SAVANNAH INTERNATIONAL AIRPORT

PAVEMENT EVALUATION REPORT

JULY 2002

GEORGIA AVIATION SYSTEM PLAN

The preparation of this document was financed in part through a planning grant from the Federal Aviation Administration, Department of Transportation, under the provisions of the Airport and Airway Improvement Act of 1982, as amended. This financial commitment is not to be construed that the FAA approves of all the recommendations and does not represent a binding financial obligation to provide federal funding. The contents of this publication reflect the views of the author(s), who is responsible for the facts and accuracy of the data presented herein. The opinions, findings and conclusions in this publication are those of the author(s) and not necessarily those of the Department of Transportation, State of Georgia or the Federal Aviation Administration.

Savannah International Airport

Pavement Evaluation Report

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July 2002

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SAVANNAH INTERNATIONAL 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 Savannah International 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 Savannah International 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.

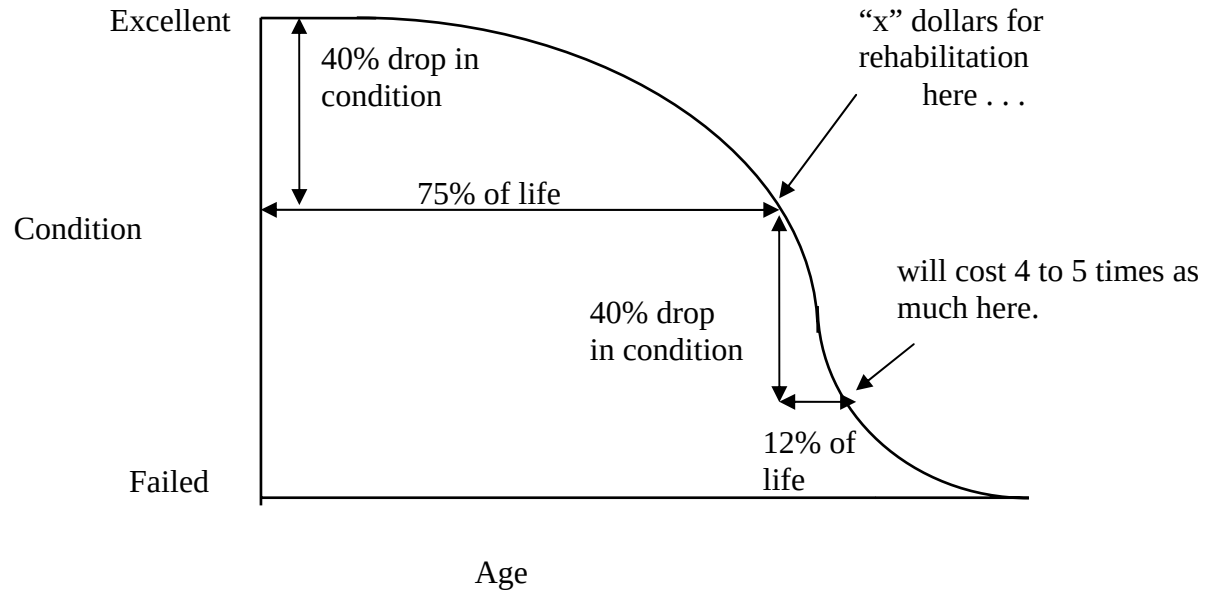


Figure 1. Pavement condition versus cost of repair.

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

Savannah International Airport has over 8,949,093 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.

