Pavement Condition Report

Duluth International Airport (DLH)

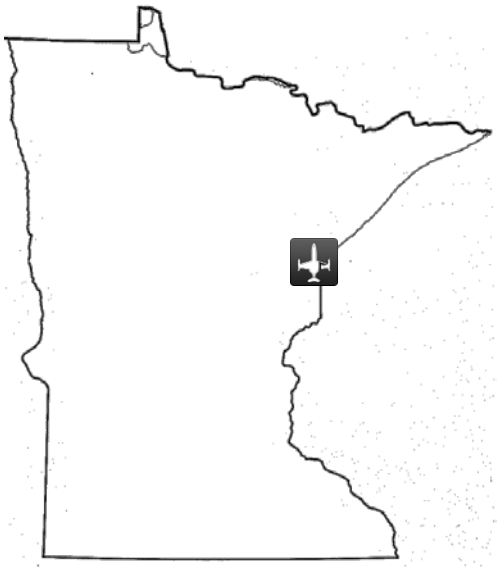

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Table of Contents

List of Figures

List of Tables

Abbreviations and Acronyms

AAC	Asphalt Overlaid with Asphalt
AC	Asphalt Concrete
APC	PCC Overlaid with Asphalt
APMS	Airport Pavement Management System
CAD	Computer-aided Drafting
CIP	Capital Improvement Plan
DLH	Duluth International Airport
FAA	Federal Aviation Administration
FOD	Foreign Object Debris
GIS	Geographic Information System
L&T	Longitudinal & Transverse Cracking
LCD	Last Construction Date
Mn/DOT	Minnesota Department of Transportation Office of Aeronautics
PCC	Portland Cement Concrete
PCI	Pavement Condition Index

1. Introduction

Since 1995, Federal grant assurances have required that to continue receiving Federal funding, airports implement a pavement maintenance-management program for any pavement constructed or repaired using Federal money. To help individual airports meet this grant assurance and improve the statewide airport system, the Minnesota Department of Transportation (Mn/DOT) Office of Aeronautics contracted with Applied Research Associates, Inc. (ARA) to provide pavement evaluation and management inspections at local airports. This report contains the results of the 2018 pavement inspections at Duluth International Airport (DLH).

Pavement conditions were assessed using the Pavement Condition Index (PCI) procedure, outlined in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5380 and ASTM D5340 for airfield pavements. The PCI was developed to provide a numerical value indicating overall pavement condition that correlates well with the ratings of experienced engineers. During a PCI survey, visible signs of deterioration within a selected sample unit are recorded and analyzed. The final calculated PCI value is a number from 0 to 100, with 100 representing a pavement in excellent condition. The PCI evaluation makes possible forecasting of future deterioration and allows for accurate projections of maintenance and rehabilitative needs.

The data collected during this project were entered into the MicroPAVER pavement management software program developed by the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory. The capabilities of MicroPAVER were utilized to meet the following project objectives:

- Update and store pavement inventory and condition data.
- Develop models to predict future conditions.
- Develop maintenance and repair recommendations.
- Report the results at the individual and statewide level.

1.1 Project Background

Aviation throughout Minnesota plays a key role in the movement of goods and services with an estimated overall economic impact of $12.2 billion. Mn/DOT realizes the value in maintaining the paved facilities by implementing and updating an airport pavement management system (APMS). An APMS provides guidance for decisions regarding pavement maintenance and repair policies at an airport and can identify short-, medium-, and long-term rehabilitation needs. Mn/DOT typically has performed PCI inspections at each airport on a 3-year cycle so that the most recent pavement condition data in the APMS reflect the field conditions.

1.2 Pavement Management Approach

The main goal of any pavement management system is to identify pavements that will receive the most benefit from an optimally timed repair. By projecting the rate at which the pavement condition will deteriorate, the optimal time for applying treatments can be determined. Typically, the optimal repair time is the point at which a gradual rate of deterioration begins to increase to a much faster rate, as illustrated in figure 1. It is critical to identify this point in time to avoid higher rehabilitation costs caused by excess deterioration. Figure 1 also shows conceptually how it is cheaper to maintain pavements that are in good to fair condition, rather than wait until the poor condition requires an expensive reconstruction treatment.

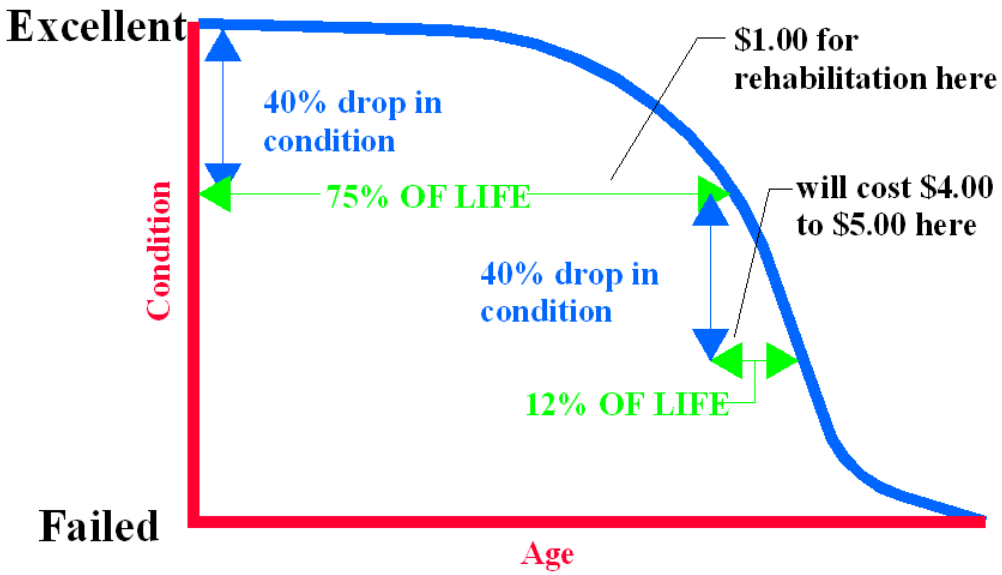

Figure 1. Pavement condition life cycle.

Often, the identified needs will cost more than the available budget and will need to be prioritized. The APMS can measure the impact of a limited budget scenario by projecting the future condition of deferred projects. Ultimately, the APMS will provide Mn/DOT and the airport a planning tool that can help identify pavement needs, optimize the selection of projects and treatments over a multi-year period, and understand the consequences of these plans.

1.3 Scope of Work

Since 2008, Mn/DOT has retained ARA to update the APMS for 106 of Minnesota's publicly owned general aviation airports. Mn/DOT identified approximately 1/3 of the airports to be inspected each year and provided the available construction history information and existing MicroPAVER databases for each airport. ARA coordinated the PCI inspections with each airport. After the field work was completed, ARA updated the MicroPAVER database and computer-aided drafting (CAD) map for each airport. MicroPAVER was then used to develop a maintenance work plan based on current distresses. In addition, a 5-year projection identifying work levels of recommended pavement repair needs was prepared at the state level for the various stakeholders to use as a planning tool. Individual reports, such as this one, were prepared for each airport documenting the results of the pavement inspections. A statewide analysis report was prepared based on that inspection year's airports. The airport maps were linked to the MicroPAVER database to allow for geographic information system (GIS) viewing of data. In addition, training was provided on the use of the MicroPAVER software and PCI procedure.

2. Project Approach

2.1 Update Pavement Inventory

The pavement inventory at DLH represents the airfield pavements that are intended for aviation-related traffic. The main objective in updating the pavement inventory was to determine the year of the construction (or most recent overlay), the limits of the project, and the surface type for each pavement area based on construction history. When available, Mn/DOT provided this information for the pavement-related projects for areas not already included in previous inspections. ARA then used this information to update the pavement section definitions on the CAD map and MicroPAVER database based on project limits, surface type, layer properties, traffic patterns, and overall condition.

2.1.1 Pavement Network Definition

The construction history information was used to divide the pavement network at DLH into management units—branches, sections, and sample units. 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). On an airfield, a branch typically represents an entire runway, taxiway, or apron.

Because of the disparity of characteristics that can occur throughout a branch, it is further subdivided into units called sections. A section is a portion of the pavement that has uniform construction history, pavement structure, traffic patterns, and condition throughout its entire length or area. Sections are used as a management unit for the selection of potential maintenance and rehabilitation projects. The guideline used in deciding where section breaks are located is to think of the section as the "repair unit"—a portion of the pavement that will be managed independently and evaluated separately for pavement maintenance and rehabilitation.

Pavement sections are further subdivided into sample units for inspection purposes. The typical sample unit size for asphalt concrete (AC) pavements is 5,000 square feet ± 2,000 square feet and 20 slabs ± 8 slabs for portland cement concrete (PCC) pavements. A statistical based sampling rate was used to determine the number of sample units to inspect for each section. The inspected sample units were representative of the overall condition within a section and were used to extrapolate the condition as a whole.

2.1.2 Naming Scheme

For the pavement management system to work efficiently, some unique identifiers were added to the database. The branch names assigned were designed to assist in identification of the pavement area. The first characters are used to identify the pavement use—apron, runway, taxiway, or taxilane (pavement in and around hangar areas). The next character is a number or letter used to further identify the pavement branch (such as RY321 for Runway 3-21 or CTA1 for Connecting Taxiway A1). The sections for each branch are assigned a number starting with 001, 002, and so on. Table 1 presents the branches defined for DLH and their corresponding areas. For those airports with taxiway guidance signs, the branch ID may or may not match up with the signage in the field; however, the branch name will correspond.

Figure 2 presents the network definition for DLH and represents the pavements included in the APMS. Some privately built/maintained pavements and "driveways" leading into hangars may not be included here because they are considered outside the scope of work.

Table 1. Branch definition.

Branch Id	Name	Number of Sections	Area (SF)
ANBD	Business Apron	1	139,000
APGA	General Aviation Apron	14	1,358,800
APTR	Terminal Ramp	3	439,800
CTA1	Connecting Taxiway A1	2	75,200
CTA2	Connecting Taxiway A2	2	61,300
CTA3	Connecting Taxiway A3	3	55,200
CTA5	Connecting Taxiway A5	1	44,800
CTB	Connecting Taxiway B	1	345,200
CTC1	Connecting Taxiway C1	1	5,200
CTD	Connecting Taxiway D	2	139,300
PTA	Parallel Taxiway A	5	928,800
PTC	Parallel Taxiway C	6	332,400
RPA1	Run-up Pad A1	1	24,300
RPE	9/27 East Run-up Pad	1	28,000
RPW	9/27 West Run-up Pad	1	105,000
RY321	Runway 3/21	8	830,500
RY927	Runway 9/27	6	1,671,000
TLA	Taxilane	5	150,300
		Airport Total	**6,734,100**

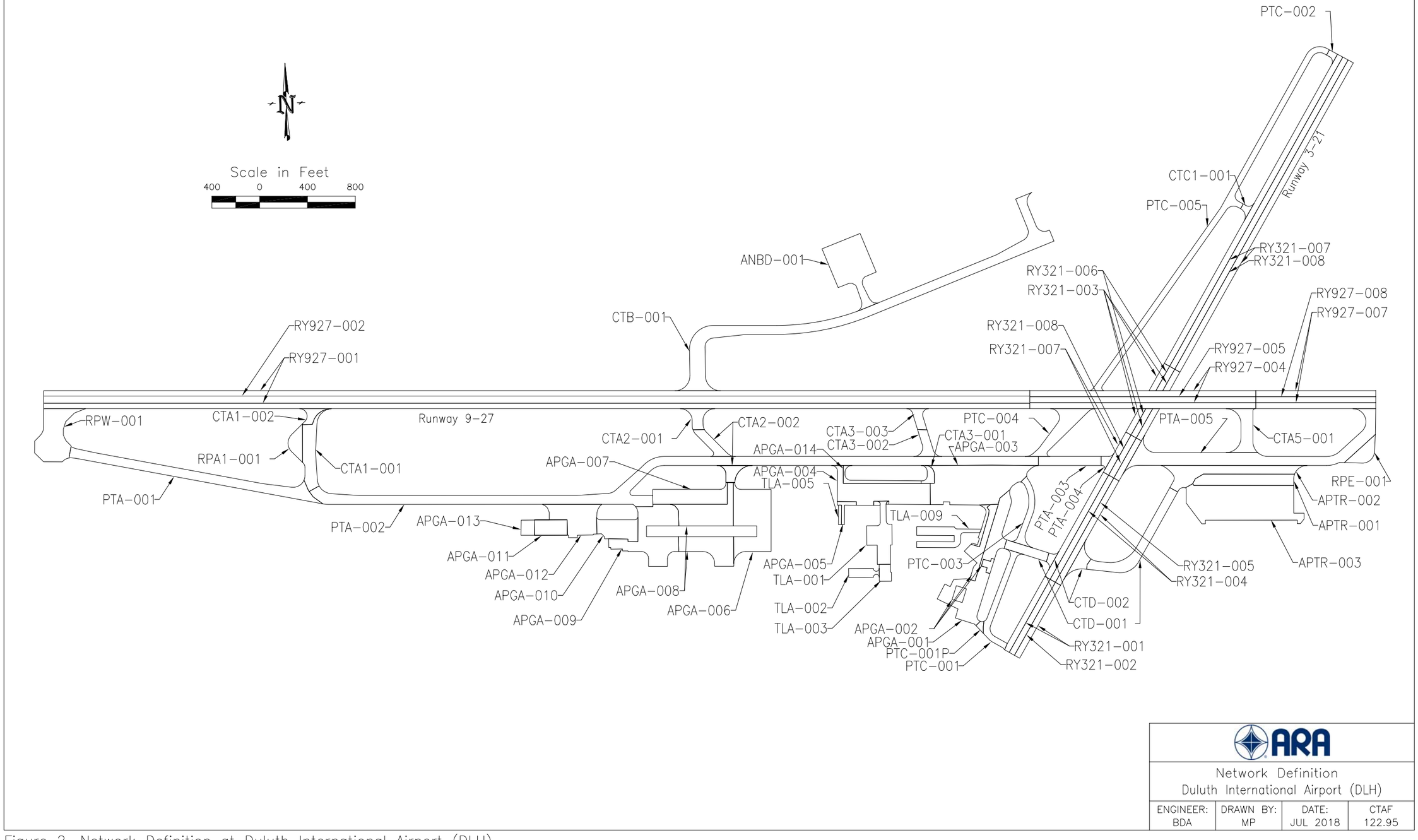

Figure 2. Network Definition at Duluth International Airport (DLH).

2.2 Pavement Evaluation

The pavement surfaces at DLH were visually inspected on June 25, 2018, using the PCI procedure. During a PCI inspection, inspectors walk over the surface of the pavement and identify visible signs of distress within a sample unit. Appendix A presents the scalable map used during the inspection to locate the inspected sample units. Each distress type is identified, then classified as low, medium, or high severity, and recorded on field sheets. In general, the higher the severity, the higher the foreign object damage (FOD) potential. The quantity, or extent, is measured for each distress/severity combination.

After collecting and summarizing the distress type, severity, and quantity for each of the inspected sample units, the distress data were entered into the MicroPAVER database and a PCI was calculated. The PCI procedure uses established deduct curves to determine the number of points to deduct for each distress type/severity combination, depending on the density of the distress. The inspected sample unit PCI's were then averaged to determine an overall PCI for that section.

The PCI value provides a general sense as to the level of rehabilitation that will be needed to repair a given pavement. In general terms, maintenance activities such as crack sealing and patching often provide benefit when the PCI is above 60. However, as the pavement continues to deteriorate, more complex and expensive treatments will be necessary. Pavements with a PCI between 40 and 60 are good candidates for a variety of major repairs ranging from overlays to reconstruction. Once the PCI drops below 40, reconstruction is typically the only viable alternative. Figure 3 presents the PCI inputs, rating scale, and the corresponding general work repair levels.

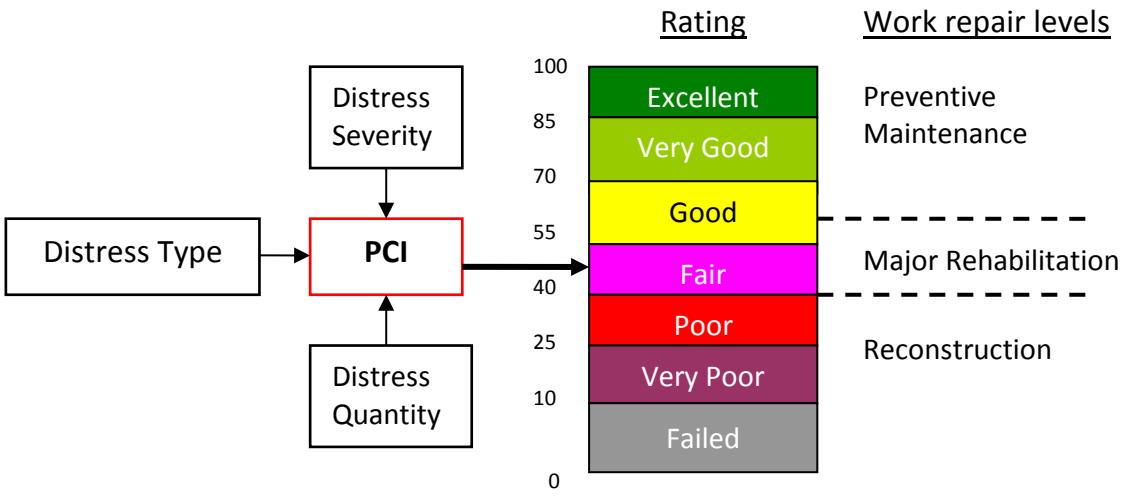

Figure 3. PCI rating scale and repair levels.

2.2.1 Distress Types

To better understand the cause of pavement deterioration, it is necessary to look at the distress types associated with each PCI. Each distress type has been classified into one of three groups based on cause—load, climate/durability, or other. Load-related distresses such as alligator cracking in asphalt pavements, or corner breaks in PCC pavements, indicate that the structural integrity of the pavement has been compromised. Climate-related distresses indicate that the pavement has aged due to seasonal environmental effects. Distresses that cannot be attributed solely to either load or climate are classified as other. Table 2 presents the asphalt and PCC distress types in the PCI procedure, their classification, and identifies which distresses were observed at DLH during the pavement inspection.

Table 2. PCI distress types.

Asphalt Distresses	Cause Classification	PCC Distresses	Cause Classification
Alligator cracking	Load	Blowup	Climate
Bleeding	Other	Corner break	Load
Block cracking	Climate	Linear cracking	Load
Corrugation	Other	Durability cracking	Climate
Depression	Other	Joint seal damage	Climate
Jet blast	Other	Small patch	Other
Joint reflection cracking	Climate	Large patch	Other
L&T cracking	Climate	Popouts	Other
Oil spillage	Other	Pumping	Other
Patching	Other	Scaling/crazing	Other
Polished aggregate	Other	Faulting	Other
Raveling	Climate	Shattered slab	Load
Rutting	Load	Shrinkage cracking	Other
Shoving	Other	Joint spalling	Other
Slippage cracking	Other	Corner spalling	Other
Swelling	Other	Alkali Silica Reaction	Climate
Weathering	Climate		

Indicates distresses found at DLH

2.3 PCI Results

The results of the 2018 PCI inspection are presented in figure 4. The overall area-weighted, inspected PCI for DLH is 66. When summarizing PCI values, an area-weighted calculation is used instead of a straight mathematical average because the area-weighted calculations eliminate the skewing of the PCI due to the disparity of the section sizes.

Figures 5 and 6 present the overall PCI for DLH by area distribution and pavement use, respectively. Table 3 presents the PCI summary for each section at DLH, including the drop in PCI per year. Generally, pavement sections will deteriorate between 1 and 3 PCI points per year. Sections deteriorating at higher rates may need maintenance above the normal application rates and should be closely monitored in case major repairs become necessary earlier than expected.

Appendix C contains the detailed inspection report with sample unit data produced from MicroPAVER. Appendix D describes the distress types most commonly identified during the PCI inspections of Minnesota airports.

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Table 3. PCI section summary table.

