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16. Abstract

This report summarizes the pavement management system developed by WSDOT staff over a period of five years.

Included is a description of what the system does in terms of the considerable amount of useful output data produced. A discussion is given on how the system was developed, what the pavement rating procedures involve and cost, what computer requirements are, and what typical data processing costs are.

The report concludes with comments on how other agencies can use the Washington State Pavement Management System.

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WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION
MATERIALS LABORATORY

DEVELOPMENT AND IMPLEMENTATION OF WASHINGTON STATE'S PAVEMENT MANAGEMENT SYSTEM EXECUTIVE SUMMARY

by
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Report No. 177-B

February 1983

CREDIT REFERENCE

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The authors also wish to express their sincere appreciation to Mrs. Ruth Renaud for typing, editing, re-typing, and re-editing this report; and to Dennis Crimmins whose diligence and data processing skills were invaluable in bringing this system to fruition.

DISCLAIMER

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DEVELOPMENT AND IMPLEMENTATION OF WASHINGTON STATE'S PAVEMENT MANAGEMENT SYSTEM --EXECUTIVE SUMMARY--

INTRODUCTION

The Washington State Pavement Management System (WSPMS) has been completed after more than five years of development. It is now fully operational and implemented to provide priority work lists of projects requiring rehabilitation because of pavement condition.

WHAT IT DOES

The output of the WSPMS includes a Project Data Sheet (Fig. 1) giving a complete description and history of the pavement together with a performance curve which depicts the condition of the pavement from its inception to the present -- and extrapolated into the future. It also produces for each project pavement a summary (Fig. 2) showing results of economic analyses performed to determine the best (recommended) combination of rehabilitation actions and time of application over a predetermined length of time called the consideration period. This is 20 years in Washington's case, but is adjustable to suit other terms.

From the recommended time and type of rehabilitation derived for each project, the WSPMS assembles a work list of projects for each year of a 6-year rehabilitation program, including estimated costs (Fig. 3). Analyses are performed to determine the distribution of pavement condition ratings of the highway system(s), both before and after the proposed work, and these data are tabulated as shown in Fig. 4. The WSPMS then summarizes each year of the 6-year program in terms of cost, miles and projects involved, plus resulting changes in average pavement condition of the network (Fig. 5). Modifications of the work program to adjust to fiscal constraints, or to meet network pavement condition limits or goals are part of the WSPMS capabilities.

The work program data described above can then be plotted against time to show the effect of different funding levels on pavement condition over the 6-year program

(Figs. 6 & 7). The plots can also be viewed as indicators of the funding level necessary to maintain present network pavement condition, or how much will be necessary to upgrade this condition.

The data bank incorporated in the WSPMS can be accessed to print out any desired portion of the pavement condition rating history and details (Fig. 8), or a listing of projects within any designated milepost interval anywhere on the system. These, together with the project data sheets (Figs. 1 & 2) are interactive and can be brought up on remote terminals for review by interested engineers in districts and headquarters.

Other statistical analyses are built into the WSPMS to give data showing the pavement condition status of the highway system. Figure 9 depicts one such table showing distribution of pavement defect ratings, ride survey results, and combined condition ratings for asphalt pavements on different functional classes of highways within one district. Similar tables are available for other pavement types within any one district, or statewide. Also available are summaries of the distribution of different pavement distress categories. Figure 10 shows how much alligator cracking was found on asphalt concrete pavements in one district. Data for other defect categories, on all pavement types, for all districts and statewide are also produced as part of the output. These tables provide ready and valuable information for administrative analysis.

Obviously, the pavement performance data inherent in the WSPMS enables a host of other statistical analyses relating material, design, or construction variables to performance.

HOW IT WAS DEVELOPED

The development of the WSPMS was handled within the Materials Division of the department, where pavement structural design responsibilities are assigned. Initially the development team consisted of one engineer at a classification level equivalent to an Assistant Project Engineer, reporting more or less directly to the Materials Engineer, but with considerable latitude to contact other divisions within the department for necessary information or assistance. During the last two years of the work the classification level was raised to that of a Project Engineer, and a junior engineer with considerable programming expertise was added. Fortunately, these two men embodied the necessary combination of knowledge and experience in the disciplines of pavement design, field

location and construction, statistics, and computer programming. In retrospect, this mix of capabilities is considered ideal, if combined with a belief in pavement management and a desire to make it work.

BASIS OF THE SYSTEM AND OPERATING COSTS

The backbone of the WSPMS is a biennial pavement condition survey. This consists of cataloging various pavement defects in terms of severity and extent, assigning a negative number to each, and subtracting the sum of the defect weightings from 100 (Fig. 11). This value is modified by a ride evaluation factor derived from the output of a Cox version of the PCA Road Meter. The ride factor gives a significant modification of the defect rating only if the ride is appreciably bad. The rating survey of some 7000 miles of pavement is conducted every two years with four 2-man ratings teams. Another 2-man team measures the ride over the entire network. Typical costs for this operation are shown in Figure 12. Time involved approximates 6 week to two months.

