MIDDLE GEORGIA REGIONAL AIRPORT

PAVEMENT EVALUATION REPORT

JULY 2002

GEORGIA AVIATION SYSTEM PLAN

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Middle Georgia Regional Airport

Pavement Evaluation Report

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MIDDLE GEORGIA REGIONAL AIRPORT

PAVEMENT EVALUATION REPORT

Introduction

In 2001, the Georgia Department of Transportation (GDOT), Aviation Programs, retained Wilbur Smith Associates, assisted by Applied Pavement Technology, Inc. (APTech), to update the Georgia Aviation System Plan (GASP). APTech's portion of the project involved updating the 1998 State Airport Pavement Management System (APMS) by reevaluating the 94 general aviation airports included in the original APMS plus incorporating eight commercial service airports. The ultimate goal of this project was to provide the airports and the State with the pavement information and analytical tools that can help them identify pavement related needs, optimize the selection of projects and treatments over a multi-year period, and evaluate the long-term impacts of their project priorities.

As part of the GASP Update, an evaluation of the pavement conditions at Middle Georgia Regional Airport was conducted in 2001. The results of this evaluation are presented within this report and can be used by GDOT, the Federal Aviation Administration (FAA), and Middle Georgia Regional Airport to monitor the condition of pavements and to identify, prioritize, and schedule pavement maintenance and rehabilitation actions at the airport.

Pavement conditions were assessed using the Pavement Condition Index (PCI) procedure – the industry standard in aviation for visually assessing the condition of pavements. During a PCI inspection, inspectors identify signs of deterioration on the surface of the pavement. The types, severities, and amounts of distress present in a pavement are quantified during the pavement survey. This information is then used to develop a composite index (PCI number) that represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent).

The PCI number provides an overall measure of condition and an indication of the level of maintenance or rehabilitation work that will be required to maintain or repair a pavement. This number also provides an objective means of prioritizing and scheduling pavement rehabilitation work. Further, the individual distress information, such as cracking or rutting, provides insight into what is causing the pavement to deteriorate. These factors can then be used to select the appropriate maintenance or rehabilitation action to correct the problem. PCI data also serve as the basis for a computerized APMS – a tool that is used to track pavement condition, identify pavement repair needs, and develop prioritized maintenance and rehabilitation programs with associated schedules and budgets.

The importance of identifying not only the best repair alternative, but also the optimal time of repair, is illustrated in Figure 1. This figure shows that during the first 75 percent of the life of a pavement, approximately 40 percent of the pavement deterioration takes place. After this point, the pavement deteriorates much faster. The financial impact of delaying repairs until the second drop in condition can mean repair expenses 4 to 5 times higher than repairs triggered over the first 75 percent of the pavements life. By evaluating the condition of pavements, and using an

APMS to project future pavement condition, the most economical time to apply pavement maintenance and rehabilitation can be identified.

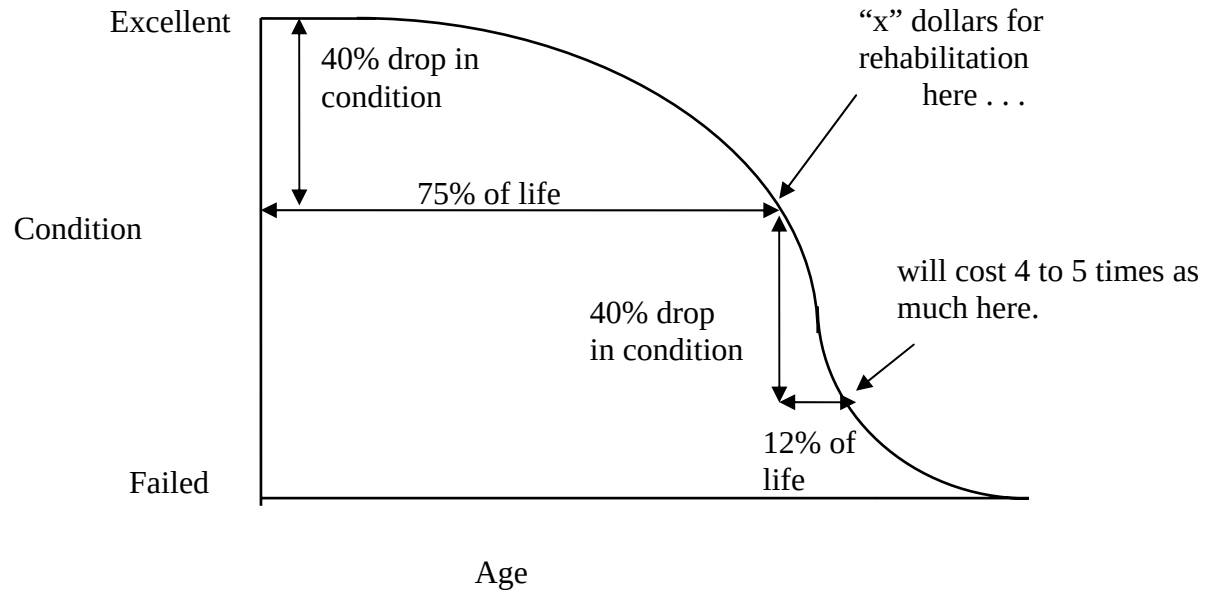


Figure 1. Pavement condition versus cost of repair.

This report contains the results of the 2001 pavement evaluation, as well as a diskette containing the Micro PAVER pavement management software database developed during this project.

Scope of Work

This project included the collection of pavement history information, the development of CAD maps, the evaluation of current pavement condition, and the development of a computerized APMS. The APMS was then used to prepare a 5-year pavement maintenance and rehabilitation program at the state level for the GDOT and the FAA to use as a planning tool.

Individual reports, such as this one, were prepared for each of the project airports to communicate the results of the pavement inspections. A statewide analysis report and an executive summary report were also developed. The statewide analysis report presents the overall results of the study and provides detailed recommendations for future maintenance and rehabilitation actions at the airports. The executive summary presents an overview of the current condition of the State's airports and a summary of the recommended 5-year maintenance and rehabilitation program.

Project Results

Pavement Inventory

Middle Georgia Regional Airport has over 3,968,470 square feet of pavement. Figure 2 shows the area of the pavement system, broken out by pavement use (runway, taxiway, and apron). This figure also shows the average age of the pavements.

