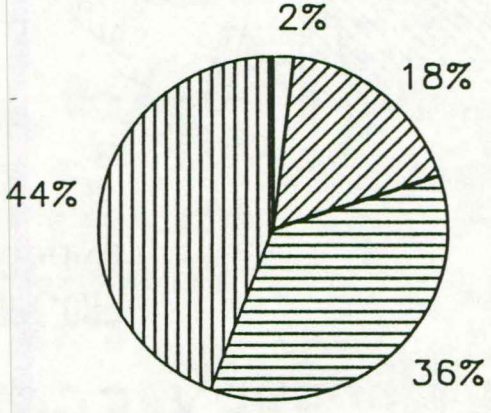
Performance Level 1



7,837 roadway miles

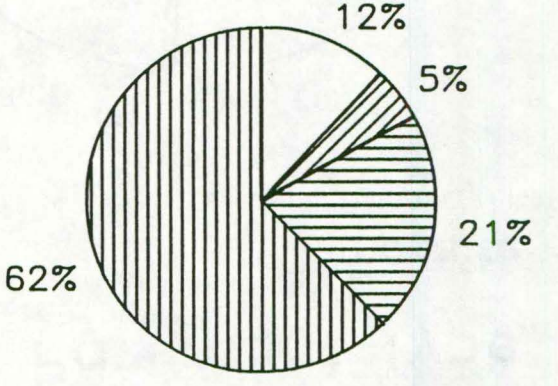
PCCP
Comp
FD.Bit
PD.Bit

Performance Level 2



2,468 roadway miles

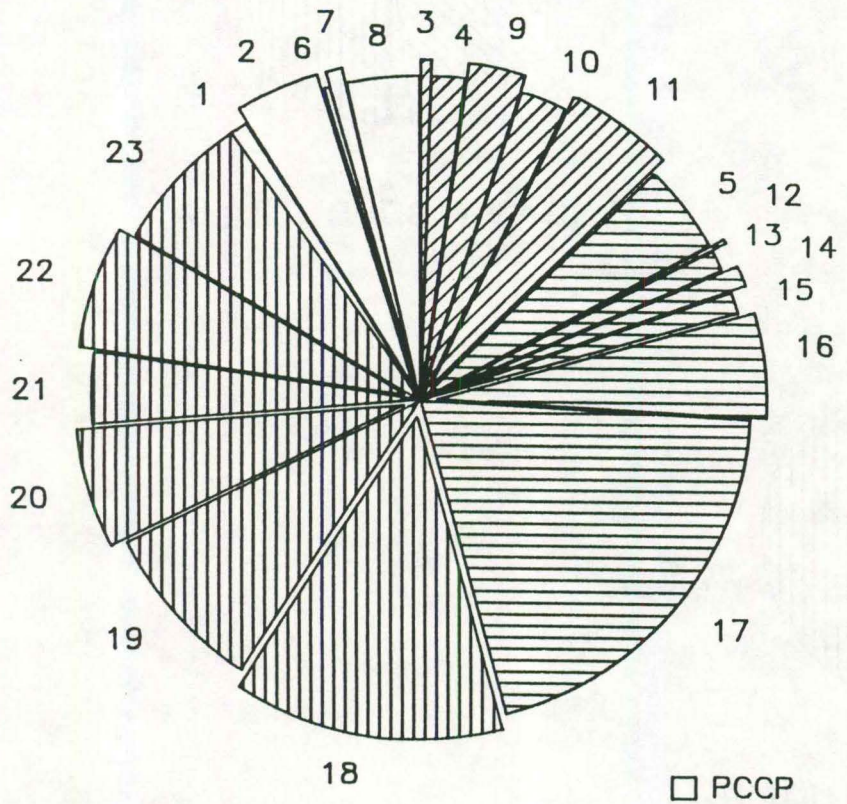
Performance Level 3



666 roadway miles

1993 Kansas Highway Mileage by Pavement Type

PCCP
1,044 roadway miles



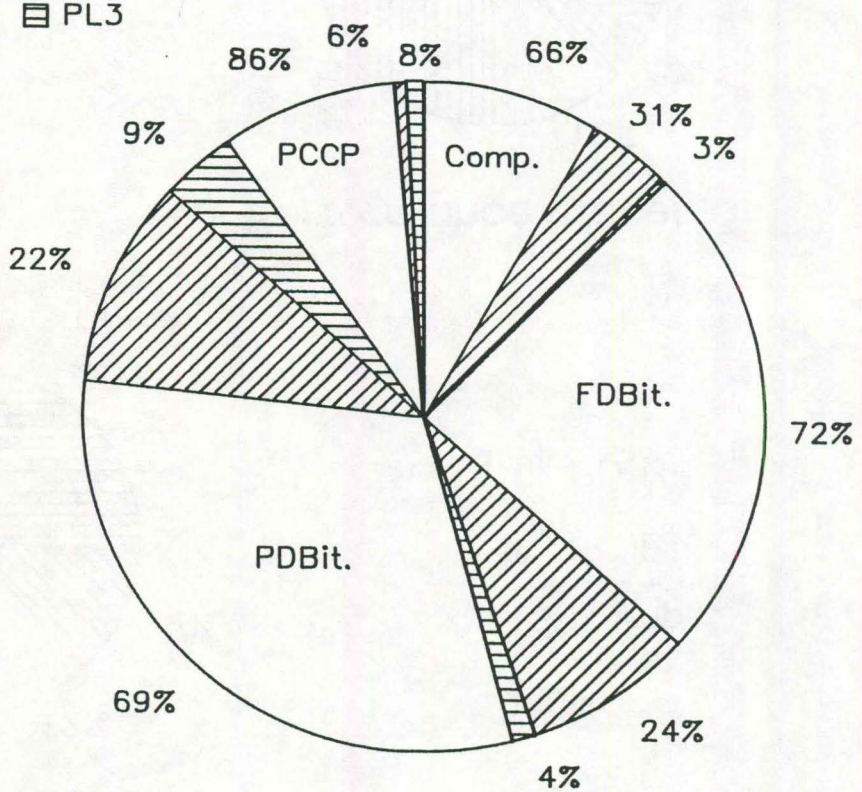
P.D.Bituminous
4,879 roadway miles

PL1
PL2
PL3

PCCP
Comp.
FDBit.
PDBit.

Percentages are of each pavement type.

Composite
1,399 roadway miles



F.D.Bituminous
3,649 roadway miles

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 1

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
1	I	PCCP	ANY	0 - 749	30.944	30.944	0.000	0.000
						100.0%	0.0%	0.0%
2	I	PCCP	ANY	750 - 9999	182.485	171.584	8.901	2.000
						94.0%	4.9%	1.1%
3	I	COMP	ANY	0 - 749	38.324	28.940	9.384	0.000
						75.5%	24.5%	0.0%
4	I	COMP	ANY	750 - 9999	69.897	37.150	32.747	0.000
						53.1%	46.9%	0.0%
5	I	FDBIT	ANY	0 - 9999	1.998	0.000	1.998	0.000
						0.0%	100.0%	0.0%
6	O	PCCP	ANY	0 - 87	16.099	15.099	1.000	0.000
						93.8%	6.2%	0.0%
7	O	PCCP	ANY	88 - 162	44.417	42.415	2.002	0.000
						95.5%	4.5%	0.0%
8	O	PCCP	ANY	163 - 9999	97.341	82.722	6.000	8.619
						85.0%	6.2%	8.9%
9	O	COMP	ANY	0 - 87	114.069	69.511	32.615	11.943
						60.9%	28.6%	10.5%
10	O	COMP	ANY	88 - 162	149.916	111.318	36.234	2.364
						74.3%	24.2%	1.6%
11	O	COMP	ANY	163 - 9999	183.283	130.100	50.137	3.046
						71.0%	27.4%	1.7%
12	O	FDBIT	<32	0 - 22	19.834	14.155	4.705	0.974
						71.4%	23.7%	4.9%
13	O	FDBIT	<32	23 - 50	26.724	24.952	0.000	1.772
						93.4%	0.0%	6.6%
14	O	FDBIT	<32	51 - 9999	13.447	1.850	11.597	0.000
						13.8%	86.2%	0.0%
15	O	FDBIT	>32	0 - 22	29.178	24.300	4.878	0.000
						83.3%	16.7%	0.0%
16	O	FDBIT	>32	23 - 50	77.503	61.667	15.836	0.000
						79.6%	20.4%	0.0%
17	O	FDBIT	>32	51 - 9999	256.542	207.506	47.105	1.931
						80.9%	18.4%	0.8%
18	O	PDBIT	<32	0 - 22	401.406	263.216	107.347	30.843
						65.6%	26.7%	7.7%
19	O	PDBIT	<32	23 - 50	167.533	137.532	25.077	4.924
						82.1%	15.0%	2.9%
20	O	PDBIT	<32	51 - 9999	23.943	23.943	0.000	0.000
						100.0%	0.0%	0.0%
21	O	PDBIT	>32	0 - 22	79.225	65.096	14.129	0.000
						82.2%	17.8%	0.0%
22	O	PDBIT	>32	23 - 50	39.928	38.928	1.000	0.000
						97.5%	2.5%	0.0%
23	O	PDBIT	>32	51 - 9999	35.198	28.474	6.724	0.000
						80.9%	19.1%	0.0%
					2099.234	1611.402	419.416	68.416
						76.8%	20.0%	3.3%

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 2

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
1	I	PCCP	ANY	0 - 749	2.000	1.000	1.000	0.000
						50.0%	50.0%	0.0%
2	I	PCCP	ANY	750 - 9999	138.704	87.298	8.141	43.265
						62.9%	5.9%	31.2%
3	I	COMP	ANY	0 - 749	45.066	14.533	30.533	0.000
						32.2%	67.8%	0.0%
4	I	COMP	ANY	750 - 9999	48.782	22.474	26.308	0.000
						46.1%	53.9%	0.0%
5	I	FDBIT	ANY	0 - 9999	90.990	60.990	30.000	0.000
						67.0%	33.0%	0.0%
6	O	PCCP	ANY	0 - 87	7.307	1.000	4.275	2.032
						13.7%	58.5%	27.8%
7	O	PCCP	ANY	88 - 162	11.980	10.720	1.260	0.000
						89.5%	10.5%	0.0%
8	O	PCCP	ANY	163 - 9999	11.104	7.363	0.000	3.741
						66.3%	0.0%	33.7%
9	O	COMP	ANY	0 - 87	58.847	34.875	21.420	2.552
						59.3%	36.4%	4.3%
10	O	COMP	ANY	88 - 162	0.935	0.935	0.000	0.000
						100.0%	0.0%	0.0%
11	O	COMP	ANY	163 - 9999	106.408	57.921	47.485	1.002
						54.4%	44.6%	0.9%
12	O	FDBIT	<32	0 - 22	25.082	15.788	5.548	3.746
						62.9%	22.1%	14.9%
13	O	FDBIT	<32	23 - 50	13.324	11.321	2.003	0.000
						85.0%	15.0%	0.0%
14	O	FDBIT	<32	51 - 9999	14.581	14.052	0.529	0.000
						96.4%	3.6%	0.0%
15	O	FDBIT	>32	0 - 22	23.591	14.956	7.799	0.836
						63.4%	33.1%	3.5%
16	O	FDBIT	>32	23 - 50	56.203	47.336	7.904	0.963
						84.2%	14.1%	1.7%
17	O	FDBIT	>32	51 - 9999	272.223	215.917	55.625	0.681
						79.3%	20.4%	0.3%
18	O	PDBIT	<32	0 - 22	347.524	241.597	75.105	30.822
						69.5%	21.6%	8.9%
19	O	PDBIT	<32	23 - 50	127.775	97.701	25.074	5.000
						76.5%	19.6%	3.9%
20	O	PDBIT	<32	51 - 9999	105.099	67.553	37.546	0.000
						64.3%	35.7%	0.0%
21	O	PDBIT	>32	0 - 22	64.687	39.188	18.097	7.402
						60.6%	28.0%	11.4%
22	O	PDBIT	>32	23 - 50	138.123	103.383	34.740	0.000
						74.8%	25.2%	0.0%
23	O	PDBIT	>32	51 - 9999	110.599	65.595	45.004	0.000
						59.3%	40.7%	0.0%
					1820.934	1233.496	485.396	102.042
						67.7%	26.7%	5.6%

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 3

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
1	I	PCCP	ANY	0 - 749	38.652	38.652	0.000	0.000
						100.0%	0.0%	0.0%
2	I	PCCP	ANY	750 - 9999	15.348	15.348	0.000	0.000
						100.0%	0.0%	0.0%
5	I	FDBIT	ANY	0 - 9999	355.264	185.290	144.304	25.670
						52.2%	40.6%	7.2%
6	O	PCCP	ANY	0 - 87	2.437	1.000	0.000	1.437
						41.0%	0.0%	59.0%
7	O	PCCP	ANY	88 - 162	1.362	0.000	0.000	1.362
						0.0%	0.0%	100.0%
9	O	COMP	ANY	0 - 87	4.530	1.039	2.409	1.082
						22.9%	53.2%	23.9%
12	O	FDBIT	<32	0 - 22	0.556	0.000	0.000	0.556
						0.0%	0.0%	100.0%
13	O	FDBIT	<32	23 - 50	13.421	9.421	2.000	2.000
						70.2%	14.9%	14.9%
14	O	FDBIT	<32	51 - 9999	37.498	35.498	2.000	0.000
						94.7%	5.3%	0.0%
15	O	FDBIT	>32	0 - 22	37.374	17.258	20.116	0.000
						46.2%	53.8%	0.0%
16	O	FDBIT	>32	23 - 50	174.909	55.965	112.291	6.653
						32.0%	64.2%	3.8%
17	O	FDBIT	>32	51 - 9999	286.238	224.967	50.112	11.159
						78.6%	17.5%	3.9%
18	O	PDBIT	<32	0 - 22	212.789	104.143	52.885	55.761
						48.9%	24.9%	26.2%
19	O	PDBIT	<32	23 - 50	147.644	93.966	34.721	18.957
						63.6%	23.5%	12.8%
20	O	PDBIT	<32	51 - 9999	250.614	124.420	78.536	47.658
						49.6%	31.3%	19.0%
21	O	PDBIT	>32	0 - 22	39.267	22.370	10.596	6.301
						57.0%	27.0%	16.0%
22	O	PDBIT	>32	23 - 50	81.504	66.205	13.299	2.000
						81.2%	16.3%	2.5%
23	O	PDBIT	>32	51 - 9999	133.910	95.312	22.267	16.331
						71.2%	16.6%	12.2%
					1833.317	1090.854	545.536	196.927
						59.5%	29.8%	10.7%

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 4

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
2	I	PCCP	ANY	750 - 9999	28.000	24.000	3.000	1.000
						85.7%	10.7%	3.6%
4	I	COMP	ANY	750 - 9999	42.540	31.416	11.124	0.000
						73.9%	26.1%	0.0%
5	I	FDBIT	ANY	0 - 9999	24.000	6.000	18.000	0.000
						25.0%	75.0%	0.0%
6	O	PCCP	ANY	0 - 87	2.173	1.671	0.502	0.000
						76.9%	23.1%	0.0%
7	O	PCCP	ANY	88 - 162	28.314	12.226	8.000	8.088
						43.2%	28.3%	28.6%
8	O	PCCP	ANY	163 - 9999	127.566	112.929	8.646	5.991
						88.5%	6.8%	4.7%
9	O	COMP	ANY	0 - 87	29.572	27.627	1.945	0.000
						93.4%	6.6%	0.0%
10	O	COMP	ANY	88 - 162	52.174	43.877	7.302	0.995
						84.1%	14.0%	1.9%
11	O	COMP	ANY	163 - 9999	118.782	92.756	26.026	0.000
						78.1%	21.9%	0.0%
12	O	FDBIT	<32	0 - 22	2.329	2.329	0.000	0.000
						100.0%	0.0%	0.0%
13	O	FDBIT	<32	23 - 50	18.268	15.201	3.067	0.000
						83.2%	16.8%	0.0%
14	O	FDBIT	<32	51 - 9999	8.371	8.371	0.000	0.000
						100.0%	0.0%	0.0%
15	O	FDBIT	>32	0 - 22	11.766	10.024	0.743	0.999
						85.2%	6.3%	8.5%
16	O	FDBIT	>32	23 - 50	39.427	31.878	7.549	0.000
						80.9%	19.1%	0.0%
17	O	FDBIT	>32	51 - 9999	466.123	420.624	43.805	1.694
						90.2%	9.4%	0.4%
18	O	PDBIT	<32	0 - 22	277.920	205.653	19.166	53.101
						74.0%	6.9%	19.1%
19	O	PDBIT	<32	23 - 50	157.631	148.593	8.038	1.000
						94.3%	5.1%	0.6%
20	O	PDBIT	<32	51 - 9999	124.618	108.696	5.000	10.922
						87.2%	4.0%	8.8%
21	O	PDBIT	>32	0 - 22	28.362	20.851	7.511	0.000
						73.5%	26.5%	0.0%
22	O	PDBIT	>32	23 - 50	9.401	8.861	0.540	0.000
						94.3%	5.7%	0.0%
23	O	PDBIT	>32	51 - 9999	97.140	92.794	2.304	2.042
						95.5%	2.4%	2.1%
					1694.477	1426.377	182.268	85.832
						84.2%	10.8%	5.1%

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 5

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
1	I	PCCP	ANY	0 - 749	8.552	8.552	0.000	0.000
						100.0%	0.0%	0.0%
2	I	PCCP	ANY	750 - 9999	92.044	90.044	1.000	1.000
						97.8%	1.1%	1.1%
3	I	COMP	ANY	0 - 749	4.122	0.000	3.122	1.000
						0.0%	75.7%	24.3%
4	I	COMP	ANY	750 - 9999	7.740	4.801	2.939	0.000
						62.0%	38.0%	0.0%
6	O	PCCP	ANY	0 - 87	1.867	1.042	0.825	0.000
						55.8%	44.2%	0.0%
7	O	PCCP	ANY	88 - 162	21.316	17.983	2.080	1.253
						84.4%	9.8%	5.9%
8	O	PCCP	ANY	163 - 9999	124.713	120.497	1.000	3.216
						96.6%	0.8%	2.6%
9	O	COMP	ANY	0 - 87	91.751	44.874	41.583	5.294
						48.9%	45.3%	5.8%
10	O	COMP	ANY	88 - 162	40.508	24.866	11.484	4.158
						61.4%	28.3%	10.3%
11	O	COMP	ANY	163 - 9999	147.011	114.942	32.069	0.000
						78.2%	21.8%	0.0%
12	O	FDBIT	<32	0 - 22	0.543	0.543	0.000	0.000
						100.0%	0.0%	0.0%
13	O	FDBIT	<32	23 - 50	18.712	18.712	0.000	0.000
						100.0%	0.0%	0.0%
14	O	FDBIT	<32	51 - 9999	14.818	12.818	2.000	0.000
						86.5%	13.5%	0.0%
15	O	FDBIT	>32	0 - 22	9.000	6.000	3.000	0.000
						66.7%	33.3%	0.0%
16	O	FDBIT	>32	23 - 50	65.534	44.302	21.232	0.000
						67.6%	32.4%	0.0%
17	O	FDBIT	>32	51 - 9999	353.177	280.066	60.562	12.549
						79.3%	17.1%	3.6%
18	O	PDBIT	<32	0 - 22	95.176	47.751	23.830	23.595
						50.2%	25.0%	24.8%
19	O	PDBIT	<32	23 - 50	154.004	91.279	40.861	21.864
						59.3%	26.5%	14.2%
20	O	PDBIT	<32	51 - 9999	116.571	96.394	19.177	1.000
						82.7%	16.5%	0.9%
21	O	PDBIT	>32	0 - 22	103.538	77.957	15.107	10.474
						75.3%	14.6%	10.1%
22	O	PDBIT	>32	23 - 50	251.271	172.595	69.377	9.299
						68.7%	27.6%	3.7%
23	O	PDBIT	>32	51 - 9999	252.049	149.626	90.618	11.805
						59.4%	36.0%	4.7%
					1974.017	1425.644	441.866	106.507
						72.2%	22.4%	5.4%

PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - DISTRICT 6

ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
8	O	PCCP	ANY	163 - 9999	9.810	9.810	0.000	0.000
						100.0%	0.0%	0.0%
9	O	COMP	ANY	0 - 87	1.080	1.080	0.000	0.000
						100.0%	0.0%	0.0%
10	O	COMP	ANY	88 - 162	1.087	0.000	1.087	0.000
						0.0%	100.0%	0.0%
11	O	COMP	ANY	163 - 9999	42.525	27.630	13.234	1.661
						65.0%	31.1%	3.9%
13	O	FDBIT	<32	23 - 50	8.000	7.000	0.000	1.000
						87.5%	0.0%	12.5%
14	O	FDBIT	<32	51 - 9999	49.084	46.084	1.000	2.000
						93.9%	2.0%	4.1%
15	O	FDBIT	>32	0 - 22	18.582	6.582	12.000	0.000
						35.4%	64.6%	0.0%
16	O	FDBIT	>32	23 - 50	144.062	91.143	44.850	8.069
						63.3%	31.1%	5.6%
17	O	FDBIT	>32	51 - 9999	570.597	376.054	140.653	53.890
						65.9%	24.7%	9.4%
18	O	PDBIT	<32	0 - 22	126.056	75.735	47.691	2.630
						60.1%	37.8%	2.1%
19	O	PDBIT	<32	23 - 50	164.868	103.243	52.625	9.000
						62.6%	31.9%	5.5%
20	O	PDBIT	<32	51 - 9999	48.012	35.338	10.621	2.053
						73.6%	22.1%	4.3%
21	O	PDBIT	>32	0 - 22	72.709	52.505	10.613	9.591
						72.2%	14.6%	13.2%
22	O	PDBIT	>32	23 - 50	151.637	111.502	28.277	11.858
						73.5%	18.6%	7.8%
23	O	PDBIT	>32	51 - 9999	141.223	105.088	31.367	4.768
						74.4%	22.2%	3.4%
					1549.332	1048.794	394.018	106.520
						67.7%	25.4%	6.9%

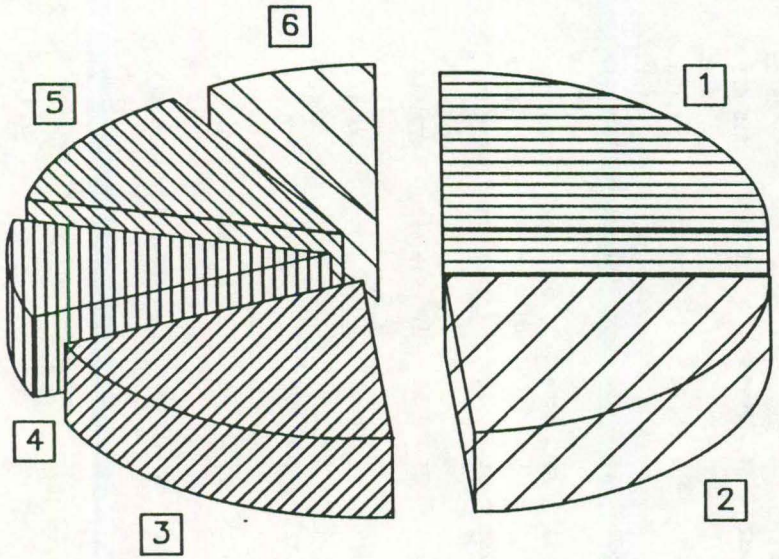
PAVEMENT MANAGEMENT SYSTEM

SUMMARY OF PAVEMENT CONDITION AS SURVEYED - STATE

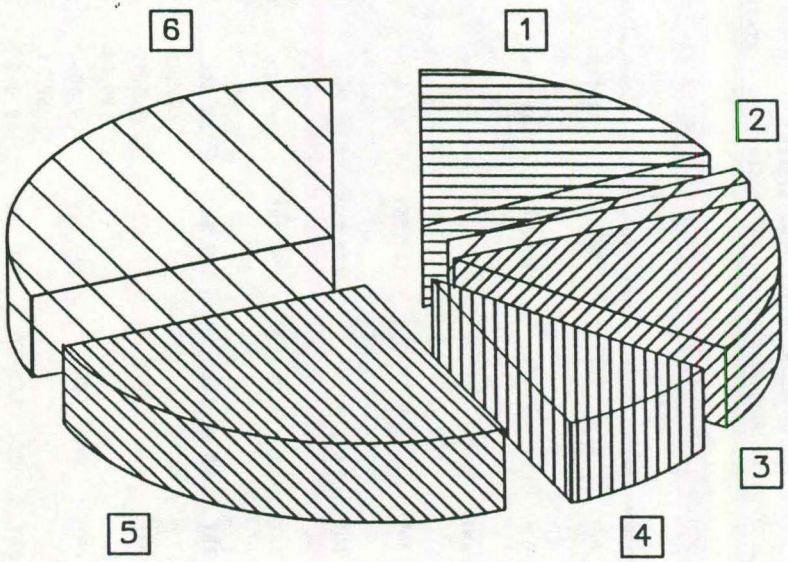
ROAD CATEGORY	CLASS. I/O	PVMT TYPE	WDT	TRAFFIC RANGE	TOTAL MILES	MILES IN LEVEL 1	MILES IN LEVEL 2	MILES IN LEVEL 3
1	I	PCCP	ANY	0 - 749	80.148	79.148	1.000	0.000
						98.8%	1.2%	0.0%
2	I	PCCP	ANY	750 - 9999	456.581	388.274	21.042	47.265
						85.0%	4.6%	10.4%
3	I	COMP	ANY	0 - 749	87.512	43.473	43.039	1.000
						49.7%	49.2%	1.1%
4	I	COMP	ANY	750 - 9999	168.959	95.841	73.118	0.000
						56.7%	43.3%	0.0%
5	I	FDBIT	ANY	0 - 9999	472.252	252.280	194.302	25.670
						53.4%	41.1%	5.4%
6	O	PCCP	ANY	0 - 87	29.883	19.812	6.602	3.469
						66.3%	22.1%	11.6%
7	O	PCCP	ANY	88 - 162	107.389	83.344	13.342	10.703
						77.6%	12.4%	10.0%
8	O	PCCP	ANY	163 - 9999	370.534	333.321	15.646	21.567
						90.0%	4.2%	5.8%
9	O	COMP	ANY	0 - 87	299.849	179.006	99.972	20.871
						59.7%	33.3%	7.0%
10	O	COMP	ANY	88 - 162	244.620	180.996	56.107	7.517
						74.0%	22.9%	3.1%
11	O	COMP	ANY	163 - 9999	598.009	423.349	168.951	5.709
						70.8%	28.3%	1.0%
12	O	FDBIT	<32	0 - 22	48.344	32.815	10.253	5.276
						67.9%	21.2%	10.9%
13	O	FDBIT	<32	23 - 50	98.449	86.607	7.070	4.772
						88.0%	7.2%	4.8%
14	O	FDBIT	<32	51 - 9999	137.799	118.673	17.126	2.000
						86.1%	12.4%	1.5%
15	O	FDBIT	>32	0 - 22	129.491	79.120	48.536	1.835
						61.1%	37.5%	1.4%
16	O	FDBIT	>32	23 - 50	557.638	332.291	209.662	15.685
						59.6%	37.6%	2.8%
17	O	FDBIT	>32	51 - 9999	2204.900	1725.134	397.862	81.904
						78.2%	18.0%	3.7%
18	O	PDBIT	<32	0 - 22	1460.871	938.095	326.024	196.752
						64.2%	22.3%	13.5%
19	O	PDBIT	<32	23 - 50	919.455	672.314	186.396	60.745
						73.1%	20.3%	6.6%
20	O	PDBIT	<32	51 - 9999	668.857	456.344	150.880	61.633
						68.2%	22.6%	9.2%
21	O	PDBIT	>32	0 - 22	387.788	277.967	76.053	33.768
						71.7%	19.6%	8.7%
22	O	PDBIT	>32	23 - 50	671.864	501.474	147.233	23.157
						74.6%	21.9%	3.4%
23	O	PDBIT	>32	51 - 9999	770.119	536.889	198.284	34.946
						69.7%	25.7%	4.5%
					10971.311	7836.567	2468.500	666.244
						71.4%	22.5%	6.1%

1993 Kansas Highway Pavement Conditions

Code 1 ONLY Transverse Cracks Total Mileage



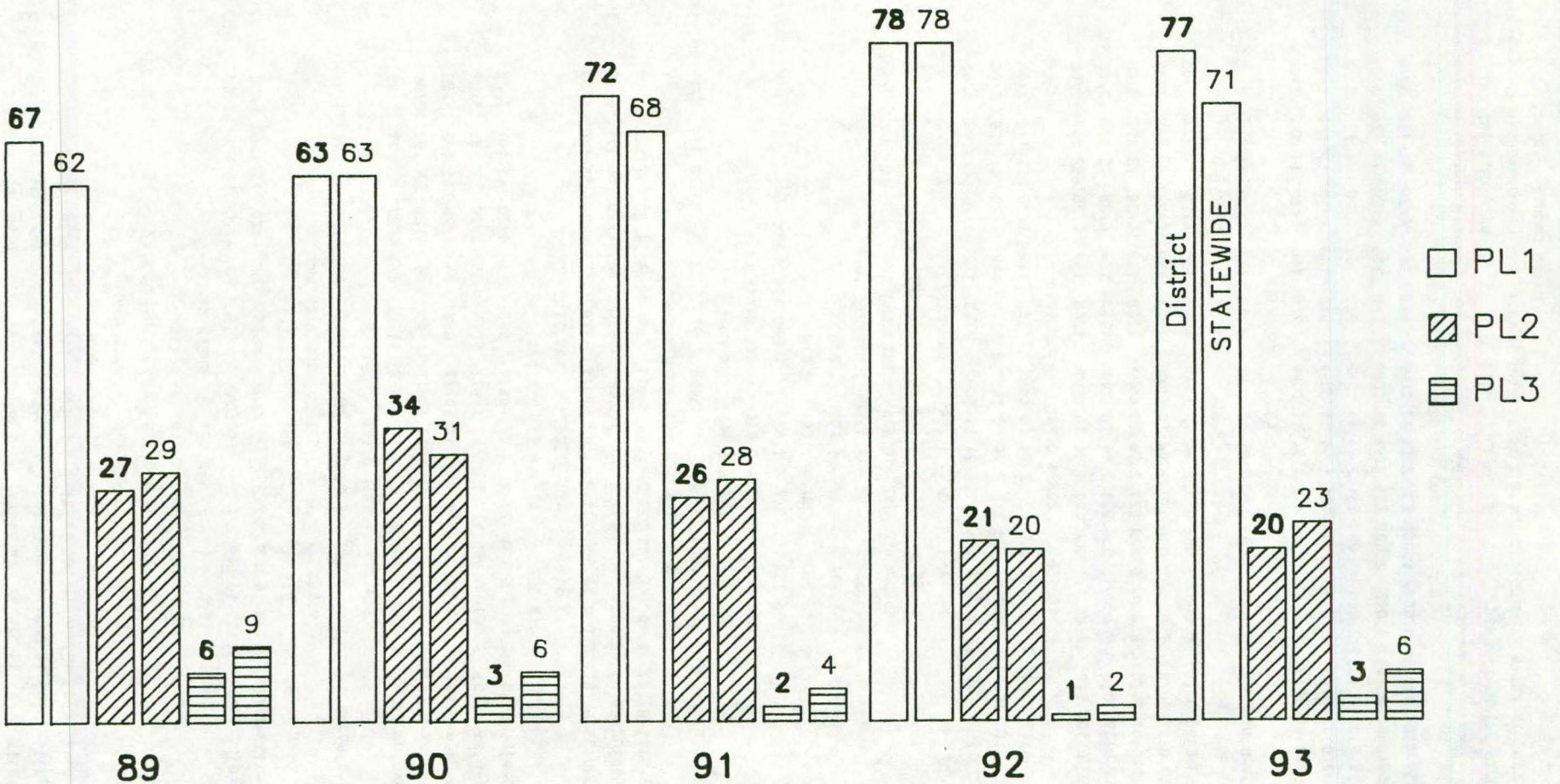
Code 2–3 Rutting Total Mileage



Districts							Districts					
1	2	3	4	5	6		1	2	3	4	5	6
385	353	304	149	192	130	Total mileage	15	4	18	20	57	29
323	304	205	122	130	107	Mileage with no action scheduled	10	1	9	5	15	18

1989–1993 Kansas Highway Pavement Conditions

District 1 versus STATEWIDE



Atchison County -- District 1

<- PMS SEG. ID NO.->	MILEPOST	DIS	P	PR	RC	PVMT	AADT	EAL	<-ROUGHNESS->		<-------- FLEXIBLE DISTRESS ------->								RIGID DISTRESS		
CO.<-ROUTE-><iMP><L>	BEG. END	ST	L	FY		TYPE			DATE	MAYS IRI	DATE	RT	FC1	FC2	FC3	FC4	T1	T2	T3	BC	DATE	F	J1J2J3J4
	0.000 193 - 0.122	S CO L																					
003(U-059-0)00-01(0)	0.000- 1.000	231	2	94	11	COMP	970	166	4/20	91 142	3/08	_	_	_	_	_	10	50	_	_			
003(U-059-0)01-02(0)	1.000- 2.000	231	2	94	11	COMP	970	166	4/20	74 126	3/08	_	_	_	_	_	30	32	_	_			
003(U-059-0)02-03(0)	2.000- 3.000	231	2	94	11	COMP	970	166	4/20	61 126	3/08	_	27	_	_	_	37	33	_	_			
003(U-059-0)03-04(0)	3.000- 4.000	121	1	94	11	COMP	970	166	4/20	59 109	3/08	_	_	_	_	_	23	23	_	_			
003(U-059-0)04-05(0)	4.000- 5.000	231	2	94	11	COMP	970	166	4/20	61 121	3/08	_	_	_	_	_	18	38	_	_			
	4.806 198 - 0.486	U59/K116																					
003(U-059-0)05-06(0)	5.000- 6.000	121	1	94	10	COMP	1213	136	4/20	55 104	3/08	_	_	_	_	_	33	23	_	_			
	5.756 198 + 0.464	FAS 23																					
003(U-059-0)06-07(0)	6.000- 7.000	231	2	94	10	COMP	1248	139	4/20	59 144	3/08	_	_	_	_	_	28	42	_	_			
003(U-059-0)07-08(0)	7.000- 8.000	131	2	94	10	COMP	1248	139	4/20	60 115	3/08	_	_	_	_	_	48	37	_	_			
003(U-059-0)08-09(0)	8.000- 9.000	221	2	94	10	COMP	1248	139	4/20	73 123	3/08	_	7	_	_	_	28	22	_	_			
003(U-059-0)09-10(0)	9.000-10.000	221	2	94	10	COMP	1248	139	4/20	75 136	3/08	10	_	_	_	_	32	7	_	_			
003(U-059-0)10-11(0)	10.000-11.000	121	1	94	10	COMP	1248	139	4/20	62 110	3/08	_	_	_	_	_	27	7	_	_			
	10.556 203 + 0.216	FAS 1290																					
003(U-059-0)11-12(0)	11.000-12.000	221	2	94	10	COMP	1335	149	4/20	59 116	3/08	_	_	_	_	_	37	17	_	_			
003(U-059-0)12-13(0)	12.000-13.000	231	2	94	10	COMP	1335	149	4/20	61 128	3/08	_	_	_	_	_	33	33	_	_			
003(U-059-0)13-14(0)	13.000-14.356	121	1	94	11	COMP	2333	172	4/20	47 98	3/08	_	_	33	_	_	22	23	_	_			
	14.125 207 - 0.294	U59/K227																					
	14.356 207 - 0.063	WCL ATCHISON																					
	15.094 207 + 0.675	GEORGE																					
	15.538 207 + 1.119	U59/U73,10TH																					
	15.914 207 + 1.495	6TH																					
	16.063 207 + 1.644	4TH																					
	16.239 207 + 1.820	W END RIVER BRG																					
	16.363 207 + 1.944	ECL,STATE LINE																					
	0.000 44 - 0.445	S CO L																					
003(U-073-0)00-01(0)	0.000- 1.000	221	2	_	9	COMP	913	63	4/20	70 151	3/09	10	17	_	_	_	_	13	_	_			
	0.608 44 + 0.163	U73/K74																					
003(U-073-0)01-02(0)	1.000- 2.000	221	2	_	14	FDBIT	990	64	4/20	57 126	3/09	_	_	_	_	_	3	12	_	_			
003(U-073-0)02-03(0)	2.000- 3.000	211	1	_	9	COMP	980	62	4/20	66 151	3/09	_	30	_	_	_	10	Crack		_			
003(U-073-0)03-04(0)	3.000- 4.000	221	2	_	17	FDBIT	970	63	4/20	53 120	3/09	_	10	_	_	_	8	5	_	_			
	3.611 47 + 0.067	FAS 2105																					
	3.857 47 + 0.313	FAS 23																					
003(U-073-0)04-05(0)	4.000- 5.000	121	1	_	17	FDBIT	985	63	4/20	43 101	3/09	_	_	_	_	_	10	18	_	_			
003(U-073-0)05-06(0)	5.000- 6.000	111	1	_	17	FDBIT	1013	65	4/20	37 83	3/09	_	_	_	_	_	_	_	_	_			
003(U-073-0)06-07(0)	6.000- 7.000	111	1	_	17	FDBIT	1088	64	4/20	45 102	3/09	_	_	_	_	_	_	_	_	_			
003(U-073-0)07-08(0)	7.000- 8.000	111	1	_	17	FDBIT	1115	66	4/20	38 92	3/09	_	_	_	_	_	_	_	_	_			
003(U-073-0)08-09(0)	8.000- 9.000	111	1	_	17	FDBIT	1140	67	4/20	41 91	3/09	_	_	_	_	_	_	_	_	_			
	8.347 52 - 0.479	FAS 21																					
003(U-073-0)09-09(0)	9.000- 9.515	111	1	_	17	FDBIT	1115	60	4/20	43 90	3/09	_	_	_	_	_	3	Crack		_	**/**		
	9.348 52 + 0.522	SCL ATCHISON																					
	9.515 53 - 0.154	2L/4LDIV																					
003(U-073-0)09-10(2)	9.515-10.049	221	2	_	9	COMP	1535	70	4/20	93 166	1/02	_	37	_	_	_	35	Crack		_	**/**		
003(U-073-0)09-10(4)	9.515-10.049	221	2	_	9	COMP	1535	70	4/20	56 124	3/09	_	37	_	_	_	35	Crack		_	**/**		
	10.196 53 + 0.527	GREEN ST																					
	10.913 53 + 1.244	SPRING																					
	11.019 53 + 1.350	EJCT U59/U73/K7																					
	12.432 56 - 0.106	WJCT U59/U73																					
	12.550 56 + 0.012	WOODLAWN																					
003(U-073-0)12-14(0)	12.550-14.000	211	1	_	6	PCCP	1153	73	4/29	50 129	. . . . .										3/15	1	_ _ _ _
003(U-073-0)14-15(0)	14.000-15.000	211	1	_	6	PCCP	1153	73	4/29	54 142	. . . . .										3/15	1	_ _ _ _
003(U-073-0)15-16(0)	15.000-16.000	211	1	_	6	PCCP	1153	73	4/29	52 141	. . . . .										3/15	_	1 _ _ _
	15.942 59 + 0.463	FAS 22																					
003(U-073-0)16-17(0)	16.000-17.000	211	1	_	6	PCCP	1058	67	4/29	55 139	. . . . .										3/15	1	_ _ _ _

