New Hampton Municipal Airport

PAVEMENT MANAGEMENT REPORT

PREPARED BY

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AUGUST 2019

applied pavement TECHNOLOGY

NEW HAMPTON MUNICIPAL AIRPORT PAVEMENT MANAGEMENT REPORT

PREPARED FOR:

IOWA DEPARTMENT OF TRANSPORTATION
AVIATION BUREAU

PREPARED BY:

APPLIED PAVEMENT TECHNOLOGY, INC.

IN ASSOCIATION WITH:

ROBINSON ENGINEERING COMPANY

August 2019

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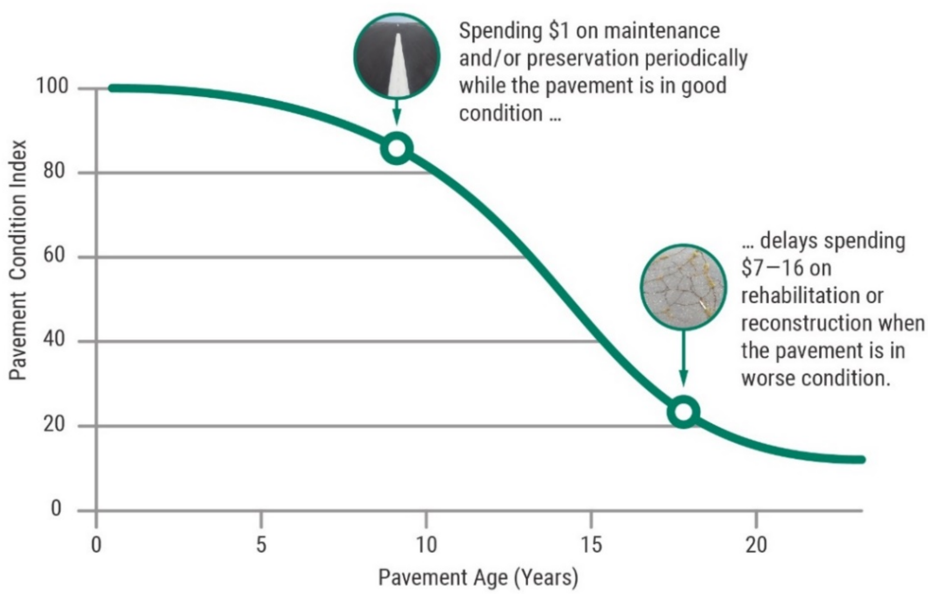
INTRODUCTION

Applied Pavement Technology, Inc. (APTech), with assistance from Robinson Engineering Company, updated the Airport Pavement Management System (APMS) for the Iowa Department of Transportation, Aviation Bureau (Iowa DOT). The APMS provides a means to monitor the condition of the pavements within the state of Iowa and to proactively plan for their preservation.

As part of this project, pavement conditions at New Hampton Municipal Airport were assessed in November 2018 using the Pavement Condition Index (PCI) procedure. During a PCI inspection, the types, severities, and amounts of distress present in a pavement are quantified. This information is then used to develop a composite index that represents the overall condition of the pavement in numerical terms, ranging from 0 (failed) to 100 (excellent). The PCI provides an overall measure of condition and an indication of the level of work that will be required to maintain or repair a pavement. The distress information also provides insight into what is causing the pavement to deteriorate, which is the first step in selecting the appropriate repair action to correct the problem.

Programmed into an APMS, PCI information is used to determine when preventive maintenance actions (such as crack or joint sealing) are advisable and to identify the most cost-effective time to perform major rehabilitation (such as an overlay or whitetopping). The importance of identifying not only the type of repair but also the optimal time of repair is illustrated in Figure 1. This figure shows that there is a point in a pavement's life cycle where the rate of deterioration increases. The financial impact of delaying repairs beyond this point can be severe.

Figure 1. Pavement condition versus cost of repair.



The pavement evaluation results for New Hampton Municipal Airport are presented within this report and can be used by the Iowa DOT, the Federal Aviation Administration (FAA), and New Hampton Municipal Airport to identify, prioritize, and schedule pavement maintenance and rehabilitation (M&R) actions at the airport. In addition to this report, the web-based Interactive Data Exchange Application (IDEA) containing the pavement management information collected during this project was updated and may be accessed from the Iowa DOT's website.

PAVEMENT INVENTORY

The pavement network at New Hampton Municipal Airport was divided into branches, sections, and sample units for pavement management purposes. 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). Aprons are also separate branches.

Each branch was 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 this approach, if a runway was built in 1968 and then extended in 1984, it would contain two separate sections.

To estimate the overall condition of a pavement section, each section was subdivided into sample units. Portions of these sample units were evaluated during the pavement inspection, and the collected information was extrapolated to predict the condition of the section as a whole.

Approximately 195,689 square feet of pavement were evaluated at New Hampton Municipal Airport, as illustrated in Figure 2. This figure also shows the area-weighted age in years of the pavements at the time of the inspection. Figure 3 provides a map that details how the pavement network was divided into management units and identifies the sample units that were evaluated during the pavement inspection at New Hampton Municipal Airport.

Figure 2. Pavement area by branch use.