The data processing program for the WSPMS is written in Fortran IV source language and requires approximately 250 K mainframe storage for compiling and running the program. Computer costs for processing survey data for the entire system, with printouts of project data amount to $950. To complete the economic analyses and produce a recommended work list for a 6-year program adds another $150 to the processing costs. This work is normally accomplished overnight.

USE BY OTHERS

The design of the WSPMS was specifically tailored to accommodate easy adoption by other agencies. Basic requirements are historical data giving pavement construction information, and pavement rating history showing distress indexed by severity and extent. Washington weightings for the distress categories can be used, or modified to match local defect development and pavement deterioration, to produce suitable performance curves. With input of the agency cost data, the WSPMS takes over from there.

CONCLUSIONS

The WSPMS provides transportation adminstrators and engineers with a most valuable tool to assist in development of rehabilitation programs, analysis of funding needs, monitoring of pavement condition on the network, and evaluation of the effectiveness of operational variables -- all at a reasonable cost.

MORE DETAIL

This report is an executive summary of the system. Should more detail be desired, your attention is directed to two other documents that were printed concurrently with this one:

1. Nelson and LeClerc, "Development and Implementation of Washington State's Pavement and Management System," FHWA Report Number WA-RD 50.1, WSDOT Materials Lab Report No. 177, Sept., 1982.

2. Nelson and LeClerc, "Development and Implementation of Washington State's Pavement Management System - Summary," FHWA Report Number WA-RD 50.2, WSDOT Materials Lab Report No. 177-A, Sept., 1982.

6:CO5

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D	SR	BEG SRMP	END SRMP	CS	BEG CSMP	END CSMP	PROJ ENG LENG	CLS	SIDE	HWY TYP	NUM LNS	RDW-RSH-LSH WIDTHS	LAST CONTR	COMPLT M-YR	CNT TYP	SURFACE TYP-THK	BASE TYPE
3	3	2066	2228	2331	2335	2497	162	R-1	R	0	2	23 3 3	09497	--73	3	6 15	10

PERFORMANCE HISTORY

YEAR		73	75	77	79
AGE		0	2	4	6
RIDE	RATING	0.99	0.99	0.97	0.98
STRUCR	RATING	100.0	100.0	97.3	88.0
COMBD	RATING	100.0	98.6	94.8	85.9
HIGH	RATING	100.0	99.2	98.7	98.4
LOW	RATING	100.0	98.1	91.4	77.5
HIGH	FRICTION	0	62	51	48
LOW	FRICTION	0	60	49	46
AVG	FRICTION	0	60	50	46

APPROXIMATE TRAFFIC DATA

79 ADT	3800
GROWTH RATE	6.8%
SINGLE UNITS	5%
COMBINATIONS	2%
TRAFFIC INDEX	6.3
K = 17%	D = 58%
2 AXLE TRUCKS =	3.3 %
3 AXLE TRUCKS =	2.0 %
4 AXLE TRUCKS =	0.3 %
5 AXLE TRUCKS =	1.3 %

PERFORMANCE EQUATION

EQUA CONST =	99.77
EQUA COEFF =	-0.15711
EQUA POWER =	2.50
R SQUARE =	0.99846
STD ERROR =	0.30
TIME TO 60 =	9.15
TIME TO 50 =	10.01
TIME TO 40 =	10.77
TIME TO 30 =	11.45
TIME TO 20 =	12.09