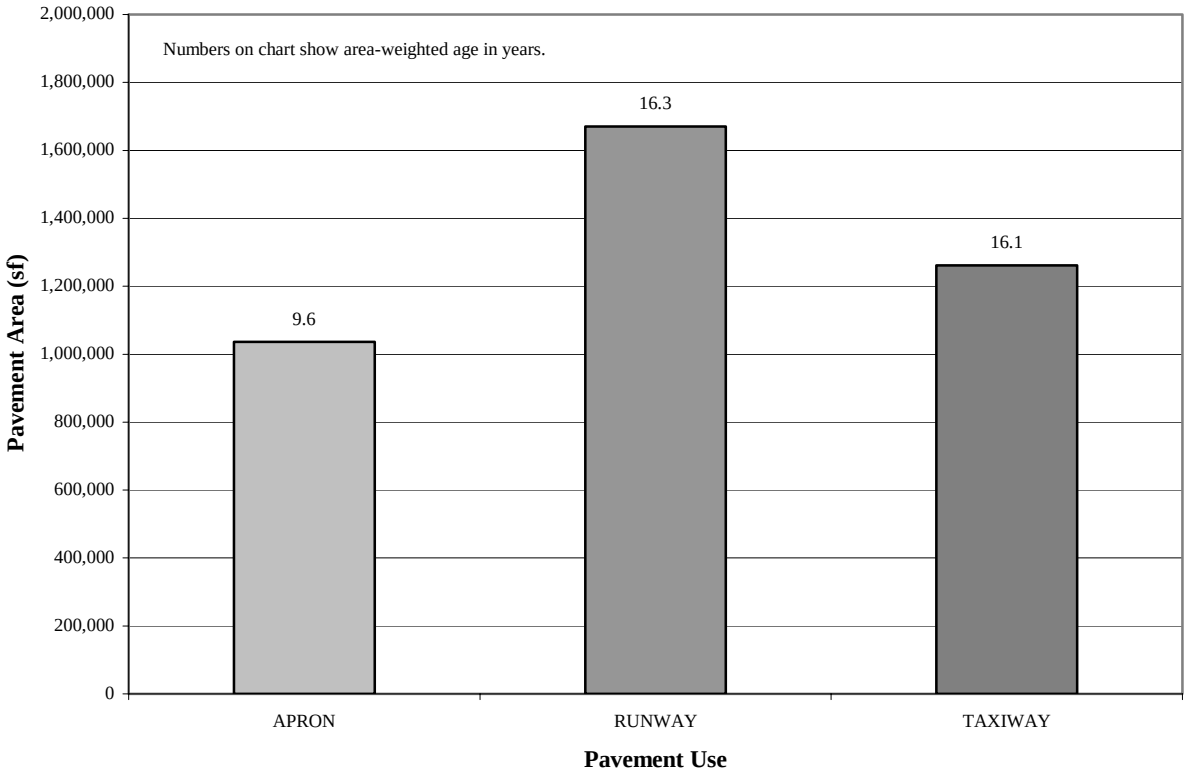


Figure 2. Pavement inventory.

Figure 3 is a network definition map that identifies the pavements at Middle Georgia Regional Airport evaluated during this project. This map shows how the pavement network was divided into branches, sections, and sample units for pavement management purposes. It also shows the nomenclature used in the Micro PAVER pavement management database to identify the different pavement areas. Finally, the map summarizes the construction history information compiled during the records review and identifies the areas inspected during the visual survey.

Figure 3. Network Definition Map (11 x 17 except for very large airports that need larger map folded into a map sleeve.

A branch is a single entity that serves a distinct function. For example, a runway is considered a branch because it serves a single function (allowing aircraft to take off and land). Taxiways and aprons are also separate branches.

A branch may be further divided into sections. Traditionally, sections are defined as parts of the branch that share common attributes, such as cross-section, last construction date, traffic level, and performance. Using the traditional approach, if a runway was built in 1968 and then extended in 1984, it would be comprised of two separate sections. A modified approach to defining pavement sections has become increasingly popular with state aviation agencies in recent years and has been adopted by GDOT. The basic premise of this approach is that the section is considered the management unit of the APMS, and that it should represent a pavement area where it is realistic to expect that pavement maintenance or rehabilitation would be undertaken. For example, if a runway was built in 1968 and then extended in 1984, in the database this runway would be represented by a single section, even though there are two distinct construction periods. This is because in the future if repair work is scheduled for that runway it is probable that it will be programmed for the entire runway and not just a portion of it.

To estimate the overall condition of each pavement section, each section is subdivided into sample units. Portions of these sample units are then evaluated during pavement inspections and this information is extrapolated to predict the condition of the section as a whole.

PCI Procedure

APTech inspected the pavements at Middle Georgia Regional Airport using the PCI procedure. This procedure is described in FAA AC 150/5380-6 and ASTM Standard D5340. A network-level sampling rate was used during the inspection, and the sample units inspected are identified on the network definition map shown in Figure 3.

The PCI provides a numerical indication of overall pavement condition, as illustrated in Figure 4. The types and amounts of deterioration are used to calculate the PCI value of the section. The PCI ranges from 0 to 100, with 100 representing a pavement in excellent condition. It should be noted that a PCI value is based on visual signs of pavement deterioration and does not provide a measure of structural capacity.

Typical Pavement Surface	PCI
	100
	60
	5

Figure 4. Visual representation of PCI scale.

In general terms, pavements with a PCI of 60 to 100 that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing and surface treatments. Pavements with a PCI of 40 to 60 may require major rehabilitation, such as an overlay. Often, when the PCI is less than 40, reconstruction is the only viable alternative due to the substantial damage to the pavement structure. Figure 5 illustrates how the appropriate repair type varies with the PCI of a pavement section.