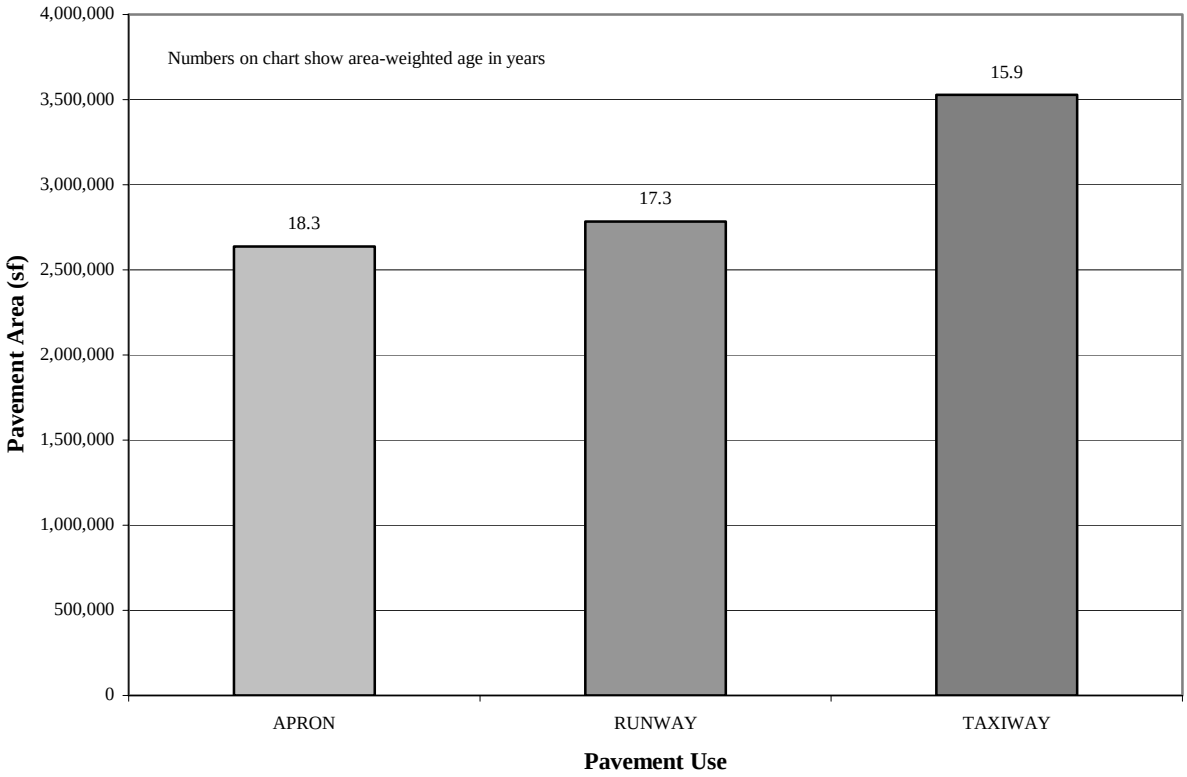


Figure 2. Pavement inventory.

Figure 3 is a network definition map that identifies the pavements at Savannah International 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 Savannah International 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.

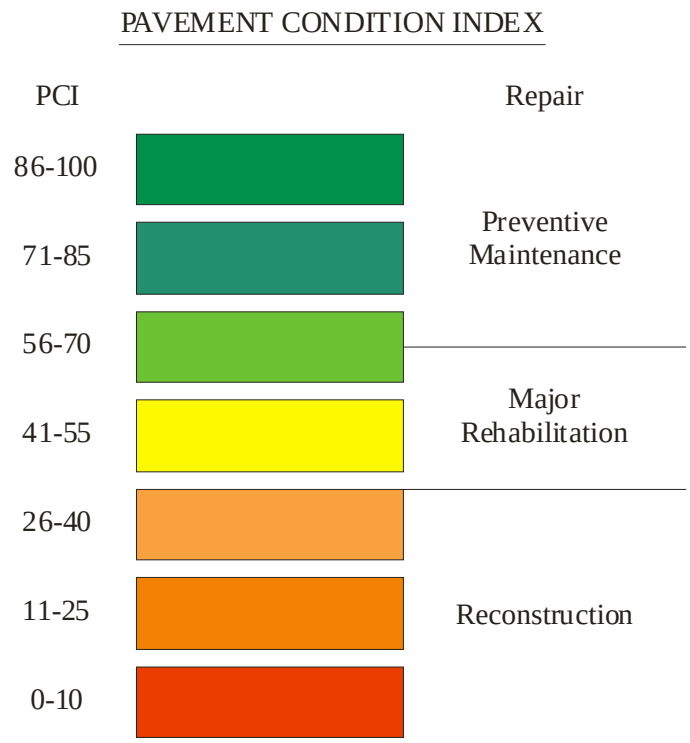


Figure 5. PCI versus repair type.

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 Savannah International Airport was completed on January 25th, 2002. Forty nine sections were defined during the inspection. For the purpose of this discussion, when referring to a section name, only the unique identifier for the section will be used. For example, R927SV-10N will be referred to as Section 10N in the discussion of Runway 9-27.

Runway 9-27

Three sections were defined in Runway 9-27. R927SV-10N, R927SV-10C, and R927SV-10S are all in excellent condition. Both R927SV-10N and R927SV-10S are asphalt surfaced pavements with small quantities of longitudinal and transverse (L&T) cracking. Some of this

cracking is adjacent to the portland cement concrete (PCC) pavement in the center of the runway and appears to be the precursor to shoving. No vertical deformation was measured however, and shoving was not called. R927SV-10C comprises the center 100' and is constructed of PCC. Isolated small patches were found in the section.