Branch ID	Section ID	Surface type[1]	Section area (SF)	LCD[2]	2015 PCI	2018 PCI	Drop in PCI/Yr[3]	% Deduct due to		Distress types
								Load[4]	Climate[5]	
ANBD	001	AC	139,000	2011	-	100	-	-	-	-
APGA	001	AC	160,000	1960	54	45	.9	-	99	Block cr, Joint reflection cr, L&T cr, Swelling, Weathering
APGA	002	PCC	60,800	1948	33	28	1.0	66	12	Corner break, Corner spalling, Faulting, Joint seal damage, Joint spalling, Large patch, Linear cr, Shattered slab, Shrinkage cr, Small patch
APGA	003	AC	228,750	1962	39	32	1.2	3	96	Alligator cr, Block cr, Joint reflection cr, L&T cr, Patching, Raveling, Swelling, Weathering
APGA	004	PCC	138,350	1957	76	62	.6	60	-	Corner break, Corner spalling, Large patch, Linear cr, Shattered slab, Small patch
APGA	005	AC	11,600	1960	97	87	.2	-	81	L&T cr, Swelling, Weathering
APGA	006	PCC	149,200	1955	13	13	1.4	71	7	Corner spalling, Faulting, Joint seal damage, Joint spalling, Linear cr, Scaling, Shattered slab, Small patch
APGA	007	PCC	79,200	1957	21	8	1.5	58	7	Joint seal damage, Joint spalling, Large patch, Linear cr, Shattered slab
APGA	008	PCC	172,000	1955	69	64	.6	19	20	Corner spalling, Faulting, Joint seal damage, Joint spalling, Large patch, Linear cr, Shattered slab, Shrinkage cr, Small patch
APGA	009	PCC	149,200	1955	51	48	.8	72	16	Corner break, Corner spalling, Faulting, Joint seal damage, Large patch, Linear cr, Shattered slab, Shrinkage cr
APGA	010	AC	54,900	2004	61	56	3.2	-	100	L&T cr, Weathering
APGA	011	AC	35,500	1996	69	62	1.7	10	89	Alligator cr, Depression, L&T cr, Patching, Raveling, Weathering
APGA	012	PCC	86,600	1956	51	47	.9	77	19	Corner break, Joint seal damage, Joint spalling, Linear cr, Shattered slab
APGA	013	AC	14,200	2007	84	60	3.7	15	85	Alligator cr, L&T cr, Raveling

Branch ID	Section ID	Surface type[1]	Section area (SF)	LCD[2]	2015 PCI	2018 PCI	Drop in PCI/Yr[3]	% Deduct due to		Distress types
								Load[4]	Climate[5]	
APGA	014	PCC	18,500	2008	-	88	1.2	100	-	Corner break, Linear cr
APTR	001	PCC	77,700	1974	47	47	1.2	41	18	Corner break, Corner spalling, Faulting, Joint seal damage, Joint spalling, Large patch, Linear cr, Shattered slab, Small patch
APTR	002	AC	101,500	1974	52	39	1.4	7	92	Alligator cr, Block cr, L&T cr, Raveling, Swelling, Weathering
APTR	003	PCC	260,600	2014	99	98	.5	-	49	Faulting, Joint seal damage, Joint spalling, Shrinkage cr
CTA1	001	AC	62,000	1978	42	39	1.5	27	73	Alligator cr, Block cr, Joint reflection cr, L&T cr, Raveling, Weathering
CTA1	002	PCC	13,200	1978	79	71	.7	28	21	Corner spalling, Joint seal damage, Joint spalling, Large patch, Linear cr, Small patch
CTA2	001	AC	36,700	1981	67	68	.9	-	100	L&T cr, Weathering
CTA2	002	AC	24,600	1981	33	31	1.9	41	57	Alligator cr, L&T cr, Patching, Raveling, Rutting, Swelling, Weathering
CTA3	001	AC	19,500	1963	78	79	.4	-	100	L&T cr, Weathering
CTA3	002	AC	20,600	1963	39	37	1.1	19	61	Alligator cr, L&T cr, Raveling, Swelling, Weathering
CTA3	003	AC	15,100	1963	60	59	.7	-	100	L&T cr, Weathering
CTA5	001	AC	44,800	1974	55	44	1.3	10	90	Alligator cr, Block cr, Joint reflection cr, L&T cr, Weathering
CTB	001	PCC	345,200	1994	90	86	.6	68	8	Corner break, Corner spalling, Joint seal damage, Joint spalling, Linear cr, Shattered slab, Small patch
CTC1	001	AC	5,200	2009	92	84	1.8	-	81	L&T cr, Swelling, Weathering
CTD	001	AC	114,000	1974	32	34	1.5	-	100	Block cr, Depression, L&T cr, Patching, Raveling, Weathering
CTD	002	AC	25,300	1974	81	82	.4	-	100	L&T cr, Weathering
PTA	001	AC	165,300	1992	33	32	2.6	27	73	Alligator cr, Block cr, L&T cr, Patching, Raveling, Weathering

Branch ID	Section ID	Surface type[1]	Section area (SF)	LCD[2]	2015 PCI	2018 PCI	Drop in PCI/Yr[3]	% Deduct due to		Distress types
								Load[4]	Climate[5]	
PTA	002	AC	493,800	1985	37	34	2.0	34	65	Alligator cr, Block cr, Depression, L&T cr, Patching, Raveling, Rutting, Swelling, Weathering
PTA	003	AC	39,400	1974	52	50	1.1	-	100	Block cr, L&T cr, Weathering
PTA	004	AC	5,900	1974	68	70	.7	-	100	L&T cr, Weathering
PTA	005	AC	224,400	1974	58	52	1.1	16	84	Alligator cr, Block cr, L&T cr, Weathering
PTC	001	AC	48,000	1960	30	42[6]	1.0	-	100	Block cr, Weathering
PTC	001P	PCC	3,600	1960	20	22	1.3	78	7	Corner break, Corner spalling, Joint seal damage, Joint spalling, Linear cr, Shattered slab
PTC	002	AC	4,400	1960	93	77	.4	-	100	L&T cr, Weathering
PTC	003	AC	32,000	1960	37	59[7]	.7	-	100	Joint reflection cr, L&T cr, Weathering
PTC	004	AAC	62,100	2016	37	79	8.0[8]	-	100	L&T cr
PTC	005	AC	182,300	1960	-	28	1.2	11	88	Alligator cr, Block cr, Depression, L&T cr, Swelling, Weathering
RPA1	001	PCC	24,300	1978	87	77	.6	25	38	Joint seal damage, Joint spalling, Linear cr
RPE	001	PCC	28,000	1964	61	48	1.0	89	-	Large patch, Linear cr, Small patch
RPW	001	PCC	105,000	1992	59	60	1.5	49	17	Corner break, Durability cr, Joint seal damage, Large patch, Linear cr, Shattered slab, Shrinkage cr, Small patch
RY321	001	AC	70,000	2009	93	84	1.8	-	100	L&T cr, Raveling, Weathering
RY321	002	AC	35,000	2009	88	85	1.7	-	100	L&T cr, Weathering
RY321	003	AC	48,700	2017	-	79	12.6[9]	-	100	L&T cr, Raveling, Weathering
RY321	004	AC	100,000	2009	89	84	1.8	-	100	L&T cr, Weathering
RY321	005	AC	50,000	2009	87	81	2.1	-	100	L&T cr, Weathering
RY321	006	AC	24,350	2017	-	86	8.4[10]	-	100	L&T cr, Raveling, Weathering
RY321	007	AC	334,950	2009	87	82	2.0	-	100	L&T cr, Weathering
RY321	008	AC	167,500	2009	86	81	2.1	-	100	L&T cr, Weathering

Branch ID	Section ID	Surface type[1]	Section area (SF)	LCD[2]	2015 PCI	2018 PCI	Drop in PCI/Yr[3]	% Deduct due to		Distress types
								Load[4]	Climate[5]	
RY927	001	PCC	742,500	2018	-	100	-	-	-	Corner break
RY927	002	PCC	495,000	2018	-	100	-	-	-	Linear cr
RY927	004	PCC	189,000	1958	87	70	.5	24	16	Corner spalling, Joint seal damage, Large patch, Linear cr, Small patch
RY927	005	PCC	94,500	1958	79	74	.4	4	6	ASR, Corner spalling, Joint seal damage, Large patch, Linear cr, Small patch
RY927	007	PCC	100,000	1958	70	48	.9	8	10	Joint seal damage, Large patch, Linear cr, Small patch
RY927	008	PCC	50,000	1958	69	63	.6	-	13	Joint seal damage, Large patch, Small patch
TLA	001	PCC	63,500	2008	100	100	-	-	-	-
TLA	002	AC	17,300	2008	96	86	1.4	39	40	Alligator cr, Bleeding, L&T cr, Swelling
TLA	003	AC	14,000	2008	96	89	1.1	-	100	L&T cr, Weathering
TLA	005	AC	4,100	1996	75	72	1.3	-	93	L&T cr, Oil Spillage, Raveling, Weathering
TLA	009	AC	51,400	1996	42	39	2.8	44	53	Alligator cr, Depression, L&T cr, Raveling, Rutting, Weathering

[1]AC = asphalt cement; AAC = asphalt overlaid with asphalt; PCC = portland cement concrete; APC = PCC overlaid with asphalt

[2]LCD = last construction date (original construction, last overlay, or reconstruction [whichever is most recent])

[3]Drop in PCI/Yr = (100 – PCI)/age where age = 2018 - LCD

[4]Percent of deduct due to load = Percentage of PCI points subtracted from 100 for load related distresses

[5]Percent of deduct due to climate = Percentage of PCI points subtracted from 100 for climate/durability related distresses

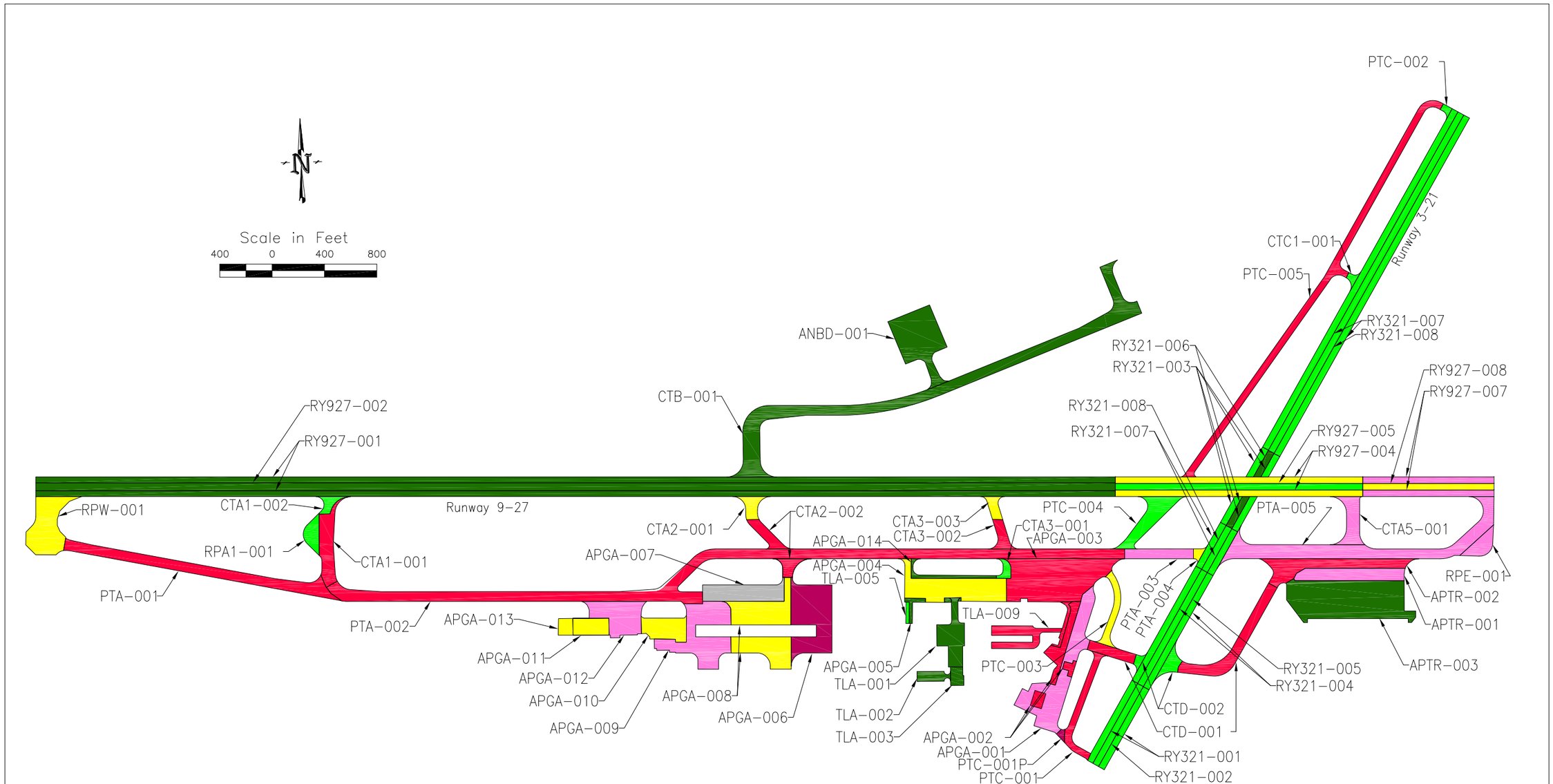
[6]Increase in PCI due to change in section boundaries and area in addition to crack sealing that was done between the 2015 and 2018 inspections.

[7]Increase in PCI due to crack sealing that took place between the 2015 and 2018 inspections.

[8]Higher than expected deterioration rate of 8.0 PCI/year due to the development of low-severity L&T cracking on a two year old pavement.

[9]Higher than expected deterioration rate of 12.6 PCI/year due to the development of low-severity L&T cracking in significant quantities on a year old pavement

[10]Higher than expected deterioration rate of 8.4 PCI/year due to the development of low-severity weathering on a year old pavement.



	Failed	Very Poor	Poor	Fair	Good	Very Good	Excellent	PCI INDEX
NS	0-10	11-25	26-40	41-55	56-70	71-85	86-100	

ARA_Logo281.jpg

2018 PCI Summary
Duluth International Airport (DLH)

ENGINEER:	DRAWN BY:	DATE:	CTAF
BDA	MP	JUL 2018	122.95

Figure 4. 2018 PCI Summary Map at Duluth International Airport (DLH).

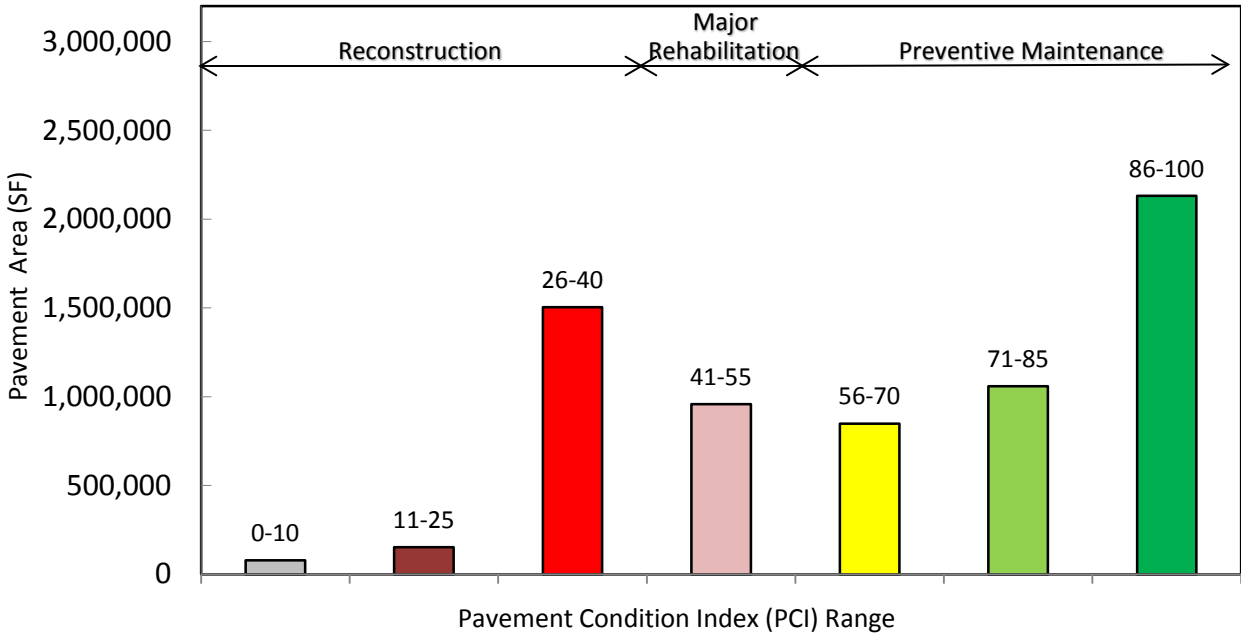


Figure 5. Condition distribution.

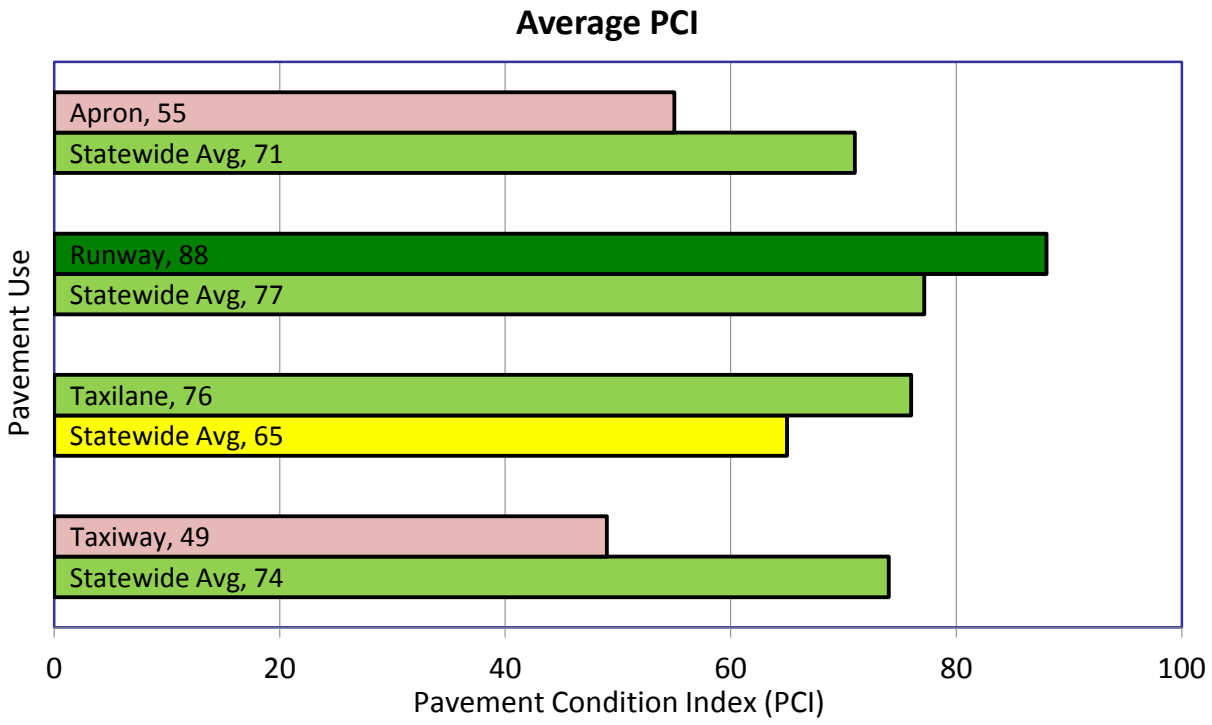


Figure 6. Area-weighted PCI by pavement use.

2.4 Projected PCI

After the 2018 distress data was entered into MicroPAVER and the PCI determined, a modeling approach was used to predict future PCI levels based on historical PCI data from Mn/DOT's airports. Pavements were grouped together in performance families based on similar construction, traffic, pavement use, and other factors affecting pavement performance. These performance models predict future PCI, not future distresses.

Figure 7 shows the projected PCI at DLH by percent area for the next 5 years assuming no major repairs (overlays, reconstruction, etc.) are performed during that period. It shows how quickly a pavement network can deteriorate when no capital improvements are made.

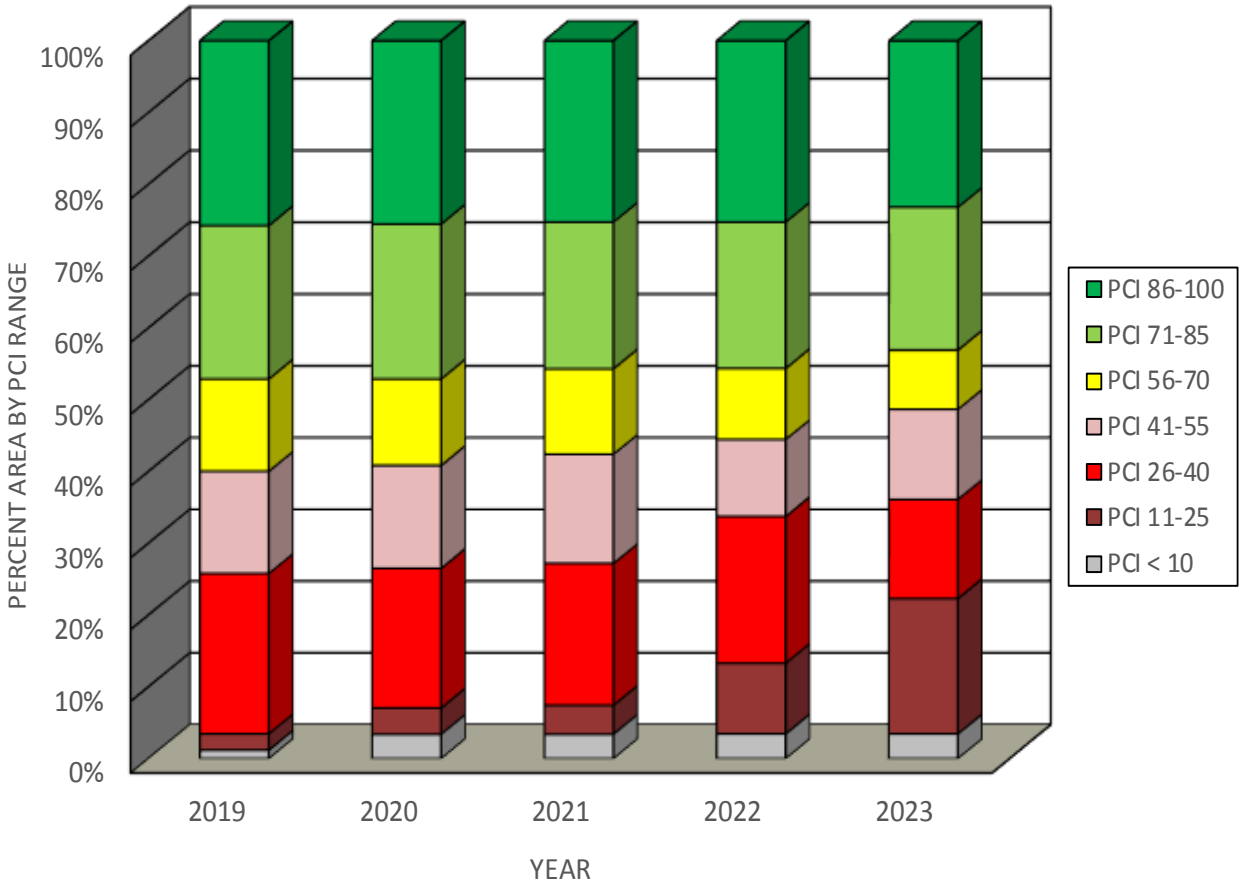


Figure 7. Projected PCI by percent area.

3. Recommendations

A 5-year maintenance and rehabilitation program was developed for DLH based on the 2018 pavement inspections and the anticipated PCI deterioration for this period. The recommendations are divided into two categories—near term maintenance (Local M&R) and major rehabilitation (Major M&R). The near term maintenance is intended to address annual maintenance needs such as crack sealing and localized patching. The major rehabilitations are applied globally and are capable of returning the pavement to a nearly distress free-state. Costs for both categories are based on industry averages and may have to be adjusted to account for local costs.

The last portion of the report covers the FAA Grant Assurance Number 11 and the steps the airport must take to remain in compliance with this program.

3.1 Near Term Maintenance

Near term maintenance is considered activities such as crack sealing, patching, and surface treatments that help to slow down the rate that a pavement is deteriorating. Localized maintenance policies and unit costs were developed with Mn/DOT for both asphalt and PCC surfaces; each policy presents the recommended maintenance treatment for each distress/severity combination and are presented in appendix E.

Table 4 presents the summarized maintenance work quantities and estimated cost to apply this near term maintenance plan at DLH. The repair quantities are based on extrapolated distress quantities from the 2018 PCI inspection. National averages of unit costs are used to estimate total costs for each treatment type; adjustments of local unit costs rates may be necessary for each airport to more accurately determine the maintenance budgetary needs.

Table 4. Summary of maintenance work plan.

Work Description	Work Quantity	Work Units	Unit Cost	Work Cost
Crack Sealing - AC	201,915	Ft	$1.26/Ft	$254,415
Crack Sealing - PCC	14,139	Ft	$1.92/Ft	$27,148
Grinding (Localized)	137	Ft	$4.98/Ft	$684
Joint Seal (Localized)	130,993	Ft	$1.92/Ft	$251,504
Patching - AC Deep	3,391	SqFt	$11.82/SqFt	$40,070
Patching - AC Shallow	106,143	SqFt	$7.95/SqFt	$843,840
Patching - PCC Full Depth	25,869	SqFt	$74.32/SqFt	$1,922,634
Patching - PCC Partial Depth	4,668	SqFt	$10.68/SqFt	$49,887
Slab Replacement - PCC	21,034	SqFt	$40.00/SqFt	$841,377
Surface Treatment	783,654	SqFt	$0.52/SqFt	$407,497
			Total	**$4,639,056**

Detailed results are reported by section and by treatment type in appendix F. Table F1 summarizes the maintenance that could be done for each pavement section by type of repair, and estimated quantity of repair. Likewise, table F2 summarizes the quantity for each repair type across the entire airport.