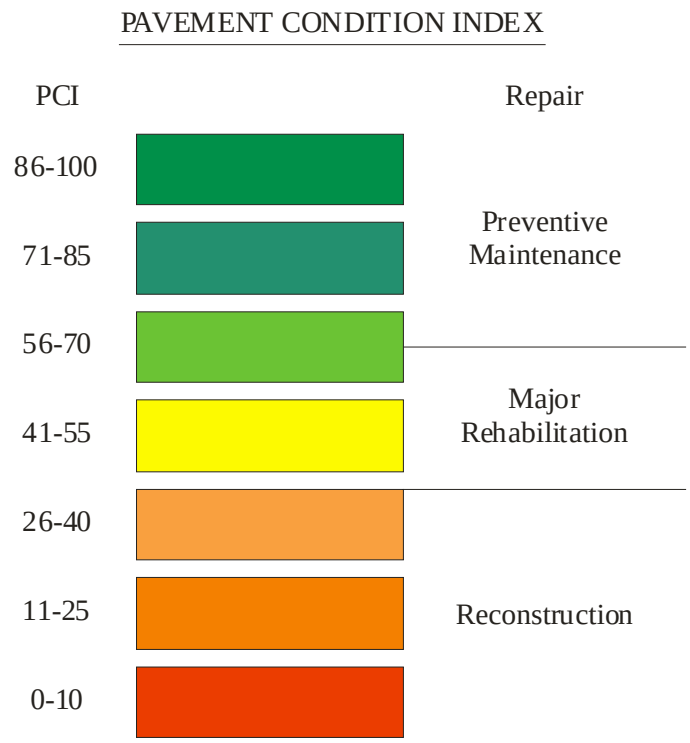


Figure 5. PCI versus repair type.

The types of distress identified during the PCI inspection provide insight into the cause of pavement deterioration. PCI distress types are characterized as load-related (such as alligator cracking on hot-mix asphalt [HMA] pavements or corner breaks on portland cement concrete [PCC] pavements), climate/durability-related (such as weathering [climate-related on HMA pavements) and D-cracking [durability-related on PCC pavements]), and other (distress types that cannot be attributed solely to load or climate/durability). Understanding the cause of distress helps in selecting a rehabilitation alternative that corrects the cause and thus eliminates its recurrence.

Appendix A contains tables for asphalt and concrete pavements indicating the typical types of distresses that may be identified during a PCI survey, the likely cause of each distress type, and feasible maintenance strategies for addressing each distress type.

Inspection Comments

The inspection of Middle Georgia Regional Airport was completed on November 14, 2001. Twenty-five sections were defined during this inspection.

Runway 13-31

Runway 13-31 was divided into three sections.

R1331MGRA-10C consists of the center 100 feet of the runway. This portion is in good condition with low-severity, unsealed, longitudinal and transverse (L&T) cracking present. R1331MGRA-10N, the north 25 feet of the runway, and R1331MGRA-10S, the south 25 feet of

the runway, both contain medium-severity L&T cracking and are in fair condition. All sections have had a surface treatment applied on them that is starting to show signs of wear in areas.

Runway 5-23

Runway 5-23 was divided into six sections. Each section is 50 feet wide.

R523MGRA-10C and R523MGRA-20C are in good condition with low-severity rutting and L&T cracking found throughout. Some vegetation growth was present in the cracking. R523MGRA-10N, R523MGRA-10S, R523MGRA-20N and R523MGRA-20S are all in fair condition with increased amounts of medium-severity L&T cracking present. Vegetation growth was also found in this cracking.

Taxiway A

Taxiway A, adjacent to the apron area, is defined as one section. TAMGRA-10 is in fair condition with low-severity, unsealed, L&T and block cracking found throughout the section.

Taxiway B

Three sections are defined in Taxiway B.

TBMGRA-10 connects Taxiway A to Runway 13-31. It is in fair condition with low-severity, unsealed, L&T cracking observed.

TBMGRA-20 runs from Runway 13-31 to TBMGRA-30 and is in very good condition. Low-severity, unsealed, L&T cracking was found in this section. The majority of the cracking was found along paving lane joints.

TBMGRA-30 extends to Runway 5-23 and is fair condition. Medium-severity L&T cracking and bleeding were observed in this section. Vegetation growth was present in much of the cracking.

Taxiway B3

Taxiway B3, defined as one section, connects Taxiway A to Runway 13-31. TB3MGRA-10 is in good condition with moderate amounts of medium-severity L&T cracking and isolated areas of swell.

Taxiway C

Taxiway C was divided into two sections.

TCMGRA-10 connects Taxiway A to the 23 end of Runway 5-23 and is in fair condition with large quantities of low-severity, unsealed, L&T, block and alligator cracking observed.

TCMGRA-20 runs from the approach end of Runway 23 to the approach end of Runway 31. This section is in good condition with low-severity, unsealed, L&T cracking found throughout.

Taxiway GA

Taxiway GA, defined by one section, is in very good condition with small amounts of L&T and alligator cracking observed throughout.

Apron

The apron area was divided into eight sections.

A01MGRA-10 is in fair condition with low-severity block and L&T cracking present throughout the section.

A01MGRA-20 is in good condition with low-severity, sealed, L&T cracking and occasional areas of swell.

A01MGRA-30, A01MGRA-40 and A01MGRA-50 were all recently rehabilitated and are in excellent condition. Isolated small amounts of low-severity L&T cracking were found scattered throughout each section with the exception of A01MGRA-30 which was found free of any distress.

A01MGRA-60 is in very good condition with low-severity, unsealed, L&T cracking and isolated raveling and weathering being observed.

A01MGRA-70 is in fair condition with significant amounts of low-severity, unsealed, block cracking and medium-severity L&T cracking present.

A01MGRA-80 is in good condition. Low-severity, unsealed, L&T cracking and medium-severity raveling and weathering were found in this section. In addition, a surface treatment has been applied over the area.

Overall Pavement Condition

The 2001 area-weighted condition of Middle Georgia Regional Airport is 71, with conditions ranging from 47 to 100 [on a scale of 0 (failed) to 100 (excellent)]. Figures 6 and 7 provide graphs summarizing the overall condition of the pavements at Middle Georgia Regional Airport. Figure 8 is a map that displays the condition of the pavements evaluated. Table 1 summarizes the results of the pavement evaluation.

Appendix B presents photographs taken during the PCI inspection, and Appendix C contains a detailed inspection report. The detailed inspection report provides information on the quantity of the different types and severities of distresses observed during the visual survey.