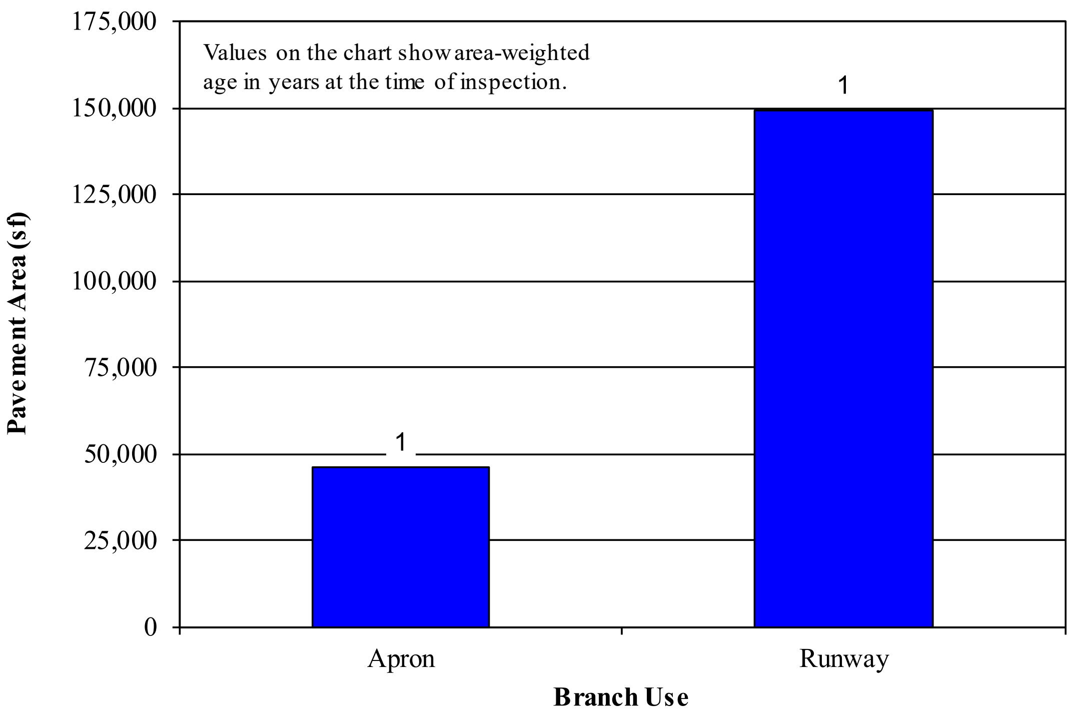
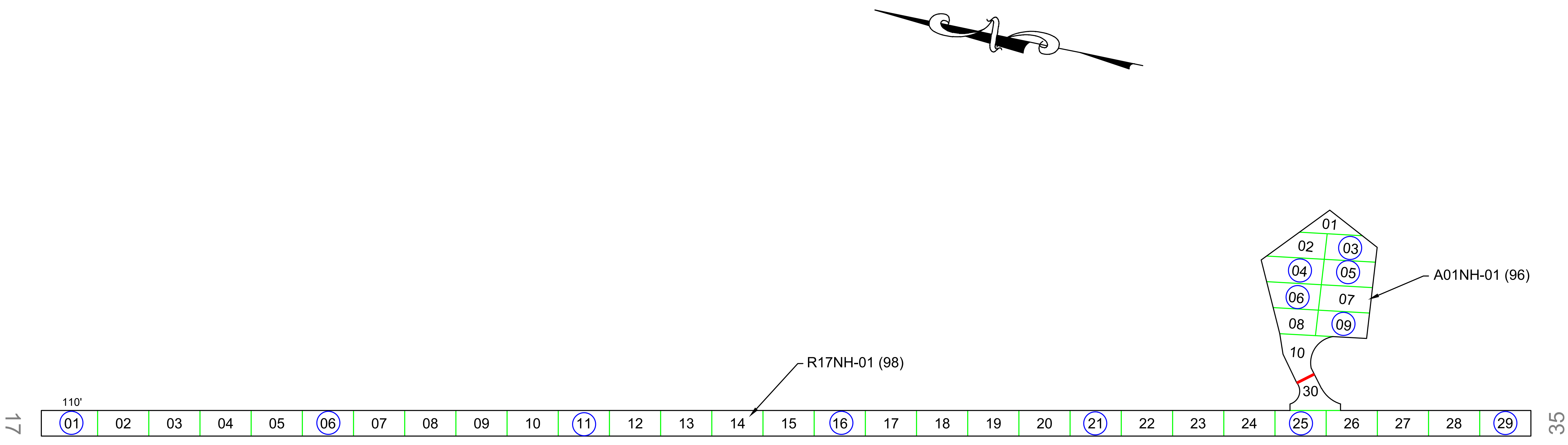


FIGURE 3. NETWORK DEFINITION MAP.