When using this plan, it is recommended that the entire section be viewed to determine whether the identified distress types are so advanced in density and severity that maintenance efforts will no longer be cost-effective. Maintenance treatments are most cost-effective when applied to pavements that are generally in good condition. It is also important to understand that the maintenance plan is based on the distress types, severities, and quantities found during the 2018 PCI survey. As field conditions change, the maintenance plan will become less accurate. Therefore, the maintenance plan will be most useful the sooner it is implemented. Applying maintenance treatments should be an annual event at the airport, and this maintenance plan can serve as a baseline for that work. Guidelines for performing crack sealing and patching techniques are provided in appendix G.

3.2 Major Rehabilitation

In addition to the annual maintenance activities such as crack sealing and patching, some pavements may require more substantial rehabilitation. As a planning aid to the airport, Mn/DOT, and FAA, table 5 provides a summary from MicroPAVER of the predicted 5-year pavement rehabilitation needs at DLH. Although the predicted rehabilitation timeline identifies specific sections and the general timing for the repair, more in-depth project-level studies will be needed to determine exactly how to fix each pavement. Routine maintenance should also be programmed annually throughout the airport, but these efforts should be coordinated with the following rehabilitation recommendations.

The pavement sections identified for major rehabilitation in this report are at or are predicted to reach a condition level where either overlays or reconstruction should be considered. Note that this analysis is based on an unconstrained budget, and these recommendations will need to be adjusted to account for economic and operational considerations. Additionally, identifying projects for work does not guarantee that Federal or State funding will be available to complete the work in the year shown. The airport and Mn/DOT should view these recommendations as viable projects when preparing future Capital Improvement Plans (CIP).

Table 5. Recommended 5-year major rehabilitation plan.

Branch ID	Section ID	Year	Predicted PCI Before Rehab	Estimated Cost
APGA	001	2019	44	$1,055,924
APGA	002	2019	26	$522,261
APGA	003	2019	31	$1,936,207
APGA	006	2019	11	$1,281,600
APGA	007	2019	6	$680,313
APGA	009	2019	47	$943,100
APGA	012	2019	46	$557,915
APTR	001	2019	46	$500,577
APTR	002	2019	38	$750,688
CTA1	001	2019	38	$459,815
CTA2	002	2019	30	$211,309
CTA3	002	2019	36	$159,001
CTA3	003	2019	59	$67,074
CTA5	001	2019	43	$302,217

Branch ID	Section ID	Year	Predicted PCI Before Rehab	Estimated Cost
CTD	001	2019	33	$931,653
PTA	001	2019	31	$1,400,837
PTA	002	2019	33	$4,035,527
PTA	003	2019	49	$236,624
PTA	005	2019	52	$1,273,679
PTC	001	2019	41	$335,685
PTC	003	2019	59	$142,143
PTC	005	2019	27	$1,565,923
PTC	001P	2019	20	$30,923
RPE	001	2019	47	$176,989
RY927	007	2019	47	$632,105
TLA	009	2019	39	$374,825
RPW	001	2022	53	$570,059
APGA	004	2023	53	$747,488
RY927	008	2023	54	$259,992
			5-year Airport Total	**$22,142,456**

3.3 Federal Guidelines

In 1995, Congress mandated that the FAA require, as a condition of grant funding, that airports be prepared to present documentation of a maintenance management program on pavement that has been constructed, reconstructed, or repaired with Federal assistance.

The FAA has defined an acceptable maintenance management program, and this report fulfills many requirements of such a program, including documenting:

- Locations of all runways, taxiways, and aprons.
- Dimensions of the pavement system.
- Types of pavement.
- Year of construction or most recent major rehabilitation.

However, **the airport owner must be an active participant**, specifically by implementing the following actions:

- Annotate pavement areas that have been constructed, reconstructed, or repaired with Federal financial assistance.
- Conduct a "drive-by" inspection at least monthly to detect changes in pavement condition.
- Keep complete records of maintenance activities. Record the date of each "drive-by" inspection and any maintenance performed as a result. Records must be maintained on file for a minimum of 5 years.
- Document detailed inspection information with a history of recorded pavement deterioration by PCI survey (e.g., this report).

An example of a form that can be completed during “drive-by” inspections is provided in appendix G.

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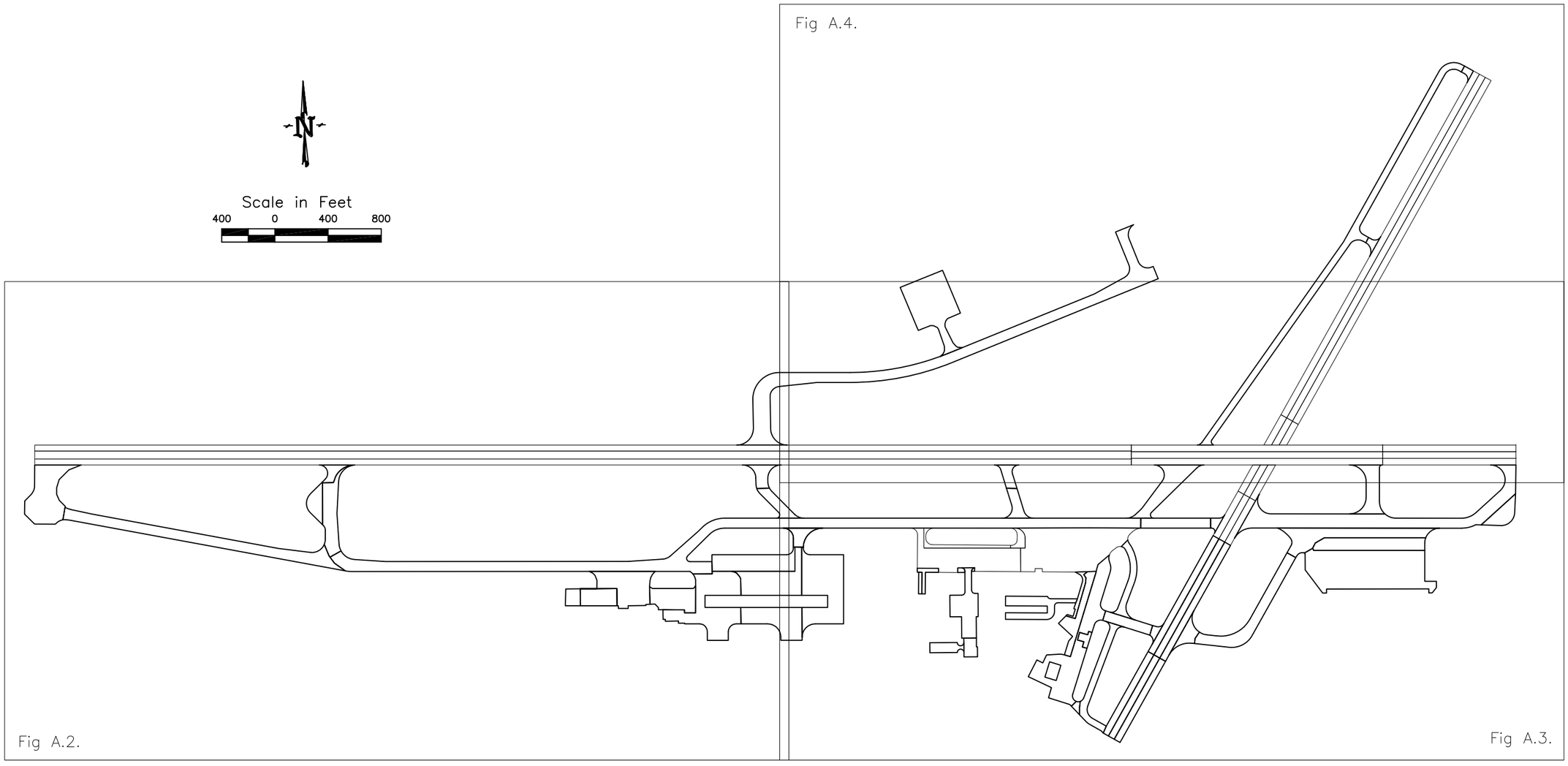
Appendix A

Sample Unit Maps



N

Scale in Feet

400 0 400 800

○ Denotes sample unit surveyed

◇ Denotes additional sample unit surveyed

ARA

Sample Unit Layout
Duluth International Airport (DLH)

ENGINEER:	DRAWN BY:	DATE:	CTAF
BDA	MJP	JUL 2018	122.95

Figure A.1. Sample Unit Layout Map at Duluth International Airport (DLH).

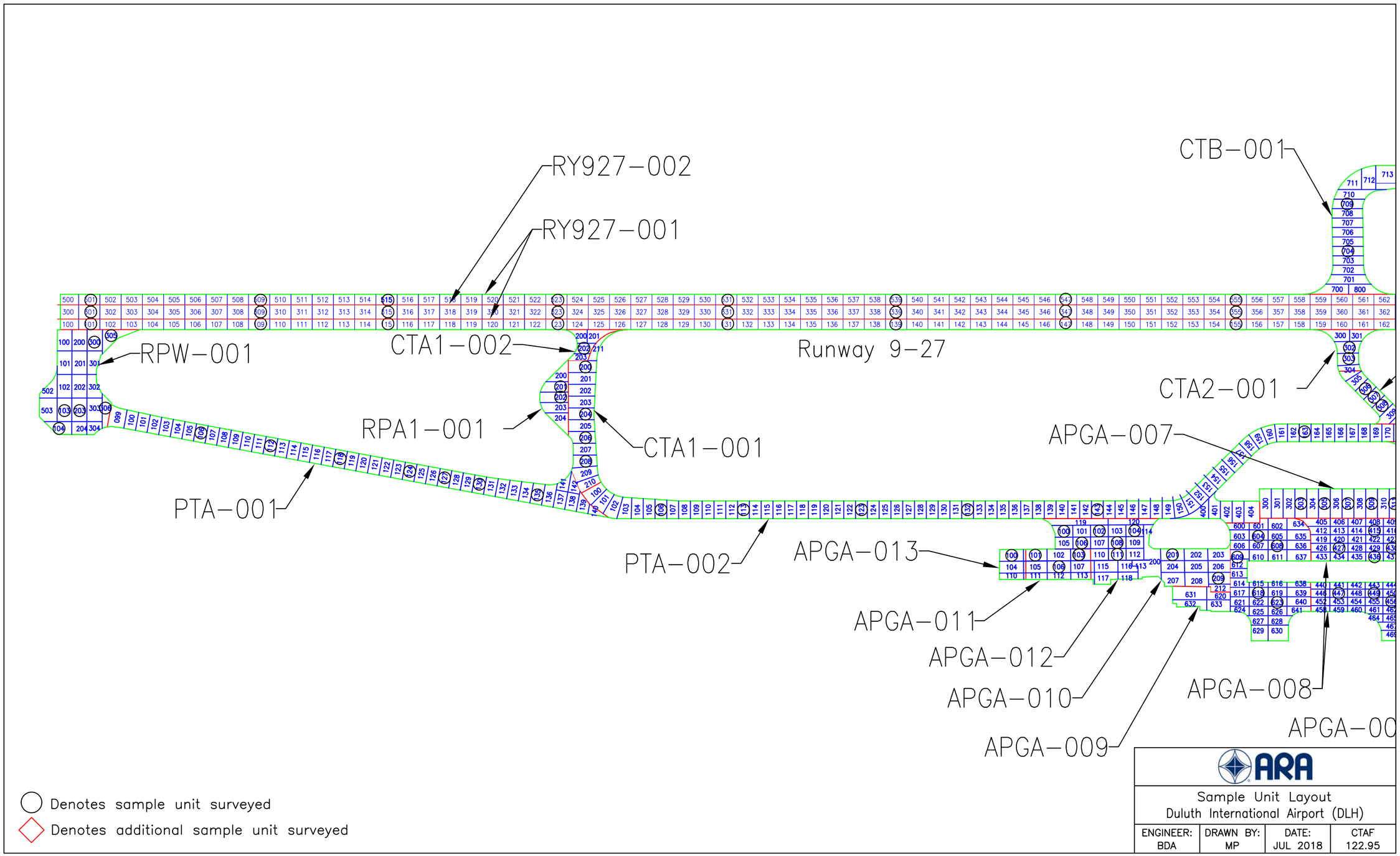


Figure A.2. Sample Unit Layout Map at Duluth International Airport (DLH).

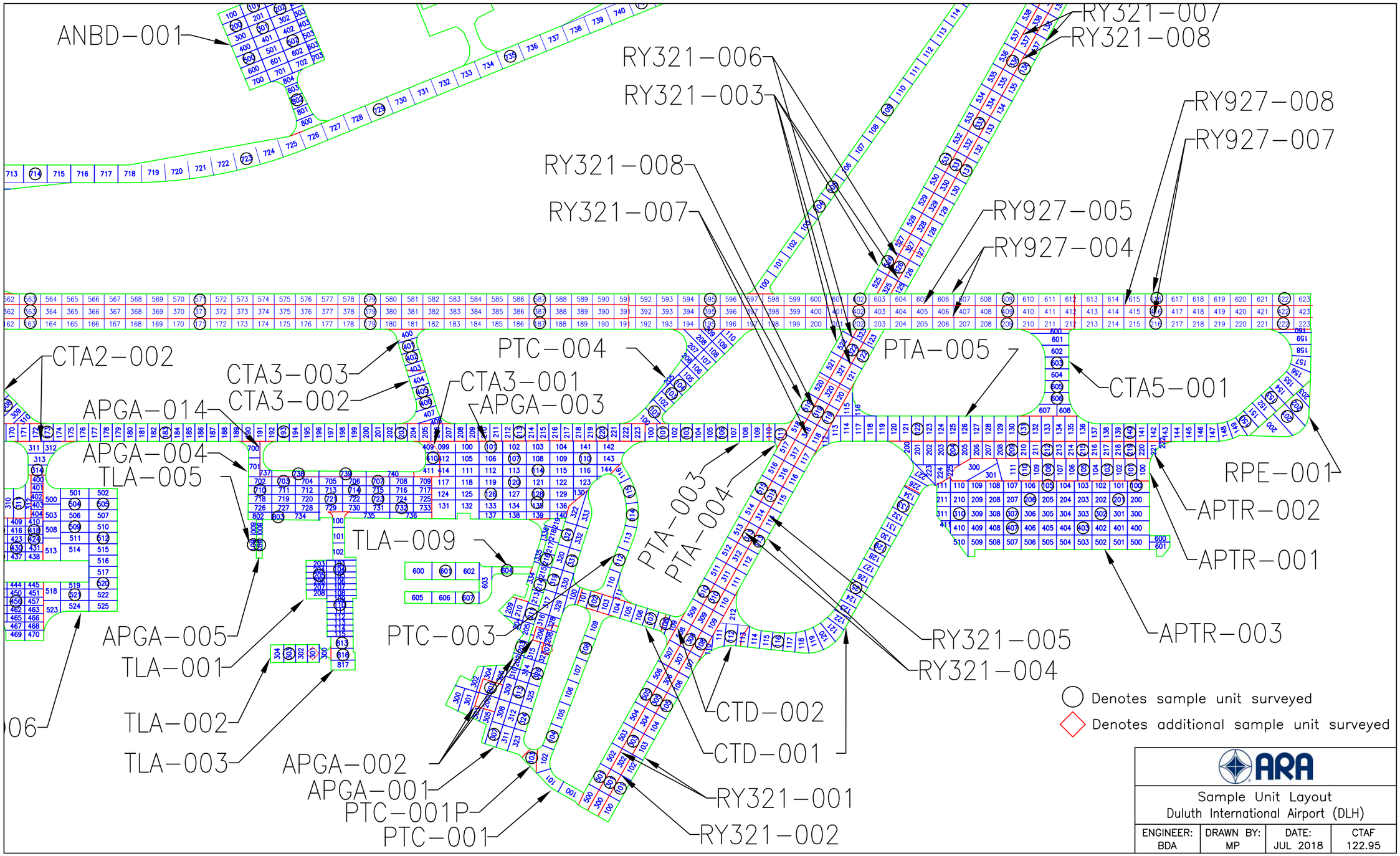


Figure A.3. Sample Unit Layout Map at Duluth International Airport (DLH).

ARA			
Sample Unit Layout Duluth International Airport (DLH)			
ENGINEER: BDA	DRAWN BY: MP	DATE: JUL 2018	CTAF 122.95

○ Denotes sample unit surveyed

◇ Denotes additional sample unit surveyed

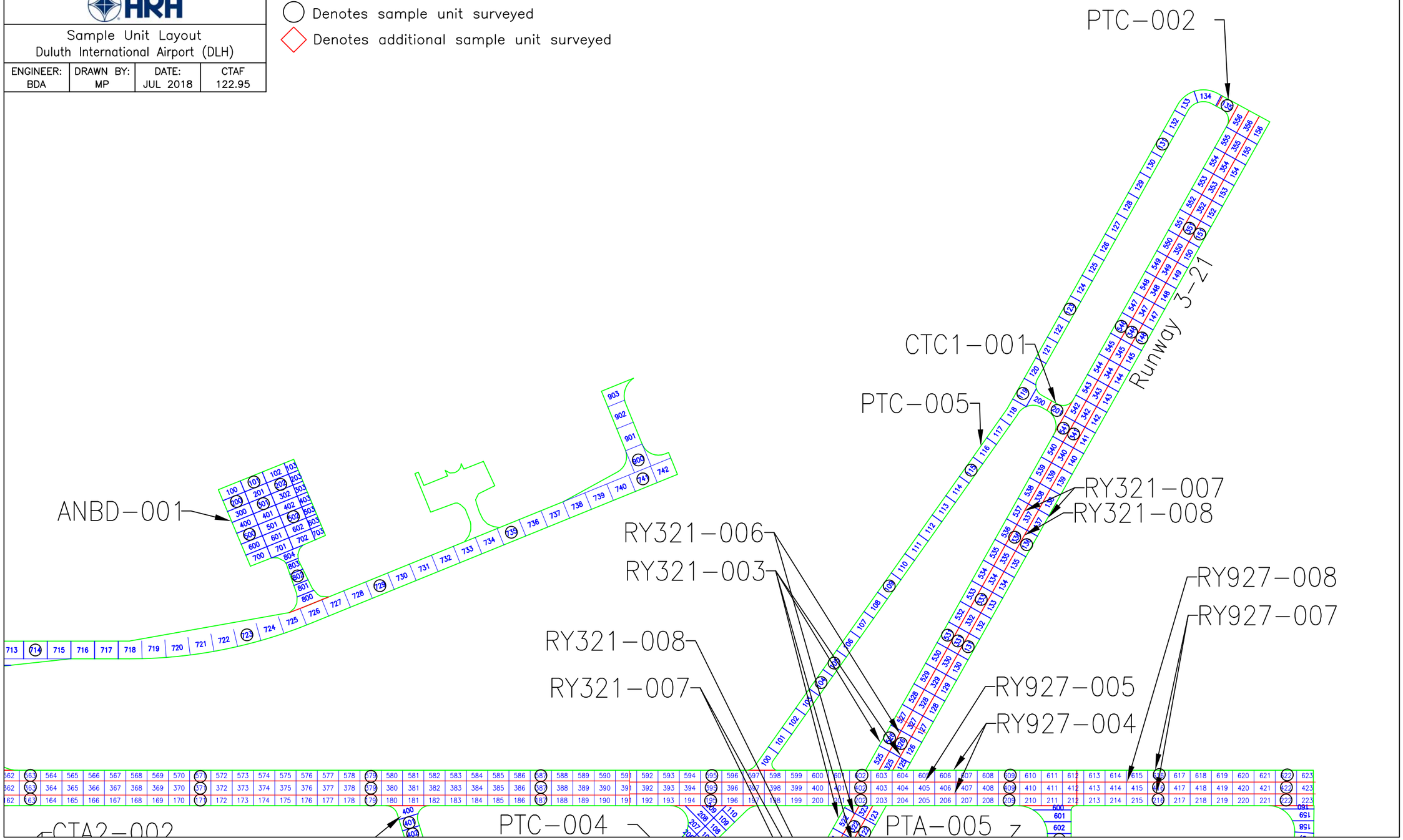


Figure A.4. Sample Unit Layout Map at Duluth International Airport (DLH).