Runway 18-36

Six sections were defined in Runway 18-36. R1836SV-10W and R1836SV-10E are in poor condition with significant quantities of low and medium-severity L&T, joint reflective, and block cracking. Smaller amounts of swelling primarily associated with joint reflective cracking were found throughout the sections. Raveling and weathering was also observed in small amounts. R1836SV-10C is constructed of PCC. This section is in good condition with shrinkage cracking and patching observed throughout the section. At first glance the shrinkage cracking resembles durability cracking. However, through discussion with airport staff it was determined that this cracking appeared shortly after construction and has not progressed in size or severity since. The process that causes durability cracking usually will not halt and is rarely found in southern climates therefore shrinkage cracking was recorded. Low-severity joint seal damage was also found.

R1836SV-20W, R1836SV-20C, and R1836SV-20E are all in excellent condition and found to be free from any distress.

Taxiway A

Five sections were defined in Taxiway A and are all in excellent condition. TASV-10 and TASV-50 are new pavements and found to be free of any distress. TASV-20 runs from Taxiway A2 to Taxiway E. Small quantities of patching and spalling were found in the section. TASV-30 lies between Taxiway E and Runway 9-27. This section has similar distresses and quantities to TASV-20. TASV-40 lies between Runway 9-27 and Taxiway C. Low-severity joint seal damage, spalling, and patching were observed throughout the section.

Taxiway A1

One section was defined in Taxiway A1. TA1SV-10 was recently constructed and found to be free of any distress.

Taxiway A2

Two sections were defined in Taxiway A2. TA2SV-10 runs from the Terminal Apron to Taxiway A and is in very good condition. Significant quantities of pumping and low-severity joint seal damage were observed along with isolated amounts of longitudinal, transverse, and diagonal (LTD) and shrinkage cracking. TA2SV-20 is in excellent condition with isolated areas of patching and spalling observed.

Taxiway A3

One section was defined in Taxiway A3. TA3SV-10 is in excellent condition. However, significant quantities of pumping were found in several areas throughout the section. Smaller amounts of patching were also observed.

Taxiway A4

Taxiway A4 is located on the south side of the field and was recently constructed. One section, TA4SV-10, was defined during the inspection and found to be free of any distress.

Taxiway B

Two sections were defined in Taxiway B. TBSV-10 is located at the north end of field and lies between Runway 18-36 and the main portion Taxiway B. A small piece of pavement leading into the Gulfstream facility is also included in this section. This section is in good condition with significant amounts of low-severity L&T cracking found throughout the section. Isolated amounts of swelling associated with the L&T cracking were also found. Finally, substantial amounts of bleeding were observed throughout the section. TBSV-20 is constructed of PCC and contains the remaining pavement in Taxiway B. This section is in excellent condition with large amounts of shrink cracking and small quantities of patching and spalling being found throughout the section.

Taxiway B1

One section was defined in Taxiway B1. TB1SV-10 is in excellent condition with significant amounts of shrinkage cracking along with smaller quantities of patching being found throughout.

Taxiway B2

One section was also defined in Taxiway B2. This section is in fair condition with large amounts of low and medium-severity block cracking being found. Significant amounts of swelling associated with the cracking were also observed.

Taxiway C

Six sections were defined in Taxiway C. With the exception of TCSV-40, all other sections are in excellent condition. Low-severity joint seal damage, however, was found in TCSV-30. TCSV-40 is in good condition with significant quantities of shrinkage cracking and low-severity joint seal damage found throughout.

Taxiway C1

One section was defined in Taxiway C1. TC1SV-10 is in excellent condition. Isolated amounts of patching, shrinkage cracking, and spalling were found in the section.

Taxiway C2

One section was also defined in Taxiway C2. TC2SV-10 is in fair condition with large quantities of mostly low-severity L&T cracking and raveling and weathering observed throughout. Substantial amounts of swelling were also found.

Taxiway E

Four sections were defined in Taxiway E. With the exception of TESV-30, the other sections in the taxiway are in excellent condition. Patching was found in TESV-20 in moderate amounts. TESV-30 is in good condition with shrinkage cracking and patching being found throughout. Isolated amounts of spalling were also observed.

Taxiway F

At the time of the inspection, Taxiway F had not been constructed. This taxiway has been included in the database since it is to be constructed in 2002. It is assumed that when completed the pavement will be in excellent condition and free of any distress.

Taxiway GA

This taxiway was constructed recently and found to be free of any distress.

Terminal Apron

Three sections were defined in the Terminal Apron. All three sections are in excellent condition. Isolated amounts of patching and spalling were found in ATERMSV-10, while ATERMSV-20 and ATERMSV-30 were found to be free of any distress.

Air Cargo Apron

The Air Cargo Apron was scheduled for rehabilitation in 2002 at the time of inspection. It is assumed that when completed, the pavement will be in excellent condition and free of any distress.