NETWORK DEFINITION LEGEND

BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI VALUE
R12AG-01 (79)

SECTION BREAK LINE
SAMPLE UNIT BREAK LINE
SLAB JOINT
03 SAMPLE UNIT NUMBER
03 SAMPLE UNIT INSPECTED
03 ADDITIONAL SAMPLE UNIT

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AGENCY: Iowa Department of Transportation Office of Aviation			
LOCATION: New Hampton Municipal Airport New Hampton, Iowa			
PAGE TITLE: Network Definition Map			
PROJECT DATE: OCT. 2018	CREATION DATE: OCT. 2018	PROJECT MANAGER: LJR	JOB NUMBER: 17-020-AM02
DRAWING SCALE: 1"=200'	LAST MODIFIED DATE: JAN. 2019	REVISED BY: DSP	DRAWN BY: KEW
FILENAME: New Hampton.dwg		LAYOUT NAME/NUMBER: NET. DEF.	PAGE NUMBER: 3

PAVEMENT EVALUATION

Pavement Evaluation Procedure

APTech inspected the pavements at New Hampton Municipal Airport using the PCI procedure described in:

- FAA Advisory Circular 150/5380-6C, *Guidelines and Procedures for Maintenance of Airport Pavements* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-6C.pdf).
- FAA Advisory Circular 150/5380-7B, *Airport Pavement Management Program (PMP)* (https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5380-7B.pdf).
- ASTM D5340-12, *Standard Test Method for Airport Pavement Condition Index Surveys*.

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 of the section. The PCI ranges from a value of 0 (representing a pavement in a failed condition) to a value of 100 (representing a pavement in excellent condition).

Figure 4. Visual representation of PCI scale on typical pavement surfaces[1].

PCI = 100 PCI = 60 PCI = 35

[1]Photographs shown are not specific to New Hampton Municipal Airport.

Generally, pavements with relatively high PCIs that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing or joint resealing. As the PCI drops, the pavements may require major rehabilitation, such as an overlay or whitetopping. In some situations where the PCI has dropped low enough, reconstruction may be 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 and provides the corresponding colors used for the maps and charts in this report for each range of PCIs.

Figure 5. PCI versus repair type.

PCI Range	Repair
86-100	Preventive Maintenance
71-85	
56-70	
41-55	Major Rehabilitation
26-40	Reconstruction
11-25	
0-10	

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 asphalt-surfaced pavements or shattered slabs on portland cement concrete [PCC] pavements), climate/durability-related (such as weathering [a climate-related distress type on asphalt-surfaced pavements] and durability cracking [a durability-related distress type 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 identifies the distress types considered during a PCI inspection and describes the likely cause of each distress type. It should be noted that a PCI is based on visual signs of pavement deterioration and does not provide a measure of structural capacity.

Pavement Evaluation Results

The pavements at New Hampton Municipal Airport were inspected on November 14, 2018. The 2018 area-weighted condition of New Hampton Municipal Airport is 98, with conditions ranging from 96 to 98 (on a scale of 0 [failed] to 100 [excellent]). During the previous pavement inspection in 2012, the area-weighted PCI of the airport was 44.

Figure 6 summarizes the overall condition of the pavements at New Hampton Municipal Airport, and Figure 7 presents area-weighted condition (average PCI adjusted to account for the relative size of the pavement sections) by branch use. Figure 8 is a map that displays the condition of the evaluated pavements. Table 1 summarizes the results of the pavement evaluation. Appendix B presents photographs taken during the PCI inspection, and Appendix C contains detailed information on the distresses observed during the visual survey. Appendix D includes detailed work history information that was collected during the record review process.

Figure 6. Pavement area by PCI range at New Hampton Municipal Airport.

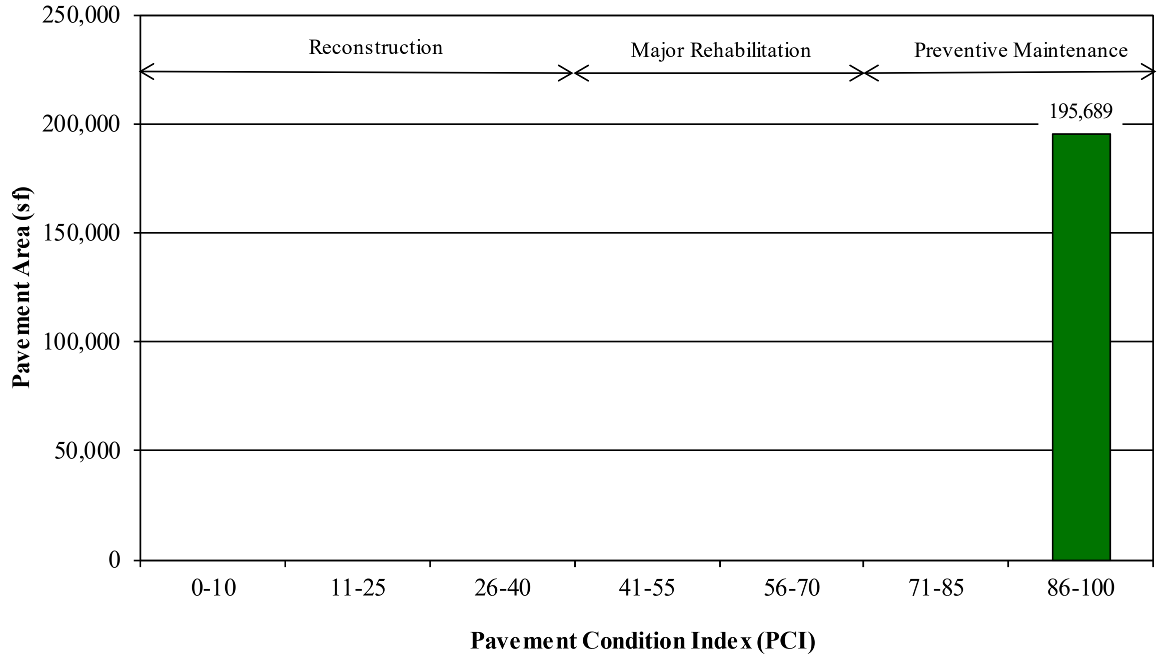


Figure 7. PCI by branch use at New Hampton Municipal Airport.
(Values on chart are area-weighted)