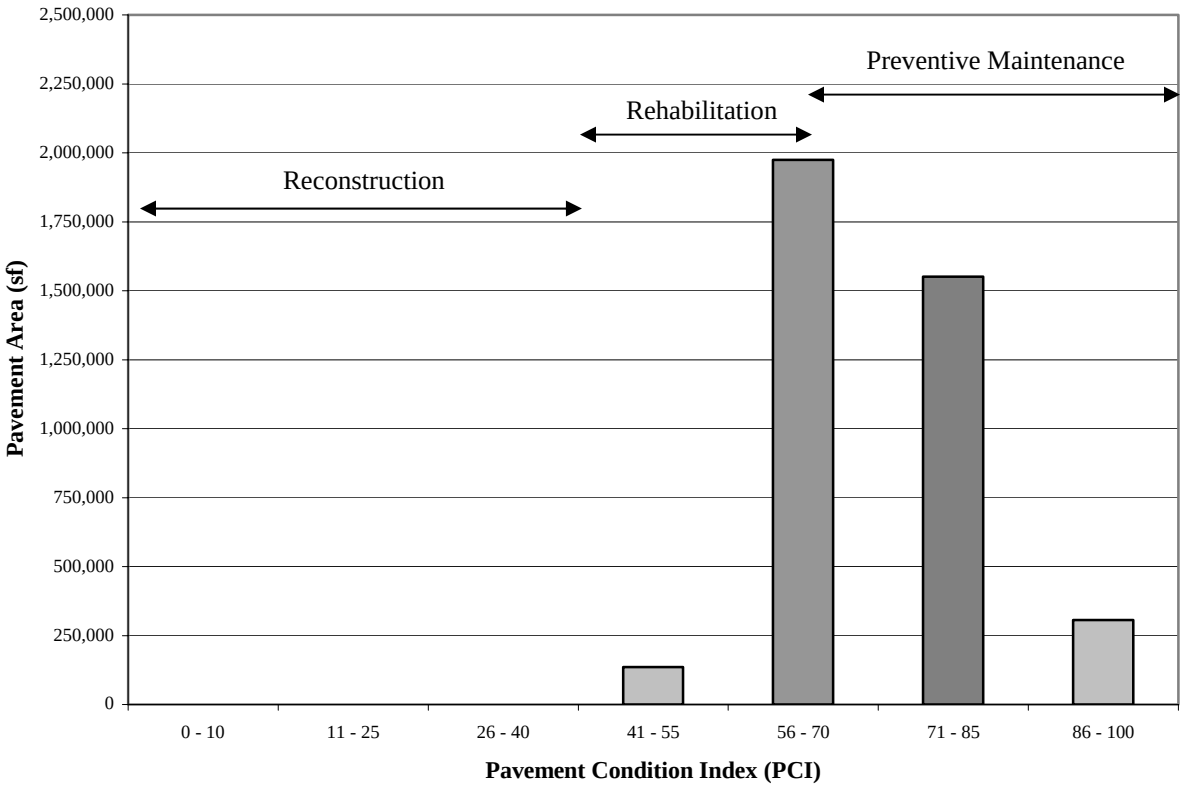


Figure 6. Condition distribution.