Old Terminal Apron

One large section was defined in the Old Terminal Apron for the purposes of this inspection. AOLDTERMSV-10 is in excellent condition with isolated quantities of patching, spalling, and high-severity joint seal damage found throughout the section.

Signature North Apron

Two sections were defined in the Signature North Apron. ASIGNORSV-10 is in poor condition with large quantities of low and medium-severity L&T and joint reflective cracking being found throughout. Raveling and Weathering was observed over the entire pavement's surface. Isolated amounts of swelling and depression were also found. ASIGNORSV-20 is older PCC pavement

and is also in poor condition. Large quantities of spalling at all severities along with high-severity joint seal damage were found throughout the section. Moderate amounts of shattered slabs, patching, and shrinkage cracking were also observed.

Signature South Apron

Two sections were defined in the Signature South Apron. ASIGSTHSV-10 is similar in construction to ASIGNORSV-20 in the Signature North Apron. However, ASIGSTHSV-10 is in good condition with moderate quantities of spalling, patching, and shrinkage cracking found throughout. An occasional LTD crack was also found. ASIGSTHSV-20 is similar in construction and condition to ASIGNORSV-20 in the Signature North Apron.

Savannah Air Apron

One section was defined in the Savannah Air Apron. ASAVAIRSV-10 is in excellent condition with moderate amounts of patching found throughout. Isolated amounts of spalling, faulting, and shrinkage cracking were also observed.

Overall Pavement Condition

The 2001 area-weighted condition of Savannah International Airport is 90, with conditions ranging from 31 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 Savannah International 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.

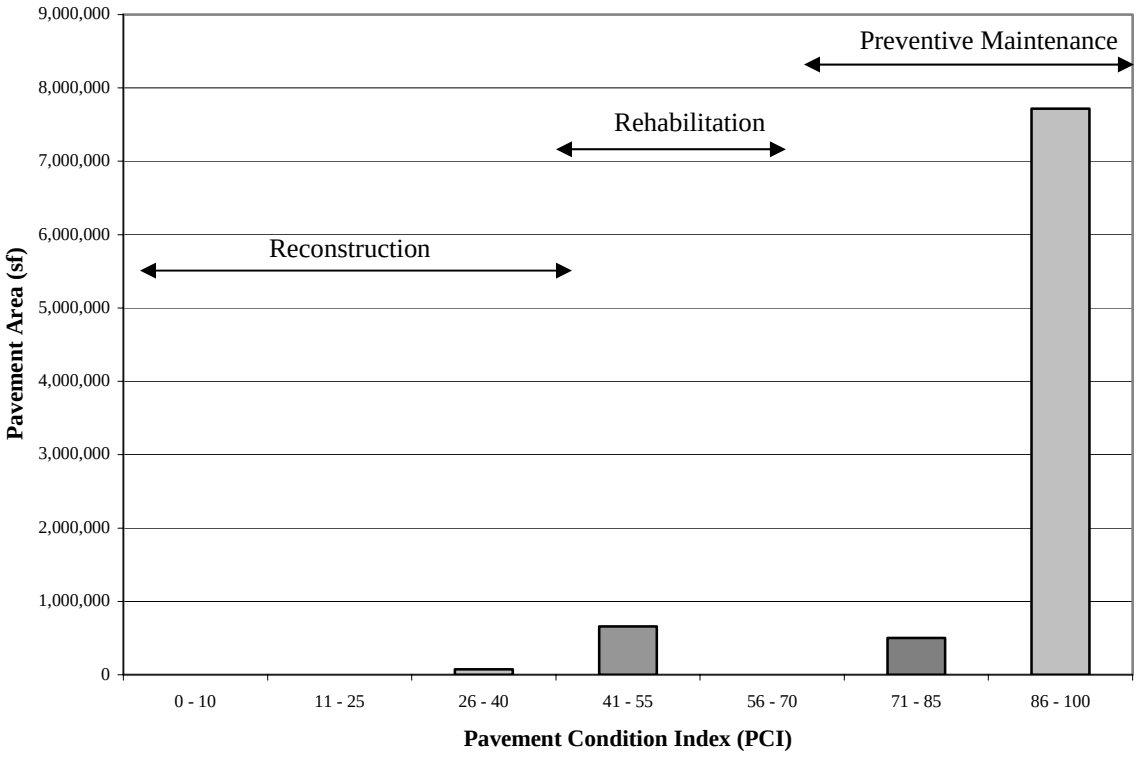


Figure 6. Condition distribution.