Appendix B

Pictures

DLH ANBD 001 (PCI = 100)

DLH APGA 001 (PCI = 45)

DLH APGA 002 (PCI = 28)

DLH APGA 004 (PCI = 62)

DLH APGA 005 (PCI = 87)

DLH APGA 006 (PCI = 13)

DLH APGA 007 (PCI = 8)

DLH APGA 008 (PCI = 64)

DLH APGA 009 (PCI = 48)

DLH APGA 010 (PCI = 56)

DLH APGA 011 (PCI = 62)

DLH APGA 012 (PCI = 47)

DLH APGA 013 (PCI = 60)

DLH APGA 014 (PCI = 88)

DLH APTR 001 (PCI = 47)

DLH APTR 002 (PCI = 39)

DLH APTR 003 (PCI = 98)

DLH CTA1 001 (PCI = 39)

DLH CTA1 002 (PCI = 71)

DLH CTA2 002 (PCI = 31)

DLH CTA3 001 (PCI = 79)

DLH CTA3 002 (PCI = 37)

DLH CTA3 003 (PCI = 59)

DLH CTA5 001 (PCI = 44)

DLH CTB 001 (PCI = 86)

DLH CTC1 001 (PCI = 84)

DLH CTD 001 (PCI = 34)

DLH CTD 002 (PCI = 82)

DLH PTA 001 (PCI = 32)

DLH PTA 002 (PCI = 34)

DLH PTA 003 (PCI = 50)

DLH PTA 004 (PCI = 70)

DLH PTA 005 (PCI = 52)

DLH PTC 001 (PCI = 42)

DLH PTC 002 (PCI = 77)

DLH PTC 003 (PCI = 59)

DLH PTC 004 (PCI = 79)

DLH PTC 005 (PCI = 28)

DLH RPA1 001 (PCI = 77)

DLH RPE 001 (PCI = 48)

DLH RPW 001 (PCI = 60)

DLH RY321 001 (PCI = 84)

DLH RY321 002 (PCI = 85)

DLH RY321 003 (PCI = 79)

DLH RY321 004 (PCI = 84)

DLH RY321 005 (PCI = 81)

DLH RY321 006 (PCI = 86)

DLH RY321 007 (PCI = 82)

DLH RY321 008 (PCI = 81)

DLH RY927 001 (PCI = 100)

DLH RY927 002 (PCI = 100)

DLH RY927 004 (PCI = 70)

DLH RY927 005 (PCI = 74)

DLH RY927 007 (PCI = 48)

DLH RY927 008 (PCI = 63)

DLH TLA 001 (PCI = 100)

DLH TLA 002 (PCI = 86)

DLH TLA 003 (PCI = 89)

DLH TLA 005 (PCI = 72)

DLH TLA 009 (PCI = 39)

Appendix C

PCI Distress Report

Re-Inspection Report

Network: DLH **Name:** Duluth International Airport

Branch: ANBD **Name:** Business Apron **Use:** APRON **Area:** 139,000 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 8/1/2011

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 139,000 SqFt **Length:** 372 Ft **Width:** 372 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 33 **Surveyed:** 7

Conditions: **PCI:** 100

Sample Number:	101	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	200	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	202	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	301	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	500	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	502	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	100

<No Distress>

Sample Number:	802	**Type:**	R	**Area:**	3200.00 SqFt	**PCI:**	100

<No Distress>

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 008 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1955

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 172,000 SqFt **Length:** 455 Ft **Width:** 380 Ft

Slabs: 1,101 **Slab Length:** 12 Ft **Slab Width:** 12 Ft **Joint Length:** 26,829 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 40 **Surveyed:** 9

Conditions: **PCI:** 64

Sample Number: 415 **Type:** R **Area:** 18.00 Slabs **PCI:** 77

67	LARGE PATCH	L	1.00	Slabs
75	CORNER SPALL	L	1.00	Slabs
74	JOINT SPALL	M	1.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs
66	SMALL PATCH	L	1.00	Slabs

Sample Number: 418 **Type:** R **Area:** 18.00 Slabs **PCI:** 63

74	JOINT SPALL	M	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs
75	CORNER SPALL	M	2.00	Slabs
67	LARGE PATCH	L	4.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs
75	CORNER SPALL	H	1.00	Slabs

Sample Number: 424 **Type:** R **Area:** 18.00 Slabs **PCI:** 59

67	LARGE PATCH	L	1.00	Slabs
74	JOINT SPALL	L	4.00	Slabs
74	JOINT SPALL	M	2.00	Slabs
75	CORNER SPALL	H	5.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs
73	SHRINKAGE CR	N	1.00	Slabs

Sample Number: 427 **Type:** R **Area:** 18.00 Slabs **PCI:** 58

71	FAULTING	L	4.00	Slabs
75	CORNER SPALL	L	11.00	Slabs
74	JOINT SPALL	M	2.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs
75	CORNER SPALL	H	2.00	Slabs

Sample Number: 430 **Type:** R **Area:** 18.00 Slabs **PCI:** 66

74	JOINT SPALL	M	4.00	Slabs
71	FAULTING	L	4.00	Slabs
66	SMALL PATCH	M	1.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs

Sample Number: 436 **Type:** R **Area:** 16.00 Slabs **PCI:** 35

65	JT SEAL DMG	H	16.00	Slabs
75	CORNER SPALL	H	2.00	Slabs
74	JOINT SPALL	M	2.00	Slabs
63	LINEAR CR	M	2.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
75	CORNER SPALL	M	5.00	Slabs

Sample Number: 447 **Type:** R **Area:** 18.00 Slabs **PCI:** 68

74	JOINT SPALL	H	2.00	Slabs
74	JOINT SPALL	M	2.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs

Sample Number: 449 **Type:** R **Area:** 18.00 Slabs **PCI:** 68

74	JOINT SPALL	H	2.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs
75	CORNER SPALL	H	1.00	Slabs

Sample Number: 456 **Type:** R **Area:** 18.00 Slabs **PCI:** 84

74	JOINT SPALL	M	1.00	Slabs
65	JT SEAL DMG	H	18.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 001 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 160,000 SqFt **Length:** 400 Ft **Width:** 400 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 38 **Surveyed:** 7

Conditions: **PCI:** 45

Sample Number: 307 **Type:** R **Area:** 5000.00 SqFt **PCI:** 42

43	BLOCK CR	M	4500.00	SqFt
57	WEATHERING	L	2500.00	SqFt
43	BLOCK CR	L	500.00	SqFt

Sample Number: 313 **Type:** R **Area:** 5000.00 SqFt **PCI:** 38

48	L & T CR	M	180.00	Ft
56	SWELLING	L	10.00	SqFt
43	BLOCK CR	L	1500.00	SqFt
43	BLOCK CR	M	2500.00	SqFt
57	WEATHERING	L	5000.00	SqFt
48	L & T CR	L	147.00	Ft

Sample Number: 319 **Type:** R **Area:** 5000.00 SqFt **PCI:** 40

57	WEATHERING	L	5000.00	SqFt
43	BLOCK CR	L	1600.00	SqFt
48	L & T CR	M	106.00	Ft
43	BLOCK CR	M	2400.00	SqFt
48	L & T CR	L	59.00	Ft
48	L & T CR	H	4.00	Ft

Sample Number: 321 **Type:** R **Area:** 5000.00 SqFt **PCI:** 41

48	L & T CR	M	540.00	Ft
56	SWELLING	L	10.00	SqFt
48	L & T CR	L	425.00	Ft
48	L & T CR	H	9.00	Ft
43	BLOCK CR	L	500.00	SqFt
57	WEATHERING	L	5000.00	SqFt

Sample Number: 324 **Type:** R **Area:** 3500.00 SqFt **PCI:** 43

43	BLOCK CR	L	2500.00	SqFt
48	L & T CR	M	192.00	Ft
43	BLOCK CR	M	500.00	SqFt
48	L & T CR	L	112.00	Ft

Sample Number: 326 **Type:** R **Area:** 5000.00 SqFt **PCI:** 45

43	BLOCK CR	M	500.00	SqFt
57	WEATHERING	L	5000.00	SqFt
43	BLOCK CR	L	2000.00	SqFt
47	JT REF. CR	M	243.00	Ft
48	L & T CR	L	143.00	Ft

Sample Number: 331 **Type:** R **Area:** 5000.00 SqFt **PCI:** 64

48	L & T CR	M	47.00	Ft
48	L & T CR	L	221.00	Ft
47	JT REF. CR	L	1039.00	Ft
47	JT REF. CR	M	104.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 014 of 14 **From:** A **To:** B **Last Const.:** 9/30/2008

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** P

Area: 18,500 SqFt **Length:** 650 Ft **Width:** 23 Ft

Slabs: 107 **Slab Length:** 15 Ft **Slab Width:** 11 Ft **Joint Length:** 1,624 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 88

Sample Number: 738 **Type:** R **Area:** 20.00 Slabs **PCI:** 80

62	CORNER BREAK	L	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs
63	LINEAR CR	L	2.00	Slabs

Sample Number: 739 **Type:** R **Area:** 20.00 Slabs **PCI:** 95

63	LINEAR CR	L	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 004 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1957

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 138,350 SqFt **Length:** 775 Ft **Width:** 210 Ft

Slabs: 553 **Slab Length:** 12 Ft **Slab Width:** 20 Ft **Joint Length:** 20,172 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 43 **Surveyed:** 7

Conditions: **PCI:** 62

Sample Number: 703 **Type:** R **Area:** 15.00 Slabs **PCI:** 53

66	SMALL PATCH	L	4.00	Slabs
72	SHAT. SLAB	L	1.00	Slabs
67	LARGE PATCH	L	5.00	Slabs
63	LINEAR CR	L	12.00	Slabs
62	CORNER BREAK	L	1.00	Slabs
75	CORNER SPALL	H	1.00	Slabs

Sample Number: 707 **Type:** R **Area:** 15.00 Slabs **PCI:** 63

63	LINEAR CR	M	1.00	Slabs
63	LINEAR CR	L	4.00	Slabs
66	SMALL PATCH	L	9.00	Slabs
67	LARGE PATCH	L	5.00	Slabs

Sample Number: 710 **Type:** R **Area:** 15.00 Slabs **PCI:** 64

66	SMALL PATCH	L	4.00	Slabs
67	LARGE PATCH	L	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs
63	LINEAR CR	L	10.00	Slabs

Sample Number: 714 **Type:** R **Area:** 15.00 Slabs **PCI:** 61

66	SMALL PATCH	L	8.00	Slabs
63	LINEAR CR	L	4.00	Slabs
75	CORNER SPALL	M	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs
75	CORNER SPALL	L	1.00	Slabs
67	LARGE PATCH	L	1.00	Slabs

Sample Number: 721 **Type:** R **Area:** 15.00 Slabs **PCI:** 49

66	SMALL PATCH	L	3.00	Slabs
63	LINEAR CR	L	5.00	Slabs
72	SHAT. SLAB	L	1.00	Slabs
63	LINEAR CR	M	3.00	Slabs
67	LARGE PATCH	L	3.00	Slabs

Sample Number: 723 **Type:** R **Area:** 15.00 Slabs **PCI:** 78

66	SMALL PATCH	L	12.00	Slabs
67	LARGE PATCH	L	4.00	Slabs
66	SMALL PATCH	M	1.00	Slabs

Sample Number: 732 **Type:** R **Area:** 15.00 Slabs **PCI:** 69

67	LARGE PATCH	L	11.00	Slabs
66	SMALL PATCH	L	13.00	Slabs
63	LINEAR CR	L	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 010 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/2004

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 54,900 SqFt **Length:** 234 Ft **Width:** 234 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 11 **Surveyed:** 3

Conditions: **PCI:** 56

Sample Number: 201 **Type:** R **Area:** 5000.00 SqFt **PCI:** 59

48	L & T CR	L	424.00	Ft
57	WEATHERING	M	5000.00	SqFt
48	L & T CR	M	248.00	Ft

Sample Number: 205 **Type:** R **Area:** 5000.00 SqFt **PCI:** 56

48	L & T CR	L	249.00	Ft
57	WEATHERING	M	5000.00	SqFt
48	L & T CR	M	441.00	Ft

Sample Number: 209 **Type:** R **Area:** 5000.00 SqFt **PCI:** 53

57	WEATHERING	M	4700.00	SqFt
57	WEATHERING	H	300.00	SqFt
48	L & T CR	M	285.00	Ft
48	L & T CR	L	480.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 009 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1955

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 149,200 SqFt **Length:** 340 Ft **Width:** 440 Ft

Slabs: 373 **Slab Length:** 20 Ft **Slab Width:** 20 Ft **Joint Length:** 14,180 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 35 **Surveyed:** 5

Conditions: **PCI:** 48

Sample Number: 604 **Type:** R **Area:** 8.00 Slabs **PCI:** 54

73	SHRINKAGE CR	N	1.00 Slabs
63	LINEAR CR	M	3.00 Slabs
65	JT SEAL DMG	H	8.00 Slabs

Sample Number: 608 **Type:** R **Area:** 8.00 Slabs **PCI:** 32

63	LINEAR CR	M	6.00 Slabs
65	JT SEAL DMG	H	8.00 Slabs
75	CORNER SPALL	H	1.00 Slabs
71	FAULTING	L	1.00 Slabs

Sample Number: 609 **Type:** R **Area:** 8.00 Slabs **PCI:** 13

72	SHAT. SLAB	M	3.00 Slabs
72	SHAT. SLAB	H	1.00 Slabs
73	SHRINKAGE CR	N	1.00 Slabs
65	JT SEAL DMG	H	8.00 Slabs
63	LINEAR CR	L	1.00 Slabs

Sample Number: 618 **Type:** R **Area:** 8.00 Slabs **PCI:** 78

65	JT SEAL DMG	H	8.00 Slabs
63	LINEAR CR	L	2.00 Slabs

Sample Number: 623 **Type:** R **Area:** 8.00 Slabs **PCI:** 61

62	CORNER BREAK	M	1.00 Slabs
75	CORNER SPALL	M	1.00 Slabs
75	CORNER SPALL	H	1.00 Slabs
65	JT SEAL DMG	M	8.00 Slabs
67	LARGE PATCH	L	2.00 Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 007 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1957

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 79,200 SqFt **Length:** 625 Ft **Width:** 130 Ft

Slabs: 127 **Slab Length:** 25 Ft **Slab Width:** 25 Ft **Joint Length:** 5,745 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 12 **Surveyed:** 5

Conditions: **PCI:** 8

Sample Number: 303 **Type:** R **Area:** 10.00 Slabs **PCI:** 3

67	LARGE PATCH	M	2.00	Slabs
63	LINEAR CR	L	2.00	Slabs
67	LARGE PATCH	H	2.00	Slabs
63	LINEAR CR	M	7.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs
67	LARGE PATCH	L	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs

Sample Number: 305 **Type:** R **Area:** 10.00 Slabs **PCI:** 3

63	LINEAR CR	L	2.00	Slabs
67	LARGE PATCH	L	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
63	LINEAR CR	M	8.00	Slabs
67	LARGE PATCH	M	4.00	Slabs

Sample Number: 307 **Type:** R **Area:** 10.00 Slabs **PCI:** 9

63	LINEAR CR	M	4.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
74	JOINT SPALL	H	2.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
67	LARGE PATCH	M	4.00	Slabs

Sample Number: 309 **Type:** R **Area:** 10.00 Slabs **PCI:** 15

63	LINEAR CR	M	5.00	Slabs
67	LARGE PATCH	M	4.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs
63	LINEAR CR	L	1.00	Slabs

Sample Number: 311 **Type:** R **Area:** 10.00 Slabs **PCI:** 11

63	LINEAR CR	L	2.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs
67	LARGE PATCH	M	4.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
72	SHAT. SLAB	L	2.00	Slabs
63	LINEAR CR	M	4.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 012 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1956

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 86,600 SqFt **Length:** 240 Ft **Width:** 360 Ft

Slabs: 139 **Slab Length:** 25 Ft **Slab Width:** 25 Ft **Joint Length:** 6,312 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 21 **Surveyed:** 6

Conditions: **PCI:** 47

Sample Number: 100 **Type:** R **Area:** 6.00 Slabs **PCI:** 20

63	LINEAR CR	M	2.00	Slabs
65	JT SEAL DMG	H	6.00	Slabs
63	LINEAR CR	L	3.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs
62	CORNER BREAK	M	1.00	Slabs

Sample Number: 102 **Type:** R **Area:** 6.00 Slabs **PCI:** 46

63	LINEAR CR	L	4.00	Slabs
63	LINEAR CR	M	2.00	Slabs
65	JT SEAL DMG	H	6.00	Slabs

Sample Number: 104 **Type:** R **Area:** 6.00 Slabs **PCI:** 43

74	JOINT SPALL	M	2.00	Slabs
65	JT SEAL DMG	M	6.00	Slabs
63	LINEAR CR	L	1.00	Slabs
63	LINEAR CR	M	2.00	Slabs

Sample Number: 106 **Type:** R **Area:** 6.00 Slabs **PCI:** 53

63	LINEAR CR	L	1.00	Slabs
63	LINEAR CR	M	2.00	Slabs
65	JT SEAL DMG	M	6.00	Slabs

Sample Number: 108 **Type:** R **Area:** 6.00 Slabs **PCI:** 69

63	LINEAR CR	M	1.00	Slabs
65	JT SEAL DMG	M	6.00	Slabs

Sample Number: 111 **Type:** R **Area:** 6.00 Slabs **PCI:** 47

63	LINEAR CR	L	3.00	Slabs
63	LINEAR CR	M	1.00	Slabs
72	SHAT. SLAB	L	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 006 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1955

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 149,200 SqFt **Length:** 520 Ft **Width:** 290 Ft

Slabs: 259 **Slab Length:** 24 Ft **Slab Width:** 24 Ft **Joint Length:** 11,757 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 26 **Surveyed:** 6

Conditions: **PCI:** 13

Sample Number: 504 **Type:** R **Area:** 10.00 Slabs **PCI:** 5

63	LINEAR CR	M	4.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
72	SHAT. SLAB	H	1.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
63	LINEAR CR	L	1.00	Slabs

Sample Number: 505 **Type:** R **Area:** 10.00 Slabs **PCI:** 13

75	CORNER SPALL	M	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
63	LINEAR CR	L	3.00	Slabs
75	CORNER SPALL	H	1.00	Slabs
63	LINEAR CR	M	4.00	Slabs
70	SCALING	M	2.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
74	JOINT SPALL	M	1.00	Slabs

Sample Number: 509 **Type:** R **Area:** 10.00 Slabs **PCI:** 7

63	LINEAR CR	M	5.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
72	SHAT. SLAB	H	1.00	Slabs
75	CORNER SPALL	L	1.00	Slabs

Sample Number: 512 **Type:** R **Area:** 10.00 Slabs **PCI:** 23

63	LINEAR CR	M	4.00	Slabs
66	SMALL PATCH	H	2.00	Slabs
75	CORNER SPALL	H	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
63	LINEAR CR	L	5.00	Slabs
75	CORNER SPALL	M	1.00	Slabs

Sample Number: 520 **Type:** R **Area:** 10.00 Slabs **PCI:** 20

72	SHAT. SLAB	M	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
66	SMALL PATCH	H	1.00	Slabs
63	LINEAR CR	L	4.00	Slabs
71	FAULTING	L	2.00	Slabs
63	LINEAR CR	M	5.00	Slabs

Sample Number: 521 **Type:** R **Area:** 10.00 Slabs **PCI:** 12

74	JOINT SPALL	M	1.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
75	CORNER SPALL	H	1.00	Slabs
65	JT SEAL DMG	H	10.00	Slabs
63	LINEAR CR	M	6.00	Slabs
71	FAULTING	L	2.00	Slabs
75	CORNER SPALL	M	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 011 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1996

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 35,500 SqFt **Length:** 188 Ft **Width:** 188 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 9 **Surveyed:** 3

Conditions: **PCI:** 62

Sample Number: 101 **Type:** R **Area:** 4500.00 SqFt **PCI:** 55

41	ALLIGATOR CR	L	10.00	SqFt
50	PATCHING	L	4.00	SqFt
50	PATCHING	M	3.00	SqFt
52	RAVELING	M	100.00	SqFt
48	L & T CR	L	161.00	Ft
48	L & T CR	M	48.00	Ft
57	WEATHERING	M	4300.00	SqFt

Sample Number: 103 **Type:** R **Area:** 4350.00 SqFt **PCI:** 63

52	RAVELING	L	100.00	SqFt
48	L & T CR	M	22.00	Ft
48	L & T CR	L	410.00	Ft
57	WEATHERING	M	4000.00	SqFt

Sample Number: 106 **Type:** R **Area:** 5000.00 SqFt **PCI:** 67

48	L & T CR	M	10.00	Ft
48	L & T CR	L	337.00	Ft
57	WEATHERING	M	5000.00	SqFt
45	DEPRESSION	L	24.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 003 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1962

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 228,750 SqFt **Length:** 468 Ft **Width:** 468 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 41 **Surveyed:** 8

Conditions: **PCI:** 32

Sample Number: 101 **Type:** R **Area:** 5000.00 SqFt **PCI:** 28

41	ALLIGATOR CR	L	6.00	SqFt
43	BLOCK CR	L	4000.00	SqFt
57	WEATHERING	H	2000.00	SqFt
43	BLOCK CR	M	994.00	SqFt
56	SWELLING	L	65.00	SqFt
48	L & T CR	H	12.00	Ft
57	WEATHERING	M	3000.00	SqFt

Sample Number: 107 **Type:** R **Area:** 5000.00 SqFt **PCI:** 28

48	L & T CR	L	453.00	Ft
50	PATCHING	M	28.00	SqFt
50	PATCHING	L	21.00	SqFt
57	WEATHERING	M	2000.00	SqFt
47	JT REF. CR	L	280.00	Ft
48	L & T CR	H	12.00	Ft
47	JT REF. CR	M	120.00	Ft
48	L & T CR	M	188.00	Ft
57	WEATHERING	H	2950.00	SqFt

Sample Number: 110 **Type:** R **Area:** 5000.00 SqFt **PCI:** 29

57	WEATHERING	H	2900.00	SqFt
48	L & T CR	H	8.00	Ft
52	RAVELING	L	100.00	SqFt
47	JT REF. CR	M	70.00	Ft
57	WEATHERING	M	2000.00	SqFt
48	L & T CR	L	626.00	Ft
48	L & T CR	M	98.00	Ft
47	JT REF. CR	L	361.00	Ft

Sample Number: 114 **Type:** R **Area:** 5000.00 SqFt **PCI:** 28

48	L & T CR	L	397.00	Ft
57	WEATHERING	H	2800.00	SqFt
41	ALLIGATOR CR	L	15.00	SqFt
43	BLOCK CR	M	600.00	SqFt
43	BLOCK CR	L	1700.00	SqFt
57	WEATHERING	M	2100.00	SqFt
52	RAVELING	L	100.00	SqFt
47	JT REF. CR	H	15.00	Ft
48	L & T CR	M	146.00	Ft

Sample Number: 120 **Type:** R **Area:** 5000.00 SqFt **PCI:** 44

48	L & T CR	L	845.00	Ft
57	WEATHERING	M	2900.00	SqFt
47	JT REF. CR	L	600.00	Ft
52	RAVELING	L	1100.00	SqFt
57	WEATHERING	H	1000.00	SqFt

Sample Number: 126 **Type:** R **Area:** 5000.00 SqFt **PCI:** 36

43	BLOCK CR	L	1600.00	SqFt
57	WEATHERING	M	4100.00	SqFt
47	JT REF. CR	L	234.00	Ft
52	RAVELING	M	500.00	SqFt
47	JT REF. CR	M	100.00	Ft
57	WEATHERING	H	400.00	SqFt
48	L & T CR	L	318.00	Ft

Sample Number: 128 **Type:** R **Area:** 5000.00 SqFt **PCI:** 28

57	WEATHERING	M	3500.00	SqFt
47	JT REF. CR	L	350.00	Ft
52	RAVELING	H	200.00	SqFt

48	L & T CR	L	518.00	Ft
52	RAVELING	M	300.00	SqFt
47	JT REF. CR	M	150.00	Ft
57	WEATHERING	H	350.00	SqFt
48	L & T CR	M	43.00	Ft
52	RAVELING	L	400.00	SqFt

Sample Number: 135 **Type:** R **Area:** 5000.00 SqFt **PCI:** 32

57	WEATHERING	H	550.00	SqFt
52	RAVELING	M	400.00	SqFt
52	RAVELING	L	450.00	SqFt
57	WEATHERING	M	3200.00	SqFt
52	RAVELING	H	200.00	SqFt
48	L & T CR	L	419.00	Ft
47	JT REF. CR	L	650.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 005 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 11,600 SqFt **Length:** 107 Ft **Width:** 107 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 87

Sample Number: 801	**Type:** R	**Area:** 2500.00 SqFt	**PCI:** 94				
57	WEATHERING	L	2500.00	SqFt			
Sample Number: 803	**Type:** R	**Area:** 2500.00 SqFt	**PCI:** 81				
56	SWELLING	L	49.00	SqFt			
48	L & T CR	M	17.00	Ft			
57	WEATHERING	L	2000.00	SqFt			

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 002 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/1948

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 60,800 SqFt **Length:** 760 Ft **Width:** 80 Ft

Slabs: 304 **Slab Length:** 10 Ft **Slab Width:** 20 Ft **Joint Length:** 8,280 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 17 **Surveyed:** 6