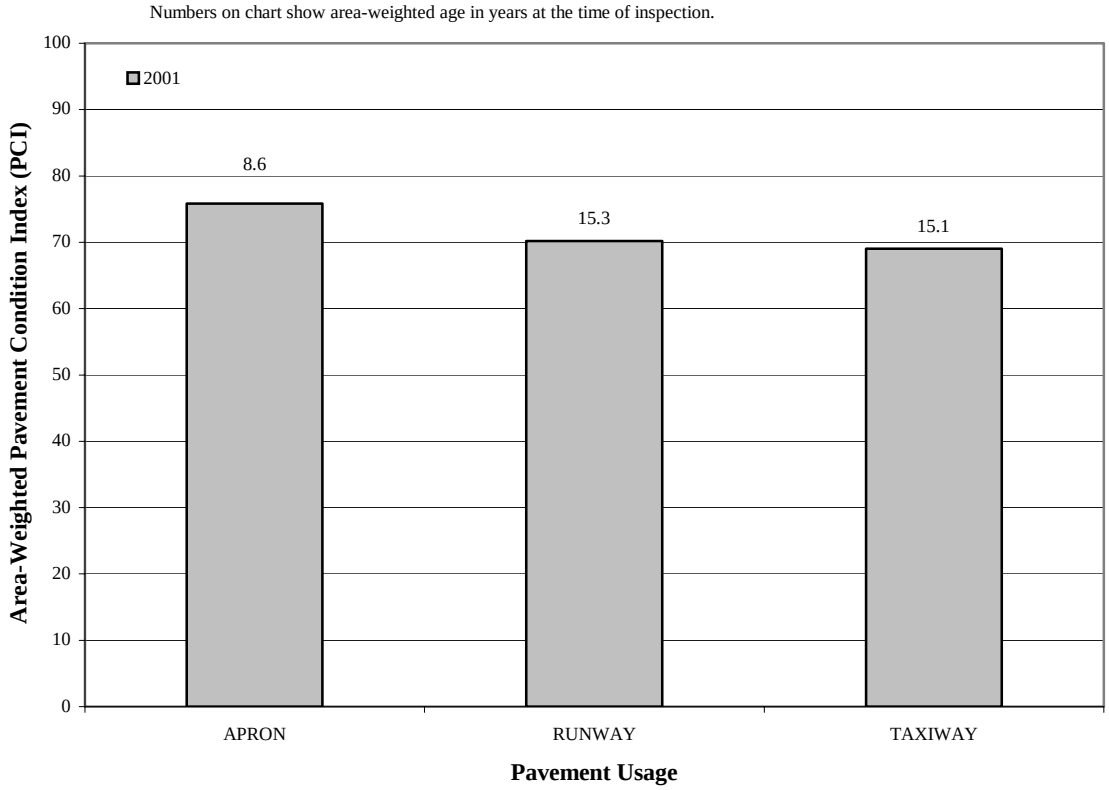
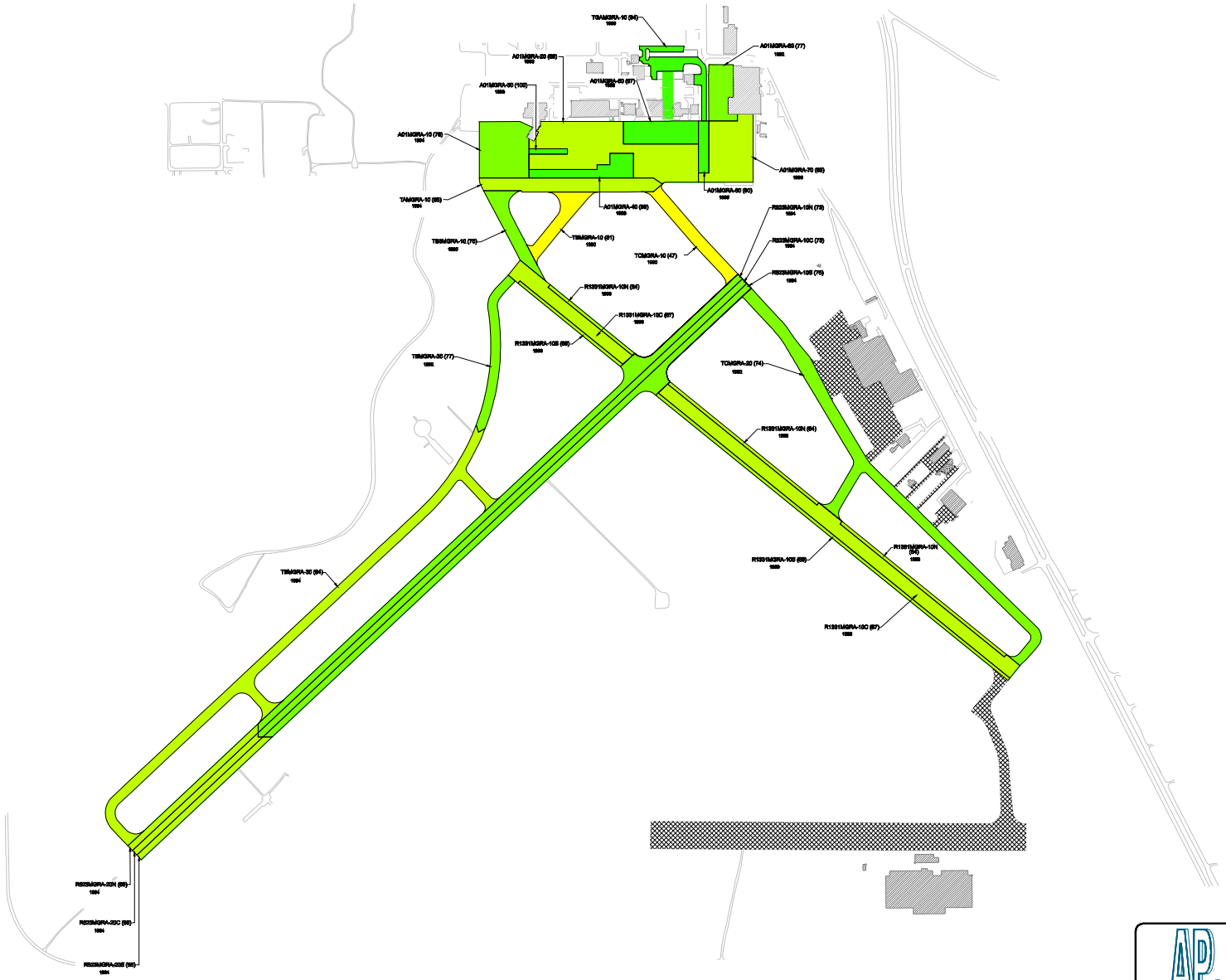


Figure 7. Condition by use.



Applied Pavement Technology, Inc.

AGENCY: Georgia Department of Transportation
Aviation Programs

LOCATION: Middle Georgia Regional Airport
Macon, Georgia

PAGE TITLE: Pavement Condition Map

PROJECT DATE	DRAWN DATE	PROJECT MANAGER	JOB NUMBER
19-Dec-02	19-Dec-02	MRB	00-060-AI
DRAWING SCALE	LAST MODIFIED DATE	REVIEWED BY	DRAWN BY
1" = 400'	9/20/2002	AMR	KMP

FILENAME: Middle Georgia Regional Airport.dwg
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Figure 8. INSERT PCI MAP
(11 x 17)

Table 1. 2001 pavement inspection results.

MIDDLE GEORGIA REGIONAL AIRPORT								
BRANCH ID	SECTION ID	SURFACE TYPE [1]	SECTION AREA (sf)	LCD [2]	2001 PCI	% Distress due to:		DISTRESS TYPES [5]
						LOAD [3]	CLIMATE OR DURABILITY [4]	
A01MGRA	10	AAC	167,742	1994	76	0	97	BLOCK CR, SWELLING, L & T CR, PATCHING
A01MGRA	20	AAC	385,815	1990	69	0	82	WEATH/RAVEL, BLOCK CR, L & T CR, OIL SPILLAGE, SWELLING
A01MGRA	30	AAC	12,000	1998	100	0	0	N/A
A01MGRA	40	AAC	79,420	1998	99	0	75	SWELLING, L & T CR
A01MGRA	50	AAC	103,271	1998	97	0	100	L & T CR
A01MGRA	60	AAC	32,292	1998	90	0	100	L & T CR, WEATH/RAVEL
A01MGRA	70	AAC	175,731	1990	63	10	88	SWELLING, ALLIGATOR CR, BLOCK CR, L & T CR
A01MGRA	80	AAC	80,303	1990	77	29	59	WEATH/RAVEL, PATCHING, L & T CR, ALLIGATOR CR, DEPRESSION
R1331MGRA	10C	AAC	483,554	1988	67	15	85	PATCHING, ALLIGATOR CR, L & T CR
R1331MGRA	10N	AAC	100,693	1988	64	0	97	L & T CR, SWELLING, WEATH/RAVEL
R1331MGRA	10S	AAC	113,000	1988	69	0	98	SWELLING, L & T CR, PATCHING
R523MGRA	10C	AAC	259,000	1984	73	0	100	WEATH/RAVEL, L & T CR
R523MGRA	10N	AAC	256,750	1984	73	0	100	WEATH/RAVEL, L & T CR
R523MGRA	10S	AAC	256,750	1984	76	0	100	L & T CR
R523MGRA	20C	AAC	66,000	1984	68	39	61	RUTTING, L & T CR
R523MGRA	20N	AAC	67,500	1984	65	0	100	WEATH/RAVEL, L & T CR
R523MGRA	20S	AAC	67,500	1984	68	0	100	L & T CR
TAMGRA	10	AC	147,730	1994	66	0	97	BLOCK CR, WEATH/RAVEL, SWELLING, L & T CR
TB3MGRA	10	AC	82,500	1990	76	0	97	L & T CR, SWELLING
TBMGRA	10	AAC	66,250	1990	51	33	63	BLOCK CR, RUTTING, ALLIGATOR CR, SWELLING, L & T CR
TBMGRA	20	AAC	89,375	1990	77	0	100	L & T CR, WEATH/RAVEL
TBMGRA	30	AAC	367,500	1984	64	0	76	BLEEDING, L & T CR
TCMGRA	10	AAC	70,000	1980	47	27	71	L & T CR, SWELLING, WEATH/RAVEL, ALLIGATOR CR, BLOCK CR
TCMGRA	20	AAC	358,750	1980	74	15	85	ALLIGATOR CR, L & T CR, PATCHING