Atchison County -- District 1

<- PMS SEG. ID NO.->	MILEPOST	DIS	P	PR	RC	PVMT	AADT	EAL	<-ROUGHNESS->		<-------- FLEXIBLE DISTRESS ------->									RIGID DISTRESS	
CO.<-ROUTE-><iMP><L>	BEG. END	ST	L	FY		TYPE			DATE	MAYS	IRI	DATE	RT	FC1	FC2	FC3	FC4	T1	T2	T3	BC	DATE	F J1J2J3J4
003(U-073-0)17-18(0)	17.000-18.000	211	1	_	6	PCCP	1058	67	4/29	64	163	. . . . .										3/15	1 _ _ _ _
003(U-073-0)18-19(0)	18.000-19.000	211	1	_	6	PCCP	1058	67	4/29	55	146	. . . . .										3/15	_ _ _ _ _
	18.942	62	+	0.465		FAS 1200																	
003(U-073-0)19-20(0)	19.000-20.000	311	2	_	6	PCCP	978	62	4/29	66	171	. . . . .										3/15	1 _ _ _ _
003(U-073-0)20-21(0)	20.000-21.203	211	1	_	7	PCCP	820	98	4/29	69	157	3/10	_	_	_	_	_	35	_	_		3/15	1 _ _ _ _
	20.581	64	+	0.106		U73/K9																	
003(U-073-0)21-22(0)	21.203-22.203	111	1	_	17	FDBIT	750	71	4/29	44	102	3/10	_	_	_	_	_	2	Crack	_			
003(U-073-0)22-23(0)	22.203-23.203	111	1	_	17	FDBIT	750	71	4/29	34	80	3/10	_	_	_	_	_	2	Crack	_			
003(U-073-0)23-24(0)	23.203-24.203	111	1	_	17	FDBIT	750	71	4/29	35	84	3/10	_	_	_	_	_	_	_	_			
003(U-073-0)24-25(0)	24.203-25.203	111	1	_	17	FDBIT	750	71	4/29	38	86	3/10	_	_	_	_	_	2	Crack	_			
003(U-073-0)25-26(0)	25.203-26.203	111	1	_	17	FDBIT	750	71	4/29	37	79	3/10	_	_	_	_	_	2	Crack	_			
003(U-073-0)26-26(0)	26.203-26.849	111	1	_	17	FDBIT	750	71	4/29	36	80	3/10	_	_	_	_	_	2	Crack	_			
	26.849	70	+	0.423		SCL HURON																	
	26.975	71	-	0.443		FAS 26																	
	27.054	71	-	0.364		NCL HURON																	
003(U-073-0)27-28(0)	27.054-28.220	111	1	_	17	FDBIT	590	68	4/29	40	83	3/10	_	_	_	_	_	3	Crack	_			
	28.220	71	+	0.802		N CO L																	
	0.000	1	-	0.269		SCOL,NCL NORTNVL																	
003(U-159-0)00-01(0)	0.000- 1.000	121	1	_	9	COMP	300	7	4/29	47	109	3/09	_	_	_	_	_	37	2	_	_		
003(U-159-0)01-02(0)	1.000- 2.000	121	1	_	9	COMP	300	7	4/29	35	95	3/09	_	_	_	_	_	22	3	_	_		
003(U-159-0)02-03(0)	2.000- 3.000	111	1	_	9	COMP	300	7	4/29	46	117	3/09	_	_	_	_	_	20	Crack	_			
003(U-159-0)03-04(0)	3.000- 4.000	111	1	_	18	PDBIT	540	17	4/29	48	104	3/09	_	_	_	_	_	23	Crack	_			
	3.084	4	-	0.226		EJCT U159/K116																	
	3.734	4	+	0.424		WJCT U159/K116																	
003(U-159-0)04-05(0)	4.000- 5.000	121	1	_	18	PDBIT	213	2	4/29	36	88	3/09	_	_	_	_	_	12	2	_	_		
003(U-159-0)05-06(0)	5.000- 6.000	111	1	_	18	PDBIT	213	2	4/29	51	107	3/09	_	_	_	_	_	17	Crack	_			
003(U-159-0)06-07(0)	6.000- 7.000	111	1	_	18	PDBIT	213	2	4/29	38	99	3/09	_	_	_	_	_	23	Crack	_			
003(U-159-0)07-08(0)	7.000- 8.000	111	1	_	18	PDBIT	213	2	4/29	55	104	3/09	_	_	_	_	_	7	Crack	_			
003(U-159-0)08-09(0)	8.000- 9.000	111	1	_	9	COMP	448	21	4/29	44	115	3/10	_	_	_	_	_	2	Crack	_			
	8.116	8	+	0.775		EJCT U159/K9																	
003(U-159-0)09-10(0)	9.000-10.000	111	1	_	9	COMP	448	21	4/29	38	88	3/10	_	_	_	_	_	_	_	_	_		
003(U-159-0)10-10(0)	10.000-10.635	211	1	_	9	COMP	448	21	4/29	68	139	3/10	_	_	_	_	_	2	Crack	_			
	10.635	11	+	0.257		ECL EFFINGHAM																	
003(U-159-0)10-11(0)	10.635-11.431	311	2	93	9	COMP	318	17	4/29	103	203	3/10	_	_	_	_	_	_	_	_	_		
	11.289	11	+	0.911		9TH																	
	11.431	13	-	0.816		WCL EFFHAM,FAS19																	
003(U-159-0)11-12(0)	11.431-12.000	111	1	_	9	COMP	400	19	4/29	35	94	3/10	_	_	_	_	_	_	_	_	_		
003(U-159-0)12-13(0)	12.000-13.000	111	1	_	9	COMP	400	19	4/29	35	101	3/10	_	_	_	_	_	3	Crack	_			
003(U-159-0)13-14(0)	13.000-14.000	111	1	_	18	PDBIT	298	15	4/29	41	101	3/10	_	_	_	_	_	2	Crack	_			
	13.042	14	-	0.221		FAS 20																	
003(U-159-0)14-15(0)	14.000-15.000	211	1	_	18	PDBIT	298	15	4/29	37	111	3/10	_	_	_	_	_	_	_	_	_		
003(U-159-0)15-16(0)	15.000-16.000	111	1	_	18	PDBIT	298	15	4/29	33	91	3/10	_	_	_	_	_	2	Crack	_			
003(U-159-0)16-17(0)	16.000-17.000	111	1	_	18	PDBIT	298	15	4/29	31	96	3/10	_	_	_	_	_	_	_	_	_		
003(U-159-0)17-18(0)	17.000-18.000	211	1	_	18	PDBIT	298	15	4/29	35	113	3/10	_	_	_	_	_	_	_	_	_		
003(U-159-0)18-19(0)	18.000-19.146	111	1	_	18	PDBIT	298	15	4/29	27	84	3/10	_	_	_	_	_	_	_	_	_		
	19.146	21	-	1.118		ECL MUSCTH,FAS18																	
003(U-159-0)19-19(0)	19.146-19.660	211	1	_	9	COMP	368	15	4/29	42	118	3/10	_	_	_	_	_	_	_	_	_		
	19.377	21	-	0.887		DELAWARE																	
	19.467	21	-	0.797		KANSAS																	
	19.602	21	-	0.662		FAS 1592																	
	19.660	21	-	0.604		WCL MUSCOTAH																	
	19.778	21	-	0.486		SCL MUSCOTAH																	
	20.121	21	-	0.143		NCL MUSCOTAH																	
003(U-159-0)20-21(0)	20.121-21.000	111	1	_	18	PDBIT	403	13	4/29	40	107	3/10	_	_	_	_	_	3	Crack	_			
003(U-159-0)21-22(0)	21.000-22.000	111	1	_	18	PDBIT	403	13	4/29	37	99	3/10	_	_	_	_	_	_	_	_	_		

Atchison County -- District 1

<- PMS SEG. ID NO.->	MILEPOST	DIS	P	PR	RC	PVMT	AADT	EAL	<-ROUGHNESS->			<-------- FLEXIBLE DISTRESS ------->							RIGID DISTRESS	
CO.<-ROUTE-><iMP><L>	BEG. END	ST	L	FY		TYPE			DATE	MAYS	IRI	RT	FC1	FC2	FC3	FC4	T1	T2	T3	BC	DATE F J1J2J3J4
003(U-159-0)22-23(0)	22.000-23.000	211	1	_	18	PDBIT	445	13	4/29	37	111	3/10	_	_	_	_	_	3	Crack	_	
	22.107	23 - 0.198				WJCT U159/K9															
003(U-159-0)23-24(0)	23.000-24.000	211	1	_	18	PDBIT	445	13	4/29	46	126	3/10	_	_	_	_	_	_	_	_	_
	23.607	25 - 0.683				FAS 1288															
003(U-159-0)24-25(0)	24.000-25.000	211	1	_	18	PDBIT	505	14	4/29	45	126	3/10	_	_	_	_	_	_	_	_	_
003(U-159-0)25-26(0)	25.000-26.000	211	1	_	18	PDBIT	505	14	4/29	48	127	3/10	_	_	_	_	_	2	Crack	_	
003(U-159-0)26-26(0)	26.000-26.708	111	1	_	18	PDBIT	505	14	4/29	43	102	3/10	_	_	_	_	_	_	_	_	_
	26.408	27 + 0.098				FAS 20															
	26.708	27 + 0.398				N CO L															
	11.985	211 - 2.465				MAIN/17TH															
	12.144	211 - 2.306				KANSAS															
	12.831	211 - 1.619				CNTRY CLUB/17TH															
	13.829	211 - 0.621				NCL ATCHISON															
003(K-007-0)13-14(0)	13.829-14.590	221	2	_	19	PDBIT	710	24	4/20	54	120	3/09	10	_	_	_	_	35	12	_	_ **/**
003(K-007-0)14-15(0)	14.590-15.590	121	1	_	19	PDBIT	670	23	4/20	47	113	3/09	_	_	_	_	_	28	9	_	_
003(K-007-0)15-16(0)	15.590-16.590	221	2	_	18	PDBIT	608	21	4/20	56	127	3/09	_	_	_	_	_	15	12	_	_
	15.852	212 + 0.380				FAS 1869															
003(K-007-0)16-17(0)	16.590-17.590	221	2	_	18	PDBIT	608	21	4/20	56	125	3/09	_	_	_	_	_	25	8	_	_
003(K-007-0)17-18(0)	17.590-18.888	121	1	_	18	PDBIT	553	19	4/20	48	105	3/09	_	_	_	_	_	23	7	_	_
	18.352	215 - 0.130				FAS 823															
	18.888	215 + 0.406				N CO L															
	0.000	297 - 0.126				W CO L															
003(K-009-0)00-01(0)	0.000- 1.000	221	2	94	18	PDBIT	223	12	4/29	59	136	5/03	10	_	_	_	_	18	22	_	_
003(K-009-0)01-02(0)	1.000- 2.027	221	2	94	18	PDBIT	223	12	4/29	55	121	5/03	10	47	_	_	_	38	22	_	_
	2.027	298 + 0.895				WJCT U159/K9															
	16.018	313 - 0.376				EJCT U159/K9															
003(K-009-0)16-17(0)	16.018-17.000	231	2	94	9	COMP	195	3	4/29	63	145	3/09	_	_	_	_	_	7	38	_	_
003(K-009-0)17-18(0)	17.000-18.000	221	2	94	9	COMP	195	3	4/29	65	153	3/09	_	_	_	_	_	17	17	_	_
003(K-009-0)18-19(0)	18.000-19.000	321	3	94	9	COMP	195	3	4/29	71	169	3/09	_	_	_	_	_	12	17	_	_
003(K-009-0)19-20(0)	19.000-20.000	321	3	94	9	COMP	215	3	4/29	77	173	3/09	_	_	_	_	_	17	5	_	_
	19.431	316 + 0.045				FAS 24															
003(K-009-0)20-20(0)	20.000-20.917	221	2	94	9	COMP	215	3	4/29	67	161	3/09	10	_	_	_	_	22	3	_	_
	20.917	318 - 0.285				U73/K9															
	0.000	1 - 1.030				POTTER															
003(K-074-0)00-01(0)	0.000- 1.000	311	3	_	18	PDBIT	160	5	4/20	80	178	3/09	_	33	_	_	_	12	Crack	_	
003(K-074-0)01-02(0)	1.000- 2.000	321	3	_	18	PDBIT	160	5	4/20	89	191	3/09	10	10	_	_	_	23	2	_	_
003(K-074-0)02-03(0)	2.000- 3.030	321	3	_	18	PDBIT	160	5	4/20	95	205	3/09	10	57	_	_	_	12	7	_	_
	3.030	3 + 0.051				U73/K74															
	0.000	10 - 0.515				W CO L															
003(K-116-0)00-01(0)	0.000- 1.000	111	1	_	18	PDBIT	355	16	4/29	35	74	3/11	_	_	_	_	_	3	Crack	_	
003(K-116-0)01-02(0)	1.000- 2.000	111	1	_	18	PDBIT	355	16	4/29	39	94	3/11	_	_	_	_	_	2	Crack	_	
	2.000	12 - 0.508				FAS 17															
003(K-116-0)02-03(0)	2.000- 3.000	111	1	_	18	PDBIT	313	14	4/29	42	96	3/11	_	_	_	_	_	2	Crack	_	
	3.000	12 + 0.492				WJCT FAS 18															
003(K-116-0)03-04(0)	3.000- 4.000	111	1	_	18	PDBIT	290	13	4/29	35	73	3/11	_	_	_	_	_	_	_	_	_
003(K-116-0)04-05(0)	4.000- 5.000	111	1	_	18	PDBIT	290	13	4/29	36	84	3/11	_	_	_	_	_	3	Crack	_	
	4.909	15 - 0.612				EJCT FAS 18															
003(K-116-0)05-06(0)	5.000- 6.000	111	1	_	18	PDBIT	285	13	4/29	38	86	3/11	_	_	_	_	_	2	Crack	_	
003(K-116-0)06-07(0)	6.000- 7.000	111	1	_	18	PDBIT	285	13	4/29	38	91	3/11	_	_	_	_	_	10	Crack	_	
003(K-116-0)07-08(0)	7.000- 8.000	221	2	_	18	PDBIT	290	13	4/29	59	129	3/11	_	_	_	_	_	32	Crack	_	
003(K-116-0)08-09(0)	8.000- 9.000	211	1	_	18	PDBIT	290	13	4/29	54	124	3/11	_	_	_	_	_	28	Crack	_	
	9.000	18 + 0.426				FAS 19															
003(K-116-0)09-10(0)	9.000-10.000	221	2	_	18	PDBIT	298	13	4/29	56	125	3/11	_	_	_	_	_	22	2	_	_
003(K-116-0)10-11(0)	10.000-11.000	221	2	_	18	PDBIT	298	13	4/29	55	133	3/11	_	_	_	_	_	38	3	_	_
003(K-116-0)11-12(0)	11.000-12.147	221	2	_	18	PDBIT	298	13	4/29	57	125	3/11	_	_	_	_	_	28	5	_	_