Conditions: **PCI:** 28

Sample Number: 201 **Type:** R **Area:** 18.00 Slabs **PCI:** 31

75	CORNER SPALL	H	1.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs
62	CORNER BREAK	L	1.00	Slabs
65	JT SEAL DMG	L	18.00	Slabs
72	SHAT. SLAB	L	3.00	Slabs
63	LINEAR CR	M	6.00	Slabs

Sample Number: 203 **Type:** R **Area:** 15.00 Slabs **PCI:** 4

72	SHAT. SLAB	H	11.00	Slabs
72	SHAT. SLAB	M	2.00	Slabs
63	LINEAR CR	H	2.00	Slabs

Sample Number: 207 **Type:** A **Area:** 12.00 Slabs **PCI:** 74

75	CORNER SPALL	H	1.00	Slabs
65	JT SEAL DMG	M	12.00	Slabs
63	LINEAR CR	M	1.00	Slabs

Sample Number: 211 **Type:** R **Area:** 16.00 Slabs **PCI:** 15

75	CORNER SPALL	M	2.00	Slabs
74	JOINT SPALL	M	7.00	Slabs
63	LINEAR CR	H	4.00	Slabs
63	LINEAR CR	L	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs
67	LARGE PATCH	M	4.00	Slabs
66	SMALL PATCH	L	1.00	Slabs
75	CORNER SPALL	H	4.00	Slabs
65	JT SEAL DMG	H	16.00	Slabs

Sample Number: 214 **Type:** R **Area:** 16.00 Slabs **PCI:** 6

65	JT SEAL DMG	H	16.00	Slabs
63	LINEAR CR	H	3.00	Slabs
71	FAULTING	M	2.00	Slabs
63	LINEAR CR	M	4.00	Slabs
71	FAULTING	L	1.00	Slabs
75	CORNER SPALL	H	2.00	Slabs
72	SHAT. SLAB	H	2.00	Slabs

Sample Number: 216 **Type:** R **Area:** 20.00 Slabs **PCI:** 65

75	CORNER SPALL	H	4.00	Slabs
65	JT SEAL DMG	H	20.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
73	SHRINKAGE CR	N	1.00	Slabs
74	JOINT SPALL	M	2.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APGA **Name:** General Aviation Apron **Use:** APRON **Area:** 1,358,800 SqFt

Section: 013 of 14 **From:** Begin **To:** End **Last Const.:** 9/30/2007

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 14,200 SqFt **Length:** 119 Ft **Width:** 119 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 3 **Surveyed:** 1

Conditions: **PCI:** 60

Sample Number: 100 **Type:** R **Area:** 5500.00 SqFt **PCI:** 60

48	L & T CR	L	99.00	Ft
52	RAVELING	H	10.00	SqFt
52	RAVELING	L	550.00	SqFt
41	ALLIGATOR CR	L	10.00	SqFt
48	L & T CR	M	178.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: APTR **Name:** Terminal Ramp **Use:** APRON **Area:** 439,800 SqFt

Section: 003 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/2014

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 260,600 SqFt **Length:** 900 Ft **Width:** 290 Ft

Slabs: 1,158 **Slab Length:** 15 Ft **Slab Width:** 15 Ft **Joint Length:** 33,610 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 61 **Surveyed:** 9

Conditions: **PCI:** 98

Sample Number: 100	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	100	
<No Distress>							
Sample Number: 105	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	92	
71 FAULTING		L	2.00 Slabs				
Sample Number: 201	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	100	
<No Distress>							
Sample Number: 206	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	98	
65 JT SEAL DMG		L	20.00 Slabs				
Sample Number: 302	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	95	
73 SHRINKAGE CR		N	3.00 Slabs				
65 JT SEAL DMG		L	20.00 Slabs				
Sample Number: 307	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	100	
<No Distress>							
Sample Number: 310	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	100	
<No Distress>							
Sample Number: 403	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	98	
73 SHRINKAGE CR		N	2.00 Slabs				
Sample Number: 407	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	98	
74 JOINT SPALL		L	1.00 Slabs				

Network: DLH **Name:** Duluth International Airport

Branch: APTR **Name:** Terminal Ramp **Use:** APRON **Area:** 439,800 SqFt

Section: 001 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 77,700 SqFt **Length:** 820 Ft **Width:** 95 Ft

Slabs: 342 **Slab Length:** 17 Ft **Slab Width:** 14 Ft **Joint Length:** 9,478 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 14 **Surveyed:** 5

Conditions: **PCI:** 47

Sample Number: 101 **Type:** R **Area:** 21.00 Slabs **PCI:** 64

66	SMALL PATCH	L	6.00	Slabs
75	CORNER SPALL	H	1.00	Slabs
63	LINEAR CR	L	7.00	Slabs
67	LARGE PATCH	L	9.00	Slabs

Sample Number: 103 **Type:** R **Area:** 16.00 Slabs **PCI:** 46

62	CORNER BREAK	L	1.00	Slabs
65	JT SEAL DMG	H	16.00	Slabs
67	LARGE PATCH	L	2.00	Slabs
74	JOINT SPALL	M	1.00	Slabs
63	LINEAR CR	L	7.00	Slabs
72	SHAT. SLAB	L	1.00	Slabs
75	CORNER SPALL	M	1.00	Slabs
66	SMALL PATCH	L	5.00	Slabs

Sample Number: 105 **Type:** R **Area:** 8.00 Slabs **PCI:** 13

74	JOINT SPALL	M	1.00	Slabs
63	LINEAR CR	H	2.00	Slabs
67	LARGE PATCH	L	4.00	Slabs
65	JT SEAL DMG	M	8.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
66	SMALL PATCH	L	4.00	Slabs
71	FAULTING	L	2.00	Slabs
63	LINEAR CR	M	1.00	Slabs
63	LINEAR CR	L	5.00	Slabs

Sample Number: 108 **Type:** R **Area:** 8.00 Slabs **PCI:** 31

67	LARGE PATCH	M	1.00	Slabs
63	LINEAR CR	L	4.00	Slabs
67	LARGE PATCH	L	2.00	Slabs
66	SMALL PATCH	M	1.00	Slabs
66	SMALL PATCH	L	2.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
63	LINEAR CR	M	1.00	Slabs

Sample Number: 110 **Type:** R **Area:** 14.00 Slabs **PCI:** 49

63	LINEAR CR	L	5.00	Slabs
75	CORNER SPALL	H	2.00	Slabs
65	JT SEAL DMG	M	14.00	Slabs
63	LINEAR CR	M	1.00	Slabs
66	SMALL PATCH	L	4.00	Slabs
67	LARGE PATCH	L	6.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: APTR **Name:** Terminal Ramp **Use:** APRON **Area:** 439,800 SqFt

Section: 002 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Aprons **Zone:** **Category:** **Rank:** S

Area: 101,500 SqFt **Length:** 318 Ft **Width:** 318 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 27 **Surveyed:** 5

Conditions: **PCI:** 39

Sample Number: 204 **Type:** R **Area:** 5000.00 SqFt **PCI:** 12

41	ALLIGATOR CR	L	14.00	SqFt
56	SWELLING	L	40.00	SqFt
57	WEATHERING	M	150.00	SqFt
43	BLOCK CR	H	4950.00	SqFt
57	WEATHERING	L	1000.00	SqFt
48	L & T CR	H	6.00	Ft

Sample Number: 209 **Type:** R **Area:** 3750.00 SqFt **PCI:** 50

48	L & T CR	M	9.00	Ft
52	RAVELING	L	30.00	SqFt
41	ALLIGATOR CR	L	17.00	SqFt
57	WEATHERING	L	1000.00	SqFt
43	BLOCK CR	L	1200.00	SqFt
43	BLOCK CR	M	300.00	SqFt
48	L & T CR	L	170.00	Ft

Sample Number: 212 **Type:** R **Area:** 3750.00 SqFt **PCI:** 54

57	WEATHERING	M	100.00	SqFt
43	BLOCK CR	L	3000.00	SqFt
43	BLOCK CR	M	750.00	SqFt
57	WEATHERING	L	800.00	SqFt

Sample Number: 215 **Type:** R **Area:** 3750.00 SqFt **PCI:** 44

57	WEATHERING	M	450.00	SqFt
43	BLOCK CR	L	1550.00	SqFt
57	WEATHERING	L	800.00	SqFt
43	BLOCK CR	M	2200.00	SqFt

Sample Number: 219 **Type:** R **Area:** 3750.00 SqFt **PCI:** 43

43	BLOCK CR	M	2000.00	SqFt
57	WEATHERING	L	3400.00	SqFt
43	BLOCK CR	L	1500.00	SqFt
41	ALLIGATOR CR	L	18.00	SqFt
57	WEATHERING	L	350.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: CTA1 **Name:** Connecting Taxiway A1 **Use:** TAXIWAY **Area:** 75,200 SqFt

Section: 001 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1978

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 62,000 SqFt **Length:** 249 Ft **Width:** 249 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 11 **Surveyed:** 4

Conditions: **PCI:** 39

Sample Number: 200 **Type:** R **Area:** 5000.00 SqFt **PCI:** 46

43	BLOCK CR	L	1150.00	SqFt
57	WEATHERING	M	5000.00	SqFt
48	L & T CR	L	496.00	Ft
48	L & T CR	M	35.00	Ft
47	JT REF. CR	L	150.00	Ft
41	ALLIGATOR CR	L	15.00	SqFt
47	JT REF. CR	M	50.00	Ft

Sample Number: 204 **Type:** R **Area:** 4500.00 SqFt **PCI:** 32

57	WEATHERING	M	200.00	SqFt
41	ALLIGATOR CR	M	8.00	SqFt
52	RAVELING	L	225.00	SqFt
57	WEATHERING	L	4000.00	SqFt
41	ALLIGATOR CR	L	100.00	SqFt
43	BLOCK CR	L	1000.00	SqFt
48	L & T CR	M	145.00	Ft
43	BLOCK CR	M	250.00	SqFt
48	L & T CR	L	495.00	Ft
52	RAVELING	H	4.00	SqFt

Sample Number: 206 **Type:** R **Area:** 4750.00 SqFt **PCI:** 38

57	WEATHERING	M	4500.00	SqFt
43	BLOCK CR	L	1200.00	SqFt
41	ALLIGATOR CR	L	225.00	SqFt
48	L & T CR	M	75.00	Ft
48	L & T CR	L	447.00	Ft
52	RAVELING	M	50.00	SqFt

Sample Number: 208 **Type:** R **Area:** 5000.00 SqFt **PCI:** 39

52	RAVELING	L	50.00	SqFt
48	L & T CR	L	650.00	Ft
41	ALLIGATOR CR	L	239.00	SqFt
57	WEATHERING	L	3500.00	SqFt
57	WEATHERING	M	1000.00	SqFt
48	L & T CR	M	180.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: CTA1 **Name:** Connecting Taxiway A1 **Use:** TAXIWAY **Area:** 75,200 SqFt

Section: 002 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1978

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 13,200 SqFt **Length:** 130 Ft **Width:** 100 Ft

Slabs: 69 **Slab Length:** 13 Ft **Slab Width:** 15 Ft **Joint Length:** 1,660 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 1

Conditions: **PCI:** 71

Sample Number: 202 **Type:** R **Area:** 18.00 Slabs **PCI:** 71

65	JT SEAL DMG	M	18.00	Slabs
66	SMALL PATCH	L	1.00	Slabs
63	LINEAR CR	L	2.00	Slabs
67	LARGE PATCH	L	2.00	Slabs
74	JOINT SPALL	M	1.00	Slabs
75	CORNER SPALL	M	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: CTA2 **Name:** Connecting Taxiway A2 **Use:** TAXIWAY **Area:** 61,300 SqFt

Section: 001 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1981

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 36,700 SqFt **Length:** 191 Ft **Width:** 191 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 8 **Surveyed:** 2

Conditions: **PCI:** 68

Sample Number: 302	**Type:** R	**Area:** 4500.00 SqFt	**PCI:** 65
57 WEATHERING	L	3000.00 SqFt	
48 L & T CR	L	724.00 Ft	

Sample Number: 303	**Type:** R	**Area:** 4500.00 SqFt	**PCI:** 70
57 WEATHERING	L	4400.00 SqFt	
48 L & T CR	L	494.00 Ft	

Network: DLH **Name:** Duluth International Airport

Branch: CTA2 **Name:** Connecting Taxiway A2 **Use:** TAXIWAY **Area:** 61,300 SqFt

Section: 002 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1981

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 24,600 SqFt **Length:** 156 Ft **Width:** 156 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 6 **Surveyed:** 4

Conditions: **PCI:** 31

Sample Number: 306 **Type:** R **Area:** 3750.00 SqFt **PCI:** 27

48	L & T CR	L	443.00	Ft
41	ALLIGATOR CR	M	30.00	SqFt
53	RUTTING	L	100.00	SqFt
48	L & T CR	M	178.00	Ft
52	RAVELING	H	5.00	SqFt
41	ALLIGATOR CR	L	120.00	SqFt
57	WEATHERING	M	1000.00	SqFt
52	RAVELING	L	300.00	SqFt
57	WEATHERING	L	2200.00	SqFt
48	L & T CR	H	12.00	Ft

Sample Number: 307 **Type:** R **Area:** 3750.00 SqFt **PCI:** 29

48	L & T CR	H	20.00	Ft
52	RAVELING	M	21.00	SqFt
41	ALLIGATOR CR	M	18.00	SqFt
57	WEATHERING	M	250.00	SqFt
48	L & T CR	L	390.00	Ft
41	ALLIGATOR CR	L	71.00	SqFt
52	RAVELING	H	2.00	SqFt
53	RUTTING	L	100.00	SqFt
48	L & T CR	M	309.00	Ft
57	WEATHERING	L	2000.00	SqFt

Sample Number: 308 **Type:** R **Area:** 3750.00 SqFt **PCI:** 32

48	L & T CR	L	474.00	Ft
57	WEATHERING	M	600.00	SqFt
50	PATCHING	L	140.00	SqFt
52	RAVELING	M	75.00	SqFt
41	ALLIGATOR CR	L	158.00	SqFt
57	WEATHERING	L	3000.00	SqFt
48	L & T CR	M	209.00	Ft
48	L & T CR	H	18.00	Ft
56	SWELLING	L	150.00	SqFt

Sample Number: 314 **Type:** R **Area:** 4250.00 SqFt **PCI:** 33

41	ALLIGATOR CR	L	378.00	SqFt
48	L & T CR	M	156.00	Ft
57	WEATHERING	L	2500.00	SqFt
52	RAVELING	H	38.00	SqFt
48	L & T CR	L	264.00	Ft
57	WEATHERING	M	500.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: CTA3 **Name:** Connecting Taxiway A3 **Use:** TAXIWAY **Area:** 55,200 SqFt

Section: 002 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/1963

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 20,600 SqFt **Length:** 143 Ft **Width:** 143 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 5 **Surveyed:** 2

Conditions: **PCI:** 37

Sample Number: 405 **Type:** R **Area:** 3750.00 SqFt **PCI:** 33

41	ALLIGATOR CR	L	50.00	SqFt
48	L & T CR	M	229.00	Ft
52	RAVELING	L	100.00	SqFt
57	WEATHERING	L	3750.00	SqFt
56	SWELLING	M	200.00	SqFt
48	L & T CR	H	16.00	Ft
48	L & T CR	L	587.00	Ft
56	SWELLING	L	200.00	SqFt

Sample Number: 406 **Type:** R **Area:** 3750.00 SqFt **PCI:** 40

56	SWELLING	L	130.00	SqFt
48	L & T CR	H	2.00	Ft
41	ALLIGATOR CR	M	6.00	SqFt
52	RAVELING	L	900.00	SqFt
57	WEATHERING	L	2800.00	SqFt
48	L & T CR	M	233.00	Ft
48	L & T CR	L	606.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: CTA3 **Name:** Connecting Taxiway A3 **Use:** TAXIWAY **Area:** 55,200 SqFt

Section: 003 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/1963

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 15,100 SqFt **Length:** 195 Ft **Width:** 195 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 59

Sample Number: 401 **Type:** R **Area:** 3750.00 SqFt **PCI:** 59

57	WEATHERING	L	3750.00	SqFt
48	L & T CR	L	535.00	Ft
48	L & T CR	M	232.00	Ft

Sample Number: 402 **Type:** R **Area:** 3750.00 SqFt **PCI:** 60

48	L & T CR	L	596.00	Ft
57	WEATHERING	L	3750.00	SqFt
48	L & T CR	M	17.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: CTA3 **Name:** Connecting Taxiway A3 **Use:** TAXIWAY **Area:** 55,200 SqFt

Section: 001 of 3 **From:** Begin **To:** End **Last Const.:** 9/30/1963

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 19,500 SqFt **Length:** 139 Ft **Width:** 139 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 6 **Surveyed:** 1

Conditions: **PCI:** 79

Sample Number: 410 **Type:** R **Area:** 2750.00 SqFt **PCI:** 79

48	L & T CR	L	95.00	Ft
48	L & T CR	M	15.00	Ft
57	WEATHERING	L	1400.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: CTA5 **Name:** Connecting Taxiway A5 **Use:** TAXIWAY **Area:** 44,800 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 44,800 SqFt **Length:** 211 Ft **Width:** 211 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 9 **Surveyed:** 3

Conditions: **PCI:** 44

Sample Number: 603 **Type:** R **Area:** 5000.00 SqFt **PCI:** 43

48	L & T CR	M	60.00	Ft
41	ALLIGATOR CR	L	36.00	SqFt
48	L & T CR	L	342.00	Ft
57	WEATHERING	L	4800.00	SqFt
43	BLOCK CR	L	2000.00	SqFt
43	BLOCK CR	M	1000.00	SqFt

Sample Number: 605 **Type:** R **Area:** 5000.00 SqFt **PCI:** 42

47	JT REF. CR	M	56.00	Ft
43	BLOCK CR	M	2000.00	SqFt
43	BLOCK CR	L	1500.00	SqFt
57	WEATHERING	L	5000.00	SqFt
48	L & T CR	L	231.00	Ft

Sample Number: 606 **Type:** R **Area:** 5000.00 SqFt **PCI:** 47

43	BLOCK CR	L	2500.00	SqFt
43	BLOCK CR	M	400.00	SqFt
57	WEATHERING	L	4800.00	SqFt
48	L & T CR	L	226.00	Ft
48	L & T CR	M	18.00	Ft
41	ALLIGATOR CR	L	5.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: CTB **Name:** Connecting Taxiway B **Use:** TAXIWAY **Area:** 345,200 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/1994

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 345,200 SqFt **Length:** 3,550 Ft **Width:** 100 Ft

Slabs: 921 **Slab Length:** 20 Ft **Slab Width:** 19 Ft **Joint Length:** 33,033 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 99 **Surveyed:** 8

Conditions: **PCI:** 86

Sample Number: 709	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	98	
65	JT SEAL DMG	L	20.00	Slabs			
Sample Number: 714	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	98	
65	JT SEAL DMG	L	20.00	Slabs			
Sample Number: 718	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	89	
66	SMALL PATCH	L	1.00	Slabs			
62	CORNER BREAK	M	1.00	Slabs			
65	JT SEAL DMG	L	20.00	Slabs			
Sample Number: 723	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	87	
65	JT SEAL DMG	L	20.00	Slabs			
63	LINEAR CR	M	1.00	Slabs			
Sample Number: 729	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	93	
75	CORNER SPALL	H	1.00	Slabs			
65	JT SEAL DMG	L	20.00	Slabs			
Sample Number: 735	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	82	
63	LINEAR CR	L	5.00	Slabs			
66	SMALL PATCH	L	1.00	Slabs			
65	JT SEAL DMG	L	20.00	Slabs			
Sample Number: 741	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	87	
65	JT SEAL DMG	L	20.00	Slabs			
63	LINEAR CR	L	1.00	Slabs			
75	CORNER SPALL	M	1.00	Slabs			
66	SMALL PATCH	L	2.00	Slabs			
Sample Number: 900	**Type:**	R	**Area:**	20.00 Slabs	**PCI:**	53	
72	SHAT. SLAB	L	2.00	Slabs			
75	CORNER SPALL	M	1.00	Slabs			
66	SMALL PATCH	L	1.00	Slabs			
74	JOINT SPALL	H	1.00	Slabs			
63	LINEAR CR	L	10.00	Slabs			
65	JT SEAL DMG	L	20.00	Slabs			
62	CORNER BREAK	L	2.00	Slabs			

Network: DLH **Name:** Duluth International Airport

Branch: CTC1 **Name:** Connecting Taxiway C1 **Use:** TAXIWAY **Area:** 5,200 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 5,200 SqFt **Length:** 72 Ft **Width:** 72 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 1 **Surveyed:** 1

Conditions: **PCI:** 84

Sample Number: 201 **Type:** R **Area:** 5275.00 SqFt **PCI:** 84

48	L & T CR	L	107.00	Ft
56	SWELLING	L	56.00	SqFt
57	WEATHERING	L	5275.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: CTD **Name:** Connecting Taxiway D **Use:** TAXIWAY **Area:** 139,300 SqFt

Section: 002 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 25,300 SqFt **Length:** 159 Ft **Width:** 159 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 82

Sample Number: 108 **Type:** R **Area:** 2475.00 SqFt **PCI:** 84

57	WEATHERING	L	2400.00	SqFt
48	L & T CR	L	79.00	Ft

Sample Number: 112 **Type:** R **Area:** 3750.00 SqFt **PCI:** 81

57	WEATHERING	M	100.00	SqFt
57	WEATHERING	L	3650.00	SqFt
48	L & T CR	L	131.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: CTD **Name:** Connecting Taxiway D **Use:** TAXIWAY **Area:** 139,300 SqFt

Section: 001 of 2 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 114,000 SqFt **Length:** 337 Ft **Width:** 337 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 30 **Surveyed:** 6

Conditions: **PCI:** 34

Sample Number: 102 **Type:** R **Area:** 3750.00 SqFt **PCI:** 36

43	BLOCK CR	M	1100.00	SqFt
43	BLOCK CR	H	150.00	SqFt
43	BLOCK CR	L	1500.00	SqFt
45	DEPRESSION	L	30.00	SqFt
57	WEATHERING	M	3750.00	SqFt

Sample Number: 107 **Type:** R **Area:** 3750.00 SqFt **PCI:** 31

57	WEATHERING	H	300.00	SqFt
57	WEATHERING	M	3400.00	SqFt
43	BLOCK CR	M	1000.00	SqFt
43	BLOCK CR	L	2500.00	SqFt
50	PATCHING	L	6.00	SqFt
43	BLOCK CR	H	120.00	SqFt

Sample Number: 116 **Type:** R **Area:** 3750.00 SqFt **PCI:** 42

48	L & T CR	M	52.00	Ft
43	BLOCK CR	L	500.00	SqFt
48	L & T CR	L	709.00	Ft
57	WEATHERING	M	2900.00	SqFt
57	WEATHERING	H	750.00	SqFt