Table 1 (continued). 2001 pavement inspection results.

BRANCH ID	SECTION ID	SURFACE TYPE [1]	SECTION AREA (sf)	LCD [2]	2001 PCI	% Distress due to:		DISTRESS TYPES [5]
						LOAD [3]	CLIMATE OR DURABILITY [4]	
TGAMGRA	10	AC	79,044	1999	94	51	49	PATCHING, ALLIGATOR CR, L & T CR

NOTES:

[1] See Figure 3 for the location of the branch.

[2] AC = asphalt cement concrete; AAC = asphalt overlay on AC; PCC = portland cement concrete; APC = asphalt overlay on PCC.

[3] LCD = last construction date.

[4] Distress due to load includes those distresses attributed to a structural deficiency in the pavement, such as alligator (fatigue) cracking, rutting, or shattered concrete slabs.

[5] Distress due to climate or durability includes those distresses attributed to either the aging of the pavement and the effects of the environment (such as weathering and raveling or block cracking in asphalt pavements) or to a materials-related problem (such as durability cracking in a concrete pavement).

[6] L & T CR = longitudinal and transverse cracking.

5-Year Pavement Maintenance and Rehabilitation Recommendations

As part of the statewide analysis, a 5-year pavement maintenance and rehabilitation program was developed for Middle Georgia Regional Airport. The initial steps in generating this program were developing maintenance policies and determining unit cost information for maintenance and rehabilitation actions. A copy of this information is provided in Appendix D. Please note that this information was developed in conjunction with the GDOT and is of a general nature for the entire state.

For purposes of this analysis, pavement repair was categorized as follows:

- major rehabilitation (reconstruction, overlay), and
- localized preventive maintenance (a preventive maintenance action that is applied only to a distressed area, such as crack sealing or patching).

Many budget scenarios were investigated during the statewide analysis, and the results of those may be found in the statewide detailed analysis report. For the purposes of this report, however, only the results of the unlimited budget scenario (where all identified projects are funded) are presented. The analysis results identify those pavement areas that are predicted to need major rehabilitation within the next 5 years, as well as those recommended for preventive maintenance actions.

An unlimited budget was used in the analysis with the goal of maintaining the pavement above its critical PCI value. For runway pavements this value is 70. The rest of the pavements on the airport were assigned a value of 65. In general, preventive maintenance is recommended for pavements with a PCI above the critical value while major rehabilitation is recommended for pavements that have a PCI below the critical value. An inflation rate of 3 percent was used during the analysis.

A summary of the 5-year pavement maintenance and rehabilitation program is presented in Table 2. Detailed information on the recommendations for localized maintenance in Year 1 of the analysis is contained in Appendix E and Appendix F. In Year 1, all distresses observed during the inspection are considered in determining viable localized maintenance projects. Preventive maintenance recommendations that are identified in subsequent years only address crack sealing those cracks in asphalt pavements that were rated as low severity at the time of inspection.

Note that these recommendations are based upon a broad network level analysis and are meant to provide the Airport with an indication of the type of pavement-related work required during the next 5 years. Further engineering investigation will need to be performed to identify exactly which repair action is most appropriate and to more accurately estimate the cost of such work. In addition, the cost estimates provided were based on a statewide policy and each airport should adjust the maintenance policies and unit costs to match its own approach to pavement maintenance and to reflect local costs.

Major rehabilitation projects may be clustered in the first year of the analysis. Obviously, for economic and operational reasons, this work will often need to be distributed over several years. It is important to remember that regardless of the recommendations presented within this report, the Airport is responsible for repairing pavements where existing conditions pose a hazard to safe operations.

Table 2. 5-year program under an unlimited funding analysis scenario.

Branch[1]	Section	Year	Type of Repair[2]	Estimated Cost[3]
R1331MRGA	10C	2002	Major M&R	$795,184
R1331MRGA	10N	2002	Major M&R	$165,585
R1331MRGA	10S	2002	Major M&R	$185,824
R523MRGA	10C	2002	Preventive	$3,739
R523MRGA	10N	2002	Preventive	$13,441
R523MRGA	10S	2002	Preventive	$15,036
R523MRGA	20C	2002	Major M&R	$108,534
R523MRGA	20N	2002	Major M&R	$111,001
R523MRGA	20S	2002	Major M&R	$111,001
TB3MGRA	10	2002	Preventive	$5,981
TBMGRA	10	2002	Major M&R	$220,909
TBMGRA	30	2002	Major M&R	$604,338
TCMGRA	10	2002	Major M&R	$233,413
TCMGRA	20	2002	Preventive	$16,175
A01MGRA	10	2002	Preventive	$5,657
A01MGRA	70	2002	Major M&R	$288,982
A01MGRA	80	2002	Preventive	$5,992
TAMGRA	10	2003	Major M&R	$250,224
A01MGRA	20	2003	Major M&R	$653,490
R523MRGA	10C	2006	Preventive	$99,300
R523MRGA	10N	2006	Preventive	$90,048
R523MRGA	10S	2006	Preventive	$79,568
TB3MGRA	10	2006	Preventive	$16,461
TBMGRA	20	2006	Preventive	$31,114
TCMGRA	20	2006	Preventive	$91,405
TGAMGRA	10	2006	Preventive	$1,678
A01MGRA	10	2006	Preventive	$63,170
A01MGRA	50	2006	Preventive	$1,934
A01MGRA	60	2006	Preventive	$777
A01MGRA	80	2006	Preventive	$10,162

[1]See Figure 3 for the location of the branch.