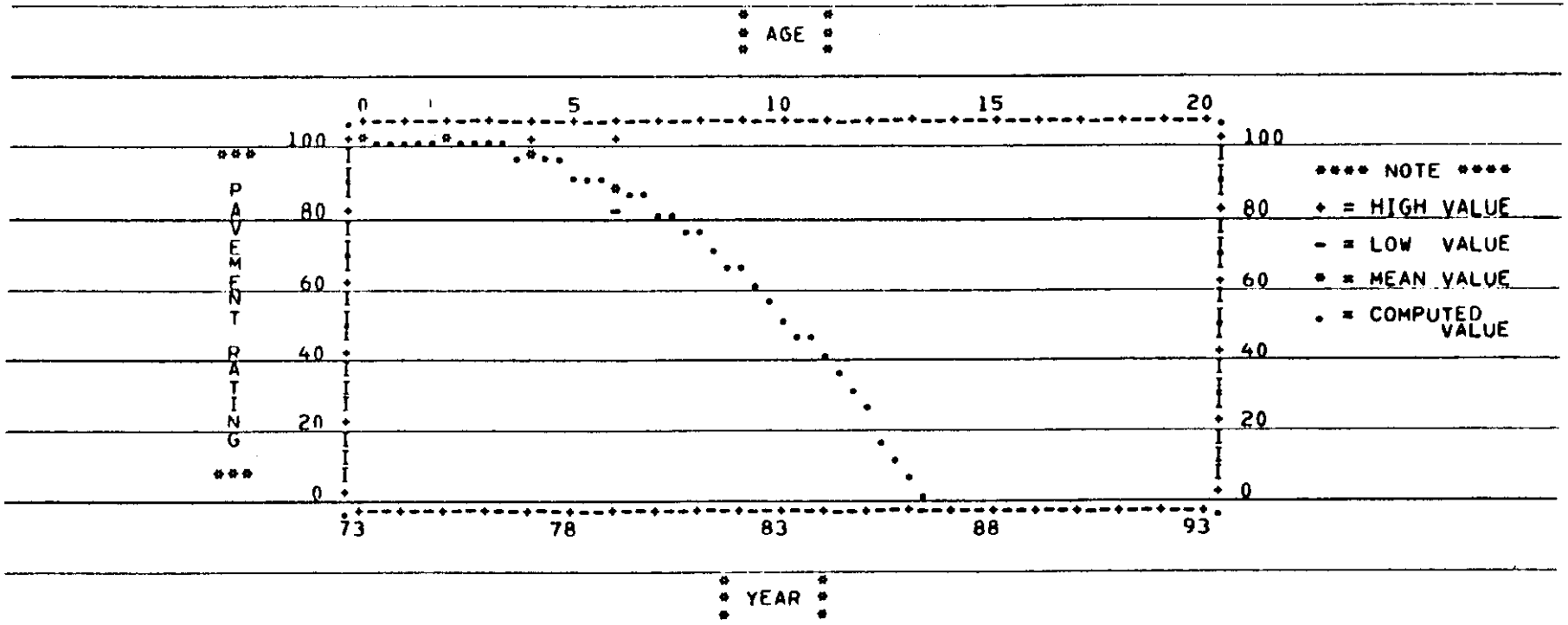

Figure 1. Project Performance Data

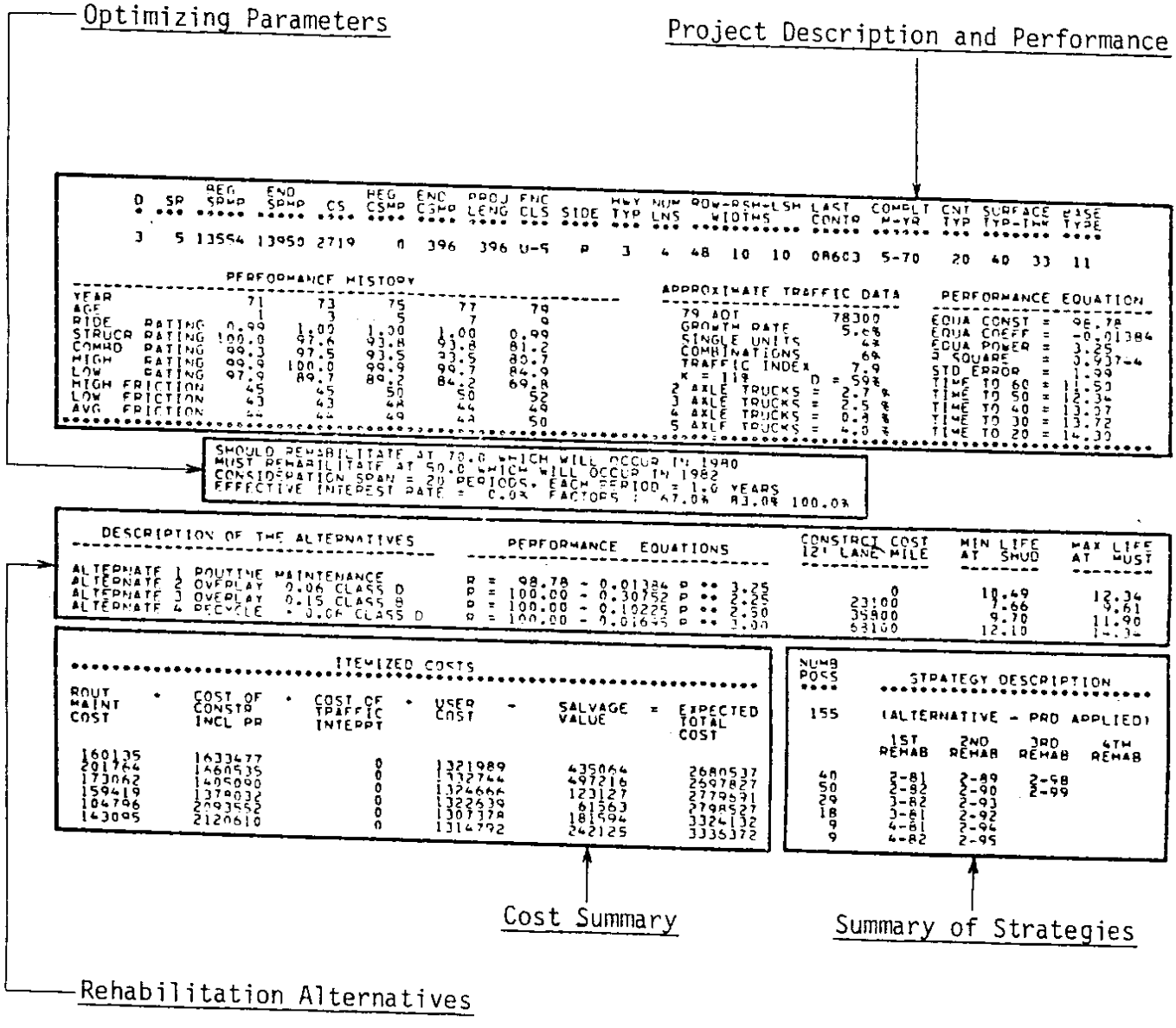

Figure 2. Project Optimum Rehabilitation Strategies

DISTRICT 3
1981 ACTION SUMMARY

	FC 1 ****	FC 2 ****	FC 3 ****	FC 4 ****	FC 5 ****
SHUD	60	60	50	50	70
MUST	40	40	30	30	50

FC	SR	BEG SRMP	END SRMP	LENG	CS	REF PTNG	PROPOSED ACTION	DES	PRESENT COST	INFLATED COST
1	3	0	6	6	2331	18.6	BITUMINOUS SURF TREATMNT	3	4492	4941
1	3	22	388	366	2331	2.3	OVERLAY 0.08 CLASS G	3	286483	315131
1	3	24	167	143	2331	23.8	OVERLAY 0.08 CLASS G	3	115485	127033
1	3	167	247	80	2331	4.7	OVERLAY 0.15 CLASS B	3	127785	140563
1	3	247	0	24	2331	1.0	OVERLAY 0.08 CLASS G	3	35961	39557
1	3	388	964	574	2331	20.1	OVERLAY 0.08 CLASS G	3	413835	455218
1	3	4796	4800	4	1805	1.0	BITUMINOUS SURF TREATMNT	1	3129	3441
1	3	4800	4807	7	1805	1.0	OVERLAY 0.08 CLASS G	1	7004	7704
1	3	5103	5166	63	1805	1.0	BITUMINOUS SURF TREATMNT	1	49055	53960
1	3	5206	5212	6	1805	1.0	BITUMINOUS SURF TREATMNT	1	4837	5320
1	3	5212	5330	118	1805	40.0	OVERLAY 0.08 CLASS G	1	99898	109887
1	3	5633	5873	240	1805	1.0	BITUMINOUS SURF TREATMNT	1	203126	223438
1	3	5873	5899	26	1805	1.0	OVERLAY 0.08 CLASS G	1	30783	33861
5	5	10269	10297	28	3401	49.3	0.35 CSTC + 0.25 AC	2	62900	69189
5	5	10297	10405	108	3401	50.0	0.35 CSTC + 0.25 AC	2	242349	266583
5	5	10405	10881	476	3407	57.1	0.35 CSTC + 0.25 AC	3	1062938	1169231