Sample Number: 125 **Type:** R **Area:** 3750.00 SqFt **PCI:** 32

43	BLOCK CR	M	3750.00	SqFt
57	WEATHERING	H	500.00	SqFt
57	WEATHERING	M	3050.00	SqFt
52	RAVELING	H	20.00	SqFt

Sample Number: 129 **Type:** R **Area:** 3750.00 SqFt **PCI:** 26

43	BLOCK CR	M	3550.00	SqFt
43	BLOCK CR	H	200.00	SqFt
57	WEATHERING	H	800.00	SqFt
57	WEATHERING	M	2950.00	SqFt

Sample Number: 133 **Type:** R **Area:** 3750.00 SqFt **PCI:** 37

57	WEATHERING	M	3250.00	SqFt
43	BLOCK CR	M	3750.00	SqFt
57	WEATHERING	H	500.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

Section: 002 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1985

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 493,800 SqFt **Length:** 198 Ft **Width:** 198 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 129 **Surveyed:** 12

Conditions: **PCI:** 34

Sample Number: 106 **Type:** R **Area:** 3900.00 SqFt **PCI:** 34

48	L & T CR	L	232.00	Ft
43	BLOCK CR	L	800.00	SqFt
57	WEATHERING	M	1000.00	SqFt
52	RAVELING	L	200.00	SqFt
41	ALLIGATOR CR	M	6.00	SqFt
41	ALLIGATOR CR	L	175.00	SqFt
48	L & T CR	M	20.00	Ft
57	WEATHERING	L	2000.00	SqFt

Sample Number: 113 **Type:** R **Area:** 3750.00 SqFt **PCI:** 38

57	WEATHERING	L	2000.00	SqFt
52	RAVELING	L	20.00	SqFt
48	L & T CR	M	125.00	Ft
41	ALLIGATOR CR	L	164.00	SqFt
57	WEATHERING	M	800.00	SqFt
48	L & T CR	L	392.00	Ft
50	PATCHING	L	500.00	SqFt

Sample Number: 123 **Type:** R **Area:** 3750.00 SqFt **PCI:** 34

48	L & T CR	L	605.00	Ft
57	WEATHERING	L	1500.00	SqFt
41	ALLIGATOR CR	L	155.00	SqFt
57	WEATHERING	H	75.00	SqFt
57	WEATHERING	M	1500.00	SqFt
52	RAVELING	L	50.00	SqFt
48	L & T CR	M	170.00	Ft

Sample Number: 132 **Type:** R **Area:** 3750.00 SqFt **PCI:** 35

52	RAVELING	L	100.00	SqFt
41	ALLIGATOR CR	M	9.00	SqFt
43	BLOCK CR	L	1100.00	SqFt
57	WEATHERING	M	500.00	SqFt
57	WEATHERING	L	3000.00	SqFt
48	L & T CR	M	93.00	Ft
48	L & T CR	L	352.00	Ft
41	ALLIGATOR CR	L	133.00	SqFt

Sample Number: 143 **Type:** R **Area:** 3750.00 SqFt **PCI:** 30

48	L & T CR	L	487.00	Ft
57	WEATHERING	M	800.00	SqFt
48	L & T CR	M	183.00	Ft
52	RAVELING	L	100.00	SqFt
52	RAVELING	H	6.00	SqFt
57	WEATHERING	L	2500.00	SqFt
41	ALLIGATOR CR	L	350.00	SqFt
41	ALLIGATOR CR	M	10.00	SqFt

Sample Number: 163 **Type:** R **Area:** 3750.00 SqFt **PCI:** 39

41	ALLIGATOR CR	L	116.00	SqFt
48	L & T CR	M	47.00	Ft
48	L & T CR	L	358.00	Ft
43	BLOCK CR	L	220.00	SqFt
52	RAVELING	H	6.00	SqFt
57	WEATHERING	L	2500.00	SqFt
50	PATCHING	L	1000.00	SqFt

Sample Number: 173 **Type:** R **Area:** 3750.00 SqFt **PCI:** 36

52	RAVELING	H	6.00	SqFt
48	L & T CR	L	555.00	Ft

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

48	L & T CR	M	126.00	Ft
50	PATCHING	L	800.00	SqFt
41	ALLIGATOR CR	L	131.00	SqFt
41	ALLIGATOR CR	M	3.00	SqFt
57	WEATHERING	L	2800.00	SqFt
52	RAVELING	L	25.00	SqFt

Sample Number: 183 **Type:** R **Area:** 3750.00 SqFt **PCI:** 35

53	RUTTING	L	150.00	SqFt
43	BLOCK CR	L	550.00	SqFt
48	L & T CR	L	391.00	Ft
50	PATCHING	L	60.00	SqFt
41	ALLIGATOR CR	L	82.00	SqFt
48	L & T CR	M	168.00	Ft
56	SWELLING	L	100.00	SqFt

Sample Number: 193 **Type:** R **Area:** 3750.00 SqFt **PCI:** 33

52	RAVELING	H	11.00	SqFt
57	WEATHERING	M	50.00	SqFt
48	L & T CR	M	121.00	Ft
57	WEATHERING	L	3000.00	SqFt
41	ALLIGATOR CR	L	50.00	SqFt
52	RAVELING	L	300.00	SqFt
53	RUTTING	M	35.00	SqFt
43	BLOCK CR	L	350.00	SqFt
50	PATCHING	L	350.00	SqFt
48	L & T CR	L	338.00	Ft

Sample Number: 203 **Type:** R **Area:** 3750.00 SqFt **PCI:** 35

48	L & T CR	M	104.00	Ft
52	RAVELING	H	25.00	SqFt
43	BLOCK CR	H	200.00	SqFt
57	WEATHERING	L	3500.00	SqFt
41	ALLIGATOR CR	L	64.00	SqFt
53	RUTTING	L	13.00	SqFt
48	L & T CR	L	364.00	Ft

Sample Number: 213 **Type:** R **Area:** 3750.00 SqFt **PCI:** 31

48	L & T CR	H	50.00	Ft
43	BLOCK CR	M	1250.00	SqFt
41	ALLIGATOR CR	L	136.00	SqFt
43	BLOCK CR	L	2500.00	SqFt
45	DEPRESSION	L	13.00	SqFt
57	WEATHERING	L	3500.00	SqFt

Sample Number: 220 **Type:** R **Area:** 3750.00 SqFt **PCI:** 25

41	ALLIGATOR CR	M	28.00	SqFt
41	ALLIGATOR CR	L	450.00	SqFt
43	BLOCK CR	M	1250.00	SqFt
52	RAVELING	H	14.00	SqFt
52	RAVELING	L	300.00	SqFt
57	WEATHERING	L	3000.00	SqFt
43	BLOCK CR	L	1250.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

Section: 005 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 224,400 SqFt **Length:** 473 Ft **Width:** 473 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 51 **Surveyed:** 5

Conditions: **PCI:** 52

Sample Number: 122 **Type:** R **Area:** 5250.00 SqFt **PCI:** 49

48	L & T CR	M	176.00	Ft
57	WEATHERING	L	1500.00	SqFt
43	BLOCK CR	M	2000.00	SqFt
48	L & T CR	L	433.00	Ft

Sample Number: 131 **Type:** R **Area:** 5250.00 SqFt **PCI:** 52

43	BLOCK CR	M	250.00	SqFt
43	BLOCK CR	L	3000.00	SqFt
41	ALLIGATOR CR	M	7.00	SqFt
48	L & T CR	M	118.00	Ft
57	WEATHERING	L	1500.00	SqFt

Sample Number: 140 **Type:** R **Area:** 3750.00 SqFt **PCI:** 44

43	BLOCK CR	M	1400.00	SqFt
57	WEATHERING	L	1500.00	SqFt
48	L & T CR	L	170.00	Ft
43	BLOCK CR	L	1400.00	SqFt
48	L & T CR	M	30.00	Ft

Sample Number: 150 **Type:** R **Area:** 3750.00 SqFt **PCI:** 56

57	WEATHERING	L	1500.00	SqFt
41	ALLIGATOR CR	L	12.00	SqFt
48	L & T CR	L	586.00	Ft
48	L & T CR	M	84.00	Ft

Sample Number: 153 **Type:** R **Area:** 4900.00 SqFt **PCI:** 58

43	BLOCK CR	L	1950.00	SqFt
48	L & T CR	L	494.00	Ft
57	WEATHERING	L	2450.00	SqFt
48	L & T CR	M	73.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

Section: 001 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1992

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 165,300 SqFt **Length:** 406 Ft **Width:** 406 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 44 **Surveyed:** 7

Conditions: **PCI:** 32

Sample Number: 106 **Type:** R **Area:** 3750.00 SqFt **PCI:** 31

48	L & T CR	M	20.00	Ft
50	PATCHING	L	950.00	SqFt
52	RAVELING	L	400.00	SqFt
48	L & T CR	L	180.00	Ft
43	BLOCK CR	L	1250.00	SqFt
57	WEATHERING	M	2000.00	SqFt
52	RAVELING	M	100.00	SqFt
41	ALLIGATOR CR	L	250.00	SqFt

Sample Number: 112 **Type:** R **Area:** 3750.00 SqFt **PCI:** 37

50	PATCHING	L	950.00	SqFt
52	RAVELING	L	200.00	SqFt
43	BLOCK CR	L	1550.00	SqFt
57	WEATHERING	M	2000.00	SqFt
41	ALLIGATOR CR	L	320.00	SqFt

Sample Number: 118 **Type:** R **Area:** 3750.00 SqFt **PCI:** 32

43	BLOCK CR	L	2100.00	SqFt
52	RAVELING	L	50.00	SqFt
41	ALLIGATOR CR	L	450.00	SqFt
50	PATCHING	L	950.00	SqFt
48	L & T CR	L	19.00	Ft
57	WEATHERING	L	1100.00	SqFt
57	WEATHERING	M	1100.00	SqFt

Sample Number: 124 **Type:** R **Area:** 3750.00 SqFt **PCI:** 34

57	WEATHERING	M	1300.00	SqFt
41	ALLIGATOR CR	L	300.00	SqFt
52	RAVELING	L	500.00	SqFt
50	PATCHING	L	950.00	SqFt
57	WEATHERING	L	1000.00	SqFt
48	L & T CR	L	70.00	Ft
43	BLOCK CR	L	1750.00	SqFt

Sample Number: 127 **Type:** R **Area:** 3750.00 SqFt **PCI:** 31

41	ALLIGATOR CR	L	350.00	SqFt
50	PATCHING	L	950.00	SqFt
57	WEATHERING	L	1200.00	SqFt
43	BLOCK CR	L	2250.00	SqFt
48	L & T CR	L	21.00	Ft
57	WEATHERING	M	1200.00	SqFt
52	RAVELING	L	300.00	SqFt

Sample Number: 130 **Type:** R **Area:** 3750.00 SqFt **PCI:** 30

41	ALLIGATOR CR	L	400.00	SqFt
52	RAVELING	H	1.00	SqFt
57	WEATHERING	L	1600.00	SqFt
57	WEATHERING	M	750.00	SqFt
50	PATCHING	L	950.00	SqFt
43	BLOCK CR	L	2350.00	SqFt
52	RAVELING	L	300.00	SqFt

Sample Number: 135 **Type:** R **Area:** 3750.00 SqFt **PCI:** 31

43	BLOCK CR	M	1300.00	SqFt
41	ALLIGATOR CR	L	200.00	SqFt
57	WEATHERING	L	1400.00	SqFt
43	BLOCK CR	L	1400.00	SqFt
50	PATCHING	L	950.00	SqFt
52	RAVELING	L	50.00	SqFt

57	WEATHERING	M	1200.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

Section: 004 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 5,900 SqFt **Length:** 76 Ft **Width:** 76 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 2 **Surveyed:** 1

Conditions: **PCI:** 70

Sample Number: 111 **Type:** R **Area:** 2250.00 SqFt **PCI:** 70

48	L & T CR	M	36.00	Ft
48	L & T CR	L	152.00	Ft
57	WEATHERING	M	2250.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTA **Name:** Parallel Taxiway A **Use:** TAXIWAY **Area:** 928,800 SqFt

Section: 003 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1974

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 39,400 SqFt **Length:** 497 Ft **Width:** 497 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 10 **Surveyed:** 3

Conditions: **PCI:** 50

Sample Number: 101 **Type:** R **Area:** 3750.00 SqFt **PCI:** 49

43	BLOCK CR	L	1850.00	SqFt
48	L & T CR	L	163.00	Ft
48	L & T CR	M	18.00	Ft
43	BLOCK CR	M	850.00	SqFt
57	WEATHERING	L	1000.00	SqFt

Sample Number: 103 **Type:** R **Area:** 3750.00 SqFt **PCI:** 52

48	L & T CR	L	164.00	Ft
57	WEATHERING	L	1000.00	SqFt
43	BLOCK CR	L	1600.00	SqFt
43	BLOCK CR	M	1000.00	SqFt

Sample Number: 106 **Type:** R **Area:** 3750.00 SqFt **PCI:** 49

57	WEATHERING	L	1000.00	SqFt
43	BLOCK CR	L	1500.00	SqFt
43	BLOCK CR	M	1000.00	SqFt
48	L & T CR	M	39.00	Ft
48	L & T CR	L	70.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 002 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 4,400 SqFt **Length:** 66 Ft **Width:** 66 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 1 **Surveyed:** 1

Conditions: **PCI:** 77

Sample Number: 135 **Type:** R **Area:** 4100.00 SqFt **PCI:** 77

57	WEATHERING	M	500.00	SqFt
48	L & T CR	L	174.00	Ft
57	WEATHERING	L	3600.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 005 of 6 **From:** A **To:** B **Last Const.:** 1/15/1960

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 182,300 SqFt **Length:** 3,500 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 45 **Surveyed:** 7

Conditions: **PCI:** 28

Sample Number: 104	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	26	
43	BLOCK CR	M	4550.00	SqFt			
57	WEATHERING	M	5000.00	SqFt			
43	BLOCK CR	H	400.00	SqFt			
41	ALLIGATOR CR	M	40.00	SqFt			
Sample Number: 105	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	25	
45	DEPRESSION	L	10.00	SqFt			
41	ALLIGATOR CR	M	9.00	SqFt			
48	L & T CR	H	30.00	Ft			
43	BLOCK CR	M	4461.00	SqFt			
57	WEATHERING	M	5000.00	SqFt			
43	BLOCK CR	H	500.00	SqFt			
Sample Number: 109	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	31	
57	WEATHERING	M	5000.00	SqFt			
41	ALLIGATOR CR	M	9.00	SqFt			
43	BLOCK CR	M	4700.00	SqFt			
43	BLOCK CR	H	291.00	SqFt			
Sample Number: 115	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	28	
41	ALLIGATOR CR	M	34.00	SqFt			
43	BLOCK CR	H	120.00	SqFt			
57	WEATHERING	M	5000.00	SqFt			
45	DEPRESSION	L	20.00	SqFt			
43	BLOCK CR	M	4830.00	SqFt			
48	L & T CR	H	25.00	Ft			
Sample Number: 119	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	32	
43	BLOCK CR	H	90.00	SqFt			
48	L & T CR	H	20.00	Ft			
43	BLOCK CR	M	4890.00	SqFt			
57	WEATHERING	M	5000.00	SqFt			
Sample Number: 123	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	27	
43	BLOCK CR	H	250.00	SqFt			
43	BLOCK CR	L	1800.00	SqFt			
57	WEATHERING	M	4000.00	SqFt			
43	BLOCK CR	M	2950.00	SqFt			
57	WEATHERING	H	1000.00	SqFt			
Sample Number: 131	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	30	
57	WEATHERING	M	4000.00	SqFt			
43	BLOCK CR	L	400.00	SqFt			
56	SWELLING	L	40.00	SqFt			
43	BLOCK CR	H	100.00	SqFt			
57	WEATHERING	H	1000.00	SqFt			
43	BLOCK CR	M	4500.00	SqFt			

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 001 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 48,000 SqFt **Length:** 960 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 45 **Surveyed:** 2

Conditions: **PCI:** 42

Sample Number: 104 **Type:** R **Area:** 5000.00 SqFt **PCI:** 43

43	BLOCK CR	L	2500.00	SqFt
57	WEATHERING	M	5000.00	SqFt
43	BLOCK CR	M	2500.00	SqFt

Sample Number: 108 **Type:** R **Area:** 5000.00 SqFt **PCI:** 40

43	BLOCK CR	L	2500.00	SqFt
57	WEATHERING	H	80.00	SqFt
43	BLOCK CR	M	2500.00	SqFt
57	WEATHERING	M	4920.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 004 of 6 **From:** Begin **To:** End **Last Const.:** 1/15/2016

Surface: AAC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 62,100 SqFt **Length:** 249 Ft **Width:** 249 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 17 **Surveyed:** 3

Conditions: **PCI:** 79

Sample Number:	101	**Type:**	R	**Area:**	3750.00 SqFt	**PCI:**	77
48	L & T CR		L	376.00 Ft			
Sample Number:	103	**Type:**	R	**Area:**	3750.00 SqFt	**PCI:**	80
48	L & T CR		L	285.00 Ft			
Sample Number:	104	**Type:**	R	**Area:**	3750.00 SqFt	**PCI:**	80
48	L & T CR		L	296.00 Ft			

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 001P of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 3,600 SqFt **Length:** 55 Ft **Width:** 65 Ft

Slabs: 14 **Slab Length:** 20 Ft **Slab Width:** 12 Ft **Joint Length:** 345 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 1 **Surveyed:** 1

Conditions: **PCI:** 22

Sample Number: 103 **Type:** R **Area:** 20.00 Slabs **PCI:** 22

75	CORNER SPALL	H	1.00	Slabs
72	SHAT. SLAB	H	2.00	Slabs
63	LINEAR CR	L	10.00	Slabs
63	LINEAR CR	M	2.00	Slabs
74	JOINT SPALL	M	2.00	Slabs
65	JT SEAL DMG	H	20.00	Slabs
62	CORNER BREAK	H	1.00	Slabs
62	CORNER BREAK	M	2.00	Slabs
74	JOINT SPALL	H	1.00	Slabs
72	SHAT. SLAB	M	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: PTC **Name:** Parallel Taxiway C **Use:** TAXIWAY **Area:** 332,400 SqFt

Section: 003 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1960

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 32,000 SqFt **Length:** 178 Ft **Width:** 178 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 7 **Surveyed:** 3

Conditions: **PCI:** 59

Sample Number: 112 **Type:** R **Area:** 5000.00 SqFt **PCI:** 65

57	WEATHERING	M	5000.00	SqFt
48	L & T CR	L	432.00	Ft
47	JT REF. CR	L	600.00	Ft

Sample Number: 114 **Type:** R **Area:** 5000.00 SqFt **PCI:** 57

47	JT REF. CR	H	100.00	Ft
47	JT REF. CR	L	500.00	Ft
48	L & T CR	L	378.00	Ft
57	WEATHERING	M	5000.00	SqFt

Sample Number: 115 **Type:** R **Area:** 5000.00 SqFt **PCI:** 54

47	JT REF. CR	L	550.00	Ft
57	WEATHERING	M	5000.00	SqFt
48	L & T CR	L	390.00	Ft
47	JT REF. CR	H	100.00	Ft
48	L & T CR	H	5.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: RPA1 **Name:** Run-up Pad A1 **Use:** APRON **Area:** 24,300 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/1978

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 24,300 SqFt **Length:** 220 Ft **Width:** 110 Ft

Slabs: 48 **Slab Length:** 22 Ft **Slab Width:** 22 Ft **Joint Length:** 1,821 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 6 **Surveyed:** 2

Conditions: **PCI:** 77

Sample Number: 201	**Type:** R	**Area:** 11.00 Slabs	**PCI:** 74
65 JT SEAL DMG	H	11.00 Slabs	
74 JOINT SPALL	H	1.00 Slabs	

Sample Number: 202	**Type:** R	**Area:** 12.00 Slabs	**PCI:** 81
65 JT SEAL DMG	H	12.00 Slabs	
63 LINEAR CR	L	2.00 Slabs	

Network: DLH **Name:** Duluth International Airport

Branch: RPE **Name:** 9/27 East Run-up Pad **Use:** APRON **Area:** 28,000 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/1964

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 28,000 SqFt **Length:** 280 Ft **Width:** 100 Ft

Slabs: 55 **Slab Length:** 22 Ft **Slab Width:** 22 Ft **Joint Length:** 2,109 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 48

Sample Number: 201 **Type:** R **Area:** 17.00 Slabs **PCI:** 40

66	SMALL PATCH	L	2.00	Slabs
63	LINEAR CR	H	2.00	Slabs
63	LINEAR CR	M	4.00	Slabs
66	SMALL PATCH	M	1.00	Slabs
63	LINEAR CR	L	2.00	Slabs

Sample Number: 202 **Type:** R **Area:** 18.00 Slabs **PCI:** 55

67	LARGE PATCH	L	2.00	Slabs
63	LINEAR CR	H	1.00	Slabs
63	LINEAR CR	M	2.00	Slabs
63	LINEAR CR	L	6.00	Slabs
66	SMALL PATCH	L	2.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RPW **Name:** 9/27 West Run-up Pad **Use:** APRON **Area:** 105,000 SqFt

Section: 001 of 1 **From:** Begin **To:** End **Last Const.:** 9/30/1992

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 105,000 SqFt **Length:** 440 Ft **Width:** 240 Ft

Slabs: 195 **Slab Length:** 21 Ft **Slab Width:** 25 Ft **Joint Length:** 8,456 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 18 **Surveyed:** 6

Conditions: **PCI:** 60

Sample Number: 103 **Type:** R **Area:** 12.00 Slabs **PCI:** 75

67	LARGE PATCH	L	4.00	Slabs
66	SMALL PATCH	L	8.00	Slabs
65	JT SEAL DMG	M	12.00	Slabs

Sample Number: 104 **Type:** R **Area:** 12.00 Slabs **PCI:** 68

63	LINEAR CR	L	2.00	Slabs
67	LARGE PATCH	L	5.00	Slabs
66	SMALL PATCH	L	4.00	Slabs
65	JT SEAL DMG	M	12.00	Slabs

Sample Number: 203 **Type:** R **Area:** 12.00 Slabs **PCI:** 81

65	JT SEAL DMG	L	12.00	Slabs
66	SMALL PATCH	L	9.00	Slabs
67	LARGE PATCH	L	3.00	Slabs

Sample Number: 300 **Type:** R **Area:** 16.00 Slabs **PCI:** 61

67	LARGE PATCH	L	9.00	Slabs
63	LINEAR CR	L	5.00	Slabs
66	SMALL PATCH	L	6.00	Slabs
65	JT SEAL DMG	M	16.00	Slabs

Sample Number: 305 **Type:** R **Area:** 16.00 Slabs **PCI:** 57

63	LINEAR CR	L	8.00	Slabs
67	LARGE PATCH	L	7.00	Slabs
66	SMALL PATCH	L	3.00	Slabs
65	JT SEAL DMG	M	16.00	Slabs
67	LARGE PATCH	M	1.00	Slabs