[2]Major Rehabilitation: overlay, mill and overlay, reconstruction, and so on;
Preventive Maintenance: crack sealing, patching, joint resealing, and so on.

[3]Cost estimates based on broad statewide policy and should be adjusted to reflect local costs.

Summary

This report documents the results of the pavement evaluation conducted at Middle Georgia Regional Airport. During a visual inspection of the pavements in 2001, it was found that the overall condition of the pavement network is a PCI of 71. A 5- year pavement repair program was generated for the Airport, which revealed that approximately $4,280,123 needs to be expended on the pavement system in order to maintain and improve its condition. If this

program is followed, over the next 5 years the pavement system will improve from an overall area-weighted PCI value of 71 to approximately a PCI of 84. If money is not expended on pavement maintenance and rehabilitation, it is predicted that the overall area-weighted PCI of the pavement network will drop from 71 to 63.

APPENDIX A

CAUSE OF DISTRESS TABLES

Table A-1. Cause of pavement distress, asphalt-surfaced pavements.

Distress Type	Probable Cause of Distress	Feasible Maintenance Strategies
Alligator Cracking	Fatigue failure of the asphalt concrete surface under repeated traffic loading	If localized, partial- or full-depth asphalt patch. If extensive, major rehabilitation needed.
Bleeding	Excessive amounts of asphalt cement or tars in the mix and/or low air void content	Spread heated sand, roll, and sweep. Another option is to plane excess asphalt. Or, remove and replace.
Block Cracking	Shrinkage of the asphalt concrete and daily temperature cycling; it is not load associated	At low severity levels, crack seal and/or surface treatment. At higher severities, consider overlay.
Corrugation	Traffic action combined with an unstable pavement layer	If localized, mill. If extensive, remove and replace.
Depression	Settlement of the foundation soil or can be "built up" during construction	Patch.
Jet Blast	Bituminous binder has been burned or carbonized	Patch.
Joint Reflection	Movement of the concrete slab beneath the asphalt concrete surface because of thermal and moisture changes	At low and medium severities, crack seal. At higher severities, especially if extensive, consider overlay.
Longitudinal and Transverse Cracking	Cracks may be caused by 1) poorly constructed paving lane joint, 2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or 3) reflective crack caused by cracks in an underlying PCC[1] slab	At low and medium severity levels, crack seal. At higher severities, especially if extensive, consider overlay options.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents	Patch.
Patching	N/A	Replace patch if deteriorated.
Polished Aggregate	Repeated traffic applications	Aggregate seal coat is one option. Could also groove or mill. Overlay is another option.
Raveling and Weathering	Asphalt binder may have hardened significantly	Patch if isolated. If low-severity, consider surface treatment if extensive. At medium and high severity levels, consider major rehabilitation if extensive.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads	Patch medium and high severity levels if localized. If extensive, consider major rehabilitation.
Shoving	Where PCC pavements adjoin flexible pavements, PCC "growth" may shove the asphalt pavement	Mill and patch as needed.
Slippage Cracking	Low strength surface mix or poor bond between the surface and next layer of pavement structure	Partial- or full-depth patch.
Swelling	Usually caused by frost action or by swelling soil	Patch if localized. Major rehabilitation if extensive.

[1]PCC: portland cement concrete

Table A-2. Cause of pavement distress, portland cement concrete pavements.

Distress Type	Probable Cause of Distress	Feasible Maintenance Strategies
Blow-Up	Incompressibles in joints	Partial- or full-depth patch. Slab replacement.
Corner Break	Load repetition combined with loss of support and curling stresses	Seal cracks at low severity. Full-depth patch.
Cracks	Combination of load repetition, curling stresses, and shrinkage stresses	Seal cracks. At high severity, may need full-depth patch or slab replacement.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles	Full-depth patch if present on small amount of slab. At higher severity levels, once it has appeared on most of slab, slab replacement.
Joint Seal Damage	Stripping of joint sealant, extrusion of joint sealant, weed growth, hardening of the filler (oxidation, loss of bond to the slab edges, or absence of sealant in joint	Replace joint seal.
Patching (Small and Large)	N/A	Replace patches if deteriorated.
Popouts	Freeze-thaw action in combination with expansive aggregates	Monitor.
Pumping	Poor drainage, poor joint sealant	Seal cracks and joints. Underseal is an option if voids have developed. Establish good drainage.
Scaling	Overfinishing of concrete, deicing salts, improper construction, freeze-thaw cycles, poor aggregate, and alkali-silica reactivity	At low severity levels, do nothing. At medium and high severity levels, partial-depth patches or slab replacement.
Settlement	Upheaval or consolidation	At higher severity levels, leveling patch or grind to restore smooth ride.
Shattered Slab	Load repetition	Replace slab.
Shrinkage	Setting and curing of the concrete	Monitor.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at joint combined with traffic loads	Partial-depth patch.

APPENDIX B

PHOTOGRAPHS

Overview of section R523MGRA-10C.

Overview of section R523MGRA-10N.

Overview of section R523MGRA-10S.

Overview of section R523MGRA-20C.

Overview of section R523MGRA-20N.

Overview of section R523MGRA-20S.

Overview of section R1331MGRA-10C.

Alligator cracking in section R1331MGRA-10C.

Overview of section R1331MGRA-10N.

L&T cracking in section R1331MGRA-10N.

Overview of section R1331MGRA-10S.

Overview of section TAMGRA-10.

Overview of section TBMGRA-10.

Overview of section TBMGRA-20.

Overview of section TBMGRA-30.

Bleeding in section TBMGRA-30.

Overview of section TB3MGRA-10.

Overview of section TCMGRA-10.

Block cracking in section TCMGRA-10.

Overview of section TCMGRA-20.

Overview of section TGAMGRA-10.

Patch in section TGAMGRA-10.

Overview of section A01MGRA-10.

Overview of section A01MGRA-20.

Overview of section A01MGRA-30.

Overview of section A01MGRA-40.

Overview of section A01MGRA-50.

Overview of section A01MGRA-60.