5	5	10405	10909	504	3407	46.1	0.35 CSTC + 0.25 AC	3	1620622	1782683
5	5	10909	10919	10	3407	55.8	0.35 CSTC + 0.25 AC	3	27589	30347
5	5	11524	11709	185	2701	50.2	OVERLAY 0.08 CLASS G	2	196931	216623
5	5	11709	11901	161	2701	58.1	OVERLAY 0.08 CLASS G	2	159146	175060
5	5	11740	11901	161	2701	58.0	OVERLAY 0.08 CLASS G	2	165095	181604
5	5	11901	12141	240	2702	36.2	OVERLAY 0.08 CLASS G	2	267052	293757
5	5	12419	12464	45	2702	55.5	0.35 CSTC + 0.25 AC	3	154043	169447
5	5	12464	12480	16	2718	55.5	0.35 CSTC + 0.25 AC	3	54771	60248
5	5	12464	12480	16	2718	41.4	0.35 CSTC + 0.25 AC	3	56402	62042
5	5	12480	12959	479	2718	50.3	0.35 CSTC + 0.25 AC	3	1654721	1820192
5	5	12480	12959	479	2718	48.5	0.35 CSTC + 0.25 AC	3	1662616	1828876
5	5	12959	13158	199	2799	48.5	0.35 CSTC + 0.25 AC	3	690732	759804
5	5	12959	13173	214	2799	43.8	0.35 CSTC + 0.25 AC	3	750327	825359
5	5	13158	13288	130	2799	55.0	0.35 CSTC + 0.25 AC	3	352651	387915
5	5	13173	13288	115	2799	47.4	0.35 CSTC + 0.25 AC	3	400019	440020
5	5	13288	13410	122	2799	37.3	0.35 CSTC + 0.25 AC	3	343293	377622
5	5	13288	13410	122	2799	45.7	0.35 CSTC + 0.25 AC	3	425980	468577
5	5	13410	13554	144	2799	41.9	0.35 CSTC + 0.25 AC	3	619589	681547
7	7	2582	2739	157	2710	40.8	OVERLAY 0.08 CLASS G	3	105727	116299
7	7	3608	3964	356	2711	33.4	OVERLAY 0.08 CLASS G	2	338531	372383
7	7	4578	4723	145	2711	30.1	BITUMINOUS SURF TREATMNT	3	94117	103528