Sample Number: 306 **Type:** R **Area:** 16.00 Slabs **PCI:** 29

64	DURABIL. CR	M	1.00	Slabs
72	SHAT. SLAB	H	1.00	Slabs
63	LINEAR CR	L	6.00	Slabs
67	LARGE PATCH	L	2.00	Slabs
62	CORNER BREAK	L	1.00	Slabs
63	LINEAR CR	M	2.00	Slabs
65	JT SEAL DMG	M	16.00	Slabs
66	SMALL PATCH	L	2.00	Slabs
73	SHRINKAGE CR	N	1.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 007 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 334,950 SqFt **Length:** 3,346 Ft **Width:** 100 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 68 **Surveyed:** 9

Conditions: **PCI:** 82

Sample Number:	119	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	78	
48	L & T CR		M	4.00	Ft			
57	WEATHERING		L	3000.00	SqFt			
48	L & T CR		L	215.00	Ft			
Sample Number:	131	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	3000.00	SqFt			
57	WEATHERING		M	100.00	SqFt			
48	L & T CR		L	205.00	Ft			
Sample Number:	136	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	4000.00	SqFt			
48	L & T CR		L	250.00	Ft			
Sample Number:	146	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	2500.00	SqFt			
48	L & T CR		L	259.00	Ft			
Sample Number:	151	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	77	
57	WEATHERING		L	3000.00	SqFt			
48	L & T CR		L	332.00	Ft			
Sample Number:	519	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	86	
48	L & T CR		L	135.00	Ft			
57	WEATHERING		L	3000.00	SqFt			
Sample Number:	531	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	87	
48	L & T CR		L	119.00	Ft			
57	WEATHERING		L	3000.00	SqFt			
Sample Number:	541	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	79	
57	WEATHERING		L	4000.00	SqFt			
48	L & T CR		L	235.00	Ft			
57	WEATHERING		M	50.00	SqFt			
Sample Number:	546	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	89	
48	L & T CR		L	99.00	Ft			
48	L & T CR		M	1.00	Ft			

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 001 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 70,000 SqFt **Length:** 700 Ft **Width:** 100 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 14 **Surveyed:** 4

Conditions: **PCI:** 84

Sample Number:	101	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	87
52	RAVELING	L	30.00	SqFt			
48	L & T CR	L	94.00	Ft			
57	WEATHERING	M	150.00	SqFt			
57	WEATHERING	L	300.00	SqFt			
Sample Number:	105	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	84
57	WEATHERING	L	4000.00	SqFt			
48	L & T CR	L	178.00	Ft			
Sample Number:	501	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	86
57	WEATHERING	L	600.00	SqFt			
48	L & T CR	L	106.00	Ft			
57	WEATHERING	M	300.00	SqFt			
Sample Number:	505	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	79
48	L & T CR	L	220.00	Ft			
57	WEATHERING	M	100.00	SqFt			
57	WEATHERING	L	3500.00	SqFt			

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 004 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 100,000 SqFt **Length:** 1,000 Ft **Width:** 100 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 20 **Surveyed:** 4

Conditions: **PCI:** 84

Sample Number:	108	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80
57	WEATHERING		L	3000.00	SqFt		
48	L & T CR		L	262.00	Ft		
Sample Number:	113	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	85
48	L & T CR		L	155.00	Ft		
57	WEATHERING		L	3000.00	SqFt		
Sample Number:	510	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	84
48	L & T CR		L	169.00	Ft		
57	WEATHERING		L	3000.00	SqFt		
Sample Number:	515	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	87
57	WEATHERING		L	3000.00	SqFt		
48	L & T CR		L	115.00	Ft		

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 002 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 35,000 SqFt **Length:** 700 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 7 **Surveyed:** 3

Conditions: **PCI:** 85

Sample Number: 301 **Type:** R **Area:** 5000.00 SqFt **PCI:** 91

48	L & T CR	L	100.00	Ft
57	WEATHERING	L	600.00	SqFt

Sample Number: 303 **Type:** R **Area:** 5000.00 SqFt **PCI:** 82

48	L & T CR	L	217.00	Ft
57	WEATHERING	L	4000.00	SqFt

Sample Number: 305 **Type:** R **Area:** 5000.00 SqFt **PCI:** 81

57	WEATHERING	L	4000.00	SqFt
48	L & T CR	L	225.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 005 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 50,000 SqFt **Length:** 1,000 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 10 **Surveyed:** 4

Conditions: **PCI:** 81

Sample Number: 308	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	79	
57	WEATHERING	L	5000.00	SqFt			
48	L & T CR	L	291.00	Ft			
Sample Number: 310	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	77	
57	WEATHERING	L	5000.00	SqFt			
48	L & T CR	L	324.00	Ft			
Sample Number: 313	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	83	
48	L & T CR	L	179.00	Ft			
57	WEATHERING	L	5000.00	SqFt			
Sample Number: 315	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	84	
57	WEATHERING	L	5000.00	SqFt			
48	L & T CR	L	160.00	Ft			

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 003 of 8 **From:** A **To:** B **Last Const.:** 1/1/2017

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** P

Area: 48,700 SqFt **Length:** 658 Ft **Width:** 100 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 9 **Surveyed:** 2

Conditions: **PCI:** 79

Sample Number: 322 **Type:** R **Area:** 5000.00 SqFt **PCI:** 77

48	L & T CR	L	205.00	Ft
57	WEATHERING	L	4985.00	SqFt
52	RAVELING	H	5.00	SqFt
52	RAVELING	M	10.00	SqFt

Sample Number: 326 **Type:** R **Area:** 5000.00 SqFt **PCI:** 80

48	L & T CR	L	213.00	Ft
57	WEATHERING	L	4400.00	SqFt
52	RAVELING	L	30.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 006 of 8 **From:** A **To:** B **Last Const.:** 1/1/2017

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** P

Area: 24,350 SqFt **Length:** 658 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 5 **Surveyed:** 2

Conditions: **PCI:** 86

Sample Number: 122 **Type:** R **Area:** 5000.00 SqFt **PCI:** 84

57	WEATHERING	L	4992.00	SqFt
52	RAVELING	L	8.00	SqFt
48	L & T CR	L	46.00	Ft
48	L & T CR	M	4.00	Ft

Sample Number: 526 **Type:** R **Area:** 5000.00 SqFt **PCI:** 88

48	L & T CR	L	50.00	Ft
57	WEATHERING	L	4990.00	SqFt
52	RAVELING	L	10.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: RY321 **Name:** Runway 3/21 **Use:** RUNWAY **Area:** 830,500 SqFt

Section: 008 of 8 **From:** Begin **To:** End **Last Const.:** 8/30/2009

Surface: AC **Family:** MN2018 Asphalt Runway-Taxiways **Zone:** **Category:** **Rank:** S

Area: 167,500 SqFt **Length:** 3,346 Ft **Width:** 50 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 34 **Surveyed:** 7

Conditions: **PCI:** 81

Sample Number:	319	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	5000.00	SqFt			
48	L & T CR		L	245.00	Ft			
Sample Number:	331	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	81	
57	WEATHERING		L	3000.00	SqFt			
48	L & T CR		L	225.00	Ft			
Sample Number:	333	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	81	
48	L & T CR		L	225.00	Ft			
57	WEATHERING		L	3000.00	SqFt			
Sample Number:	336	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	78	
57	WEATHERING		L	3000.00	SqFt			
48	L & T CR		L	300.00	Ft			
Sample Number:	341	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	2500.00	SqFt			
48	L & T CR		L	250.00	Ft			
Sample Number:	346	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	83	
48	L & T CR		M	60.00	Ft			
48	L & T CR		L	132.00	Ft			
Sample Number:	351	**Type:**	R	**Area:**	5000.00 SqFt	**PCI:**	80	
57	WEATHERING		L	2500.00	SqFt			
48	L & T CR		L	270.00	Ft			

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 005 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1958

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 94,500 SqFt **Length:** 1,890 Ft **Width:** 50 Ft

Slabs: 504 **Slab Length:** 12 Ft **Slab Width:** 15 Ft **Joint Length:** 11,920 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 22 **Surveyed:** 6

Conditions: **PCI:** 74

Sample Number: 195 **Type:** R **Area:** 24.00 Slabs **PCI:** 80

66	SMALL PATCH	L	15.00	Slabs
65	JT SEAL DMG	L	24.00	Slabs
67	LARGE PATCH	L	7.00	Slabs

Sample Number: 202 **Type:** R **Area:** 24.00 Slabs **PCI:** 80

66	SMALL PATCH	L	17.00	Slabs
65	JT SEAL DMG	L	24.00	Slabs
67	LARGE PATCH	L	4.00	Slabs
75	CORNER SPALL	H	1.00	Slabs

Sample Number: 209 **Type:** R **Area:** 24.00 Slabs **PCI:** 47

67	LARGE PATCH	L	11.00	Slabs
65	JT SEAL DMG	L	24.00	Slabs
63	LINEAR CR	L	1.00	Slabs
76	ASR	H	2.00	Slabs
66	SMALL PATCH	L	21.00	Slabs

Sample Number: 595 **Type:** R **Area:** 24.00 Slabs **PCI:** 80

66	SMALL PATCH	L	15.00	Slabs
67	LARGE PATCH	L	7.00	Slabs
65	JT SEAL DMG	L	24.00	Slabs

Sample Number: 602 **Type:** R **Area:** 24.00 Slabs **PCI:** 79

75	CORNER SPALL	H	1.00	Slabs
65	JT SEAL DMG	L	24.00	Slabs
66	SMALL PATCH	L	22.00	Slabs
67	LARGE PATCH	L	3.00	Slabs

Sample Number: 609 **Type:** R **Area:** 24.00 Slabs **PCI:** 77

65	JT SEAL DMG	L	24.00	Slabs
66	SMALL PATCH	L	15.00	Slabs
63	LINEAR CR	L	1.00	Slabs
67	LARGE PATCH	L	6.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 008 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1958

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 50,000 SqFt **Length:** 1,000 Ft **Width:** 50 Ft

Slabs: 267 **Slab Length:** 12 Ft **Slab Width:** 15 Ft **Joint Length:** 6,283 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 11 **Surveyed:** 2

Conditions: **PCI:** 63

Sample Number: 416 **Type:** R **Area:** 24.00 Slabs **PCI:** 61

67	LARGE PATCH	L	8.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs
66	SMALL PATCH	M	1.00	Slabs
66	SMALL PATCH	H	6.00	Slabs
66	SMALL PATCH	L	15.00	Slabs

Sample Number: 422 **Type:** R **Area:** 24.00 Slabs **PCI:** 66

67	LARGE PATCH	H	1.00	Slabs
66	SMALL PATCH	L	20.00	Slabs
67	LARGE PATCH	L	11.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 004 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1958

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 189,000 SqFt **Length:** 1,890 Ft **Width:** 100 Ft

Slabs: 1,008 **Slab Length:** 12 Ft **Slab Width:** 15 Ft **Joint Length:** 25,730 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 44 **Surveyed:** 3

Conditions: **PCI:** 70

Sample Number: 395 **Type:** R **Area:** 24.00 Slabs **PCI:** 73

63	LINEAR CR	L	2.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs
66	SMALL PATCH	L	14.00	Slabs
67	LARGE PATCH	L	6.00	Slabs

Sample Number: 402 **Type:** R **Area:** 24.00 Slabs **PCI:** 80

65	JT SEAL DMG	M	24.00	Slabs
66	SMALL PATCH	L	21.00	Slabs
67	LARGE PATCH	L	2.00	Slabs

Sample Number: 409 **Type:** R **Area:** 24.00 Slabs **PCI:** 57

67	LARGE PATCH	L	7.00	Slabs
75	CORNER SPALL	L	5.00	Slabs
66	SMALL PATCH	L	24.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs
63	LINEAR CR	L	8.00	Slabs
75	CORNER SPALL	M	3.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 001 of 6 **From:** Begin **To:** End **Last Const.:** 1/15/2018

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 742,500 SqFt **Length:** 8,250 Ft **Width:** 90 Ft

Slabs: 3,300 **Slab Length:** 15 Ft **Slab Width:** 15 Ft **Joint Length:** 90,660 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 184 **Surveyed:** 24

Conditions: **PCI:** 100

Sample Number: 101 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 109 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 115 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 123 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 131 **Type:** R **Area:** 15.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 139 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 147 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 155 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 163 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 171 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 179 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 187 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 501 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 509 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 515 **Type:** R **Area:** 18.00 Slabs **PCI:** 95

62 CORNER BREAK L 1.00 Slabs

Sample Number: 523 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 531 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 539 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 547 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 555 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 563 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 571 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number:	579	**Type:**	R	**Area:**	18.00 Slabs	**PCI:**	100

<No Distress>

Sample Number:	587	**Type:**	R	**Area:**	18.00 Slabs	**PCI:**	100

<No Distress>

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 007 of 6 **From:** Begin **To:** End **Last Const.:** 9/30/1958

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 100,000 SqFt **Length:** 1,000 Ft **Width:** 100 Ft

Slabs: 533 **Slab Length:** 12 Ft **Slab Width:** 15 Ft **Joint Length:** 13,567 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 22 **Surveyed:** 4

Conditions: **PCI:** 48

Sample Number: 216 **Type:** R **Area:** 24.00 Slabs **PCI:** 35

67	LARGE PATCH	M	18.00	Slabs
63	LINEAR CR	L	5.00	Slabs
66	SMALL PATCH	M	17.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs

Sample Number: 222 **Type:** R **Area:** 24.00 Slabs **PCI:** 62

65	JT SEAL DMG	M	24.00	Slabs
67	LARGE PATCH	M	2.00	Slabs
66	SMALL PATCH	M	20.00	Slabs
63	LINEAR CR	L	1.00	Slabs

Sample Number: 616 **Type:** R **Area:** 24.00 Slabs **PCI:** 41

67	LARGE PATCH	H	2.00	Slabs
66	SMALL PATCH	M	22.00	Slabs
67	LARGE PATCH	M	6.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs

Sample Number: 622 **Type:** R **Area:** 24.00 Slabs **PCI:** 55

66	SMALL PATCH	M	19.00	Slabs
67	LARGE PATCH	M	6.00	Slabs
65	JT SEAL DMG	M	24.00	Slabs

Network: DLH **Name:** Duluth International Airport

Branch: RY927 **Name:** Runway 9/27 **Use:** RUNWAY **Area:** 1,671,000 SqFt

Section: 002 of 6 **From:** Begin **To:** End **Last Const.:** 1/15/2018

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 495,000 SqFt **Length:** 8,250 Ft **Width:** 60 Ft

Slabs: 2,200 **Slab Length:** 15 Ft **Slab Width:** 15 Ft **Joint Length:** 57,690 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 92 **Surveyed:** 12

Conditions: **PCI:** 100

Sample Number: 301 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 309 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 315 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 323 **Type:** R **Area:** 24.00 Slabs **PCI:** 96

63 LINEAR CR L 1.00 Slabs

Sample Number: 331 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 339 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 347 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 355 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 363 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 371 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 379 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 387 **Type:** R **Area:** 24.00 Slabs **PCI:** 100

<No Distress>

Network: DLH **Name:** Duluth International Airport

Branch: TLA **Name:** Taxilane **Use:** TAXILANE **Area:** 150,300 SqFt

Section: 009 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1996

Surface: AC **Family:** MN2018 Asphalt Taxilanes **Zone:** **Category:** **Rank:** S

Area: 51,400 SqFt **Length:** 226 Ft **Width:** 226 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 8 **Surveyed:** 3

Conditions: **PCI:** 39

Sample Number: 601 **Type:** R **Area:** 7500.00 SqFt **PCI:** 44

48	L & T CR	L	504.00	Ft
52	RAVELING	L	1600.00	SqFt
57	WEATHERING	M	5900.00	SqFt
48	L & T CR	M	735.00	Ft
41	ALLIGATOR CR	L	8.00	SqFt

Sample Number: 604 **Type:** R **Area:** 4925.00 SqFt **PCI:** 23

48	L & T CR	M	425.00	Ft
48	L & T CR	L	50.00	Ft
45	DEPRESSION	M	12.00	SqFt
41	ALLIGATOR CR	H	8.00	SqFt
53	RUTTING	H	52.00	SqFt
57	WEATHERING	M	4800.00	SqFt
41	ALLIGATOR CR	M	160.00	SqFt
45	DEPRESSION	L	33.00	SqFt

Sample Number: 607 **Type:** R **Area:** 5000.00 SqFt **PCI:** 48

57	WEATHERING	H	450.00	SqFt
48	L & T CR	M	431.00	Ft
48	L & T CR	L	514.00	Ft
57	WEATHERING	M	4550.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: TLA **Name:** Taxilane **Use:** TAXILANE **Area:** 150,300 SqFt

Section: 002 of 5 **From:** Begin **To:** End **Last Const.:** 10/30/2008

Surface: AC **Family:** MN2018 Asphalt Taxilanes **Zone:** **Category:** **Rank:** S

Area: 17,300 SqFt **Length:** 118 Ft **Width:** 118 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 86

Sample Number: 301 **Type:** A **Area:** 4000.00 SqFt **PCI:** 74

41	ALLIGATOR CR	L	44.00	SqFt
48	L & T CR	L	21.00	Ft
42	BLEEDING	N	3.00	SqFt
48	L & T CR	M	46.00	Ft

Sample Number: 303 **Type:** R **Area:** 4000.00 SqFt **PCI:** 90

48	L & T CR	L	11.00	Ft
56	SWELLING	L	100.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: TLA **Name:** Taxilane **Use:** TAXILANE **Area:** 150,300 SqFt

Section: 003 of 5 **From:** Begin **To:** End **Last Const.:** 10/30/2008

Surface: AC **Family:** MN2018 Asphalt Taxilanes **Zone:** **Category:** **Rank:** S

Area: 14,000 SqFt **Length:** 131 Ft **Width:** 131 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 4 **Surveyed:** 2

Conditions: **PCI:** 89

Sample Number: 813 **Type:** R **Area:** 5000.00 SqFt **PCI:** 93

48	L & T CR	L	51.00	Ft
57	WEATHERING	M	29.00	SqFt

Sample Number: 816 **Type:** R **Area:** 5000.00 SqFt **PCI:** 85

48	L & T CR	L	51.00	Ft
57	WEATHERING	L	225.00	SqFt
48	L & T CR	M	32.00	Ft

Network: DLH **Name:** Duluth International Airport

Branch: TLA **Name:** Taxilane **Use:** TAXILANE **Area:** 150,300 SqFt

Section: 005 of 5 **From:** Begin **To:** End **Last Const.:** 9/30/1996

Surface: AC **Family:** MN2018 Asphalt Taxilanes **Zone:** **Category:** **Rank:** S

Area: 4,100 SqFt **Length:** 64 Ft **Width:** 64 Ft

Slabs: **Slab Length:** Ft **Slab Width:** Ft **Joint Length:** Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 2 **Surveyed:** 1

Conditions: **PCI:** 72

Sample Number: 801 **Type:** R **Area:** 2500.00 SqFt **PCI:** 72

52	RAVELING	H	2.00	SqFt
49	OIL SPILLAGE	N	4.00	SqFt
57	WEATHERING	L	2100.00	SqFt
48	L & T CR	L	89.00	Ft
57	WEATHERING	M	200.00	SqFt

Network: DLH **Name:** Duluth International Airport

Branch: TLA **Name:** Taxilane **Use:** TAXILANE **Area:** 150,300 SqFt

Section: 001 of 5 **From:** Begin **To:** End **Last Const.:** 10/30/2008

Surface: PCC **Family:** MN2018 PCC **Zone:** **Category:** **Rank:** S

Area: 63,500 SqFt **Length:** 550 Ft **Width:** 115 Ft

Slabs: 406 **Slab Length:** 12 Ft **Slab Width:** 12 Ft **Joint Length:** 9,455 Ft

Shoulder: **Street Type:** **Grade:** 0 **Lanes:** 0

Last Insp. Date: 6/25/2018 **TotalSamples:** 21 **Surveyed:** 3

Conditions: **PCI:** 100

Sample Number: 104 **Type:** R **Area:** 20.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 110 **Type:** R **Area:** 18.00 Slabs **PCI:** 100

<No Distress>

Sample Number: 205 **Type:** R **Area:** 14.00 Slabs **PCI:** 100

<No Distress>

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Appendix D

Distress Identification

This appendix lists and describes distress types most commonly identified during the PCI inspections of Minnesota airports. Note that the pictures provided in this appendix are for illustration purposes and do not necessarily reflect the conditions or pavements at this airport. Descriptions and measurement inspection criteria are provided herein.

Flexible (Asphalt) Pavement Distress

Example of Longitudinal and Transverse Cracking (L&T cracking)

Longitudinal and transverse cracks are caused by pavement aging, by construction, and by subsurface movement. Aging occurs as pavement loses some of its components to the atmosphere and becomes more brittle. Consistent application of pavement sealcoats can help to prevent the occurrence of age related cracks. Cracks will also develop along poorly constructed paving lane joints. Ensuring that joints are made when both sides are still hot, and near the same temperature, is one of the best ways to mitigate this potential problem. Seasonal movement caused by changes in moisture content or temperature differences can also cause pavement cracks. Asphalt pavement placed over a PCC pavement or cement stabilized base course may evidence reflective cracking from the underlying material. Longitudinal and transverse cracks are not caused by wheel loads, although traffic may worsen their condition.

Low severity longitudinal and transverse cracks are less than ¼ inch wide, or if sealed with suitable filler material in satisfactory condition can be any width, less than 3 inches, if they are not spalled. Maintenance usually is not indicated for low-severity cracking. Moderately spalled cracks and cracks wider than ¼ inch which are not satisfactorily sealed are at medium severity. Medium-severity cracks should be sealed with a high-quality crack filling material. Severely spalled cracks and cracks wider than 3 inches are at high severity. High-severity L&T cracks normally require patching.

Example of Block Cracking

Block cracking is longitudinal and transverse cracking that has established a pattern of blocks ranging in size from 1ft x 1ft to 10ft x 10ft. This distress typically happens in older asphalt pavements and is an indication that the bituminous binder has lost most of its flexibility. The severity determination is basically determined by the crack width criteria defined for longitudinal and transverse cracking. Crack sealing typically is used to repair block cracking; however, the amount of required sealant can be extensive due to the high density of cracks.

Example of Alligator Cracking

Alligator (or fatigue) cracks are a series of interconnected load-related cracks caused by fatigue of the asphalt surface. Alligator cracking is a significant structural distress and develops only in places subject to traffic loads. These cracks typically initiate at the bottom of the asphalt layer (where tensile strains

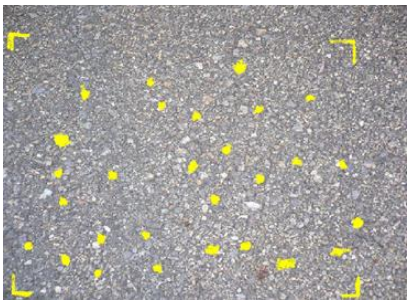
are highest) and propagate upward - so once a fatigue crack is visible, significant damage has already occurred.