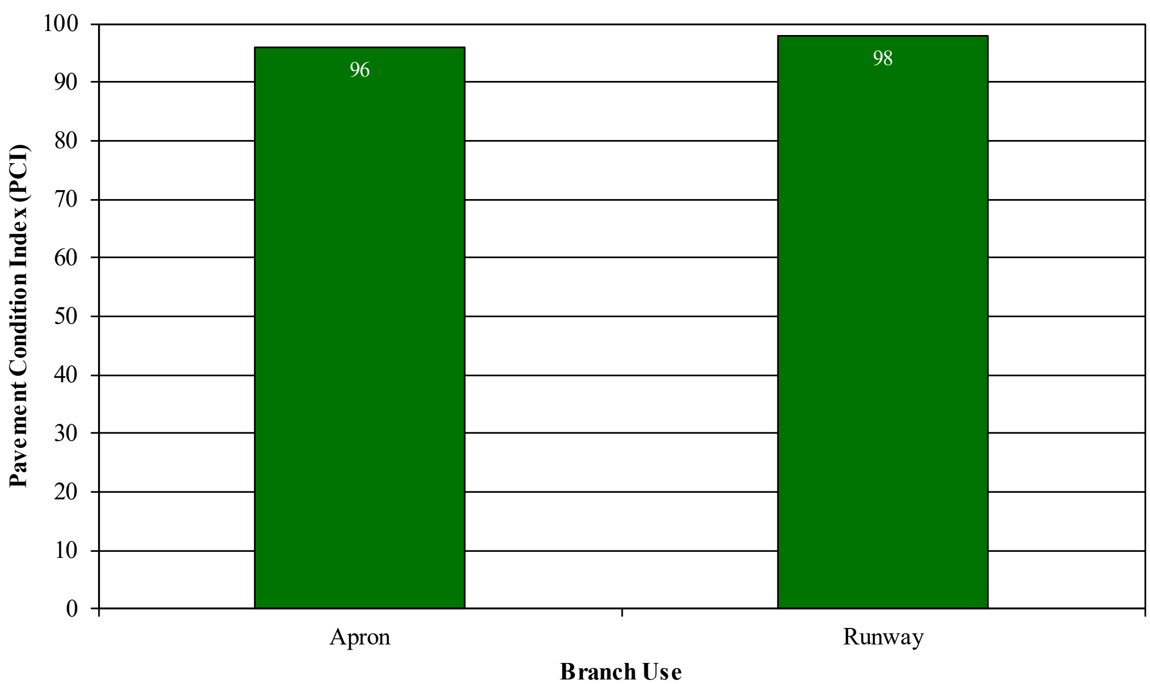
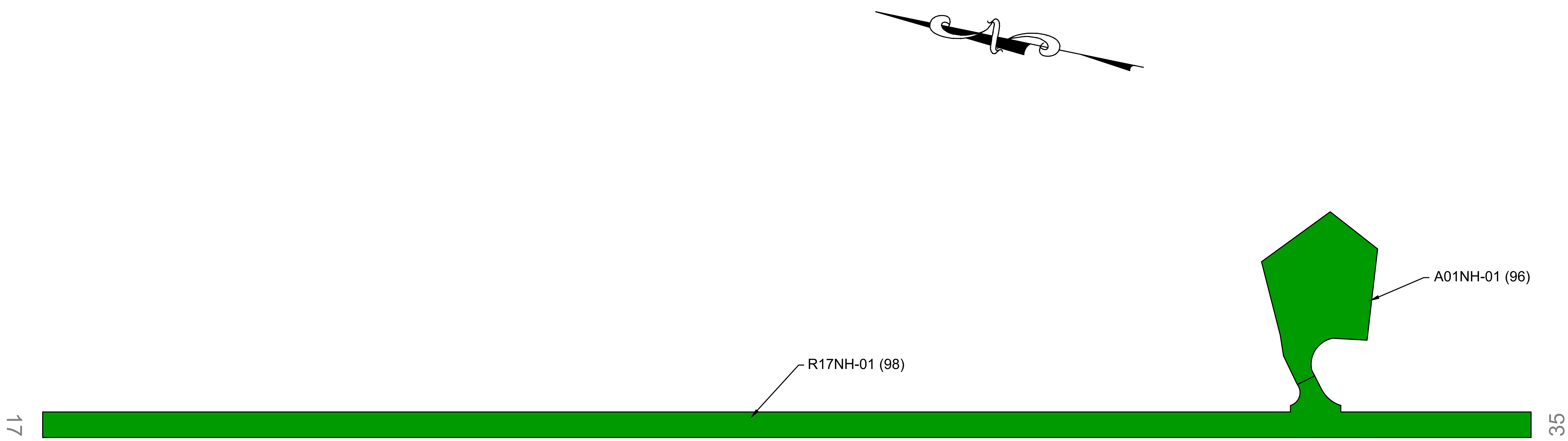


FIGURE 8. PCI MAP.