Figure 3. Rehabilitation Work List

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DISTRICT 3
1981 RATING DISTRIBUTION SUMMARY

04/09/80

	FC 1 ****	FC 2 ****	FC 3 ****	FC 4 ****	FC 5 ****
SHUD	60	60	50	50	70
MUST	40	40	30	30	50

LANE MILES IN RATING GROUP BEFORE ACTION ******

FC	100-91	90-81	80-71	70-61	60-51	50-41	40-31	30-21	20-11	10 -0	AVG RTNG	TOTAL MILES
1	131.4	82.7	43.0	70.9	41.9	21.9	53.3	47.7	22.3	129.2	53.3	644.5
2	27.7	13.7	39.1	45.9	34.1	33.0	45.2	12.7	9.0	17.8	54.2	278.3
3	28.4	1.8	4.3	0.8	3.4	18.8	11.7	6.9	25.1	43.0	36.2	144.2
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	27.1	19.5	14.1	7.2	16.6	19.3	3.6	0.0	0.0	0.0	71.1	107.4
ALL	214.7	117.7	100.5	124.8	96.0	92.9	113.8	67.4	56.5	190.0	53.1	1174.4

LANE MILES IN RATING GROUP AFTER ACTION *****

FC	100-91	90-81	80-71	70-61	60-51	50-41	40-31	30-21	20-11	10 -0	AVG RTNG	TOTAL MILES
1	444.3	82.7	43.0	41.4	32.6	0.4	0.0	0.0	0.0	0.0	90.8	644.5
2	143.1	13.7	39.1	44.5	34.1	3.7	0.0	0.0	0.0	0.0	83.1	278.3
3	110.7	1.8	4.3	0.8	3.4	18.8	4.5	0.0	0.0	0.0	87.7	144.2
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	66.7	19.5	14.1	7.2	0.0	0.0	0.0	0.0	0.0	0.0	90.1	107.4
ALL	764.9	117.7	100.5	93.9	70.1	22.8	4.5	0.0	0.0	0.0	88.6	1174.4

Figure 4. Distribution of Pavement Condition Ratings

	FC 1 ****	FC 2 ****	FC 3 ****	FC 4 ****	FC 5 ****
SHUD	60	60	50	50	70
MUST	40	40	30	30	50

FC	RTNG AVG BEF ACTN	RTNG AVG AFT ACTN	NUMB PROJ	MILES ACTED ON	TOTAL MILES	% ACTED ON	PRESENT COST	INFLATED COST	DISCOUNTED COST
1	53	90	157	312	644	48 %	30632400	33695545	29454227
2	54	83	104	115	278	41 %	8557393	9413074	8228260
3	36	87	30	82	144	57 %	6888495	7577323	6623550
4	0	0	0	0	0	0 %	0	0	0
5	71	90	21	39	107	36 %	10969766	12066726	10547846
ALL	52	87	312	550	1174	46 %	57048054	62752668	54853883