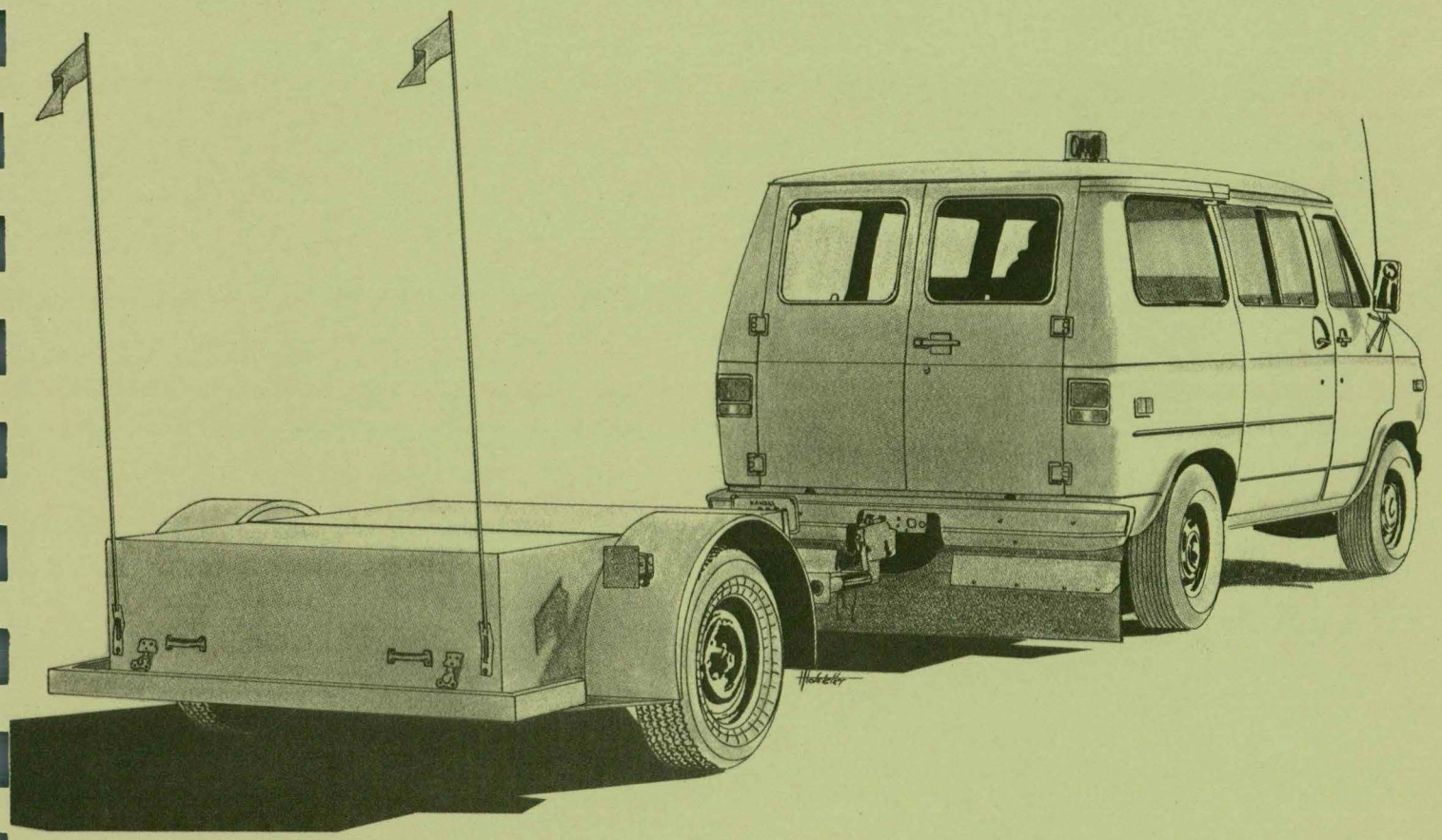
Atchison County -- District 1

<- PMS SEG. ID NO.->	MILEPOST	DIS	P	PR	RC	PVMT	AADT	EAL	<-ROUGHNESS->			<-------- FLEXIBLE DISTRESS -------->							RIGID DISTRESS			
CO.<-ROUTE-><iMP><L>	BEG. END	ST	L	FY		TYPE			DATE	MAYS	IRI	DATE	RT	FC1	FC2	FC3	FC4	T1	T2	T3	BC	DATE	F	J1J2J3J4
	12.147	21	+	0.544		WJCT U159/K116																		
	12.797	23	-	0.772		EJCT U159/K116																		
003(K-116-0)12-14(0)	12.797-14.000	221	2	_	9	COMP	278	14	4/29	71	155	3/11	_	_	_	_	_	27	5	_	_			
003(K-116-0)14-15(0)	14.000-15.000	121	1	_	9	COMP	278	14	4/29	52	114	3/11	_	_	_	_	_	13	3	_	_			
	14.984	24	+	0.419		FAS 24																		
003(K-116-0)15-16(0)	15.000-16.000	221	2	_	9	COMP	295	14	4/29	57	124	3/11	_	_	_	_	_	37	12	_	_			
003(K-116-0)16-16(0)	16.000-16.634	221	2	_	9	COMP	295	14	4/29	61	133	3/11	_	_	_	_	_	22	2	_	_			
	16.634	26	+	0.071		U59/K116																		
	0.000	339	-	0.552		WCOL,WJT U36/U75																		
007(U-036-0)00-01(0)	0.000- 1.000	121	1	94	11	COMP	1810	241	4/29	42	84	3/11	10	13	_	_	_	5	28	_	_			
007(U-036-0)01-02(0)	1.000- 2.000	131	2	94	11	COMP	1810	241	4/29	42	107	3/11	10	70	_	_	_	_	42	_	_			
	1.952	340	+	0.393		FAS 1291																		
007(U-036-0)02-02(0)	2.000- 2.949	131	2	94	11	COMP	1840	234	4/29	48	104	3/11	10	35	_	_	_	_	35	_	_			
	2.910	341	+	0.337		2L/4L																		
	2.929	341	+	0.356		EJCT U36/U75																		
	2.949	341	+	0.376		WCL FAIRVIEW																		
007(U-036-0)02-03(0)	2.949- 3.456	221	2	94	11	COMP	1608	167	4/29	58	127	3/11	_	_	_	_	_	_	27	_	_			
	3.456	342	-	0.153		ECL FAIRVIEW																		
007(U-036-0)03-04(0)	3.456- 4.000	221	2	94	10	COMP	1375	139	4/29	53	110	3/11	_	_	_	_	_	2	17	_	_			
	3.581	342	-	0.028		4L/2L																		
	3.956	342	+	0.347		FAS 62																		
007(U-036-0)04-05(0)	4.000- 5.000	121	1	94	10	COMP	1295	131	4/29	54	108	3/11	_	_	_	_	_	2	20	_	_			
	4.966	343	+	0.354		FAS 1296																		
007(U-036-0)05-06(0)	5.000- 6.000	121	1	94	10	COMP	1318	133	4/29	43	95	3/11	_	_	_	_	_	_	12	_	_			
007(U-036-0)06-07(0)	6.000- 7.000	121	1	94	10	COMP	1363	137	4/29	42	91	3/11	_	_	_	_	_	5	2	_	_			
007(U-036-0)07-08(0)	7.000- 8.000	111	1	94	10	COMP	1363	137	4/29	40	79	3/11	_	_	_	_	_	_	_	_	_			
	8.000	346	+	0.393		FAS 61																		
007(U-036-0)08-09(0)	8.000- 9.000	121	1	94	10	COMP	1533	154	4/29	38	81	3/11	_	_	_	_	_	3	7	_	_			
007(U-036-0)09-10(0)	9.000-10.000	121	1	94	10	COMP	1533	154	4/29	39	83	3/11	_	_	_	_	_	_	12	_	_			
	10.000	348	+	0.399		FAS 1265																		
007(U-036-0)10-11(0)	10.000-11.000	121	1	94	10	COMP	1633	158	4/29	39	86	3/11	_	_	_	_	_	_	8	_	_			
007(U-036-0)11-12(0)	11.000-12.000	121	1	94	10	COMP	1633	158	4/29	47	102	3/11	10	_	_	_	_	3	10	_	_			
007(U-036-0)12-13(0)	12.000-13.000	221	2	93	17	FDBIT	1075	128	4/29	67	133	3/11	_	_	_	_	_	3	3	7	_			
007(U-036-0)13-13(0)	13.000-13.667	221	2	93	17	FDBIT	1075	128	4/29	70	145	3/11	_	_	_	_	_	_	8	_	_			
	13.667	351	+	0.974		WCL HIAWATHA																		
	13.696	353	-	1.001		ECL HIAWATHA																		
007(U-036-0)13-15(0)	13.696-15.000	221	2	93	17	FDBIT	950	138	4/29	75	117	3/11	_	_	_	_	_	_	10	10	_			
	14.311	353	-	0.386		U36/U73																		
007(U-036-0)15-16(0)	15.000-16.000	221	2	93	17	FDBIT	950	138	4/20	75	117	3/10	10	_	_	_	_	3	7	_	_			
007(U-036-0)16-17(0)	16.000-17.000	221	2	93	17	FDBIT	1073	156	4/20	71	121	3/10	10	_	_	_	_	_	7	_	_			
	16.311	355	-	0.386		FAS 1298																		
007(U-036-0)17-18(0)	17.000-18.000	221	2	93	17	FDBIT	1073	156	4/20	70	112	3/10	10	_	_	_	_	3	7	_	_			
007(U-036-0)18-19(0)	18.000-19.000	221	2	93	17	FDBIT	1073	156	4/20	73	113	3/10	10	_	_	_	_	7	7	_	_			
007(U-036-0)19-20(0)	19.000-20.000	221	2	93	17	FDBIT	1073	156	4/20	73	126	3/10	10	_	_	_	_	8	5	5	_			
007(U-036-0)20-21(0)	20.000-21.000	211	1	93	17	FDBIT	1105	160	4/20	77	140	3/10	_	_	_	_	_	17	Crack		_			
	20.311	359	-	0.390		FAS 69																		
007(U-036-0)21-22(0)	21.000-22.000	221	2	93	17	FDBIT	1105	160	4/20	77	137	3/10	_	_	_	_	_	5	7	_	_			
007(U-036-0)22-23(0)	22.000-23.000	221	2	93	17	FDBIT	1105	160	4/20	67	116	3/10	_	_	_	_	_	10	10	_	_			
007(U-036-0)23-24(0)	23.000-24.305	121	1	93	17	FDBIT	1023	148	4/20	71	110	3/10	_	_	_	_	_	12	2	_	_			
	23.311	362	-	0.393		FAS 2086																		
	24.305	362	+	0.601		E CO L																		
	0.000	72	-	0.188		S CO L																		
007(U-073-0)00-01(0)	0.000- 1.000	121	1	_	23	PDBIT	610	73	4/29	38	76	3/10	_	_	_	_	_	27	12	_	_			
007(U-073-0)01-02(0)	1.000- 2.000	121	1	_	23	PDBIT	620	74	4/29	35	75	3/10	_	_	_	_	_	8	20	_	_			
007(U-073-0)02-03(0)	2.000- 3.000	121	1	_	23	PDBIT	620	74	4/29	38	90	3/10	_	_	_	_	_	20	8	_	_			

Balance of 1993 CSR
not included with this excerpt

KANSAS DEPARTMENT OF TRANSPORTATION

PAVEMENT MANAGEMENT SYSTEM



1991 NOS CONDITION SURVEY

County Codes and District Numbers

ABBR.	NO.	DIST.	COUNTY	ABBR.	NO.	DIST.	COUNTY	ABBR.	NO.	DIST.	COUNTY
AL	1	4	ALLEN	GL	36	6	GREELEY	OB	71	3	OSBORNE
AN	2	4	ANDERSON	GW	37	4	GREENWOOD	OT	72	2	OTTAWA
AT	3	1	ATCHISON	HM	38	6	HAMILTON	PN	73	5	PAWNEE
BA	4	5	BARBER	HP	39	5	HARPER	PL	74	3	PHILLIPS
BT	5	5	BARTON	HV	40	5	HARVEY	PT	75	1	POTTAWATOMIE
BB	6	4	BOURBON	HS	41	6	HASKELL	PR	76	5	PRATT
BR	7	1	BROWN	HG	42	6	HODGEMAN	RA	77	3	RAWLINS
BU	8	5	BUTLER	JA	43	1	JACKSON	RN	78	5	RENO
CS	9	2	CHASE	JF	44	1	JEFFERSON	RP	79	2	REPUBLIC
CQ	10	4	CHAUTAUQUA	JW	45	2	JEWELL	RC	80	5	RICE
CK	11	4	CHEROKEE	JO	46	1	JOHNSON	RL	81	1	RILEY
CN	12	3	CHEYENNE	KE	47	6	KEARNY	RO	82	3	ROOKS
CA	13	6	CLARK	KM	48	5	KINGMAN	RH	83	5	RUSH
CY	14	2	CLAY	KW	49	5	KIOWA	RS	84	3	RUSSELL
CD	15	2	CLOUD	LB	50	4	LABETTE	SA	85	2	SALINE
CF	16	4	COFFEY	LE	51	6	LANE	SC	86	6	SCOTT
CM	17	5	COMANCHE	LV	52	1	LEAVENWORTH	SG	87	5	SEDGWICK
CL	18	5	COWLEY	LC	53	2	LINCOLN	SW	88	6	SEWARD
CR	19	4	CRAWFORD	LN	54	4	LINN	SN	89	1	SHAWNEE
DC	20	3	DECATUR	LG	55	3	LOGAN	SD	90	3	SHERIDAN
DK	21	2	DICKINSON	LY	56	1	LYON	SH	91	3	SHERMAN
DP	22	1	DONIPHAN	MN	57	2	MARION	SM	92	3	SMITH
DG	23	1	DOUGLAS	MS	58	1	MARSHALL	SF	93	5	STAFFORD
ED	24	5	EDWARDS	MP	59	2	MCPHERSON	ST	94	6	STANTON
EK	25	4	ELK	ME	60	6	MEADE	SV	95	6	STEVENS
EL	26	3	ELLIS	MI	61	4	MIAMI	SU	96	5	SUMNER
EW	27	2	ELLSWORTH	MC	62	2	MITCHELL	TH	97	3	THOMAS
FI	28	6	FINNEY	MG	63	4	MONTGOMERY	TR	98	3	TREGO
FO	29	6	FORD	MR	64	2	MORRIS	WB	99	1	WABAUNSEE
FR	30	4	FRANKLIN	MT	65	6	MORTON	WA	100	3	WALLACE
GE	31	2	GEARY	NM	66	1	NEMAHA	WS	101	2	WASHINGTON
GO	32	3	GOVE	NO	67	4	NEOSHO	WH	102	6	WICHITA
GH	33	3	GRAHAM	NS	68	6	NESS	WL	103	4	WILSON
GT	34	6	GRANT	NT	69	3	NORTON	WO	104	4	WOODSON
GY	35	6	GRAY	OS	70	1	OSAGE	WY	105	1	WYANDOTTE

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Examples of:

1993 Completed Rehabilitation Project Form
(including District 1's Master Check List)
and
1993 Continuous Maintenance Overlays Form

Distribution: Geotechnical Engr.
District Engr.
File

KANSAS DEPARTMENT OF TRANSPORTATION

PAVEMENT MANAGEMENT SYSTEM

1993 COMPLETED REHABILITATION PROJECT

1. District First County Pottawatomie 75
2. Project Route K- 16 Project No. K-2111-01
3. Project Location 1.2 S OF WHEATON, E TO N K63

Proj. Length 12.954 COUNTY: MP 25.330 to MP 38.284
or
Lane 2L STATE: RP _____ to RP _____

4. Projected Action 12 Overlay 1.5"
5. Other action and location _____
6. Overlay layer thickness: Top_____ Int._____ Bott._____
7. Matrl. layer (BM-,etc.): Top_____ Int._____ Bott._____
8. Type Asphalt used in mix _____
9. Type of surface before action _____
10. Shoulder construction _____

    By contract or maintenance _____
11. Date open to unrestricted traffic _____
12. Prepared by _____ DATE _____

    Telephone No. _____

Provided project information
reflects PMIS database status as of: Sat Jun 19 18:22:50 1993

NOTE: See backside of form for instructions.

THIS FORM IS TO BE COMPLETED FOR EACH CONTRACT SURFACE REHABILITATION ACTION CONSTRUCTED ON THE HIGHWAY NETWORK.

Refer to the PMS rehabilitation action list of feasible actions for action code and action description.

Districts are to submit completed forms within two weeks after a project is opened to unrestricted traffic.

A separate form is to be used for each different action completed on a project.

Instructions for specific lines are as follows:

Line 3. Reference to county mile post, beginning and ending. If major exceptions, such as a city, are within the project, list extent of exception by county mile posts. MP refers to county mile posts (not mile reference posts).

Line 4. Enter action code from master list of rehabilitation actions. For actions not on the master list, use line 5.

Line 5. If action constructed is not on the master list, describe the action in similar terms and list extent of the action with reference to county mile post, beginning and ending.

Line 6. If action included an overlay, enter constructed thicknesses of layers in inches.

Line 7. Referring to line 6, enter material type which corresponds to layers listed above.

Line 8. List asphalt type used in overlay described on lines 6 and 7.

Line 9. State whether bituminous, portland cement concrete, or composite (overlaid p.c.c.p.).

Line 10. If shoulders were constructed, list material type and state whether by contract or maintenance.

Line 11. Self explanatory.

Line 12. Please supply a telephone number where preparer can be reached during normal working hours.

MASTER CHECK LIST FOR COMPLETED REHABILITATION PROJECT FORMS

D	ROUTE	LN	COUNTY	PROJECT #	LOCATION DESCRIPTION	BEGMP	ENDMP	LENGTH	ACT	TYPE OF WORK	COMPDATE
1	K 16		75 Pottawatomie	K-2111-01	1.2 S OF WHEATON, E TO N K63	25.330	38.284	12.954	12	Overlay 1.5"	01/01/93
1	I 70	NL	89 Shawnee	K-2446-02	0.4 E OF WJCT U75, E TO DANBURY LN	10.448	11.748	1.300	200	New Const(IFD=4)	10/15/93
1	I 70	SL	89 Shawnee	K-2446-02	0.4 E OF WJCT U75, E TO DANBURY LN	10.448	11.748	1.300	200	New Const(IFD=4)	10/15/93
1	I 70	NL	105 Wyandotte	K-2447-01	U69, N TO U24	15.628	17.149	1.521	200	New Const(IFD=4)	09/01/93
1	I 70	SL	105 Wyandotte	K-2447-01	U69, N TO U24	15.628	17.149	1.521	200	New Const(IFD=4)	09/01/93
1	I 35	EL	46 Johnson	K-2578-01	I435, NE TO U69	20.641	23.141	2.500	200	New Const(IFD=4)	03/01/93
1	I 35	WL	46 Johnson	K-2578-01	I435, NE TO U69	20.641	23.141	2.500	200	New Const(IFD=4)	03/01/93
1	I 35	EL	56 Lyon	K-2633-01	KTA, E TO E U50	10.902	16.717	5.815	200	New Const(IFD=4)	12/01/93
1	I 35	WL	56 Lyon	K-2633-01	KTA, E TO E U50	10.902	16.717	5.815	200	New Const(IFD=4)	12/01/93
1	U 75		89 Shawnee	K-2866-01	0.6 S 4L/2L, N TO SN-JA	23.146	27.526	4.400	200	New Const(IFD=4)	03/01/93
1	U 75		70 Osage	K-3247-01	NCL LYNDON, N TO K31	13.380	15.071	1.691	200	New Const(IFD=4)	07/01/93
1	U 75		43 Jackson	K-3250-01	SN-JA, N TO FAS321 MAYETTA NEW 4/L	0.000	8.000	8.000	200	New Const(IFD=4)	11/01/93
1	U 36		66 Nemaha	K-3328-01	K236, E TO W U75/NM-BR	15.964	23.987	8.023	356	CM2",HR4",OL1"	10/01/93
1	I 70	NL	89 Shawnee	K-3344-01	I470, E TO 2000'E OF W U75	9.162	10.462	1.300	200	New Const(IFD=4)	10/15/93
1	I 70	SL	89 Shawnee	K-3344-01	I470, E TO 2000'E OF W U75	9.162	10.462	1.300	200	New Const(IFD=4)	10/15/93
1	I 35	EL	46 Johnson	K-3361-01	I35 / QUIVERA ROAD IN LENEXA	22.903	24.003	1.100	200	New Const(IFD=4)	05/15/93
1	I 35	WL	46 Johnson	K-3361-01	I35 / QUIVERA ROAD IN LENEXA	22.903	24.003	1.100	200	New Const(IFD=4)	05/15/93
1	U 159		3 Atchison	K-4223-01	WCL OF EFFINGHAM, TO ECL	10.635	11.435	0.800	200	New Const(IFD=4)	01/01/93
1	K 9		58 Marshall	K-4794-01	N K99, E TO MS-NM	23.535	33.020	9.485	12	Overlay 1.5"	01/01/93
1	K 9		66 Nemaha	K-4796-01	MS-NM, E TO K187	0.000	6.037	6.037	12	Overlay 1.5"	01/01/93
1	K 10	NL	46 Johnson	K-4797-01	DG-JO, E TO BEG. PCCP E OF K7	0.000	12.086	12.086	300	Overlay 1"	01/01/93
1	K 10	SL	46 Johnson	K-4797-01	DG-JO, E TO BEG. PCCP E OF K7	0.000	12.086	12.086	300	Overlay 1"	01/01/93
1	U 24		81 Riley	K-4798-01	E U77, SE TO N K13	16.243	25.808	9.565	21	CM1.5",HR3"	01/01/93
1	K 32		52 Leavenworth	K-4800-01	DG-LV, E & NE LV-WY	0.000	17.009	17.009	12	Overlay 1.5"	01/01/93
1	U 36		7 Brown	K-4801-01	2.4 W U73, E TO BR-DP	11.878	24.305	12.427	26	CraR(F),OL.75"	01/01/93
1	U 36		22 Doniphan	K-4802-01	BR-DP, E 0.6	0.000	0.657	0.657	26	CraR(F),OL.75"	01/01/93
1	U 40		23 Douglas	K-4803-01	SN-DG, E TO WAKARUSA DR IN LAW	0.000	12.555	12.555	12	Overlay 1.5"	01/01/93
1	U 40		89 Shawnee	K-4804-01	ECL TOPEKA, E TO SN-DG	20.016	27.247	7.231	12	Overlay 1.5"	01/01/93
1	U 56		46 Johnson	K-4805-01	N I35, E TO KS-MO	28.433	33.541	5.108	19	CM.5",HR1"	01/01/93
1	U 56		70 Osage	K-4806-01	LY-OS, E TO S K31	0.000	6.163	6.163	12	Overlay 1.5"	01/01/93
1	U 73		7 Brown	K-4807-01	NCL HORTON, N TO IOWA ST IN HIAWTH	9.461	21.482	12.021	20	CM1",HR2"	01/01/93
1	U 73		7 Brown	K-4808-01	NCL HIAWATHA, N 6.251	22.234	28.485	6.251	20	CM1",HR2"	01/01/93
1	U 73		52 Leavenworth	K-4809-01	3.305 N LV-WY, TO LIMIT ST(4l)	3.305	6.057	2.752	21	CM1.5",HR3"	01/01/93
1	U 75	EL	89 Shawnee	K-4810-01	U75 ALT, N TO SCL TOPEKA	2.525	7.561	5.036	10	SAM	01/01/93
1	U 75	WL	89 Shawnee	K-4810-01	U75 ALT, N TO SCL TOPEKA	2.525	7.561	5.036	10	SAM	01/01/93
1	U 77		81 Riley	K-4811-01	E U24, N TO 1.56 S K16	15.461	23.492	8.031	21	CM1.5",HR3"	01/01/93
1	K 99		56 Lyon	K-4813-01	U56, N TO LY-WB	38.082	44.142	6.060	12	Overlay 1.5"	01/01/93
1	K 99		99 Wabaunsee	K-4814-01	LY-WB, N TO SCL ESKRIDGE	0.000	8.314	8.314	12	Overlay 1.5"	01/01/93
1	I 70	NL	99 Wabaunsee	K-4932-01	K30, E TO WB-SN	19.000	24.000	5.000	34	JT Repair on PCC	01/01/93
1	I 70	SL	99 Wabaunsee	K-4932-01	K30, E TO WB-SN	19.000	24.000	5.000	34	JT Repair on PCC	01/01/93
1	I 70	NL	81 Riley	K-4934-01	DEEP CREEK BRIDGE, E TO RL-WB	0.200	5.900	5.700	42	FD PCCP Patching	01/01/93
1	I 70	SL	81 Riley	K-4934-01	DEEP CREEK BRIDGE, E TO RL-WB	0.200	5.900	5.700	42	FD PCCP Patching	01/01/93
1	U 59		44 Jefferson	K-4957-01	NCL OSKALOOSA, N TO K4	15.990	29.230	13.200	8	Conv Seal	01/01/93
1	U 56		70 Osage	K-4958-01	U75, E TO DG-OS	22.979	32.813	9.800	8	Conv Seal	01/01/93
1	U 56		23 Douglas	K-4959-01	DG-OS, E TO U59	0.000	12.481	12.481	8	Conv Seal	01/01/93
1	U 77		58 Marshall	M-1681-01	RL-MS, N TO W K9	0.000	8.542	8.542	9	Slurry Seal	05/01/93
1	U 77		81 Riley	M-1682-01	1.56 S K16, N TO RL-MS	23.491	34.162	10.671	9	Slurry Seal	05/01/93
1	I 635	EL	105 Wyandotte	M-1691-01	I35, TO KS-MO	0.000	8.526	8.256	42	FD PCCP Patching	05/01/93
1	I 635	WL	105 Wyandotte	M-1691-01	I35, TO KS-MO	0.000	8.526	8.526	42	FD PCCP Patching	05/01/93