LEGEND

BRANCH IDENTIFIER
SECTION IDENTIFIER
PCI VALUE
R12AG-01 (79)

SECTION BREAK LINE

PAVEMENT CONDITION INDEX

PCI

86-100
71-85
56-70
41-55
26-40
11-25
0-10

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AGENCY: Iowa Department of Transportation Office of Aviation			
LOCATION: New Hampton Municipal Airport New Hampton, Iowa			
PAGE TITLE: 2018 Pavement Condition Index Map			
PROJECT DATE: OCT. 2018	CREATION DATE: OCT. 2018	PROJECT MANAGER: LJR	JOB NUMBER: 17-020-AM02
DRAWING SCALE: 1"=300'	LAST MODIFIED DATE: APR. 2019	REVISED BY: DSP	DRAWN BY: KEW
FILENAME: New Hampton.dwg		LAYOUT NAME/NUMBER: PCI	PAGE NUMBER: 7

Table 1. 2018 pavement evaluation results.

Branch[1]	Section[1]	Surface Type[2]	Section Area (sf)	LCD[3]	2018 PCI	% Distress due to Load[4]	% Distress due to Climate/ Durability[5]	% Distress due to Other[6]	Type of Distresses[7]
A01NH	01	AAC	46,300	6/1/2017	96	0	100	0	L&T Cracking, Raveling
R17NH	01	AC	149,389	6/3/2017	98	0	100	0	Raveling

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

[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 cracking or rutting on asphalt-surfaced pavements or shattered slabs on a PCC pavement.

[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, raveling, or block cracking in asphalt-surfaced pavements) or to a materials-related problem (such as durability cracking or alkali-silica reaction [ASR] in a PCC pavement). If materials-related distresses were recorded during the inspection, further laboratory testing is required to definitively determine the type present.

[6]Other refers to distresses not attributed to one factor but rather may be caused by a combination of factors.

[7]Distress types are defined by ASTM D5340-12. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

Inspection Comments

New Hampton Municipal Airport was inspected on November 14, 2018. There were two pavement sections defined during the inspection.

Runway

Runway 17/35 was defined by one recently rehabilitated section that was in excellent condition. Only isolated areas of high-severity raveling were recorded where mechanical damage was observed at the time of inspection.

Apron

The apron area consisted of one recently rehabilitated section. Section 01 was in excellent condition with only small amounts of low-severity, unsealed longitudinal and transverse (L&T) cracking and high-severity raveling due to mechanical damage identified.

PAVEMENT MAINTENANCE AND REHABILITATION PROGRAM

Using the information collected during the pavement inspection, the PAVER pavement management software was used to develop a 5-year M&R program for New Hampton Municipal Airport. In addition, a 1-year plan for localized preventive maintenance (such as crack sealing and patching) was prepared.

Analysis Parameters

Critical PCIs

PAVER uses critical PCIs to determine whether localized preventive maintenance or major rehabilitation is the appropriate repair action. Above the critical PCI, localized preventive maintenance activities are recommended. Below the critical PCI, major rehabilitation actions, such as an overlay or reconstruction, are recommended. The Iowa DOT set the critical PCIs at 65 for runways and 55 for aprons.

Localized Preventive Maintenance Policies and Unit Costs

Localized preventive maintenance policies were developed for asphalt-surfaced and PCC pavements. These policies, shown in Appendix E, identify the localized preventive maintenance actions that the Iowa DOT considered appropriate to correct different distress types and severities. The Iowa DOT provided unit costs for each of the localized preventive maintenance actions included in these policies, and these costs are detailed in Appendix E. Please note that this information is of a general nature for the entire state. The maintenance policies and unit costs may require adjustment to reflect specific conditions at New Hampton Municipal Airport.

Major Rehabilitation Unit Costs

PAVER estimates the cost of major rehabilitation based on the predicted PCI of the pavement section. The Iowa DOT provided the costs for major rehabilitation, and they are presented in Appendix E. If major rehabilitation is recommended in the 5-year program, further engineering investigation will be needed to identify the most appropriate rehabilitation action and to more accurately estimate the cost of such work.

Budget and Inflation Rate

An unlimited budget with a start date of July 1, 2019, and an inflation rate of 1.5 percent was used during the analysis.

Analysis Approach

The 5-year M&R program was prepared with the goal of maintaining the pavements above established critical PCIs. During this analysis, major rehabilitation was recommended for pavements in the year they dropped below their critical PCI. For the first year (2019) of the analysis only, a localized preventive maintenance plan was developed for those pavement sections that were above their critical PCI. If major rehabilitation was triggered for a section in 2020 or 2021, then localized maintenance was not recommended for 2019. While localized preventive maintenance should be an annual undertaking at New Hampton Municipal Airport, it is not possible to accurately predict the propagation of cracking and other distress types. Therefore, the airport should budget for maintenance every year and can use the 2019 localized preventive maintenance plan as a baseline for that work. As the pavements age, it can be assumed that the amount of localized preventive maintenance required will increase.

Analysis Results

A summary of the M&R program for New Hampton Municipal Airport is presented in Table 2. Detailed information on the recommended localized preventive maintenance plan for 2019 is contained in Appendix F.

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

Year	Branch[1]	Section[1]	Surface Type[2]	Type of Repair[3]	Estimated Cost[4]
2019	A01NH	01	AAC	Localized Maintenance	$25
2019	R17NH	01	AC	Localized Maintenance	$583

Total Estimated Cost: $1,000

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

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

[3]Major Rehabilitation: such as pavement reconstruction or an overlay. Localized Preventive Maintenance: such as crack sealing or patching.