Figure 5. Annual Cost Summary

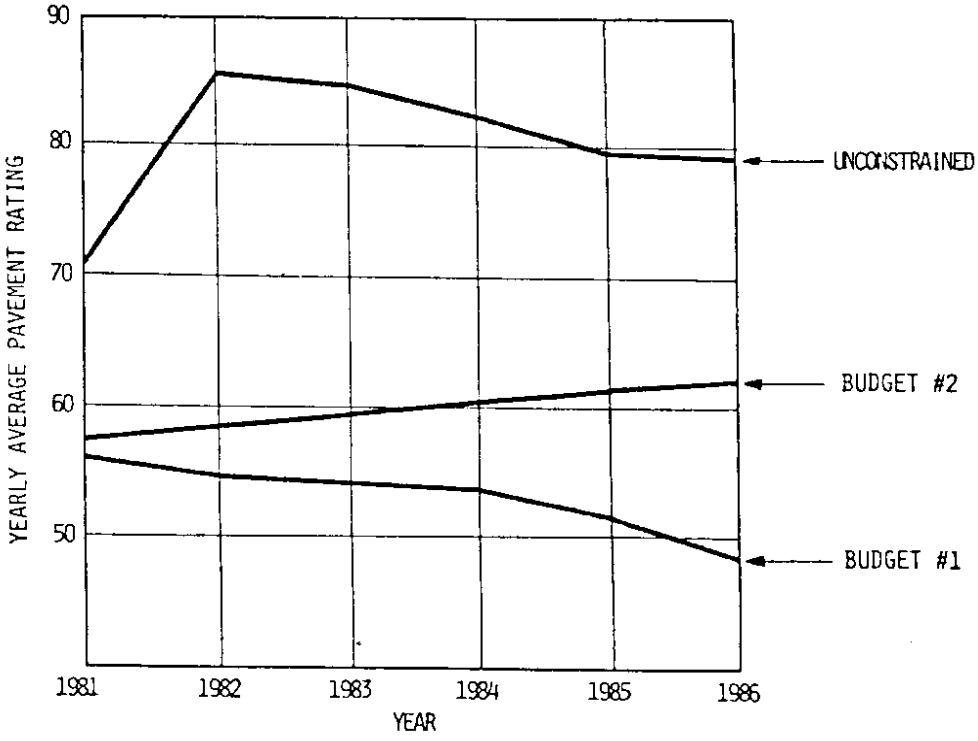
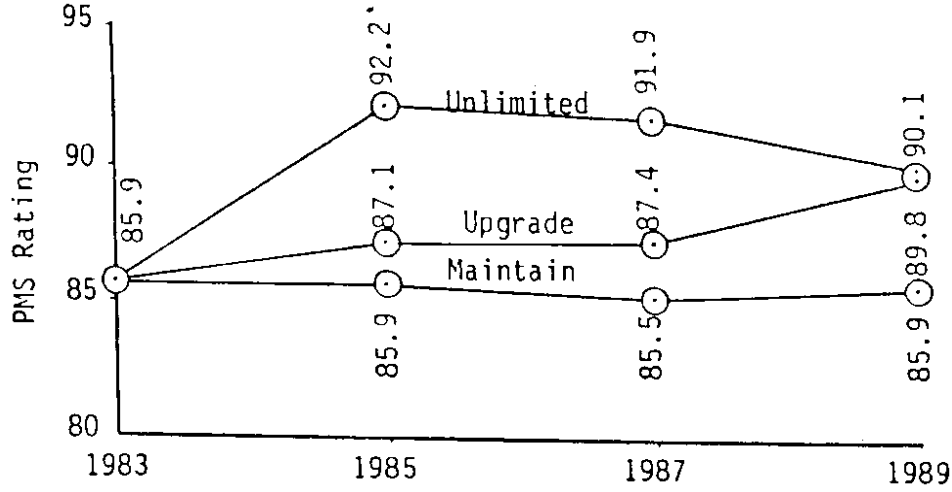


Figure 6. Pavement Condition vs Budget Level



Unlimited Budget	36,114,882 (20%)	25,286,924 (13%)	28,367,426 ← $ in program (15%) ← % of system acted on
Upgrade Cond. Level	19,226,745 (10%)	24,439,130 (13%)	42,077,816 (22%)
Maintain Cond. Level	16,572,007 (8%)	21,205,024 (11%)	32,500,680 (16%)

Figure 7. Pavement Condition vs Funding

R67714MF 06/14/82

CS	REG	END	D	SR	BEG	END	LENG	FC	L	HT	RDW	RSH	LSH	CONT#	TY	SF	TK	M	YR	BASE	80 ADT	GRW	SU	CM
2331	343	591	3	3	72	320	248	U1	R	02	23	3	3	01437	20	40	15	8	80	11	4400	53	5	2