Overview of section A01MGRA-70.

Overview of section A01MGRA-80.

Raveling and weathering in section A01MGRA-80.

APPENDIX C

INSPECTION REPORT

APPENDIX D

MAINTENANCE POLICIES AND UNIT COSTS

Table D-1. GDOT's preventive maintenance policy, asphalt-surfaced pavements.

Distress Type	Severity Level	Maintenance Action
Alligator Cracking	Low	Monitor
	Medium	Patch (major rehabilitation if extensive)
	High	Patch (major rehabilitation if extensive)
Bleeding	N/A	Monitor (major rehabilitation required if skid resistance significantly impacted by the distress)
Block Cracking	Low	Monitor
	Medium	Crack Seal
	High	Crack Seal (major rehabilitation if extensive)
Corrugation	Low	Monitor
	Medium	Patch (major rehabilitation if extensive)
	High	Patch (major rehabilitation if extensive)
Depression	Low	Monitor
	Medium	Patch
	High	Patch
Jet Blast	N/A	Patch
Joint Reflection Cracking	Low	Monitor
	Medium	Crack Seal
	High	Crack Seal (major rehabilitation if extensive)
Longitudinal and Transverse Cracking	Low	Monitor
	Medium	Crack Seal
	High	Crack Seal (major rehabilitation if extensive)
Oil Spillage	N/A	AC Patch
Patching	Low	Monitor
	Medium	Monitor
	High	Patch
Polished Aggregate	N/A	Monitor (major rehabilitation required if skid resistance significantly impacted by the distress)
Raveling and Weathering	Low	Monitor (global preventive maintenance action such as surface treatment if extensive)
	Medium	Patch if localized
	High	Patch if localized
Rutting	Low	Monitor
	Medium	Patch (major rehabilitation if extensive)
	High	Patch (major rehabilitation if extensive)
Shoving	Low	Monitor
	Medium	Patch
	High	Patch
Slippage Cracking	N/A	Patch (major rehabilitation if extensive)
Swelling	Low	Monitor
	Medium	Patch
	High	Patch

Table D-2. GDOT's preventive maintenance policy, portland cement concrete pavements.

Distress Type	Severity Level	Maintenance Action
Blow-Up	Low	Patch
	Medium	Patch
	High	Patch
Corner Break	Low	Crack Seal
	Medium	Crack Seal
	High	Patch
Cracks	Low	Crack Seal
	Medium	Crack Seal
	High	Crack Seal
Durability Cracking	Low	Monitor
	Medium	Patch
	High	Slab Replacement
Joint Seal Damage	Low	Monitor
	Medium	Joint Seal
	High	Joint Seal
Patching	Low	Monitor
	Medium	Patch
	High	Patch
Popouts	N/A	Monitor
Pumping	N/A	Monitor
Scaling	Low	Monitor
	Medium	Slab Replacement
	High	Slab Replacement
Settlement	Low	Monitor
	Medium	Monitor
	High	Grinding
Shattered Slab	Low	Crack Seal
	Medium	Slab Replacement
	High	Slab Replacement
Shrinkage	N/A	Monitor
Spalling (Joint and Corner)	Low	Monitor
	Medium	Patch
	High	Patch

Table D-3. Unit costs for GDOT preventive maintenance actions, commercial service airports.

Maintenance Action	Unit Cost ($/sf)
Patching	2.55
Crack Sealing	3.20
Slab Replacement	5.10
Joint Sealing	4.00
Grinding	50.00

Table D-4. GDOT's unit costs based on PCI ranges, commercial service airports.

	PCI Range							
Work Type	0 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89	> 89
Major Rehabilitation: CS	$30.01/sy	$30.01/sy	$30.01/sy	$14.80/sy	$14.80/sy	$14.80/sy	$10.71/sy	$10.71/sy

APPENDIX E

YEAR 2002 MAINTENANCE PLAN
ORGANIZED BY SECTION

Table E-1. 2002 maintenance plan organized by section.

Plan Year	Network	Branch	Section	Distress Description	Severity	Work Description	Work Qty.	Work Unit	Unit Cost	Work Cost
2002	MACON-MCN	A01MGRA	10	L & T CR	M	Crack Sealing	1,768	LF	$3.20	$5,657
2002	MACON-MCN	A01MGRA	80	WEATH/RAVEL	M	Patching	2,350	SF	$2.55	$5,992
2002	MACON-MCN	R523MGRA	10C	L & T CR	M	Crack Sealing	1,168	LF	$3.20	$3,739
2002	MACON-MCN	R523MGRA	10N	L & T CR	M	Crack Sealing	4,200	LF	$3.20	$13,441
2002	MACON-MCN	R523MGRA	10S	L & T CR	M	Crack Sealing	4,699	LF	$3.20	$15,036
2002	MACON-MCN	TB3MGRA	10	L & T CR	M	Crack Sealing	1,869	LF	$3.20	$5,981
2002	MACON-MCN	TCMGRA	20	L & T CR	M	Crack Sealing	5,055	LF	$3.20	$16,175

APPENDIX F

YEAR 2002 MAINTENANCE PLAN
ORGANIZED BY REPAIR TYPE

Table F-1. 2002 maintenance plan organized by repair type.

Plan Year	Network	Branch	Section	Distress Description	Severity	Work Description	Work Qty.	Work Unit	Unit Cost	Work Cost
2002	MACON-MCN	A01MGRA	10	L & T CR	M	Crack Sealing	1,768	LF	$3.20	$5,657
2002	MACON-MCN	R523MGRA	10C	L & T CR	M	Crack Sealing	1,168	LF	$3.20	$3,739
2002	MACON-MCN	R523MGRA	10N	L & T CR	M	Crack Sealing	4,200	LF	$3.20	$13,441
2002	MACON-MCN	R523MGRA	10S	L & T CR	M	Crack Sealing	4,699	LF	$3.20	$15,036
2002	MACON-MCN	TB3MGRA	10	L & T CR	M	Crack Sealing	1,869	LF	$3.20	$5,981
2002	MACON-MCN	TCMGRA	20	L & T CR	M	Crack Sealing	5,055	LF	$3.20	$16,175
2002	MACON-MCN	A01MGRA	80	WEATH/RAVEL	M	Patching	2,350	SF	$2.55	$5,992