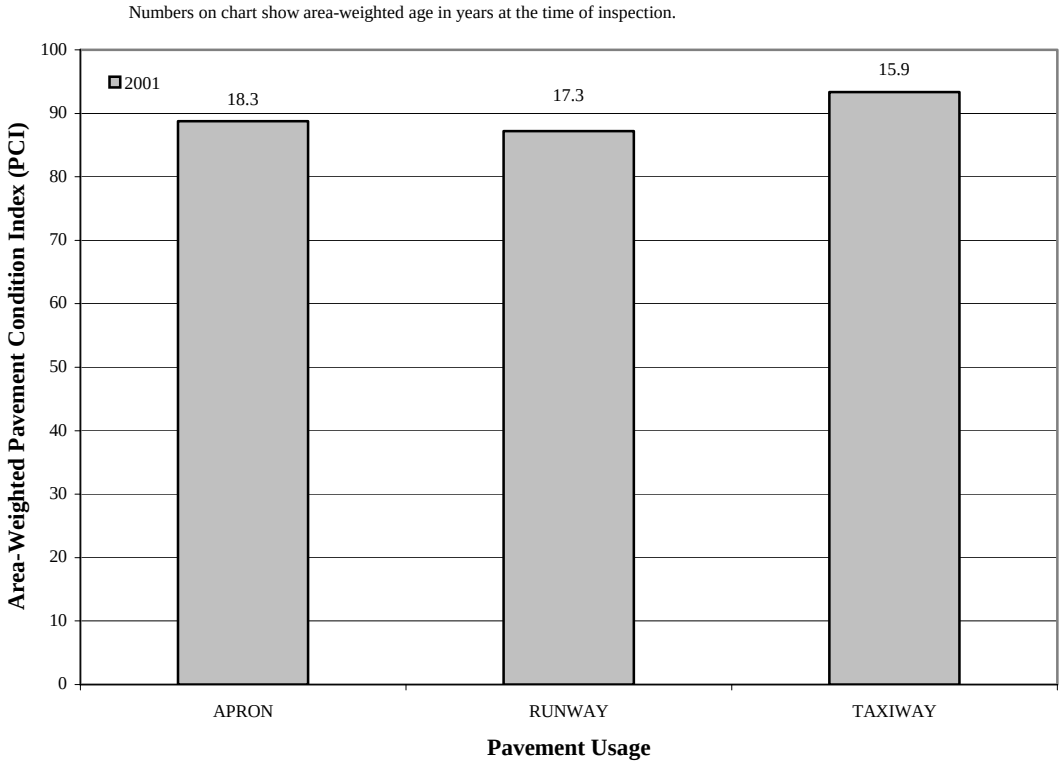
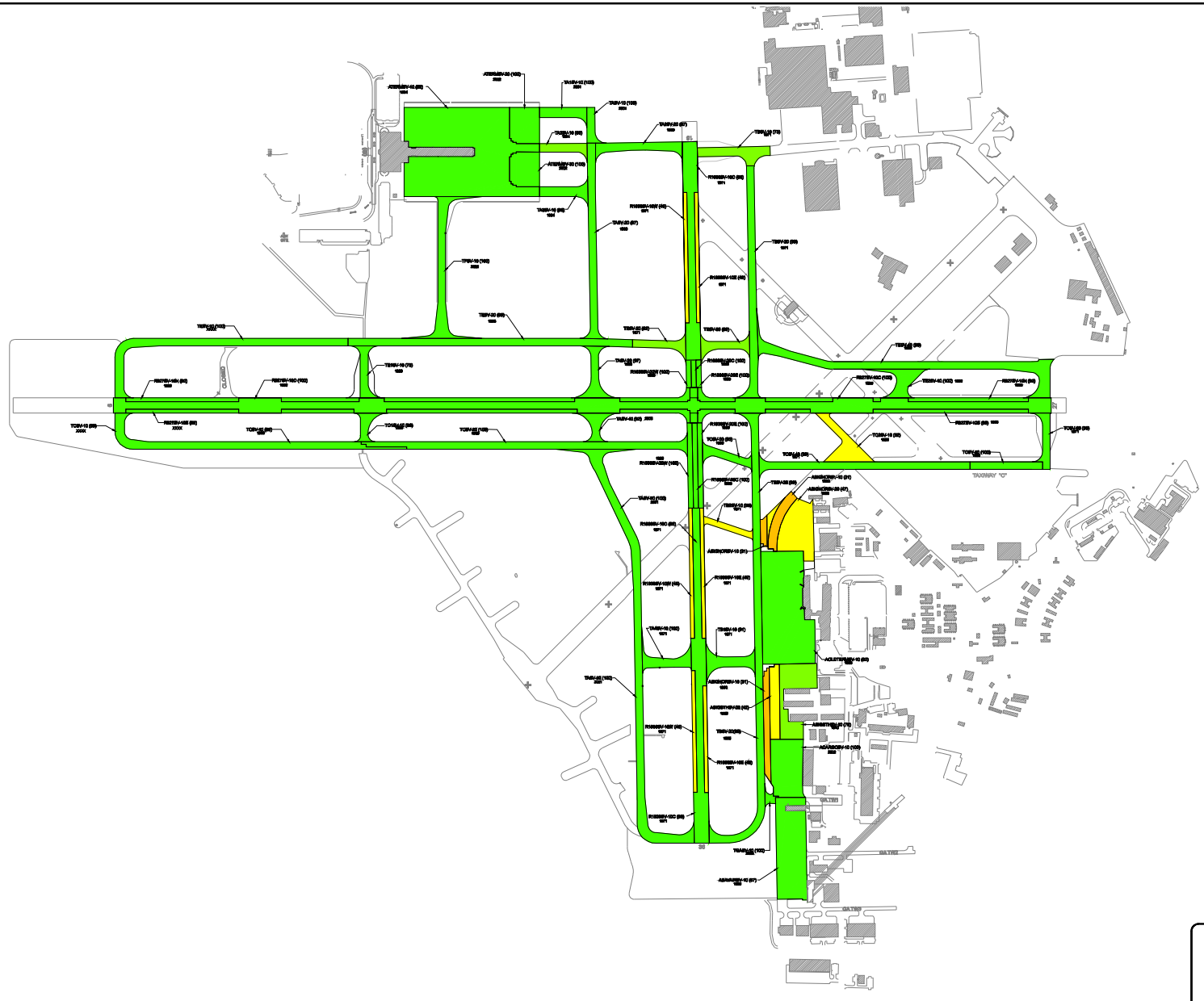