[4]The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at the airport.

The recommendations made in this report are based on a broad network-level analysis and meant to provide New Hampton Municipal Airport with an indication of the type of pavement-related work required during the next 5 years. Further engineering investigation may be necessary to identify which repair action is most appropriate. In addition, the cost estimates provided are based on overall unit costs for the entire state, and New Hampton Municipal Airport should adjust the plan to reflect local costs.

Because an unlimited budget was used in the analysis, it is possible that the pavement repair program may need to be adjusted to consider economic and/or operational constraints. The identification of a project need does not necessarily mean that state or federal funding will be available in the year it is indicated. It is important to remember that regardless of the recommendations presented within this report, New Hampton Municipal Airport is responsible for repairing pavements where existing conditions pose a hazard to safe operations.

General Maintenance Recommendations

In addition to the specific maintenance actions presented in Appendix F, it is recommended that the following strategies are considered for prolonging pavement life:

1. Regularly inspect all safety areas of the airport and document all inspection activity.
2. Conduct an aggressive campaign against weed growth through timely herbicide applications and mowing programs of the safety areas. Vegetation growth in pavement cracks is very destructive and significantly increases the rate of pavement deterioration.
3. Implement a periodic crack and joint sealing program. Keeping water and debris out of the pavement system by sealing cracks and joints is a proven and cost-effective method of extending the life of the pavement system.
4. Ensure that dirt does not build up along the edges of the pavements. This can create a “bathtub” effect, reducing the ability of water to drain away from the pavement system.

5. Closely monitor the movement of heavy equipment (particularly farming, construction, and fueling equipment) to make sure it is only operating on pavements that are designed to accommodate heavy loads. Failure to restrict heavy equipment to appropriate areas may result in the premature failure of airport pavements.

SUMMARY

This report documents the results of the pavement evaluation conducted at New Hampton Municipal Airport. A visual inspection of the pavements in 2018 found that the overall condition of the pavement network is a PCI of 98. A 5-year pavement repair program, shown in Table 2, was generated for New Hampton Municipal Airport, which revealed that approximately $1,000 needs to be expended on M&R. New Hampton Municipal Airport should utilize these study results to assist in planning for future maintenance needs as part of the airport CIP planning process.

APPENDIX A

CAUSE OF DISTRESS TABLES

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

Distress Type	Probable Cause of Distress
Alligator Cracking	Fatigue failure of the asphalt surface under repeated traffic loading.
Bleeding	Excessive amounts of asphalt cement or tars in the mix or low air void content, or both.
Block Cracking	Shrinkage of the asphalt and daily temperature cycling; it is not load associated.
Corrugation	Traffic action combined with an unstable pavement layer.
Depression	Settlement of the foundation soil or can be “built up” during construction.
Jet-Blast Erosion	Bituminous binder has been burned or carbonized.
Joint Reflection Cracking	Movement of the concrete slab beneath the asphalt surface due to thermal and moisture changes.
L&T Cracking	Cracks may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the asphalt surface due to low temperatures or hardening of the asphalt, or (3) reflective cracking caused by cracks in an underlying PCC slab.
Oil Spillage	Deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.
Patching	N/A
Polished Aggregate	Repeated traffic applications.
Raveling	Asphalt binder may have hardened significantly, causing coarse aggregate pieces to dislodge.
Rutting	Usually caused by consolidation or lateral movement of the materials due to traffic loads.
Shoving	Where PCC pavements adjoin flexible pavements, PCC “growth” may shove the asphalt pavement.
Slippage Cracking	Low strength surface mix or poor bond between the surface and the next layer of the pavement structure.
Swelling	Usually caused by frost action or by swelling soil.
Weathering	Asphalt binder and/or fine aggregate may wear away as the pavement ages and hardens.

Table A-2. Cause of pavement distress, PCC pavements.

Distress Type	Probable Cause of Distress
ASR	Chemical reaction of alkalis in the portland cement with certain reactive silica minerals. ASR may be accelerated by the use of chemical pavement deicers.
Blowup	Incompressible materials in the joints.
Corner Break	Load repetition combined with loss of support and curling stresses.
Durability Cracking	Concrete's inability to withstand environmental factors such as freeze-thaw cycles.
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 the joint.
LTD Cracking	Combination of load repetition, curling stresses, and shrinkage stresses.
Patching (Small and Large)	N/A
Popouts	Freeze-thaw action in combination with expansive aggregates.
Pumping	Poor drainage, poor joint sealant.
Scaling	Over finishing of concrete, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate.
Settlement	Upheaval or consolidation.
Shattered Slab	Load repetition.
Shrinkage Cracking	Setting and curing of the concrete.
Spalling (Joint and Corner)	Excessive stresses at the joint caused by infiltration of incompressible materials or traffic loads; weak concrete at the joint combined with traffic loads.

APPENDIX B

INSPECTION PHOTOGRAPHS

A01NH-01. Overview.

A01NH-01. L&T Cracking (Sample Unit No. 09).

R17NH-01. Overview.

R17NH-01. Raveling (Sample Unit No. 06).