Balance of Master Check List not included with this excerpt

Distribution: Geotechnical Engr.
District Engr.
File

KANSAS DEPARTMENT OF TRANSPORTATION

PAVEMENT MANAGEMENT SYSTEM

****
"1993" CONTINUOUS MAINTENANCE OVERLAYS
****

1. District _____ County _____

2. Route _____

3. Overlay Location _____

_____

Length _____ COUNTY : MP _____ to MP _____
or
Lane _____ STATE : RP _____ to RP _____

4. Overlay Description _____

_____

5. Overlay Purpose:

   a. Is the maintenance overlay in preparation for a contract project? 1. Yes or No. _____

      2. If yes, show Project No. _____

   b. If the overlay is not maintenance preparation for a contract project, do you expect significant additional maintenance patching to be required within one year? Yes or No. _____

6. Overlay layer thickness: Top_____ Int._____ Bott._____

7. Matrl. layer (BM-,etc.): Top_____ Int._____ Bott._____

8. Type Asphalt used in mix _____

9. Type of surface before action _____

10. Shoulder construction _____

11. Date of completion (or estimated completion) _____

12. Prepared by _____ Date _____

    Telephone No. _____

NOTE: See backside of form for instructions.

INFORMATION IS NEEDED FOR EACH "1993" CONTINUOUS MAINTENANCE OVERLAY WITH A LENGTH OF HALF A MILE OR MORE CONSTRUCTED ON THE HIGHWAY NETWORK.

IF YOU HAD NO SUCH PROJECTS IN YOUR AREA, PLEASE INFORM US OF THIS FACT.

Instructions for specific lines are as follows:

Line 3. Reference to county mile post, beginning and ending. If major exceptions, such as a city, are within the project, list extent of exception by county mile posts. MP refers to county mile posts (not mile reference posts).

Line 4. Description of the work performed.

Line 5. The purpose of the maintenance overlay or patching should be defined by answering the questions. List a Project Number if the overlay is in preparation for a contract project.

Line 6. Enter constructed thicknesses of layers in inches.

Line 7. Referring to line 6, enter material type which corresponds to layers listed above.

Line 8. List asphalt type used in overlay.

Line 9. State whether bituminous, portland cement concrete, or composite (overlaid p.c.c.p.).

Line 10. If shoulders were constructed, list material type.

Line 11. Self explanatory.

Line 12. Please supply a telephone number where preparer can be reached during normal working hours.

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Bureau of Materials and Research

1994 Substantial Maintenance

"Year 2" NOS district mileage distribution

and

Candidate Project Selection Listing

KANSAS DEPARTMENT OF TRANSPORTATION
Bureau of Materials and Research, Geotechnical Unit
Materials and Research Center, 2300 Van Buren
Topeka, Kansas 66611-1195 (913)296-3008

October 14, 1992

MEMORANDUM TO: Dean M. Testa, P.E., Chief
Bureau of Construction and Maintenance

SUBJECT: Non-Interstate Substantial Maintenance Program.

District listings of Year 2, 3 and 4 Substantial Maintenance candidate locations are attached along with a three page supplement entitled "Explanation of Candidate Project Selection Listing".

These listings contain candidate projects which have had rehabilitation actions accomplished on them in the recent past. This is because the pavement management routines consider the roughness of a pavement to be a significant predictor of future pavement distress. Our methodology regularly selects recent projects which have only above average roughness. The engineers that have detailed knowledge about such projects must make the determination as to the appropriateness of taking additional substantial maintenance actions on them.

The following distribution was accomplished by adjusting the policy to match the actual budget, as directed by the Preservation Project Development Committee on October 21, 1988.

Action Type	Dist.1	Dist.2	Dist.3	Dist.4	Dist.5	Dist.6	Statewide
			Year 2 NOS roadway miles				
Con.Action	264.9	149.2	348.7	267.2	213.2	142.8	1386.0

The ratios between the available BUDGET and POLICY defined costs were taken times all mileage figures produced by the 1992 five period run (#04b) to produce the preceding table.

Lon S. Ingram, P.E., Chief
Bureau of Materials and Research

G. N. Clark, P.E.
PMS Task Force Leader

LSI:GNC:VRW

cc: James Jones, Director of Operations
G. David Comstock, Chief of Program Management

KANSAS DEPARTMENT OF TRANSPORTATION
Bureau of Materials and Research, Geotechnical Unit
Materials and Research Center, 2300 Van Buren
Topeka, Kansas 66611-1195 (913)296-3008

October 14, 1992

****
Explanation of
Candidate Project Selection Listing
****

The attached candidate project selection listing is sorted by district, action group and weighted probability.

The limits of the candidate projects will need to be adjusted to logical project limits in many cases.

An explanation of the headers on the printout follows:

Dist - District number.

Co - County number.

Rtty - Route Type.
"1" = Interstate Routes
"2" = U.S. Routes
"3" = Kansas Routes

Route - Route number.

Suf - Route suffix.

"0" = No suffix	"5" = Alternate
"1" = North	"6" = Spur
"2" = East	"7" = Connector
"3" = South	"8" = Business
"4" = West	"9" = Special

Lane - Lane designation.
Lane designations are assigned on the basis of the route number. Even numbered routes have north and south lanes and odd numbered routes have east and west lanes regardless of the roadway's direction on the ground.
"0" = Undivided route
"1" = North lanes
"2" = East lanes
"3" = South lanes
"4" = West lanes

MP to MP - Beginning and ending county milepost.
This defines the candidate project location based on the segments included.

Length - Length of the candidate project.

Wt. Prob. - Weighted probability.
The probability of the need for an action at this location is weighted on the basis of constituent segment lengths.

Act. Grp. - Action group.
The action group assignment is based upon the first action listed under "Most Prob Act.", so projects with actions in two groups could be assigned to either.

"1" = Routine maintenance action
"2" = Contract maintenance action
"3" = Contract action

Most Prob Act. - Most probable action.
This action is the one that represents the largest number of segments, within an action group, with the same action on the candidate project. Two or more actions indicate ties.

" 8" = Seal Conventional {Contract MAINT.}
" 9" = Seal Slurry
"10" = SAM (Stress Absorbing Membrane)
"11" = Overlay .75"
"12" = Overlay 1.5"
"13" = Overlay 3.0"
"14" = Overlay 4.0"
"15" = Recycle Surface .75" with Overlay 1.0"
"16" = Recycle Surface .75" with Overlay 2.0"
"18" = Cold Mill 1.0" {Contract MAINT.}
"19" = Cold Mill .5", Recycle Hot 1.0"
"20" = Cold Mill 1.0", Recycle Hot 2.0"
"21" = Cold Mill 1.5", Recycle Hot 3.0"
"22" = Cold Mill 2.0", Recycle Hot 4.0"
"23" = Cold Mill 3.0", Recycle Hot 6.0"
"24" = SAM with Overlay 1.5"
"25" = Crack Repair ONLY-Type F{Contract MAINT.}
"26" = Crack Repair (F) with Overlay .75"
"27" = Crack Repair (F) with Overlay 1.5"
"28" = Crack Repair (F) with Overlay 3.0"
"29" = Crack Repair ONLY-Type P{Contract MAINT.}
"30" = Crack Repair (P) with Overlay .75"
"31" = Crack Repair (P) with Overlay 1.5"
"32" = Crack Repair (P) with Overlay 3.0"
"33" = Recycle Cold 4.0" with Overlay 1.0"
"34" = Joint Repair Only (PCC) {Contract MAINT.}
"35" = Joint Repair (PCC)w/2A, (Overlay .75")
"36" = Joint Repair (PCC)w/3A, SR .75" & OL 1.0"

- continued on next page -

Most Prob Act. (continued):

"37" = Joint Repair (PCC)w/5A, CM .5" & HR 1.0"
"38" = Joint Repair Only (AC) {Contract MAINT.}
"39" = Joint Repair (AC)w/2A, (Overlay .75")
"40" = Joint Repair (AC)w/3A, SR .75" & OL 1.0"
"41" = Joint Repair (AC)w/5A, CM .5" & HR 1.0"
"42" = Patching, FullDepth PCCP{Contract MAINT.}
"43" = Overlay Plain PCC Unbonded 6.0"
"44" = Patching Extensive with Overlay 3.0"
"45" = Patching Limited with Overlay 4.0"
"46" = Grinding with Patching
"47" = Grinding with Underseal & Patching
"99" = No action assigned

Project Type (%).

All segments contained within a candidate project are assigned one of the following project types and the percentage figures indicate the amount of each project type in the project.

"0" = Does not meet any selection criteria
"1" = Year 1 action: that is not scheduled
"2" = Year 2 action:
with probability greater than cutoff criteria
"3" = Year 3 action:
with probability greater than cutoff criteria
"4" = Year 4 action:
with probability greater than cutoff criteria
"M" = Maintenance overlay:
DO expect to return in one year...YES (03)
"N" = Maintenance overlay:
DO NOT expect to return in one year...NO (02)
"P" = Maintenance preparation overlay...(01)
"R" = Code 2 or 3 rutting without an action
"T" = Performance level 3 trapping states
without an action

Pavement Type (%).

All segments contained within a candidate project are assigned one of the following pavement types and the percentage figures indicate the amount of each pavement type in the project.

"PCCP" = Portland Concrete Cement Pavement
"COMP" = COMPosite pavement
"FDBIT" = Full Depth BITuminous pavement
"PDBIT" = Partial Depth BITuminous pavement

Both project type and pavement type percentage figures appear only on the first data line for a candidate project. When equal action probabilities force tie situations more than one "most probable action" will be selected for a candidate project. Subsequent lines will show blanks in these percentage areas which will cause these lines to list out separate from the first data line. Subsequent lines do not normally print out adjacent to the first data line.

Year 2 locations sorted by district, action group and weighted probability.

Dist	Co	Rtty	Route	Suf	Lane	MP to MP		Length	Wt. Prob.	Act. Grp.	Most Prob Act.	Project Type (%) 0	1	2	3	4	M	N	P	R	T	Pavement Type (%) PCCP	COMP	FDBIT	PDBIT
1	3	2	159	0	0	0.000	3.000	3.000	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	3	3	116	0	0	12.797	16.634	3.837	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	22	3	7	0	0	13.306	18.766	5.460	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	23	2	56	0	0	12.000	17.509	5.509	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	23	2	56	0	0	17.953	24.274	6.321	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	46	2	169	0	2	18.081	20.641	2.560	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	52	3	90	0	0	0.000	2.180	2.180	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	56	3	78	0	0	0.000	1.057	1.057	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	58	3	87	0	0	0.000	8.625	8.625	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	70	3	278	0	0	0.000	3.017	3.017	1.000	3	11	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	3	3	74	0	0	0.000	3.030	3.030	1.000	3	13	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	7	3	246	0	0	0.000	6.120	6.120	1.000	3	13	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	56	3	99	0	0	22.853	37.610	14.757	1.000	3	13	0	33	0	0	0	47	0	0	20	0	0	7	0	93
1	66	3	236	0	0	0.000	1.535	1.535	1.000	3	13	0	100	0	0	0	0	0	0	0	0	0	0	0	100
1	3	2	73	0	2	9.515	10.049	0.534	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	3	2	73	0	4	9.515	10.049	0.534	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	3	3	9	0	0	18.000	20.917	2.917	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	3	3	116	0	0	12.797	16.634	3.837	1.000	3	15														
1	46	2	56	0	1	28.426	32.093	3.667	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	46	2	56	0	3	28.426	32.093	3.667	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	58	2	36	0	0	25.000	30.146	5.146	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	105	2	40	0	3	8.896	9.652	0.756	1.000	3	15	0	100	0	0	0	0	0	0	0	0	0	100	0	0
1	70	3	68	0	0	0.000	12.469	12.469	0.967	3	11	8	92	0	0	0	0	0	0	0	0	0	0	15	85
1	3	2	59	0	0	0.000	14.356	14.356	0.942	3	15	0	93	0	0	7	0	0	0	0	0	0	100	0	0
1	43	3	9	0	0	0.000	6.000	6.000	0.911	3	13	0	83	0	0	17	0	0	0	0	0	0	0	17	83
1	52	2	24	0	0	0.000	11.000	11.000	0.886	3	11	9	82	0	9	0	0	0	0	0	0	0	91	9	0
1	99	3	4	0	0	24.768	40.501	15.733	0.876	3	11	13	88	0	0	0	0	0	0	0	0	0	6	0	94
1	46	2	169	0	0	11.020	17.052	6.032	0.845	3	11	0	60	40	0	0	0	0	0	0	0	0	0	100	0
1	7	2	36	0	0	0.000	12.000	12.000	0.841	3	11	15	77	8	0	0	0	0	0	0	0	0	100	0	0
1	66	3	9	0	0	15.906	21.630	5.724	0.798	3	13	0	67	0	0	33	0	0	0	0	0	0	0	0	100
1	99	3	31	0	0	0.000	10.090	10.090	0.778	3	13	0	70	0	0	30	0	0	0	0	0	0	0	0	100
1	3	2	73	0	0	0.000	9.515	9.515	0.751	3	11	0	40	50	10	0	0	0	0	0	0	0	20	80	0
1	75	2	24	0	3	0.000	3.889	3.889	0.747	3	15	0	75	0	0	25	0	0	0	0	0	25	75	0	0
1	81	3	113	0	2	1.325	1.823	0.498	0.728	3	11	0	0	100	0	0	0	0	0	0	0	0	0	100	0
1	81	3	113	0	4	1.325	1.823	0.498	0.728	3	11	0	0	100	0	0	0	0	0	0	0	0	0	100	0
1	66	3	9	0	0	9.000	15.637	6.637	0.728	3	13	0	57	0	29	14	0	0	0	0	0	0	0	29	71
1	46	2	169	0	4	18.081	20.641	2.560	0.728	3	15	0	67	0	0	33	0	0	0	0	0	0	100	0	0
1	58	3	99	0	0	24.000	33.129	9.129	0.714	3	31	0	0	0	44	0	0	0	0	56	0	0	0	0	100
1	56	2	56	0	0	0.000	19.000	19.000	0.689	3	31	5	42	11	21	11	11	0	0	0	0	0	0	53	47
1	44	3	4	0	0	25.000	28.582	3.582	0.671	3	11	0	25	75	0	0	0	0	0	0	0	0	25	75	0
1	56	3	170	0	0	0.000	7.333	7.333	0.667	3	13	14	14	0	0	29	43	0	0	0	0	0	0	0	100
1	81	2	24	0	3	25.808	31.454	5.646	0.665	3	11	0	20	60	20	0	0	0	0	0	0	20	0	80	0
1	70	2	75	0	0	7.000	16.000	9.000	0.653	3	11	20	50	10	0	20	0	0	0	0	0	10	40	10	40
1	52	2	73	0	0	19.000	21.846	2.846	0.651	3	11	33	67	0	0	0	0	0	0	0	0	0	100	0	0
1	105	3	7	0	4	0.227	4.327	4.100	0.648	3	15	0	50	0	0	50	0	0	0	0	0	0	100	0	0
1	81	2	24	0	0	5.000	16.000	11.000	0.643	3	31	0	36	18	36	9	0	0	0	0	0	0	0	45	55
1	44	3	4	0	0	0.000	19.465	19.465	0.639	3	11	0	21	63	16	0	0	0	0	0	0	0	0	100	0

1	99	3	30	0	0	0.000	1.950	1.950	0.636	3	13	0	50	0	0	50	0	0	0	0	0	0	0	0	100
1	23	3	33	0	0	0.000	2.020	2.020	0.629	3	11	0	50	0	0	50	0	0	0	0	0	0	0	0	10
1	23	3	33	0	0	0.000	2.020	2.020	0.629	3	13														
1	75	3	99	0	0	0.921	5.027	4.106	0.626	3	16	0	25	25	25	25	0	0	0	0	0	0	0	25	75
1	75	3	99	0	0	0.921	5.027	4.106	0.626	3	27														
1	75	3	99	0	0	0.921	5.027	4.106	0.626	3	31														
1	70	3	31	0	0	32.327	35.030	2.703	0.617	3	11	33	67	0	0	0	0	0	0	0	0	0	0	0	100
1	7	2	75	0	0	15.945	19.464	3.519	0.615	3	11	0	33	33	33	0	0	0	0	0	0	0	0	100	0
1	7	2	75	0	0	15.945	19.464	3.519	0.615	3	22														
1	7	2	73	0	0	28.000	33.870	5.870	0.613	3	11	0	17	67	17	0	0	0	0	0	0	0	0	100	0
1	81	2	24	0	1	25.808	31.454	5.646	0.606	3	11	20	40	40	0	0	0	0	0	0	0	20	0	80	0
1	58	2	77	0	0	20.000	25.140	5.140	0.600	3	11	0	0	100	0	0	0	0	0	0	0	0	0	100	
1	75	3	16	0	0	22.000	25.000	3.000	0.516	3	13	25	50	0	25	0	0	0	0	0	0	0	0	25	7
1	52	3	5	0	0	0.000	5.772	5.772	0.500	3	11	50	50	0	0	0	0	0	0	0	0	0	0	17	83
1	52	3	5	0	0	0.000	5.772	5.772	0.500	3	13														
1	23	2	24	0	0	0.000	6.632	6.632	0.488	3	11	29	14	29	0	29	0	0	0	0	0	0	100	0	
1	99	3	99	0	0	21.000	27.399	6.399	0.487	3	11	50	50	0	0	0	0	0	0	0	0	0	0	0	100
1	22	3	7	0	0	27.077	31.890	4.813	1.000	2	29	0	100	0	0	0	0	0	0	0	0	0	0	20	80
1	70	3	368	0	0	0.000	1.000	1.000	1.000	2	29	0	100	0	0	0	0	0	0	0	0	0	0	0	10
1	52	2	73	0	2	0.000	3.305	3.305	1.000	2	42	0	100	0	0	0	0	0	0	0	0	100	0	0	
1	75	2	24	0	1	0.000	3.889	3.889	1.000	2	42	0	50	0	0	0	0	25	0	25	0	100	0	0	0
1	66	3	9	0	0	22.168	30.064	7.896	0.923	2	29	0	88	0	0	13	0	0	0	0	0	0	0	13	8
1	22	3	7	0	0	0.000	6.000	6.000	0.878	2	29	0	83	0	0	17	0	0	0	0	0	0	0	0	10
1	3	3	7	0	0	13.829	18.888	5.059	0.818	2	29	0	80	0	0	20	0	0	0	0	0	0	0	0	100

Year 3 locations sorted by district, action group and weighted probability.