Figure 7. Condition by use.



Applied Pavement Technology, Inc.

AGENCY:	Georgia Department of Transportation Aviation Programs
LOCATION:	Savannah International Airport Savannah, Georgia
PAGE TITLE:	Pavement Condition Index Map

PROJECT DATE: 19-Dec-02	OBSERVATION DATE: 19-Dec-02	PROJECT MANAGER: MRB	JOB NUMBER: 00-060-J
DRAWING SCALE: 1" = 500'	LAST MODIFIED DATE: 7/31/2002	REVIEWED BY: KAC	DRAWN BY: KMP
FILENAME: Savannah International Airport.dwg		LAYOUT NUMBER/NUMBERS: 1	PAGE NUMBER: 1

Figure 8. INSERT PCI MAP
(11 x 17)

Table 1. 2001 pavement inspection results.

SAVANNAH INTERMATIONAL 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]	
ACARGOSV	10	PCC	183,046	2002	100	0	0	N/A
AOLDTERMSV	10	PCC	518,698	1985	92	0	80	SMALL PATCH, LARGE PATCH, JT SEAL DMG, CORNER SPALL, JOINT SPALL
ASAVAIRSV	10	PCC	292,500	1988	97	62	0	SMALL PATCH, JOINT SPALL, LINEAR CR, SHAT. SLAB, SHRINKAGE CR
ASIGNORSV	10	APC	75,285	1980	31	0	98	BLEEDING, SWELLING, WEATH/RAVEL, L & T CR, BLOCK CR, JT REF. CR, DEPRESSION
ASIGNORSV	20	PCC	182,054	1940	47	36	17	LINEAR CR, SHAT. SLAB, SHRINKAGE CR, LARGE PATCH, JT SEAL DMG, JOINT SPALL, FAULTING, CORNER SPALL, SMALL PATCH
ASIGSTHSV	10	PCC	219,954	1940	79	28	25	SMALL PATCH, SHRINKAGE CR, LINEAR CR, JT SEAL DMG, JOINT SPALL, CORNER SPALL, CORNER BREAK
ASIGSTHSV	20	APC	73,714	1980	42	0	98	L & T CR, WEATH/RAVEL, SWELLING, JT REF. CR, PATCHING, BLOCK CR
ATERMSV	10	PCC	892,500	1994	99	0	0	SMALL PATCH, LARGE PATCH, JOINT SPALL, SHRINKAGE CR
ATERMSV	20	PCC	103,000	2002	100	0	0	N/A
ATERMSV	30	PCC	96,000	2002	100	0	0	N/A
R1836SV	10C	PCC	1,087,500	1971	86	0	12	JT SEAL DMG, LARGE PATCH, SHRINKAGE CR, JOINT SPALL, SMALL PATCH
R1836SV	10E	APC	142,500	1971	49	0	98	WEATH/RAVEL, BLOCK CR, SWELLING, L & T CR, JT REF. CR
R1836SV	10W	APC	142,500	1971	46	0	98	L & T CR, SWELLING, JT REF. CR, BLOCK CR, WEATH/RAVEL
R1836SV	20C	PCC	56,250	1999	100	0	0	N/A
R1836SV	20E	PCC	56,250	1999	100	0	0	N/A
R1836SV	20W	PCC	56,250	1999	100	0	0	N/A
R927SV	10C	PCC	731,250	1998	100	0	0	SMALL PATCH
R927SV	10N	APC	257,813	1998	90	0	91	L & T CR, SWELLING
R927SV	10S	APC	254,063	1998	89	0	100	L & T CR