APPENDIX C

INSPECTION REPORT

Re-inspection Report

IA2018ALL
Report Generated Date: June 25, 2019

Network: 1Y5 Name: NEW HAMPTON MUNICIPAL AIRPORT

Branch: A01NH Name: APRON AT NEW HAMPTON Use: APRON Area: 46,305.00SqFt

Section: 01 of 1 From: SEE MAP To: SEE MAP Last Const.: 06/01/2017
Surface: AAC Family: IowaAACAPNorthern Zone: Category: Rank: P
Area: 46,300.00SqFt Length: 202.40Ft Width: 175.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/14/2018 Total Samples: 10 Surveyed: 5
Conditions: PCI : 96
Inspection Comments:

Sample Number: 003 Type: R Area: 4,681.00SqFt PCI = 94
Sample Comments:
52 RAVELING H 1.00 SqFt Comments:md

Sample Number: 004 Type: R Area: 5,763.00SqFt PCI = 96
Sample Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING L 17.00 Ft Comments:u

Sample Number: 005 Type: R Area: 5,009.00SqFt PCI = 95
Sample Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING L 47.00 Ft Comments:u

Sample Number: 006 Type: R Area: 4,885.00SqFt PCI = 98
Sample Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING L 3.00 Ft Comments:u

Sample Number: 009 Type: R Area: 5,009.00SqFt PCI = 96
Sample Comments:
48 LONGITUDINAL/TRANSVERSE CRACKING L 16.00 Ft Comments:

Re-inspection Report

IA2018ALL
Report Generated Date: June 25, 2019

Network: 1Y5 Name: NEW HAMPTON MUNICIPAL AIRPORT

Branch: R17NH Name: RUNWAY 17/35 NEW HAMPTON Use: RUNWAY Area: 149,389.00SqFt

Section: 01 of 1 From: RUNWAY 17 END To: RUNWAY 35 END Last Const.: 06/03/2017
Surface: AC Family: IowaACRWNCE&NE Zone: Category: Rank: P
Area: 149,389.00SqFt Length: 2,900.00Ft Width: 75.00Ft
Shoulder: Street Type: Grade: 0.00 Lanes: 0

Section Comments:

Last Insp. Date: 11/14/2018 Total Samples: 30 Surveyed: 7
Conditions: PCI : 98
Inspection Comments:

Sample Number: 001 Type: R Area: 5,000.00SqFt PCI = 94
Sample Comments:
52 RAVELING H 4.00 SqFt Comments:md

Sample Number: 006 Type: R Area: 5,000.00SqFt PCI = 93
Sample Comments:
52 RAVELING H 6.00 SqFt Comments:md

Sample Number: 011 Type: R Area: 5,000.00SqFt PCI = 100
Sample Comments:
<NO DISTRESSES>

Sample Number: 016 Type: R Area: 5,000.00SqFt PCI = 100
Sample Comments:
<NO DISTRESSES>

Sample Number: 021 Type: R Area: 5,000.00SqFt PCI = 100
Sample Comments:
<NO DISTRESSES>

Sample Number: 025 Type: R Area: 5,000.00SqFt PCI = 100
Sample Comments:
<NO DISTRESSES>

Sample Number: 029 Type: R Area: 5,000.00SqFt PCI = 100
Sample Comments:
<NO DISTRESSES>

APPENDIX D

WORK HISTORY REPORT

Work History Report

Pavement Database:IA2018All

Network: 1Y5 **Branch:** A01NH (APRON AT NEW HAMPTON) **Section:** 01 **Surface:** AAC
L.C.D.: 06/01/2017 **Use:** APRON **Rank:** P **Length:** 202.40 Ft **Width:** 175.00 Ft **True Area:** 46,300.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/01/2017	OL-AS	Overlay - AC Structural	$0	2.00	True	2" AC OVERLAY
06/30/1965	NC-AC	New Construction - AC	$0	0.00	True	-

Network: 1Y5 **Branch:** R17NH (RUNWAY 17/35 NEW HAMPTON) **Section:** 01 **Surface:** AC
L.C.D.: 06/03/2017 **Use:** RUNWAY **Rank:** P **Length:** 2,900.00 Ft **Width:** 75.00 Ft **True Area:** 149,389.00 SqF

Work Date	Work Code	Work Description	Cost	Thickness (in)	Major M&R	Comments
06/03/2017	NC-AC	New Construction - AC	$0	1.50	True	1.5" AC
06/02/2017	BA-BI	Base Course - Bituminous	$0	1.50	False	1.5" BIT BASE
06/01/2017	BA-AG	Base Course - Aggregate	$0	8.00	False	5" RECLAIMED AC MIXED WITH 3" OF EXISTING CRUSHED STONE BASE
06/30/1965	NC-AC	New Construction - AC	$0	0.00	True	-

Summary:

Work Description	Section Count	Area Total (SqFt)	Thickness Avg (in)	Thickness STD (in)
Base Course - Aggregate	1	149,389.00	8.00	-
Base Course - Bituminous	1	149,389.00	1.50	-
New Construction - AC	3	345,078.00	.50	.87
Overlay - AC Structural	1	46,300.00	2.00	-

APPENDIX E

LOCALIZED PREVENTIVE MAINTENANCE POLICIES AND UNIT COST TABLES

Table E-1. Localized preventive maintenance policy, asphalt-surfaced pavements.