GEN	SIDE	ECSMP	RUTT WEAP	WAVE SAGS	ALG CRK	RAV FLU	LONG CRK	TRNS CRK	PTCH	BUMPS	BUMP SPEED	ADJ BUMPS	RIDE RATNG
69	B	371	N	11	1N	11	11	1N	1N	0	0	0	1.00
69	B	471	N	11	1N	11	11	1N	1N	0	0	0	1.00
69	B	571	N	11	1N	11	11	1N	1N	0	0	0	1.00
69	B	671	N	11	1N	11	11	1N	11	0	0	0	1.00
71	B	371	1	12	12	13	31	31	11	667	40	518	1.00
71	B	471	1	12	12	13	31	31	11	1435	50	2254	0.94
71	B	571	1	12	12	13	31	31	1N	1184	50	1825	0.96
71	B	671	1	12	1N	13	21	1N	11	910	50	1356	0.98
73	B	371	1	12	22	31	33	31	21	665	30	153	1.00
73	B	471	1	12	22	31	33	1N	1N	512	30	63	1.00
73	B	571	1	12	22	31	33	1N	1N	763	50	420	1.00
73	B	671	1	12	21	31	33	1N	21	975	50	589	1.00
75	B	400	R	12	12	13	31	1N	1N	979	30	1658	0.97
75	B	500	R	12	12	22	31	21	1N	1648	50	1648	0.97
75	B	600	R	13	22	32	31	1N	1N	1680	50	1680	0.97
77	B	400	N	12	13	21	21	21	23	1540	40	1926	0.96
77	B	500	1	11	22	11	21	1N	22	2118	50	2118	0.95
77	B	600	N	12	12	11	21	1N	22	1233	40	1554	0.97
79	B	400	N	21	12	12	21	1N	23	2102	50	2102	0.95
79	B	500	N	12	12	31	21	1N	23	1747	50	1747	0.96
79	B	600	N	12	12	12	21	1N	23	1358	50	1358	0.98
81	B	344	N	11	1N	21	1N	1N	1N	1854	50	1418	0.98
81	B	400	N	11	1N	21	1N	1N	1N	1731	50	1331	0.98
81	B	500	N	11	1N	21	1N	1N	1N	1618	50	1251	0.98
81	B	509	N	11	1N	21	1N	1N	1N	949	50	764	0.99
81	B	600	N	11	1N	11	1N	1N	1N	1101	50	876	0.99

Figure 8. Pavement Rating History

DISTRICT 1 81 DEFECT RATING SUMMARY FOR ASPHALT PAVTS

FC	100-91	90-81	80-71	71-60	60-51	50-41	40-31	30-21	20-11	10-0	AVG
1	204.0	54.1	44.9	40.7	20.7	26.5	17.3	6.7	14.0	23.3	76.6
2	210.0	32.9	34.6	40.7	26.3	30.6	18.6	19.6	13.4	34.3	72.0
3	48.4	16.6	21.9	12.8	10.0	5.5	5.2	3.4	1.1	5.0	76.4
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	127.5	16.0	5.1	13.2	3.5	4.9	0.8	1.9	3.7	0.0	90.6
TOTAL	589.9	119.7	106.5	107.5	60.4	67.5	41.8	31.6	32.3	62.6	76.9

BUMP COUNT SUMMARY FOR ASPHALT PAVTS

FC	LT 500	.5K-1K	1K-1.5K	1.5K-2K	2K-3K	3K-4K	4K-5K	5K-7.5K	7.5-10K	GT 10K	AVG
1	24.4	119.8	100.6	79.1	80.5	34.2	9.6	3.7	0.2	0.2	1643.7
2	41.9	130.1	127.0	68.3	55.2	17.8	9.7	6.9	0.5	0.0	1455.2
3	4.0	43.9	42.5	16.6	16.3	5.6	0.1	0.7	0.2	0.0	1382.9
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	85.0	69.2	11.0	4.9	4.9	1.4	0.1	0.1	0.0	0.0	661.3
TOTAL	155.4	363.0	281.2	168.9	156.9	59.0	19.5	11.4	0.9	0.2	1402.1

COMBINED RATING SUMMARY FOR ASPHALT PAVTS

FC	100-91	90-81	80-71	71-60	60-51	50-41	40-31	30-21	20-11	10-0	AVG
1	187.4	56.1	44.3	46.3	23.8	27.0	20.4	7.4	14.0	23.5	73.6
2	203.7	35.2	34.3	38.6	27.5	33.4	19.4	20.8	13.7	34.4	70.0
3	47.8	15.7	22.7	11.9	10.7	5.9	5.5	3.5	0.9	5.4	74.4
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	126.5	16.7	4.7	13.8	3.5	5.0	0.8	1.9	3.7	0.0	90.0
TOTAL	565.4	123.8	106.0	112.6	65.5	71.3	46.0	33.7	32.3	63.4	74.7