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]	
TA1SV	10	PCC	55,000	2001	100	0	0	N/A
TA2SV	10	PCC	48,750	1994	83	0	9	SMALL PATCH, SHRINKAGE CR, PUMPING, CORNER SPALL, JT SEAL DMG
TA2SV	20	PCC	71,250	1989	97	0	70	CORNER SPALL, SMALL PATCH, LARGE PATCH, JT SEAL DMG
TA3SV	10	PCC	55,000	1994	86	0	10	SHRINKAGE CR, JT SEAL DMG, PUMPING, SMALL PATCH
TA4SV	10	PCC	41,250	2001	100	0	0	N/A
TASV	10	PCC	28,750	2001	100	0	0	N/A
TASV	20	PCC	151,250	1989	97	0	0	SMALL PATCH, JOINT SPALL
TASV	30	PCC	50,000	1986	97	0	35	JOINT SPALL, JT SEAL DMG, SMALL PATCH, CORNER SPALL
TASV	40	PCC	22,500	1983	92	0	16	SMALL PATCH, CORNER SPALL, LARGE PATCH, JOINT SPALL, JT SEAL DMG, SHRINKAGE CR
TASV	50	PCC	389,442	2001	100	0	0	N/A
TB1SV	10	PCC	50,700	1971	91	0	0	SMALL PATCH, CORNER SPALL, LARGE PATCH, SHRINKAGE CR
TB2SV	10	AC	36,200	1971	55	0	87	BLOCK CR, SWELLING
TBSV	10	APC	93,375	1971	73	0	74	BLEEDING, WEATH/RAVEL, L & T CR, SWELLING
TBSV	20	PCC	536,250	1971	89	0	0	SMALL PATCH, CORNER SPALL, JOINT SPALL, LARGE PATCH, SHRINKAGE CR
TC1SV	10	PCC	33,875	1983	96	33	0	CORNER SPALL, SMALL PATCH, CORNER BREAK, SHRINKAGE CR
TC2SV	10	AAC	80,000	1983	52	0	89	L & T CR, BLOCK CR, PATCHING, SWELLING, WEATH/RAVEL
TCSV	10	PCC	207,500	1988	99	67	0	LARGE PATCH, CORNER BREAK
TCSV	20	PCC	258,750	1983	100	0	0	N/A
TCSV	30	PCC	46,875	1983	95	0	32	CORNER SPALL, JOINT SPALL, JT SEAL DMG
TCSV	40	PCC	165,000	1971	89	0	18	SHRINKAGE CR, JT SEAL DMG
TCSV	50	PCC	52,500	1999	100	0	0	N/A
TCSV	60	PCC	46,250	1971	93	0	89	SHRINKAGE CR, JT SEAL DMG

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]	
TE1SV	10	PCC	51,875	1986	73	16	5	CORNER BREAK, SMALL PATCH, SHRINKAGE CR, LINEAR CR, LARGE PATCH, JT SEAL DMG, JOINT SPALL, CORNER SPALL
TE2SV	10	PCC	53,500	1998	100	0	0	N/A
TESV	10	PCC	213,750	1989	100	0	0	N/A
TESV	20	PCC	211,875	1986	98	0	0	SMALL PATCH, LARGE PATCH
TESV	30	PCC	87,500	1971	83	0	11	SMALL PATCH, SHRINKAGE CR, JT SEAL DMG, JOINT SPALL
TESV	40	PCC	257,500	1998	98	0	0	JOINT SPALL, SMALL PATCH
TFSV	10	PCC	114,000	2002	100	0	0	N/A
TGASV	10	PCC	17,500	2000	100	0	0	N/A