Distress Type	Severity Level	Maintenance Action
Alligator Cracking	Low	Monitor
Alligator Cracking	Medium	Asphalt Patch
Alligator Cracking	High	Asphalt Patch
Bleeding	N/A	Monitor
Block Cracking	Low	Monitor
Block Cracking	Medium	Crack Seal—Asphalt
Block Cracking	High	Crack Seal—Asphalt
Corrugation	Low	Monitor
Corrugation	Medium	Asphalt Patch
Corrugation	High	Asphalt Patch
Depression	Low	Monitor
Depression	Medium	Monitor
Depression	High	Asphalt Patch
Jet-Blast Erosion	N/A	Asphalt Patch
Joint Reflection Cracking	Low	Monitor
Joint Reflection Cracking	Medium	Crack Seal—Asphalt
Joint Reflection Cracking	High	Crack Seal—Asphalt
L&T Cracking	Low	Monitor
L&T Cracking	Medium	Crack Seal—Asphalt
L&T Cracking	High	Crack Seal—Asphalt
Oil Spillage	N/A	Asphalt Patch
Patching	Low	Monitor
Patching	Medium	Asphalt Patch
Patching	High	Asphalt Patch
Polished Aggregate	N/A	Monitor
Raveling	Low	Monitor
Raveling	Medium	Asphalt Patch
Raveling	High	Asphalt Patch
Rutting	Low	Monitor
Rutting	Medium	Monitor
Rutting	High	Asphalt Patch
Shoving	Low	Monitor
Shoving	Medium	Asphalt Patch
Shoving	High	Asphalt Patch
Slippage Cracking	N/A	Asphalt Patch
Swelling	Low	Monitor
Swelling	Medium	Monitor
Swelling	High	Asphalt Patch
Weathering	Low	Monitor
Weathering	Medium	Monitor
Weathering	High	Asphalt Patch

Table E-2. Localized preventive maintenance policy, PCC pavements.

Distress Type	Severity Level	Maintenance Action
ASR	Low	Monitor
ASR	Medium	Slab Replacement
ASR	High	Slab Replacement
Blowup	Low	Slab Replacement
Blowup	Medium	Slab Replacement
Blowup	High	Slab Replacement
Corner Break	Low	Crack Seal—PCC
Corner Break	Medium	Full Depth PCC Patch
Corner Break	High	Full Depth PCC Patch
Durability Cracking	Low	Monitor
Durability Cracking	Medium	Full Depth Patch
Durability Cracking	High	Slab Replacement
Joint Seal Damage	Low	Monitor
Joint Seal Damage	Medium	Joint Seal
Joint Seal Damage	High	Joint Seal
LTD Cracking	Low	Monitor
LTD Cracking	Medium	Crack Seal—PCC
LTD Cracking	High	Slab Replacement
Patching (Small and Large)	Low	Monitor
Patching (Small and Large)	Medium	Full Depth PCC Patch
Patching (Small and Large)	High	Full Depth PCC Patch
Popouts	N/A	Monitor
Pumping	N/A	Monitor
Scaling	Low	Monitor
Scaling	Medium	Partial Depth PCC Patch
Scaling	High	Slab Replacement
Settlement	Low	Monitor
Settlement	Medium	Grinding
Settlement	High	Slab Replacement
Shattered Slab	Low	Crack Seal—PCC
Shattered Slab	Medium	Slab Replacement
Shattered Slab	High	Slab Replacement
Shrinkage Cracking	N/A	Monitor
Spalling (Joint and Corner)	Low	Monitor
Spalling (Joint and Corner)	Medium	Partial Depth PCC Patch
Spalling (Joint and Corner)	High	Partial Depth PCC Patch

Table E-3. 2019 unit costs for preventive maintenance actions.

Maintenance Action	Unit Cost
Asphalt Patch—Asphalt-Surfaced Pavement	$13.66/sf
Crack Sealing—Asphalt-Surfaced Pavement	$2.34/lf
Partial Depth PCC Patch—PCC Pavement	$34.97/sf
Full Depth PCC Patch—PCC Pavement	$15.62/sf
Crack Sealing—PCC Pavement	$2.81/lf
Joint Sealing—PCC Pavement	$2.81/lf
Grinding—PCC Pavement	$0.34/sf
Slab Replacement—PCC Pavement	$15.62/sf

Table E-4. 2019 unit costs (per square foot) based on pavement type and PCI ranges.

Pavement Type	PCI Range 0–40	PCI Range 40–50	PCI Range 50–60	PCI Range 60–70	PCI Range 70–80	PCI Range 80–90	PCI Range 90–100
AC	$9.70	$4.59	$4.59	$4.59	$0.00	$0.00	$0.00
PCC	$16.19	$7.65	$7.65	$7.65	$0.00	$0.00	$0.00

APPENDIX F

YEAR 2019 LOCALIZED PREVENTIVE MAINTENANCE DETAILS

Table F-1. Year 2019 localized preventive maintenance details.

Branch[1]	Section[1]	Distress Type[2]	Severity	Distress Quantity	Distress Unit	Maintenance Action	Unit Cost[3]	2019 Estimated Cost[3]
A01NH	01	Raveling	High	2	SqFt	Patching - AC Deep	$13.66	$25
R17NH	01	Raveling	High	43	SqFt	Patching - AC Deep	$13.66	$583

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

[2]Distress types are defined by ASTM D5340-12. L&T Cracking = Longitudinal and Transverse Cracking; LTD Cracking = Longitudinal, Transverse, and Diagonal Cracking; ASR = Alkali-Silica Reaction.

[3]The costs provided are of a general nature for the entire state and may require adjustment to reflect specific conditions at the airport.

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