Dist	Co	Rtty	Route	Suf	Lane	MP to MP	Length	Wt. Prob.	Act. Grp.	Most Prob Act.	Project Type (%) 0	1	2	3	4	M	N	P	R	T	Pavement Type (%) PCCP	COMP	FDBIT	PDBIT
1	105	3	7	0	2	0.227 4.327	4.100	0.694	3	11	0	25	0	75	0	0	0	0	0	0	0	25	75	0
1	44	2	59	0	0	11.000 15.990	4.990	0.666	3	9	0	20	0	80	0	0	0	0	0	0	0	20	80	0
1	99	3	99	0	0	38.000 41.007	3.007	0.607	3	11	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	58	2	77	0	0	26.769 30.000	3.231	0.602	3	11	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	3	2	73	0	0	21.203 26.849	5.646	0.592	3	9	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	23	2	59	0	2	11.064 13.154	2.090	0.592	3	9	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	23	2	59	0	4	11.064 13.154	2.090	0.592	3	9	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	58	2	77	0	0	8.895 20.000	11.105	0.592	3	9	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	81	3	113	0	0	1.823 5.631	3.808	0.592	3	9	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	81	2	77	0	0	0.000 11.361	11.361	0.580	3	9	0	0	0	100	0	0	0	0	0	0	0	0	55	45
1	70	3	170	0	0	0.000 4.000	4.000	0.577	3	13	0	25	0	50	25	0	0	0	0	0	0	0	50	50
1	44	3	4	0	0	20.121 25.000	4.879	0.567	3	9	0	0	20	80	0	0	0	0	0	0	0	0	100	0
1	52	2	24	0	0	17.000 19.260	2.260	0.545	3	15	0	0	0	100	0	0	0	0	0	0	0	100	0	0
1	56	3	99	0	0	18.204 22.853	4.649	0.544	3	11	20	20	0	40	20	0	0	0	0	0	20	20	40	20
1	56	3	99	0	0	20.000 24.000	4.000	0.536	3	31	0	20	0	80	0	0	0	0	0	0	0	0	20	80
1	22	3	7	0	0	18.766 27.077	8.311	0.510	3	10	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	81	3	82	0	0	7.878 11.859	3.981	0.487	3	15	0	0	0	75	25	0	0	0	0	0	0	0	0	100
1	75	3	99	0	0	21.027 27.100	6.073	0.480	3	31	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	99	3	57	0	0	0.000 0.998	0.998	0.477	3	10	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	58	3	99	0	0	0.000 5.000	5.000	0.472	3	31	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	81	3	82	0	0	0.000 1.509	1.509	0.464	3	31	0	0	0	100	0	0	0	0	0	0	0	0	0	100
1	70	3	31	0	0	15.687 22.879	7.192	0.459	3	31	0	0	0	63	38	0	0	0	0	0	0	0	0	100
1	58	3	9	0	0	9.601 24.000	14.399	0.456	3	9	8	8	0	69	15	0	0	0	0	0	0	8	85	8
1	66	2	36	0	0	9.732 16.000	6.268	0.451	3	11	0	0	0	100	0	0	0	0	0	0	0	0	100	0
1	105	2	24	0	3	0.000 2.942	2.942	0.415	3	15	33	0	0	67	0	0	0	0	0	0	0	100	0	0
1	70	3	31	0	0	35.493 39.254	3.761	0.398	3	27	33	0	0	67	0	0	0	0	0	0	0	0	67	33
1	66	3	63	0	0	19.984 31.072	11.088	0.392	3	31	18	0	0	64	18	0	0	0	0	0	0	0	36	64
1	99	3	99	0	0	28.248 32.000	3.752	0.390	3	31	25	0	0	50	25	0	0	0	0	0	0	0	0	100
1	44	3	237	0	0	0.000 3.351	3.351	0.673	2	25	0	33	0	67	0	0	0	0	0	0	0	0	100	0
1	70	3	276	0	0	0.000 1.384	1.384	0.452	2	25	0	0	0	100	0	0	0	0	0	0	0	0	100	0

Year 4 locations sorted by district, action group and weighted probability.

OTHER

Dist	Co	Rtty	Route	Suf	Lane	MP	to MP	Length	Wt. Prob.	Act. Grp.	Most Prob Act.	Project Type (%) 0	1	2	3	4	M	N	P	R	T	Pavement Type (%) PCCP	COMP	FDBIT	PDBIT
1	89	2	75	0	4	0.000	3.000	3.000	0.786	3	11	0	33	0	0	67	0	0	0	0	0	0	100	0	
1	89	2	75	0	4	17.517	23.714	6.197	0.783	3	11	0	33	0	0	67	0	0	0	0	0	17	83	0	0
1	89	2	75	0	2	0.000	3.000	3.000	0.759	3	11	0	33	0	0	67	0	0	0	0	0	0	100	0	0
1	52	2	73	0	4	0.000	3.305	3.305	0.742	3	11	0	0	33	0	67	0	0	0	0	0	0	67	33	
1	105	3	32	0	1	2.046	11.672	9.626	0.716	3	11	0	20	0	0	80	0	0	0	0	0	0	100	0	
1	105	3	32	0	3	2.046	11.672	9.626	0.716	3	11	0	20	0	0	80	0	0	0	0	0	0	100	0	0
1	89	2	75	0	2	17.517	23.714	6.197	0.707	3	11	0	17	0	0	83	0	0	0	0	0	17	83	0	0
1	66	2	36	0	0	3.000	6.000	3.000	0.693	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	
1	89	2	24	0	3	17.739	21.903	4.164	0.672	3	11	0	25	0	0	75	0	0	0	0	0	25	75	0	0
1	81	2	24	0	0	0.000	5.000	5.000	0.667	3	31	0	40	0	0	60	0	0	0	0	0	0	0	0	100
1	3	3	116	0	0	7.000	12.147	5.147	0.658	3	13	0	40	0	0	60	0	0	0	0	0	0	0	0	100
1	75	2	24	0	0	14.173	19.000	4.827	0.645	3	12	0	40	0	0	60	0	0	0	0	0	60	40	0	
1	44	2	24	0	0	14.000	18.705	4.705	0.638	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	70	2	75	0	2	24.602	27.386	2.784	0.638	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	70	2	75	0	2	27.444	31.142	3.698	0.638	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	70	2	75	0	4	24.602	27.386	2.784	0.638	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	70	2	75	0	4	27.444	31.142	3.698	0.638	3	11	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	7	2	73	0	0	0.000	8.475	8.475	0.558	3	16	0	0	0	13	88	0	0	0	0	0	0	0	0	100
1	43	3	214	0	0	0.000	1.967	1.967	0.521	3	10	0	33	0	0	67	0	0	0	0	0	0	0	33	67
1	43	3	214	0	0	0.000	1.967	1.967	0.521	3	11														
1	43	3	214	0	0	0.000	1.967	1.967	0.521	3	12														
1	70	2	75	0	0	0.000	7.000	7.000	0.516	3	12	0	14	0	0	86	0	0	0	0	0	57	43	0	0
1	105	2	40	0	1	8.896	9.652	0.756	0.508	3	20	0	0	0	0	100	0	0	0	0	0	0	100	0	0
1	89	2	24	0	1	17.739	21.903	4.164	0.505	3	11	0	0	0	0	100	0	0	0	0	0	50	50	0	0
1	89	2	24	0	1	17.739	21.903	4.164	0.505	3	12														
1	46	3	7	0	2	15.145	19.193	4.048	0.473	3	11	20	0	0	0	80	0	0	0	0	0	40	60	0	0
1	46	3	7	0	2	15.145	19.193	4.048	0.473	3	12														
1	23	2	59	0	0	6.000	11.064	5.064	0.468	3	11	20	0	0	40	40	0	0	0	0	0	0	60	40	
1	52	3	92	0	0	0.000	15.000	15.000	0.465	3	13	13	13	0	0	73	0	0	0	0	0	0	0	7	93
1	46	3	7	0	4	15.145	23.893	8.748	0.454	3	12	0	10	0	10	80	0	0	0	0	0	80	10	10	0
1	75	3	13	0	0	19.000	21.790	2.790	0.440	3	31	0	0	0	0	100	0	0	0	0	0	0	0	0	100
1	75	3	99	0	0	9.027	18.027	9.000	0.403	3	31	22	0	0	0	78	0	0	0	0	0	0	0	0	100
1	75	3	16	0	0	5.486	10.496	5.010	0.394	3	31	0	0	0	0	100	0	0	0	0	0	0	0	0	100
1	22	2	36	0	0	24.446	26.846	2.400	0.393	3	12	0	0	0	0	100	0	0	0	0	0	100	0	0	0
1	44	2	24	0	3	2.000	7.276	5.276	0.393	3	12	0	0	0	0	100	0	0	0	0	0	100	0	0	0
1	58	3	99	0	0	11.257	20.000	8.743	0.391	3	31	0	0	0	0	100	0	0	0	0	0	0	0	0	100
1	43	3	9	0	0	6.000	13.502	7.502	0.383	3	13	14	0	0	0	86	0	0	0	0	0	0	0	14	86
1	81	3	13	0	0	0.000	0.976	0.976	0.382	3	11	0	0	0	0	100	0	0	0	0	0	0	0	100	
1	81	3	16	0	0	0.000	1.734	1.734	0.382	3	11	0	0	0	0	100	0	0	0	0	0	0	0	100	
1	75	3	16	0	0	0.121	5.270	5.149	0.378	3	31	0	0	0	20	80	0	0	0	0	0	0	0	40	60
1	70	3	31	0	0	3.000	5.536	2.536	0.367	3	11	33	0	0	0	67	0	0	0	0	0	0	0	0	100
1	70	3	31	0	0	3.000	5.536	2.536	0.367	3	13														
1	70	3	31	0	0	3.000	5.536	2.536	0.367	3	14														
1	44	3	92	0	0	20.119	23.104	2.985	0.362	3	31	33	0	0	0	67	0	0	0	0	0	0	0	0	100
1	75	3	16	0	0	18.645	22.000	3.355	0.360	3	13	33	0	0	0	67	0	0	0	0	0	0	0	0	100
1	75	3	13	0	0	0.305	14.000	13.695	0.357	3	10	0	0	0	0	100	0	0	0	0	0	0	0	0	100
1	3	2	159	0	0	3.000	8.000	5.000	0.346	3	13	40	0	0	0	60	0	0	0	0	0	0	0	0	100

1	44	3	16	0	0	9.079	12.000	2.921	0.338	3	11	33	0	0	0	67	0	0	0	0	0	0	0	67	33
1	44	3	16	0	0	3.000	8.147	5.147	0.338	3	13	20	0	0	20	60	0	0	0	0	0	0	0	40	60
1	44	2	24	0	1	2.000	7.276	5.276	0.332	3	12	20	0	0	0	80	0	0	0	0	0	100	0	0	0
1	46	2	169	0	0	5.457	8.161	2.704	0.227	3	12	33	0	0	0	67	0	0	0	0	0	100	0	0	0
1	23	2	59	0	0	0.000	3.000	3.000	0.346	2	18	33	0	0	0	67	0	0	0	0	0	0	100	0	0

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Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Final Fiscal Year 1994 1R Program
(District 1 Only)

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selected from the
Candidate Project Selection Lists

WALRAFEN

Kansas Department of Transportation

BUREAU OF CONSTRUCTION AND MAINTENANCE
Topeka, Kansas
May 6, 1993

Memorandum To: District Engineers

Attached is the final Fiscal Year 1994 1R Program for your district. If you have any questions, please advise.

Dean M. Testa, P.E.
Chief of Construction/Maintenance

DMT:sdb
Attachment
cc: James D. Jones, Director of Operations, w/attach.
L. S. Ingram, Chief of Materials and Research, w/attach.
G. David Comstock, Chief of Program Management, w/attach.
G. N. Clark, Geotechnical Engineer, w/attach.
Jim Kowach, Estimating Engineer, w/attach.
Ray Weaver, Estimating Technician, w/attach.

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
1	K-4	JF	K-5178-01	FAS 1799, NE TO 0.1 MI N OF AT&SF RR	0.000	PMS		3/4" OL					
				HR USE HR-1B WITH AC-10 OR R&M PICK ADD 3'X6" SHLD EXT USE HR ADJ RAP TO FIT ROCK SHLD PORTION MAY REQUIRE EXTRA MATL		1	0.00	1 1/2" CM, 3" HR	ROCK	$0	$0	$0	$0
												$0	$0
												$0	$0
				6.860 miles original				DISTRICT CUT				$0	$0
2	K-7	WY	K-5179-01	N END KANSAS RIVER BR, N TO JCT US-24	4.099	PMS		3/4" SR, 1" OL					
				HR USE HR-1B WITH AC-10 OR R&M PICK PROJ WILL RECYCLE THE EXISTING BM-1T (APPX 3/4") DO NOT CM OR HR THE EXISTING SHLDS		1	0.00	3/4" CM, 1 1/2" HR	ASPH	$80,000	$0	$80,000	$327,920
												$0	$0
												$0	$0
				NOTE: PROJ IS 4-LANE								$0	$0
3	K-9	AT	K-5180-01	JA-AT CO L, E TO W JCT US-159	2.027	PMS		1 1/2" OL					
				TIE K-5181 OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$71,959
												$0	$0
												$0	$0
												$0	$0
4	K-9	AT	K-4629-01	E JCT US-159, NE TO W JCT US-73	4.578	PMS		3/4" SR, 1" OL					
				TIE K-5193 OL USE BM-1B WITH AC-10		1	0.00	1" SR, 1 1/2" OL	TURF	$42,000	$2,500	$44,500	$203,721
												$0	$0
												$0	$0
												$0	$0
5	K-9	JA	K-5181-01	JCT US-75 TO JA-AT CO L	10.302	PMS		3" OL					
				TIE K-5183 & K-5180 OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$365,721
												$0	$0
												$0	$0
												$0	$0

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
6	K-9	MS	K-5182-01	E JCT US-77, E TO S JCT K-99	12.283	PMS		SLURRY SEAL					
				APPX 60% OF PROJ WILL REQUIRE THE RUT BOX		1	0.00	MSS	TURF	$29,000	$0	$29,000	$356,207
				ASSUME 20 LBS/SQ YD FOR FULL ROADWAY WIDTH FOR RUTS								$0	$0
				MSS ASSUME 25 LBS/SQ YD ENTIRE PROJ								$0	$0
												$0	$0
7	K-9	NM	K-5183-01	S JCT K-63, E TO NM-JA CO L	0.000	PMS		CR(F), 3" OL					
				TIE K-5180 & K-5181		1	5.00	1 1/2" OL	TURF	$0	$0	$0	$0
				OL USE BM-1B WITH AC-10								$0	$0
												$0	$0
				14.041 miles original				DISTRICT CUT				$0	$0
8	K-16	PT	K-5184-01	N JCT K-99, E & S TO 1.2 MI S OF WHEATON	6.284	PMS		3" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$223,082
												$0	$0
												$0	$0
												$0	$0
9	US-24	LV	K-5185-01	DG-LV CO L, NE TO C&G IN TONGANOXIE	9.544	PMS		3/4" OL					
				HR USE HR-1B WITH AC-10 OR R&M PICK		1	0.00	1" CM, 2" HR	TURF/ROCK	$68,000	$3,500	$71,500	$682,396
				ADD 3'X6" SHLD EXT								$0	$0
				BRING TURF SHLD TO SHAPE								$0	$0
												$0	$0
10	US-24	RL	K-5186-01	JCT K-82, E, S & E TO E JCT US-77	13.314	PMS		CR(F), 1 1/2" OL					
				CR USE FLY ASH ADDITIVE		1	0.00	4" CR, 1 1/2" OL	ROCK	$62,000	$2,500	$64,500	$858,753
				E APPX 4 MI CR 6" & ADD 3'X6" SHLD EXT OL IN THIS								$0	$0
				SECT TO BE 30' THE 6" CR SHOULD MAKE THE								$0	$0
				BOTTOM OF THE SHLD EXT								$0	$0
				OL USE BM-1B WITH AC-10								$0	$0
				NOTE: WILL MAKE FINAL DECISION AFTER PROJ HAS								$0	$0
				BEEN CORED								$0	$0

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
11	K-30	WB	K-5187-01	JCT I-70, NE TO SCL MAPLE HILL	1.136	PMS		3" OL					
				OL USE BM-__ (MIX SHOULD BE SAME AS PB PROJ) THIS PROJ TO BE TIED & LET WITH K-4054 (NOW PLANNED FOR AUG 93 LETTING) THIS PROJ TO COVER EACE END OF THE PB PROJ		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$40,328
												$0	$0
												$0	$0
												$0	$0
12	K-31	OS	K-5188-01	JCT US-75, E & S TO W JCT I-35	7.188	PMS		3/4" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$255,174
												$0	$0
				NOTE: CONSIDER DOING THE S LAG DOWN TO I-35 LOOKING AT THIS TO GENERATE A MORE REASONABLE PROJ								$0	$0
												$0	$0
13	K-31	WB	K-5189-01	JCT K-99, E TO W WB-OS CO L	10.090	PMS		3" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$358,195
												$0	$0
												$0	$0
												$0	$0
14	US-36	BR	K-5190-01	NM-BR CO L, E TO 2.4 M W OF S JCT US-73	11.910	PMS		3/4" OL					
				TIE K-1725 & K-3258 HR USE HR-1B WITH AC-10 OR R&M PICK FROM E JCT US-75 ADD 3'X6" SHLD EXT USE HR BETWEEN THE US-75 JCTS OL 1 1/2" OL 30' WIDE USE HR HR IS FROM THE CM E OF E JCT US-75 ADJ RAP TO FIT ROCK PORTION OF SHLDS MAY REQUIRE EXTRA MATL		1	0.00	1 1/2" CM, 3" HR	ROCK	$85,000	$5,000	$90,000	$1,071,900
												$0	$0
												$0	$0
												$0	$0
15	US-56	DG	K-5191-01	JCT US-59, E TO DG-JO CO L	0.000	PMS		3/4" OL					
			11.793 miles original	HR IS SPECIAL WILL BE A COMBINATION OF BM-1B & THE CM THIS MAY BE DONE IN PLANT OR ON THE ROAD WITH A HEATER MIXER BALDWIN EAST ADD 3'X6" SHLD EXT USE THE SPECIAL MIXED MATERIAL. SHOULD BE LET AS A OPTION ROCK PORTION OF SHLD WILL REQUIRE EXTRA MATERIAL		1	0.00	1" CM, 2" HR (SPECIAL)	TURF/ROCK	$0	$0	$0	$0
												$0	$0
												$0	$0
								DISTRICT CUT				$0	$0