Figure 9. Distribution of Rating Data

R67750

DISTRICT 1

04/21/82

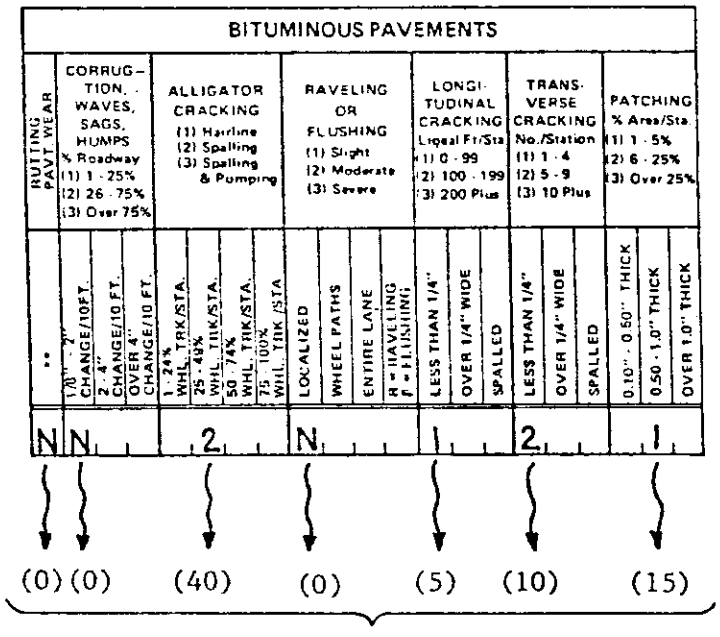
81 PAVEMENT CONDITION DEFICIENCY SUMMARY

ASPHALT CONCRETE PAVEMENT

ALLIGATOR CRACKING

FUNCTIONAL CLASS		NONE	1-24 PERCENT WHEEL H-LINE	1-24 PERCENT TRACK/STA SPAL	1-24 PERCENT TRACK/STA PUMP	25-49 PERCENT WHEEL H-LINE	25-49 PERCENT TRACK/STA SPAL	25-49 PERCENT TRACK/STA PUMP	50-74 PERCENT WHEEL H-LINE	50-74 PERCENT TRACK/STA SPAL	50-74 PERCENT TRACK/STA PUMP	75-100 PERCENT WHEEL H-LINE	75-100 PERCENT TRACK/STA SPAL	75-100 PERCENT TRACK/STA PUMP	TOTAL
1	MILES	349.	77.	15.	0.	5.	4.	0.	0.	1.	0.	0.	1.	0.	452.
	PERCENT	77.	17.	3.	0.	1.	1.	0.	0.	0.	0.	0.	0.	0.	
2	MILES	296.	76.	23.	0.	16.	30.	0.	4.	13.	0.	0.	3.	0.	461.
	PERCENT	64.	16.	5.	0.	3.	7.	0.	1.	3.	0.	0.	1.	0.	
3	MILES	86.	30.	10.	0.	3.	1.	0.	0.	0.	0.	0.	0.	0.	130.
	PERCENT	66.	23.	8.	0.	2.	1.	0.	0.	0.	0.	0.	0.	0.	
4	MILES	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
	PERCENT	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
5	MILES	168.	6.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	177.
	PERCENT	95.	3.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	
TOTAL	MILES	899.	188.	49.	0.	23.	37.	0.	5.	14.	0.	0.	4.	0.	1220.
	PERCENT	74.	15.	4.	0.	2.	3.	0.	0.	1.	0.	0.	0.	0.	

Figure 10. Distribution of Allegator Cracking



Weighting Values

$\Sigma D = 0+0+40+0+5+10+15 = 70$

Distress Rating = 100 - ΣD = 30

Figure 11. Pavement Defect Weightings

PAVEMENT MANAGEMENT COST FIGURES

PAVEMENT CONDITION RATING

4 x 2-MAN CREWS @ 75 MILES/DAY/CREW = 300 MILES/DAY

BASICALLY PLANNING TECHNICIANS - APPROXIMATE '79 SALARY = $18,000

1 SUPERVISOR - APPROXIMATE '79 SALARY = $23,000

RIDE RATING

1 x 2-MAN CREW @ 320 MILES/DAY (SALARY = $16,300 - $25,400)

UNIT = 1978 FORD LTD WITH ULTRASONIC RANGING ROAD METER

ORIGINAL COST = $8600 WITH SOFTWARE, NOT INCLUDING AUTO

OPERATIONAL COST = $1.50/HR OR $0.10/MILE

FRICTION RATING

1 x 2-MAN CREW @ 320 MILES/DAY (SALARY SAME AS RIDE RATING)

UNIT = 10,000 GVW TRUCK WITH TRAILING K. J. LAW MODEL 1270 SKID TESTER

ORIGINAL COST = $56,000 in 1974

OPERATIONAL COST = $25.66/HR

SYSTEM CALIBRATION ONCE EACH 2 YEARS = $10,000

Figure 12. Pavement Survey Costs