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 Savannah International 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]
R1836SV	10C	2002	Preventive	$1,444
R1836SV	10E	2002	Major M&R	$475,163
R1836SV	10W	2002	Major M&R	$475,163
TA2SV	20	2002	Preventive	$4,538
TB2SV	10	2002	Major M&R	$90,119
TC2SV	10	2002	Major M&R	$253,238
TCSV	60	2002	Preventive	$21,730
AOLDTERMSV	10	2002	Preventive	$158,908
ASAVAIRSV	10	2002	Preventive	$1,493
ASIGNORSV	10	2002	Major M&R	$251,036
ASIGNORSV	20	2002	Major M&R	$607,055
ASIGSTHSV	10	2002	Preventive	$41,125
ASIGSTHSV	20	2002	Major M&R	$245,798
ATERMSV	10	2002	Preventive	$865
TBSV	10	2005	Major M&R	$167,790
R927SV	10N	2006	Preventive	$31,102
R927SV	10S	2006	Preventive	$35,611

[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 Savannah International 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 90. A 5- year pavement repair program was generated for the Airport, which revealed that approximately $2,862,178 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 90 to approximately a PCI of 93. 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 90 to 87.

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 R1836SV-10C.

Shrinkage cracking in section R1836SV-10C.

Overview of section R1836SV-10E.

Block cracking in section R1836SV-10E.

Overview of section R1836SV-10W.

Overview of section R1836SV-20C.

Overview of section R1836SV-20E.

Overview of section R1836SV-20W.

Overview of section R927SV-10C.

Overview of section R927SV-10N.

Overview of section R927SV-10S.

Overview of section TASV-10.

Overview of section TASV-20.

Overview of section TASV-30.

Overview of section TASV-40.

Overview of section TA1SV-10.

Overview of section TA2SV-10.

Overview of section TA2SV-20.

Overview of section TA3SV-10.

Overview of section TBSV-10.

Overview of section TBSV-20.

Overview of section TB1SV-10.

Overview of section TB2SV-10.

Block cracking in section TB2SV-10.

Overview of section TCSV-10.

Overview of section TCSV-20.

Overview of section TCSV-30.

Overview of section TCSV-40.

Shrinkage cracking in section TCSV-40.

Overview of section TCSV-60.

Overview of section TC1SV-10.

Overview of section TC2SV-10.

Overview of section TESV-10.

Overview of section TESV-20.

Shrinkage cracking in section TESV-20.

Overview of section TESV-30.

Overview of section TE1SV-10.

Overview of section AOLDTERMSV-10.

Overview of section ASAVAIRSV-10.

Overview of section ASIGNORTHSV-10.

Overview of section ASIGNORTHSV-20.

Shattered slab in section ASIGNORTHSV-20.

Overview of section ASIGSOUTHSV-10.

LTD cracking in section ASIGSOUTHSV-10.

Overview of section ASIGSOUTHSV-20.

Overview of section ATERMSV-10.

Overview of section ATERMSV-20.

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	SAVANNAH	AOLDTERMSV	10	JT SEAL DMG	H	Joint Seal	39,477	LF	$4.00	$157,908
2002	SAVANNAH	ASAVAIRSV	10	SHAT. SLAB	L	Crack Sealing	227	LF	$3.20	$726
2002	SAVANNAH	ASIGSTHSV	10	JOINT SPALL	M	Patching	336	SF	$2.55	$856
2002	SAVANNAH	ASIGSTHSV	10	JT SEAL DMG	M	Joint Seal	10,142	LF	$4.00	$40,569
2002	SAVANNAH	ATERMSV	10	JOINT SPALL	M	Patching	339	SF	$2.55	$865
2002	SAVANNAH	R1836SV	10C	JOINT SPALL	M	Patching	566	SF	$2.55	$1,444
2002	SAVANNAH	TA2SV	20	JT SEAL DMG	M	Joint Seal	1,134	LF	$4.00	$4,538
2002	SAVANNAH	TCSV	60	JT SEAL DMG	M	Joint Seal	5,433	LF	$4.00	$21,730

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	SAVANNAH	ASAVAIRSV	10	SHAT. SLAB	L	Crack Sealing	227	LF	$3.20	$726
2002	SAVANNAH	AOLDTERMSV	10	JT SEAL DMG	H	Joint Seal	39,477	LF	$4.00	$157,908
2002	SAVANNAH	ASIGSTHSV	10	JT SEAL DMG	M	Joint Seal	10,142	LF	$4.00	$40,569
2002	SAVANNAH	TA2SV	20	JT SEAL DMG	M	Joint Seal	1,134	LF	$4.00	$4,538
2002	SAVANNAH	TCSV	60	JT SEAL DMG	M	Joint Seal	5,433	LF	$4.00	$21,730
2002	SAVANNAH	ASIGSTHSV	10	JOINT SPALL	M	Patching	336	SF	$2.55	$856
2002	SAVANNAH	ATERMSV	10	JOINT SPALL	M	Patching	339	SF	$2.55	$865
2002	SAVANNAH	R1836SV	10C	JOINT SPALL	M	Patching	566	SF	$2.55	$1,444