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
16	US-56	LY	K-5192-01	MR-LY CO L, E TO LY-OS CO L	0.000	PMS		CR(F), 1 1/2" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$0	$0	$0	$0
												$0	$0
			22.134 miles original	NOTE: THERE ARE TWO DIFFERENT PROJ E&W OF K-99								$0	$0
				SECT W K-99 LOOKS GOOD IF CUTS NEEDED DIST MAY SMOKE THIS SECT AND OL THE E SECT									
								DISTRICT CUT				$0	$0
17	US-59	AT	K-5193-01	JF-AT CO L, NE TO WCL ATCHISON	14.356	PMS		3/4" SR, 1" OL					
				TIE K-4629		1	0.00	1" SR, 1 1/2" OL	TURF	$42,000	$2,500	$44,500	$638,842
				OL USE BM-1B WITH AC-10								$0	$0
				ADD 3'X6" SHLD EXT USE BM-1B								$0	$0
												$0	$0
18	US-69	JO	K-5194-01	65TH ST TO FOSTER IN OVERLAND PARK	1.400	PMS		1" CM, 2" HR					
				HR USE HR-1B WITH AC-10 OR R&M PICK		1	0.00	1" CM, 2" HR	C&G/ASPH	$72,000	$20,000	$92,000	$128,800
				DO NOT CM SHLDS BUT WILL OL SHLDS WITH HR-1B								$0	$0
				ADJ RAP TO FIT								$0	$0
				NOTE: 4 LANE WITH SOME OTHER LANES								$0	$0
19	US-75	BR	K-3258-01	W JCT US-36, N TO NCL SABETHA	4.521	PMS		3/4" OL					
				TIE K-1725 & K-5190		1	0.00	1 1/2" CM, 3" HR	ROCKS	$56,000	$2,500	$58,500	$264,479
				EXISTING SURFACE HAS 30' TOP								$0	$0
				CM & OL THE 30' OF EXISTING SURFACE								$0	$0
				OL USE HR-1B WITH AC-10 OR R&M PICK								$0	$0
20	US-77	MS	K-5195-01	E JCT K-9, N TO SCL MARYSVILLE	0.000	PMS		3/4" OL					
				CR USE FLY ASH ADDITIVE		1	0.00	6" CR, 1 1/2" OL	TURF/ROCK	$0	$0	$0	$0
				ADD 3'X6" SHLD EXT BUILD BOTTOM 4 1/2" WITH CR								$0	$0
				OL USE BM-1B WITH AC-10								$0	$0
			10.180 miles original					DISTRICT CUT				$0	$0

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
21	K-87	MS	K-5196-01	NCL VLIETS, N TO JCT US-36	8.625	PMS		3/4" OL					
				OL USE BM-2A WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$306,188
				NOTE: THIS MAY BE BM-1A UNKNOWN WHICH WILL WORK BEST								$0	$0
												$0	$0
												$0	$0
22	K-90	LV	K-5197-01	JCT K-16, W TO END AT ST PARK DAM	0.000	PMS		3/4" OL					
				OL USE BM-1A WITH AC-10.		1	5.00	1" OL	TURF	$0	$0	$0	$0
												$0	$0
			2.180 miles original	NOTE: MAY WANT TO HOLD OFF THIS YEAR AS THIS MAY GO BACK TO COUNTY AS PART OF MAJOR MOD, AND WE ONLY WANT TO FIX THIS ONCE								$0	$0
				DISTRICT TO CONTACT COUNTY				DISTRICT CUT				$0	$0
23	K-99	LY	K-5198-01	0.5 MI N OF JCT I-35, N TO JCT US-56	19.256	PMS		3" OL					
				TIE K-5200		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$683,588
				OL USE BM-1B WITH AC-10								$0	$0
												$0	$0
												$0	$0
24	K-99	PT	K-4631-01	JCT US-24, N TO SCL WESTMORELAND	14.182	PMS		3/4" SR, 2" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$503,461
												$0	$0
												$0	$0
												$0	$0
25	K-99	WB	K-5199-01	NCL ALMA, N TO JCT I-70	0.000	PMS		1 1/2" OL					
				OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$0	$0	$0	$0
												$0	$0
												$0	$0
				3.429 miles original				DISTRICT CUT				$0	$0

DISTRICT 1

FISCAL YEAR 1994 PROJECT COST ESTIMATE

	ROUTE	CO.	PROJECT NO.	LOCATION (DESCRIPTION)	LENGTH (MI.)	PRIORITY SCOPE	PERCENT CONTING.	TYPE OF WORK	TYPE SHOULDERS	ESTIMATED COST WORK	ESTIMATED COST SHOULDERS	ESTIMATED COST/MILE	PROJECT COST
26	K-170	LY	K-5200-01	JCT K-99, E TO LY-OS CO L	8.031	PMS		3" OL					
				TIE K-5198 OL USE BM-1B WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$285,101
												$0	$0
												$0	$0
												$0	$0
27	K-237	JF	K-5201-01	JCT US-24, N TO PERRY ST PARK	3.351	PMS		CR(F) ONLY					
				OL USE BM-1B WITH AC-10 CR(P) APPX EVERY 250' THESE TO BE FULL DEPTH REPAIR PROJ HAS 8' ROCK SHLDS DIST DOES NOT WANT TO USE 3'X6" ASPH SHLD EXT. LOW TRUCK VOLUME, SLOW SPEEDS, EXISTING SHLD REQUIRES VERY LITTLE MAINT WILL SEEK EXCEPTION FROM STE		1	5.00	CR(P), 1 1/2" OL	ROCK	$35,600	$5,000	$40,600	$136,051
												$0	$0
												$0	$0
												$0	$0
28	K-246	BR	K-1725-01	JCT US-75, E TO WCL MORRILL	6.120	PMS		3" OL					
				TIE K-3258 & K-5190 OL USE BM-2A WITH AC-10		1	5.00	1 1/2" OL	TURF	$33,000	$2,500	$35,500	$217,260
												$0	$0
												$0	$0
												$0	$0

TOTAL MILES FOR DISTRICT 1 = 172.597

TOTAL PROJECT COST FOR DISTRICT 1= $7,979,124

Iowa Department of Transportation
and
Iowa Transportation Center

Site Visit

for

Introduction to the

Pavement Management Process

Examples of:

A Kornshell Script (CALCDS-I)

An Embedded SQL Program (calcds-i.sc)

and

An Ingres Report Writer Routine (rdcat.rw)

```
# [ CALCDS-I ] ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
#                        KDOT Pavement Management
#    06/15/93  ---------------------------------------- V.R.Walrafen
#  ------------------------------------------------------------------------
#    Kansas Dept. of Transportation - Bureau of Materials and Research
#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
if [ $# -ne 1 -o "$1" = "-" -o "$1" = "-?" ];then echo "
                          CALCDS-I  run_year
      ------------------------------------------------------------
          Calculates distress states using Right Wheelpath IRI
               from the most recent condition survey data.
     ------------------------------------------------------------------
             The actual calculated value for certain fields
                depend upon which program was run last.
     1) calcpsic.sc fills
        <geom>.pvsr      - with Dr.Moore based on CORRELATED Mays
        <geom>.psi       - with FHWA based on LEFT Wheelpath IRI
        <geom>.psipave   - with FHWA based on LEFT Wheelpath IRI
     2) calcpsis.sc fills
        <geom>.pvsr      - with Dr.Moore based on SIMULATED Mays
        <geom>.psi       - with FHWA based on RIGHT Wheelpath IRI
        <geom>.psipave   - with FHWA based on RIGHT Wheelpath IRI
     3) calcds-c.sc fills <cstate>.dsyr1 based on CORRELATED Mays
     4) calcds-s.sc fills <cstate>.dsyr1 based on SIMULATED Mays
     5) calcds-i.sc fills <cstate>.dsyr1 based on RIGHT Wheelpath IRI
     ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
      Any outputs from routines that use any of these values, such as
      __calccs.sc__ which uses <cstate>.dsyr1 to fill <cstate>.csyr1,
        must be clearly documented as to which; CORRELATED Mays,
       SIMULATED Mays or Right Wheelpath IRI, data they are based on.
       ------------------------------------------------------------
/* ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: *\\
       1992 Correlation formula:  IRI = 16.660987 * Mays^0.470214
    ------------------------------------------------------------------
       Mays ranges were:  0-59    60-125  126up  prior to 1993.
    1993 IRI ranges were:  0-114  115-162  163up (due to logic error).
         IRI ranges are:  0-113  114-161  162up  after 1993.
    ------------------------------------------------------------------
    The 1993 CSR shows the following:
         +==================-==================-==================+
         |  92PL 93IRI 93PL  |  92PL 93IRI 93PL  |  92PL 93IRI 93PL  |
         |-------------------+-------------------+-------------------|
         |    1   <119   1   |    2   <109   1   |    3   <114   1   |
         |    1 119-161  2   |    2 109-166  2   |    3 114-156  2   |
         |    1   >161   3   |    2   >166   3   |    3   >156   3   |
         +=================================================================+
         which shows the breaks as they should have been done and
              not as was actually done by the flawed logic.
\* ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: */
      I:/usr3/calc                        'date'\n"|
      pg -sp" $0 - help screen %d: ";exit 1;fi
#::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
case $1 in
  91|92|93|94|95|96|97|98|99) ;;
  *) echo "\aERROR: \"$1\" is an invalid run year!."
     echo "\a       Use (91).....(99).";exit;;esac
banner! $0
#:::::::::::::::#
database='pmis'
#:::::::::::::::#
```

```
k=/usr4/logs/korn.log
echo "$0 $1: 'date' 'pwd' {database=$database}"
echo "$0 $1: 'date' 'pwd' {database=$database}">>$k
@PROTECT out $0 calcds-i.$1;if [ $? -eq 1 ];then exit;fi
echo "This calculation uses Right Wheelpath IRI values!"
calcds-i.x $database
mv calcds-i.out calcds-i.$1
tail -6 calcds-i.$1
ls -laF calcds-i.$1
home='basename $HOME'
echo "$0 $1: 'date +%T' ===> Done <=== $home"
echo "$0 $1: 'date +%T' ===> Done <=== $home">>$k
```

```
/* [ calcds-i.sc ] :::::::::::::::::::::::::::::::::::::::::::::::::: *\
                    KDOT Pavement Management
   06/16/93  ------------------------------------  V.R.Walrafen

       EMBEDDED SQL PROGRAM TO CALCULATE DISTRESS STATE CODE.
  ===> Using Right Wheelpath IRI to determine roughness 1,2,3. <===

            The actual calculated value for certain fields
                depend upon which program was run last.
    1) calcpsic.sc fills
       <geom>.pvsr      - with Dr.Moore based on CORRELATED Mays
       <geom>.psi       - with FHWA based on LEFT Wheelpath IRI
       <geom>.psipave   - with FHWA based on LEFT Wheelpath IRI
    2) calcpsis.sc fills
       <geom>.pvsr      - with Dr.Moore based on SIMULATED Mays
       <geom>.psi       - with FHWA based on RIGHT Wheelpath IRI
       <geom>.psipave   - with FHWA based on RIGHT Wheelpath IRI
    3) calcds-c.sc fills <cstate>.dsyr1 based on CORRELATED Mays
    4) calcds-s.sc fills <cstate>.dsyr1 based on SIMULATED Mays
    5) calcds-i.sc fills <cstate>.dsyr1 based on RIGHT Wheelpath IRI
    ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
     Any outputs from routines that use any of these values, such as
      __calccs.sc__ which uses <cstate>.dsyr1 to fill <cstate>.csyr1,
        must be clearly documented as to which; CORRELATED Mays,
       SIMULATED Mays or Right Wheelpath IRI, data they are based on.

   ------------------------------------------------------------------
   Kansas Dept. of Transportation -- Bureau of Materials and Research
\* :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: */
#include <stdio.h>
EXEC SQL INCLUDE SQLCA;

EXEC SQL BEGIN DECLARE SECTION;
short dateyr1_null,   /* null indicator variable */
      fdateyr1_null,  /* null date variable */
      rdateyr1_null;  /* null indicator variable */
int   bcryr1,         /* block cracking code */
      c1,             /* county - county number */
      c2,             /* rtty - route type */
      c3,             /* rtno - route number */
      c4,             /* suffix - route code */
      c5,             /* geom integer beg milepost */
      c6,             /* geom integer end milepost */
      c7,             /* lane */
      dsyr1,          /* distress state - calculated */
      dsyr2,          /* distress state for previous year */
      faultyr1,       /* faulting code */
      fcr1yr1,        /* fatigue cracking code 1 */
      fcr2yr1,        /* fatigue cracking code 2 */
      fcr3yr1,        /* fatigue cracking code 3 */
      fcr4yr1,        /* fatigue cracking code 4 */
      jd1yr1,         /* joint distress code 1 */
      jd2yr1,         /* joint distress code 2 */
      jd3yr1,         /* joint distress code 3 */
      jd4yr1,         /* joint distress code 4 */
      rdcat,          /* road category */
      rtngyr1,        /* rating */
      iriyr1,         /* RIGHT wheelpath IRI value from profile. */
/* :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: *\
   iriyr__ before 1993 is CORRELATED IRI value from pulled MAYS.
```

```
   iriyr__ after 1992 is RIGHT wheelpath IRI value from profile.
   irilyr__ ONLY after 1992 is LEFT wheelpath IRI value from profile.
\* :::^:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: */
      tcr1yr1,        /* transverse cracking code 1 */
      tcr2yr1,        /* transverse cracking code 2 */
      tcr3yr1;        /* transverse cracking code 3 */
char  dateyr1[9],     /* survey date from rough table */
      fdateyr1[9],    /* survey date from flexible distress */
      rdateyr1[9];    /* survey date from rigid distress */
EXEC SQL END DECLARE SECTION;
int   break1,         /* lower IRI breakpoint for all groups */
      break2,         /* upper IRI breakpoint for all groups */
      chk1,           /* roughness level for previous year */
      code1,          /* first digit of distress level */
      code2,          /* second digit of distress level */
      code3,          /* third digit of distress level */
/*    **********      */
      limit1=114,     /* lower IRI value for PL2 for all pvmt groups */
      limit2=161,     /* upper IRI value for PL2 for all pvmt groups */
/*    **********      */
/* :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: *\
      1992 Correlation formula:  IRI = 16.660987 * Mays^0.470214
   ------------------------------------------------------------------
      Mays ranges were:  0-59    60-125  126up  prior to 1993.
   1993 IRI ranges were:  0-114  115-162  163up (due to logic error).
       IRI ranges are:  0-113  114-161  162up  after 1993.
   ------------------------------------------------------------------
   The 1993 CSR shows the following:
       +==================-==================-==================+
       |  92PL 93IRI 93PL  |  92PL 93IRI 93PL  |  92PL 93IRI 93PL  |
       |-------------------+-------------------+-------------------|
       |    1   <119   1   |    2   <109   1   |    3   <114   1   |
       |    1 119-161  2   |    2 109-166  2   |    3 114-156  2   |
       |    1   >161   3   |    2   >166   3   |    3   >156   3   |
       +=================================================================+
       which shows the breaks as they should have been done and
            not as was actually done by the flawed logic.
\* :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::: */
     n=0,             /* number of records accessed in geom table */
     n1=0,            /* number of records with IRI data */
     n2=0,            /* number of records without rigid dist. data */
     n3=0,            /* number of records without flex. dist. data */
     n4=0,            /* number of ids added to cstate file */
     n5=0,            /* number of records updated */
     oldc1=0,         /* last county number */
     pavement,        /* 1=pccp, 2=comp., 3=fdbit, 4=pdbit */
     rtable[5][335]; /* rating for each rdcat and dsyr1 */
FILE  *ofp;

void main (int argc, char *argv[]) {
   if (argc!=2) {
      printf("\aERROR: Database name argument not specified.\n");
      exit(1); }
   if ((ofp=fopen("calcds-i.out","w"))==NULL) {
      printf("\aERROR: __calcds-i.out__ could not be opened!\n");
      exit(2); }
   fprintf(ofp,"This calculation uses Right Wheelpath IRI values!\n");
   fflush(ofp);
   EXEC SQL WHENEVER SQLERROR STOP;
   if (*(argv[1])=='p')
```

```
      EXEC SQL CONNECT pmis;
   else if (*(argv[1])=='f')
      EXEC SQL CONNECT firm;
   else if (*(argv[1])=='t')
      EXEC SQL CONNECT trial;
   else { printf("\aERROR: Invalid database specified!\n");
      exit(3); }
   EXEC SQL DECLARE c_geom CURSOR FOR
   SELECT county,rtty,rtno,code,impbeg,impend,lane,rdcat
   FROM geom;
   EXEC SQL OPEN c_geom;
rtable[1][111]=1; rtable[1][112]=1; rtable[1][113]=1; rtable[1][121]=1;
rtable[1][122]=1; rtable[1][123]=1; rtable[1][131]=2; rtable[1][132]=2;
rtable[1][133]=2; rtable[1][211]=1; rtable[1][212]=1; rtable[1][213]=1;
rtable[1][221]=1; rtable[1][222]=1; rtable[1][223]=2; rtable[1][231]=2;
rtable[1][232]=2; rtable[1][233]=2; rtable[1][311]=2; rtable[1][312]=3;
rtable[1][313]=3; rtable[1][321]=3; rtable[1][322]=3; rtable[1][323]=3;
rtable[1][331]=3; rtable[1][332]=3; rtable[1][333]=3; rtable[2][111]=1;
rtable[2][112]=1; rtable[2][113]=1; rtable[2][121]=1; rtable[2][122]=1;
rtable[2][123]=2; rtable[2][131]=2; rtable[2][132]=2; rtable[2][133]=2;
rtable[2][211]=1; rtable[2][212]=1; rtable[2][213]=1; rtable[2][221]=2;
rtable[2][222]=2; rtable[2][223]=2; rtable[2][231]=2; rtable[2][232]=2;
rtable[2][233]=2; rtable[2][311]=2; rtable[2][312]=3; rtable[2][313]=3;
rtable[2][321]=3; rtable[2][322]=3; rtable[2][323]=3; rtable[2][331]=3;
rtable[2][332]=3; rtable[2][333]=3; rtable[3][111]=1; rtable[3][112]=1;
rtable[3][113]=1; rtable[3][121]=1; rtable[3][122]=1; rtable[3][123]=2;
rtable[3][131]=2; rtable[3][132]=2; rtable[3][133]=2; rtable[3][211]=1;
rtable[3][212]=1; rtable[3][213]=2; rtable[3][221]=2; rtable[3][222]=2;
rtable[3][223]=2; rtable[3][231]=2; rtable[3][232]=2; rtable[3][233]=2;
rtable[3][311]=3; rtable[3][312]=3; rtable[3][313]=3; rtable[3][321]=3;
rtable[3][322]=3; rtable[3][323]=3; rtable[3][331]=3; rtable[3][332]=3;
rtable[3][333]=3; rtable[4][111]=1; rtable[4][112]=1; rtable[4][113]=2;
rtable[4][121]=1; rtable[4][122]=1; rtable[4][123]=2; rtable[4][131]=2;
rtable[4][132]=2; rtable[4][133]=2; rtable[4][211]=1; rtable[4][212]=2;
rtable[4][213]=2; rtable[4][221]=2; rtable[4][222]=2; rtable[4][223]=2;
rtable[4][231]=2; rtable[4][232]=2; rtable[4][233]=2; rtable[4][311]=3;
rtable[4][312]=3; rtable[4][313]=3; rtable[4][321]=3; rtable[4][322]=3;
rtable[4][323]=3; rtable[4][331]=3; rtable[4][332]=3; rtable[4][333]=3;
/*:::::::::::::::::::::::::*/
   while (sqlca.sqlcode==0) {
      EXEC SQL FETCH c_geom INTO :c1,:c2,:c3,:c4,:c5,:c6,:c7,:rdcat;
      if (sqlca.sqlcode==100) break;
      ++n;
      if (c1!=oldc1) {
        if (c1%10==1) printf("\nWorking in county:");
        printf("%4d",c1); fflush(stdout); oldc1=c1;}
      EXEC SQL SELECT dateyr1,iriyr1
      INTO :dateyr1:dateyr1_null,:iriyr1
      FROM rough
      WHERE county=:c1 and rtty=:c2 and rtno=:c3 and code=:c4 and
            impbeg=:c5 and impend=:c6 and lane=:c7;
      if (sqlca.sqlcode==100) {
        fprintf(ofp,"No <rough> record for "
                    "%03d(%01d-%03d-%01d)%02d-%02d(%01d)",
                    c1,c2,c3,c4,c5,c6,c7); fflush(ofp);
        ++n1; sqlca.sqlcode=0;
      }
      else {
         if (dateyr1_null != -1) {
            switch (rdcat) {
```

```
case 1: case 2: case 6: case 7: case 8:
   pavement=1;                                              /*PCCP*/
   EXEC SQL SELECT rdateyr1,faultyr1,
                   jd1yr1,jd2yr1,jd3yr1,jd4yr1
   INTO :rdateyr1:rdateyr1_null,:faultyr1,:jd1yr1,
        :jd2yr1,:jd3yr1,:jd4yr1
   FROM rdist
   WHERE county=:c1 and rtty=:c2 and rtno=:c3 and
         code=:c4 and impbeg=:c5 and
         impend=:c6 and lane=:c7;
   if (sqlca.sqlcode==100) {
      fprintf(ofp,"No <rdist> record for "
                  "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                  c1,c2,c3,c4,c5,c6,c7);
      ++n2; code2=code3=0; fflush(ofp);
   }
   else {
      if (rdateyr1_null==-1) {
        fprintf(ofp,"No __rdateyr1__ for "
                    "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                    c1,c2,c3,c4,c5,c6,c7);
        ++n2; code2=code3=0; fflush(ofp);
      }
      else {
         if (faultyr1==0) faultyr1=1;
         code3=faultyr1;
         if (jd3yr1>5 || jd4yr1>0) code2=30;
         else if (jd2yr1>=3 || jd3yr1>0) code2=20;
              else code2=10;
      }
   }
   break;
case 3: case 4: case 9: case 10: case 11: case 5:
case 12: case 13: case 14: case 15: case 16: case 17:
   pavement=2;                                              /*COMP*/
   if (rdcat==5 || rdcat>=12) pavement=3;                   /*FDBIT*/
   EXEC SQL SELECT fdateyr1,tcr1yr1,tcr2yr1,tcr3yr1,bcryr1
   INTO :fdateyr1:fdateyr1_null,
        :tcr1yr1,:tcr2yr1,:tcr3yr1,:bcryr1
   FROM fdist
   WHERE county=:c1 and rtty=:c2 and rtno=:c3 and
         code=:c4 and impbeg=:c5 and
         impend=:c6 and lane=:c7;
   if (sqlca.sqlcode==100) {
      fprintf(ofp,"No <fdist> record for "
                  "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                  c1,c2,c3,c4,c5,c6,c7);
      ++n3; code2=code3=0; fflush(ofp);
   }
   else {
      if (fdateyr1_null==-1) {
        fprintf(ofp,"No __fdateyr1__ for "
                    "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                    c1,c2,c3,c4,c5,c6,c7);
        ++n3; code2=code3=0; fflush(ofp);
      }
      else {
         if (tcr3yr1>=20 || tcr2yr1>=30) code2=30;
         else if (tcr3yr1>0 || tcr2yr1>0 || tcr1yr1>=30)
                code2=20;
```

```
                    else code2=10;
               if (bcryr1<=1) code3=1;
               else if (bcryr1==4) code3=3;
                    else code3=2;
          }
     }
     break;
case 18: case 19: case 20: case 21: case 22: case 23:
     pavement=4;                                        /*PDBIT*/
     EXEC SQL SELECT fdateyr1,fcr1yr1,fcr2yr1,fcr3yr1,fcr4yr1,
                     tcr1yr1,tcr2yr1,tcr3yr1
     INTO :fdateyr1:fdateyr1_null,
          :fcr1yr1,:fcr2yr1,:fcr3yr1,:fcr4yr1,
          :tcr1yr1,:tcr2yr1,:tcr3yr1
     FROM fdist
     WHERE county=:c1 and rtty=:c2 and
           rtno=:c3 and code=:c4 and
           impbeg=:c5 and impend=:c6 and lane=:c7;
     if (sqlca.sqlcode==100) {
        fprintf(ofp,"No <fdist> record for "
                    "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                    c1,c2,c3,c4,c5,c6,c7);
        ++n3; code2=code3=0; fflush(ofp);
     }
     else {
        if (fdateyr1_null==-1) {
          fprintf(ofp,"No __fdateyr1__ for "
                      "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                      c1,c2,c3,c4,c5,c6,c7);
           ++n3; code2=code3=0; fflush(ofp);
        }
        else {
           if (fcr2yr1>200 || fcr3yr1>75 || fcr4yr1>25)
             code2=3;
           else if (fcr1yr1>200 || fcr2yr1>0 || fcr3yr1>0 || fcr4yr1>0 )
                  code2=2;
                else code2=1;
           if (tcr3yr1>=20 || tcr2yr1>=30) code3=30;
           else if (tcr3yr1>0 || tcr2yr1>0 || tcr1yr1>=30)
                  code3=20;
                else code3=10;
        }
     }
     break;
default:
     fprintf(ofp,"Invalid __rdcat__ for "
                 "%03d(%01d-%03d-%01d)%02d-%02d(%01d)\n",
                 c1,c2,c3,c4,c5,c6,c7); fflush(ofp);
     break;
}
dsyr2=0;
EXEC SQL SELECT dsyr2
INTO :dsyr2
FROM cstate
WHERE county=:c1 and rtty=:c2 and rtno=:c3 and
      code=:c4 and impbeg=:c5 and impend=:c6 and lane=:c7;
if (sqlca.sqlcode==100) {
     fprintf(ofp,"No <cstate> record for "
                 "%03d(%01d-%03d-%01d)%02d-%02d(%01d)"
                 " it will be added.\n",
```

```
                        c1,c2,c3,c4,c5,c6,c7); fflush(ofp);
                EXEC SQL INSERT INTO cstate
                (county,rtty,rtno,code,impbeg,impend,lane,
                 dsyr2,rtngyr2,csyr2)
                VALUES (:c1,:c2,:c3,:c4,:c5,:c6,:c7,0,0,0);
                chk1=0;
                ++n4;
              }
              else chk1=dsyr2/100;
              switch (chk1) {
                case 0: break1=limit1;   break2=limit2;   break;
                case 1: break1=limit1+5; break2=limit2;   break;
                case 2: break1=limit1-5; break2=limit2+5; break;
                case 3: break1=limit1;   break2=limit2-5;
              }
              code1=200;
              switch (pavement) {
              case 1: case 2: case 3: case 4:
                 if (iriyr1<break1) code1=100;
                 if (iriyr1>break2) code1=300;
              }
              dsyr1=code1+code2+code3;
              rtngyr1=rtable[pavement][dsyr1];
              EXEC SQL UPDATE cstate
              SET dsyr1=:dsyr1,rtngyr1=:rtngyr1
              WHERE county=:c1 and rtty=:c2 and rtno=:c3 and
                    code=:c4 and impbeg=:c5 and impend=:c6 and lane=:c7;
              ++n5;
            }
            else {
              fprintf(ofp,"No ROUGH record for "
                          "%03d(%01d-%03d-%01d)%02d-%02d(%01d)"
                          " SKIPPING\n",
                          c1,c2,c3,c4,c5,c6,c7); fflush(ofp);
              ++n1;
            }
          }
        }
/*:::::::::::::::::::::::::*/
        EXEC SQL commit;
        EXEC SQL disconnect;
        printf("\n");
        fprintf(ofp,"Number of records:\n"
                    "   Accessed in geom ..... %d\n"
                    "   Without IRI data ..... %d\n"
                    "   Without rigid dist. data ... %d\n"
                    "   Without flex. dist. data ... %d\n"
                    "   Added to cstate ..... %d\n"
                    "   Updated in cstate ..... %d\n",n,n1,n2,n3,n4,n5);
}
```

```
/*****************************************************************************
     rdcat.rw    ------------------------------------------  V.R.Walrafen
     02/10/91              KDOT Pavement Management          M.J.Lawless
  View: vcstate  ------------------------------------------  R.J.Holthaus

   Description: Ingres 6.2 Report-Writer script for the PMIS database.

-----------------------------------------------------------------------------
   Kansas Department of Transportation  -  Bureau of Materials and Research
*****************************************************************************/
/*---------------------------------------------------------------------------
                      <<<<<     INITIALIZATION     >>>>>
---------------------------------------------------------------------------*/
.NAME rdcat .RM 78
     /********/
.SREM /usr/ingres/ingres/abfsrc/pmis report!       (Not Linked)
/*   [****************************************-----------------]   */
.DECLARE _run=c1 with null with prompt
' 1) Run "Road Categories"?  (y/n=^C)  [default "y"]',
         /*****************************************************************/
         _i=c1 with null with prompt
' 2)      Include Interstate Routes?  (y/n)  [default "n"]',
         _n=c1 with null with prompt
' 3) Include Non-Interstate Routes?  (y/n)  [default "y"]',
         _totmile=float4 with prompt
' 4)      Enter statewide mileage [default 11000.000 miles]:',
         _totarea=float4 with prompt
' 5) Enter statewide surface area [default 158000000 sq.yd]:',
         _pl1=float4,  _pl2=float4,  _pl3=float4,  _tot=float4,
         _pl1c=float4, _pl2c=float4, _pl3c=float4, _totc=float4
/*---------------------------------------------------------------------------
                          <<<<<     QUERY     >>>>>
---------------------------------------------------------------------------*/
.QUERY SELECT   rdcat,rtngyr1,rtty,pvmtgrp,seclgt,_area=seclgt*1760*wdtp/3
       FROM     vcstate
       ORDER BY rdcat
.BREAK rdcat
/*---------------------------------------------------------------------------
                         <<<<<     HEADERS     >>>>>
---------------------------------------------------------------------------*/
.HEAD report
  .LET _pl1c:=0 .LET _pl2c:=0 .LET _pl3c:=0 .LET _totc:=0
  .LET _pl1:=0 .LET _pl2:=0 .LET _pl3:=0 .LET _tot:=0
  .NL .CENTER .P 'Road Categories'
              /*************************************************************/
  .IF _i is null .THEN .LET _i:='n'
  .ELSE .LET _i:=lowercase(_i)
       .IF _i!='y' and _i!='n' .THEN .LET _i:='n' .ENDIF .ENDIF
  .IF _n is null .THEN .LET _n:='y'
  .ELSE .LET _n:=lowercase(_n)
       .IF _n!='y' and _n!='n' .THEN .LET _n:='y' .ENDIF .ENDIF
  .IF _i='y' and _n!='y' .THEN
    .NL .CENTER .P 'Interstate Routes ONLY'
  .ELSEIF _i!='y' and _n='y' .THEN
    .NL .CENTER .P 'Non-Interstate Routes ONLY'
  .ELSE
    .NL .CENTER .P 'Interstate and Non-Interstate Routes' .ENDIF
    .NL .CENTER .P '( Roadway Mileage )'
    .NL         .P 'Time: ',current_time(d"04:05 PM")
        .RIGHT  .P 'Date: ',current_date(d"02/03/01")
```

```
  .IF _totmile is null .THEN .LET _totmile:=11000.000 .ENDIF
  .IF _totarea is null .THEN .LET _totarea:=158000000 .ENDIF
  .NL2 .P
'    RdCat   PL-1   PL-2   PL-3       Mileage      Ave.PL     Area(sq.yd)      '
  .NL  .P
'    -----  -----  -----  -----  ---------------  ------  ----------------   '
/*-------------------------------------------------------------------------
                          <<<<<     DETAIL     >>>>>
-------------------------------------------------------------------------*/
.DETAIL
  .IF ( rtty=1 and _i='y' ) or ( rtty!=1 and _n='y' ) .THEN
    .IF rtngyr1=1 .THEN .LET _pl1:=_pl1+seclgt .LET _pl1c:=_pl1c+seclgt .ENDIF
    .IF rtngyr1=2 .THEN .LET _pl2:=_pl2+seclgt .LET _pl2c:=_pl2c+seclgt .ENDIF
    .IF rtngyr1=3 .THEN .LET _pl3:=_pl3+seclgt .LET _pl3c:=_pl3c+seclgt .ENDIF
    .LET _tot:=_tot+seclgt .LET _totc:=_totc+seclgt
  .ENDIF
/*-------------------------------------------------------------------------
                          <<<<<     FOOTERS     >>>>>
-------------------------------------------------------------------------*/
.FOOT rdcat
     /********/
  .IF _tot>0 .THEN
    .NL .P rdcat(+n8)
         /*****************************************************************/
    .IF _pl1!=0 .THEN          .P _pl1/_tot*100("zzzzz.z"),'%' .ENDIF
    .IF _pl2!=0 .THEN .TAB 16 .P _pl2/_tot*100("zzzz.z"),'%' .ENDIF
    .IF _pl3!=0 .THEN .TAB 23 .P _pl3/_tot*100("zzzz.z"),'%' .ENDIF
                      .TAB 32 .P _tot("zz,zzz.zzz"),
                                 _tot/_totmile*100("zzz.z"),'%',
                                 (_pl1+_pl2*2+_pl3*3)/_tot("zzzz.zz"),
                                 cum(rdcat)sum(_area)("zzzzzz,zzz,zzz"),
                                 cum(rdcat)sum(_area)/_totarea*100("zzz.z"),'%',
    .LET _pl1:=0 .LET _pl2:=0 .LET _pl3:=0 .LET _tot:=0
  .ENDIF
.FOOT report
  .NL .P
'    -----  -----  -----  -----  ---------------  ------  ----------------   '
  .NL .P '    State',_pl1c/_totc*100("zzzz.z"),'%',
                     _pl2c/_totc*100("zzzz.z"),'%',
                     _pl3c/_totc*100("zzzz.z"),'%',
                     _totc("zzzzzzz,zzz.zzz"),
                     (_pl1c+_pl2c*2+_pl3c*3)/_totc("zzzzzzz.zz"),
                     sum(_area)("zzzzzzzzz,zzz,zzz")
  .NL2 .CENTER
       .P 'Mileage/Area percentages based on',_totmile("zzz,zzz.zzz"),
          ' miles and',_totarea("zzzz,zzz,zzz"),' sq.yds.'
  .NL2 .P $_source,' PMIS:Ingres ',count(seclgt)("zz,zzz"),' vcstate records.'
       .RIGHT  .P 'Report: rdcat'
                          /********/
/*-------------------------------------------------------------------------
                        <<<<<     REPORT FORMAT     >>>>>
-------------------------------------------------------------------------*/
```

Road Categories
Interstate Routes ONLY
(Roadway Mileage)

Time: 08:25 AM Date: 02/08/91

RdCat	PL-1	PL-2	PL-3	Mileage		Ave.PL	Area(sq.yd)	
1	94.0%	2.2%	3.7%	133.513	1.2%	1.10	2,160,421	1.4%
2	65.5%	8.7%	25.8%	373.830	3.4%	1.60	5,758,208	3.6%

3	70.0%	28.1%	1.9%	156.571	1.4%	1.32	2,218,600	1.4%
4	55.4%	42.0%	2.6%	129.349	1.2%	1.47	1,909,643	1.2%
5	46.0%	48.6%	5.4%	473.544	4.3%	1.59	6,676,595	4.2%
State	60.7%	28.7%	10.5%	1,266.807		1.50	157,370,131	

Mileage/Area percentages based on 11,000.000 miles and 158,000,000 sq.yds.
PMIS:Ingres vcstate records selected: 11,063 Report: rdcat
----------*/

Road Categories
Interstate and Non-Interstate Routes
(Roadway Mileage)

Time: 08:28 PM Date: 06/17/93

RdCat	PL-1	PL-2	PL-3	Mileage		Ave.PL	Area(sq.yd)	
1	98.8%	1.2%		80.148	.7%	1.01	1,281,845	.8%
2	85.0%	4.6%	10.4%	456.581	4.2%	1.25	7,217,376	4.6%
3	49.7%	49.2%	1.1%	87.512	.8%	1.51	1,246,250	.8%
4	56.7%	43.3%		168.959	1.5%	1.43	2,439,496	1.5%
5	53.4%	41.1%	5.4%	472.252	4.3%	1.52	6,649,308	4.2%
6	66.3%	22.1%	11.6%	29.883	.3%	1.45	457,012	.3%
7	77.6%	12.4%	10.0%	107.389	1.0%	1.32	1,535,831	1.0%
8	90.0%	4.2%	5.8%	370.534	3.4%	1.16	5,329,764	3.4%
9	59.7%	33.3%	7.0%	299.849	2.7%	1.47	4,213,564	2.7%
10	74.0%	22.9%	3.1%	244.620	2.2%	1.29	3,623,539	2.3%
11	70.8%	28.3%	1.0%	598.009	5.4%	1.30	8,526,177	5.4%
12	67.9%	21.2%	10.9%	48.344	.4%	1.43	675,064	.4%
13	88.0%	7.2%	4.8%	98.449	.9%	1.17	1,369,211	.9%
14	86.1%	12.4%	1.5%	137.799	1.3%	1.15	1,902,431	1.2%
15	61.1%	37.5%	1.4%	129.491	1.2%	1.40	1,894,909	1.2%
16	59.6%	37.6%	2.8%	557.638	5.1%	1.43	8,029,255	5.1%
17	78.2%	18.0%	3.7%	2,204.900	20.0%	1.25	31,658,464	20.0%
18	64.2%	22.3%	13.5%	1,460.872	13.3%	1.49	19,529,851	12.4%
19	73.1%	20.3%	6.6%	919.455	8.4%	1.33	12,552,258	7.9%
20	68.2%	22.6%	9.2%	668.857	6.1%	1.41	9,198,068	5.8%
21	71.7%	19.6%	8.7%	387.788	3.5%	1.37	5,522,025	3.5%
22	74.6%	21.9%	3.4%	671.864	6.1%	1.29	9,602,432	6.1%
23	69.7%	25.7%	4.5%	770.119	7.0%	1.35	10,797,782	6.8%
State	71.4%	22.5%	6.1%	10,971.315		1.35	155,251,912	

Mileage/Area percentages based on 11,000.000 miles and 158,000,000 sq.yds.

PMIS:Ingres 11,054 vcstate records. Report: rdcat