At low severity, alligator cracks are evidenced by a series of parallel hairline cracks (usually in a wheel path). Further traffic and deterioration leads to the interconnection of these cracks. Medium severity alligator cracking is a well-defined pattern of interconnected cracks, some spalling may be present. High severity alligator cracks have lost aggregate interlock between adjacent pieces, the cracks may be severely spalled with FOD potential, and most likely the pieces will move freely under traffic. Alligator cracking is a structural failure and cannot be repaired with sealant, the proper repair is full-depth patching.

Example of Raveling/Weathering

Raveling and weathering are the wearing away of the pavement surface. Raveling is the condition where the mid- to large size aggregates are becoming dislodged; weathering is when the fine aggregate wears away exposing the edges of the larger aggregate. These distresses are usually evident over large areas and may occur together (pictured above) or separately. Raveling and weathering may indicate that the asphalt binder has hardened significantly.

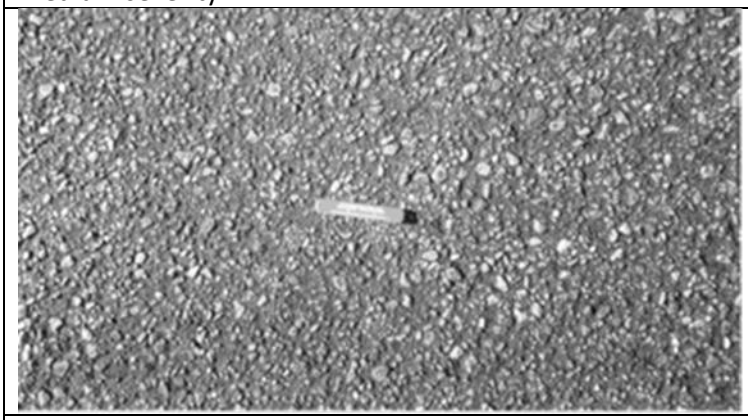
Raveling – At low severity, the number of missing coarse aggregates (> 3/8 inch) is between 5-20 missing/yd^2, medium severity (pictured below where the missing coarse aggregates have been dotted with yellow paint) is 21-40 missing/yd^2, and high severity is > 40 missing/yd^2.



Weathering – At low severity, the coarse aggregate is slightly exposed due to the wearing away of the fine aggregate. At medium severity, the coarse aggregate is exposed up to ¼ the width of the longest side. At high severity, the coarse is exposed greater than ¼ the width of the longest side.

Low severity

Medium severity



High severity

Example of Patching

Patched areas are defined when a portion of the original pavement is replaced with a material intended as a semi-permanent repair. A patch is documented as a defect because it is considered a break in the integrity of the pavement structure. Patches are constructed for a variety of reasons including utility repairs, correcting grade issues, and addressing a defect in the original pavement.
The severity level of patches is determined by the amount of distress (i.e. cracking, depression, weathering/raveling, etc.) occurring within the limits of the patched area.

Example of Rutting

Ruts are localized, load related, areas of pavement having elevations lower than the surrounding sections. Rutting is due to base and subgrade consolidation, caused by excessive wheel loads or poor compaction. Ruts indicate structural failure, and can cause hydroplaning. At low severity, ruts have an

average depth of ¼ to ½ inches. At medium severity, ruts have an average depth of ½ to 1 inch. High severity, ruts have an average depth greater than 1 inch.
Full-depth patching is the appropriate repair for ruts.

Rigid (Concrete) Pavement Distress

Example of Longitudinal, Transverse, and Diagonal Cracking

LTD cracking is most often a result of externally applied loads and/or constrained temperature deformations. External loads cause LTD cracking through flexure. Temperature changes on restrained slabs will result in stresses due to friction or curling. When any of these stresses exceed the strength of the slab, cracking will occur. LTD cracking is recorded at low, medium, or high severity, depending on the width of crack opening and degree of deterioration. At low severity, the crack is less than 1/8th inch wide with little spalling and no corrective action is indicated. At medium severity, LTD cracks can be up to 1 inch wide with moderate spalling, and should be repaired and sealed using procedures similar to joint sealing. At high severity, cracks exceed 1 inch in width and may be severely spalled. High-severity LTD cracking is evidence of serious load failure of the slab, and correction may require patching or slab replacement. If the distress occurs in several adjacent slabs at medium or high severity, major rehabilitation of that pavement area is indicated.

When a slab is divided by LTD cracks into four or more pieces, the slab is said to be "divided" or "shattered." Shattered slab is a separate distress category and is indicative of significant structural failure as the slab loses its ability to distribute loads to subgrade and further slab deterioration can be expected. Shattered slabs are rated in three severities, with slab replacement recommended for medium and high severities.

Example of Shrinkage Cracking

Shrinkage cracks are small, nonworking (no spalling along edge) cracks that are visible at the surface but do not penetrate through the full depth of concrete. Shrinkage cracks most commonly occur shortly after construction due to concrete shrinkage during the curing process. Shrinkage cracks are usually so small that they are not visible until staining or material loss at crack edges begins to take place. Shrinkage cracks do not represent a structural weakness, and no corrective action is prescribed.

Example of Joint and Corner Spalling

Spalls at slab joints and corners are caused by excessive internal stress in the pavement. Spalls occur when these stresses exceed the shear strength of the concrete. Spalling usually results from thermal expansion during warm or hot weather. As slabs expand, they push against one another at joints. If the joints are filled with incompressibles, such as sand, or if adjacent slabs offset slightly, stresses can become severe, causing spalls. Spalling can be reduced significantly by conscientious maintenance of joint sealant.

Spall repair requires patching. The extent and severity of spalling on a pavement surface suggests appropriate action. For example, at low severity, spalled concrete remains securely in place in the slab. A low-severity spall should be monitored closely for further deterioration and should be patched when

spalled particles become loose in place, or at the next scheduled patching activity in the section. Medium- and high-severity spalls should be repaired immediately to prevent the incidence of FOD. If the pavement can be restored to serviceable condition, spalls should be carefully patched for long-term service. If the pavement is beyond repair, temporary patching should be considered to control FOD.

Example of Durability Cracking

Durability cracking (D-cracking) is caused by environmental factors, the most common of which is freezing/thawing. It usually appears as a pattern of hairline cracks running parallel to a joint or crack, or in a corner, where water tends to collect. This type of cracking eventually leads to disintegration of the pavement, creating FOD potential. At low severity, D-cracking is evident, but no disintegration has occurred. As the distress advances to medium severity, the distress pattern is evident over a significant area of the slab, and some disintegration and FOD potential exists. High severity durability cracking is evidenced by extensive cracking with loose and missing pieces and significant FOD potential.

Example of Joint Seal Damage

Joint seal damage is recorded at three severities: low, medium, and high. When joint sealant is in perfect condition (no damage), it is not a distress. At low severity, at least 10 percent of the sealant is debonded but still in contact with the joint edges (i.e., joint sealant is in serviceable condition but should

be monitored for evidence of more serious failure). Medium-severity joint seal damage is recorded when at least 10 percent of the sealant has visible gaps smaller than 1/8th inch and is an indicator that replacement should be programmed as soon as is practicable. In the meantime, aggressive inspection and sustaining maintenance is recommended to minimize subsurface damage from moisture penetration. At high severity, visible gaps exceed 1/8th inch and the amount and degree of joint seal damage is such that repair is no longer feasible. The only appropriate corrective action is sealant replacement.

On serviceable pavement, deteriorated joint sealant should be repaired or replaced to preserve pavement and subgrade integrity and prolong service life. The issue is not so clear-cut with unserviceable pavement. Pavement that can be restored to serviceable condition by maintenance activities such as patching and joint seal repair, or by slab replacement, should be so maintained as long as the process is cost-effective. However, when age and condition preclude economical return to serviceable condition by such means, joint seal repair would no longer be cost-effective and should be suspended except for an interim maintenance program to control FOD potential.

Joint sealant can stop the evidence of pumping (water forced to surface through joints and cracks) but will not correct the cause (voids under pavement).

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Appendix E

Maintenance and Major Rehabilitation Policies

Table E1. Localized maintenance policy for asphalt surfaces.

Distress type	Distress severity	Maintenance treatment
Alligator cracking	Low	Crack Sealing - AC
	Medium	Patching - AC Deep
	High	Patching - AC Deep
Bleeding	N/A	Monitor
Block cracking	Low	Monitor
	Medium	Crack Sealing - AC
	High	Crack Sealing - AC
Corrugation	Low	Monitor
	Medium	Patching - AC Deep
	High	Patching - AC Deep
Depression	Low	Monitor
	Medium	Patching - AC Shallow
	High	Patching - AC Deep
Jet blast	N/A	Patching - AC Shallow
Joint reflection cracking	Low	Monitor
	Medium	Crack Sealing - AC
	High	Crack Sealing - AC
Longitudinal & transverse cracking (L&T cracking)	Low	Monitor
	Medium	Crack Sealing - AC
	High	Crack Sealing - AC
Oil spillage	N/A	Patching - AC Shallow
Patching	Low	Monitor
	Medium	Patching - AC Shallow
	High	Patching - AC Deep
Polished aggregate	N/A	Monitor
Raveling	Low	Monitor
	Medium	Surface Treatment
	High	Patching - AC Shallow
Rutting	Low	Monitor
	Medium	Patching - AC Deep
	High	Patching - AC Deep
Shoving	Low	Monitor
	Medium	Patching - AC Shallow
	High	Patching - AC Deep
Slippage cracking	N/A	Patching - AC Shallow
Swelling	Low	Monitor
	Medium	Patching - AC Deep
	High	Patching - AC Deep
Weathering	Low	Monitor
	Medium	Surface Treatment
	High	Patching - AC Shallow

Table E2. Localized maintenance policy for PCC surfaces.

Distress type	Distress severity	Maintenance treatment
Blow up	Low	Patching - PCC Partial Depth
	Medium	Slab Replacement - PCC
	High	Slab Replacement - PCC
Corner break	Low	Monitor
	Medium	Patching - PCC Full Depth
	High	Patching - PCC Full Depth
Linear cracking	Low	Monitor
	Medium	Crack Sealing - PCC
	High	Patching - PCC Full Depth
Durability cracking	Low	Monitor
	Medium	Patching - PCC Full Depth
	High	Slab Replacement - PCC
Joint seal damage	Low	Monitor
	Medium	Joint Seal (Localized)
	High	Joint Seal (Localized)
Small patch	Low	Monitor
	Medium	Patching - PCC Partial Depth
	High	Patching - PCC Partial Depth
Large patch	Low	Monitor
	Medium	Patching - PCC Full Depth
	High	Patching - PCC Full Depth
Popouts	N/A	Monitor
Pumping	N/A	Monitor
Scaling	Low	Monitor
	Medium	Patching - PCC Partial Depth
	High	Slab Replacement - PCC
Faulting	Low	Monitor
	Medium	Grinding (Localized)
	High	Grinding (Localized)
Shattered slab	Low	Monitor
	Medium	Crack Sealing - PCC
	High	Slab Replacement - PCC
Shrinkage cracking	N/A	Monitor
Joint spall	Low	Monitor
	Medium	Patching - PCC Partial Depth
	High	Patching - PCC Partial Depth
Corner spall	Low	Monitor
	Medium	Patching - PCC Partial Depth
	High	Patching - PCC Partial Depth
ASR	Low	Monitor
	Medium	Patching - PCC Full Depth
	High	Slab Replacement - PCC

Table E3. Unit costs for localized maintenance treatments.

Treatment name	Unit cost
Crack Sealing - AC	$1.26 ft
Crack Sealing - PCC	$1.92 ft
Grinding (Localized)	$4.98 ft
Joint Seal (Localized)	$1.92 ft
Patching - AC Deep	$11.82 sf
Patching - AC Leveling	$4.14 sf
Patching - AC Shallow	$7.95 sf
Patching - PCC Full Depth	$74.32 sf
Patching - PCC Partial Depth	$10.68 sf
Slab Replacement - PCC	$40.00 sf
Surface Treatment	$0.52 sf
Undersealing - PCC	$3.17 ft

Table E4. Major rehabilitation unit costs based on PCI ranges.

PCI range	Cost
0-30	$8.59 sf
30-40	$8.59-$7.13 sf
40-50	$7.13-$5.94 sf
50-60	$5.94-$4.19 sf
60-70	$4.19-$2.66 sf
70-80	$2.66-$1.30 sf
> 80	$1.30 sf

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Appendix F

Localized Maintenance Recommendations

Table F.1. Recommended maintenance by section report (DLH)

Branch	Section	Treatment	Quantity	Unit	Cost
APGA	001	Crack Sealing - AC	21,946	Ft	$27,652
Restorative		**PCI Before: 45 After: 58**	**-**	**Total**	**$27,652**
APGA	002	Crack Sealing - PCC	891	Ft	$1,711
APGA	002	Grinding (Localized)	137	Ft	$684
APGA	002	Joint Seal (Localized)	5,192	Ft	$9,969
APGA	002	Patching - PCC Full Depth	2,874	SqFt	$213,597
APGA	002	Patching - PCC Partial Depth	351	SqFt	$3,741
APGA	002	Slab Replacement - PCC	8,932	SqFt	$357,271
Restorative		**PCI Before: 28 After: 72**	**-**	**Total**	**$586,973**
APGA	003	Crack Sealing - AC	8,331	Ft	$10,497
APGA	003	Patching - AC Shallow	76,560	SqFt	$608,655
APGA	003	Surface Treatment	137,250	SqFt	$71,370
Stopgap		**PCI Before: 32 After: 48**	**-**	**Total**	**$690,522**
APGA	004	Crack Sealing - PCC	513	Ft	$986
APGA	004	Patching - PCC Partial Depth	42	SqFt	$454
Preventive		**PCI Before: 62 After: 69**	**-**	**Total**	**$1,440**
APGA	005	Crack Sealing - AC	39	Ft	$50
Preventive		**PCI Before: 87 After: 89**	**-**	**Total**	**$50**
APGA	006	Crack Sealing - PCC	4,766	Ft	$9,150
APGA	006	Joint Seal (Localized)	11,757	Ft	$22,573
APGA	006	Patching - PCC Partial Depth	1,079	SqFt	$11,532
APGA	006	Slab Replacement - PCC	4,973	SqFt	$198,912
Restorative		**PCI Before: 13 After: 56**	**-**	**Total**	**$242,166**
APGA	007	Crack Sealing - PCC	2,667	Ft	$5,121
APGA	007	Joint Seal (Localized)	5,745	Ft	$11,030
APGA	007	Patching - PCC Full Depth	6,251	SqFt	$464,500
APGA	007	Patching - PCC Partial Depth	41	SqFt	$438
Restorative		**PCI Before: 8 After: 53**	**-**	**Total**	**$481,089**
APGA	008	Crack Sealing - PCC	602	Ft	$1,156
APGA	008	Joint Seal (Localized)	26,829	Ft	$51,512
APGA	008	Patching - PCC Partial Depth	1,239	SqFt	$13,250
Preventive		**PCI Before: 64 After: 81**	**-**	**Total**	**$65,918**
APGA	009	Crack Sealing - PCC	2,798	Ft	$5,371
APGA	009	Joint Seal (Localized)	14,180	Ft	$27,226
APGA	009	Patching - PCC Full Depth	301	SqFt	$22,379
APGA	009	Patching - PCC Partial Depth	75	SqFt	$804
APGA	009	Slab Replacement - PCC	3,730	SqFt	$149,200
Restorative		**PCI Before: 48 After: 74**	**-**	**Total**	**$204,980**

Branch	Section	Treatment	Quantity	Unit	Cost
APGA	010	Crack Sealing - AC	3,565	Ft	$4,492
APGA	010	Patching - AC Shallow	1,098	SqFt	$8,729
APGA	010	Surface Treatment	53,802	SqFt	$27,977
Preventive		**PCI Before: 56 After: 65**	**-**	**Total**	**$41,198**
APGA	011	Crack Sealing - AC	220	Ft	$278
APGA	011	Patching - AC Shallow	23	SqFt	$182
APGA	011	Surface Treatment	34,347	SqFt	$17,860
Preventive		**PCI Before: 62 After: 70**	**-**	**Total**	**$18,319**
APGA	012	Crack Sealing - PCC	1,158	Ft	$2,224
APGA	012	Joint Seal (Localized)	5,260	Ft	$10,099
APGA	012	Patching - PCC Full Depth	125	SqFt	$9,266
APGA	012	Patching - PCC Partial Depth	50	SqFt	$533
Restorative		**PCI Before: 47 After: 73**	**-**	**Total**	**$22,122**
APGA	013	Crack Sealing - AC	475	Ft	$598
APGA	013	Patching - AC Shallow	26	SqFt	$205
Preventive		**PCI Before: 60 After: 73**	**-**	**Total**	**$804**
APGA	014	Crack Sealing - PCC	35	Ft	$68
Preventive		**PCI Before: 88 After: 90**	**-**	**Total**	**$68**
APTR	001	Crack Sealing - PCC	232	Ft	$445
APTR	001	Joint Seal (Localized)	5,376	Ft	$10,321
APTR	001	Patching - PCC Full Depth	848	SqFt	$63,103
APTR	001	Patching - PCC Partial Depth	217	SqFt	$2,318
Preventive		**PCI Before: 47 After: 63**	**-**	**Total**	**$76,187**
APTR	002	Crack Sealing - AC	15,950	Ft	$20,098
APTR	002	Surface Treatment	3,552	SqFt	$1,847
Restorative		**PCI Before: 39 After: 52**	**-**	**Total**	**$21,945**
CTA1	001	Crack Sealing - AC	2,430	Ft	$3,062
CTA1	001	Patching - AC Deep	51	SqFt	$593
CTA1	001	Patching - AC Shallow	13	SqFt	$102
CTA1	001	Surface Treatment	34,624	SqFt	$18,004
Stopgap		**PCI Before: 39 After: 48**	**-**	**Total**	**$21,762**
CTA1	002	Joint Seal (Localized)	1,660	Ft	$3,188
CTA1	002	Patching - PCC Partial Depth	36	SqFt	$375
Preventive		**PCI Before: 71 After: 84**	**-**	**Total**	**$3,562**
CTA2	002	Crack Sealing - AC	1,826	Ft	$2,301
CTA2	002	Patching - AC Deep	115	SqFt	$1,363
CTA2	002	Patching - AC Shallow	71	SqFt	$568
CTA2	002	Surface Treatment	3,883	SqFt	$2,019
Stopgap		**PCI Before: 31 After: 40**	**-**	**Total**	**$6,250**

Branch	Section	Treatment	Quantity	Unit	Cost
CTA3	001	Crack Sealing - AC	106	Ft	$134
Preventive		PCI Before: 79 After: 83	-	Total	$134
CTA3	002	Crack Sealing - AC	1,376	Ft	$1,734
CTA3	002	Patching - AC Deep	685	SqFt	$8,091
Stopgap		PCI Before: 37 After: 40	-	Total	$9,824
CTA3	003	Crack Sealing - AC	501	Ft	$632
Restorative		PCI Before: 59 After: 63	-	Total	$632
CTA5	001	Crack Sealing - AC	3,548	Ft	$4,470
Stopgap		PCI Before: 44 After: 55	-	Total	$4,470
CTB	001	Crack Sealing - PCC	112	Ft	$214
CTB	001	Patching - PCC Full Depth	186	SqFt	$13,815
CTB	001	Patching - PCC Partial Depth	93	SqFt	$993
Preventive		PCI Before: 86 After: 89	-	Total	$15,021
CTD	001	Crack Sealing - AC	21,297	Ft	$26,835
CTD	001	Patching - AC Shallow	14,541	SqFt	$115,604
CTD	001	Surface Treatment	97,787	SqFt	$50,849
Stopgap		PCI Before: 34 After: 52	-	Total	$193,287
CTD	002	Surface Treatment	407	SqFt	$211
Preventive		PCI Before: 82 After: 84	-	Total	$211
PTA	001	Crack Sealing - AC	7,126	Ft	$8,979
PTA	001	Patching - AC Shallow	6	SqFt	$50
PTA	001	Surface Treatment	60,768	SqFt	$31,599
Stopgap		PCI Before: 32 After: 35	-	Total	$40,628
PTA	002	Crack Sealing - AC	29,072	Ft	$36,630
PTA	002	Patching - AC Deep	1,099	SqFt	$12,989
PTA	002	Patching - AC Shallow	1,564	SqFt	$12,434
PTA	002	Surface Treatment	50,856	SqFt	$26,445
Stopgap		PCI Before: 34 After: 43	-	Total	$88,498
PTA	003	Crack Sealing - AC	3,242	Ft	$4,085
Stopgap		PCI Before: 50 After: 60	-	Total	$4,085
PTA	004	Crack Sealing - AC	94	Ft	$119
PTA	004	Surface Treatment	5,900	SqFt	$3,068
Preventive		PCI Before: 70 After: 74	-	Total	$3,187
PTA	005	Crack Sealing - AC	15,665	Ft	$19,739
PTA	005	Patching - AC Deep	105	SqFt	$1,252
Restorative		PCI Before: 52 After: 61	-	Total	$20,991

Branch	Section	Treatment	Quantity	Unit	Cost
PTC	001	Crack Sealing - AC	7,315	Ft	$9,217
PTC	001	Patching - AC Shallow	384	SqFt	$3,053
PTC	001	Surface Treatment	47,616	SqFt	$24,760
Stopgap		**PCI Before: 42 After: 57**	**-**	**Total**	**$37,030**
PTC	002	Surface Treatment	537	SqFt	$279
Preventive		**PCI Before: 77 After: 82**	**-**	**Total**	**$279**
PTC	003	Crack Sealing - AC	437	Ft	$551
PTC	003	Surface Treatment	32,000	SqFt	$16,640
Restorative		**PCI Before: 59 After: 65**	**-**	**Total**	**$17,191**
PTC	005	Crack Sealing - AC	52,197	Ft	$65,768
PTC	005	Patching - AC Deep	572	SqFt	$6,753
PTC	005	Patching - AC Shallow	10,417	SqFt	$82,816
PTC	005	Surface Treatment	171,882	SqFt	$89,379
Stopgap		**PCI Before: 28 After: 49**	**-**	**Total**	**$244,716**
PTC	001P	Crack Sealing - PCC	45	Ft	$87
PTC	001P	Joint Seal (Localized)	345	Ft	$662
PTC	001P	Patching - PCC Full Depth	68	SqFt	$5,040
PTC	001P	Patching - PCC Partial Depth	16	SqFt	$177
PTC	001P	Slab Replacement - PCC	350	SqFt	$14,000
Restorative		**PCI Before: 22 After: 66**	**-**	**Total**	**$19,966**
RPA1	001	Joint Seal (Localized)	1,821	Ft	$3,497
RPA1	001	Patching - PCC Partial Depth	17	SqFt	$180
Preventive		**PCI Before: 77 After: 91**	**-**	**Total**	**$3,676**
RPE	001	Crack Sealing - PCC	212	Ft	$407
RPE	001	Patching - PCC Full Depth	348	SqFt	$25,864
RPE	001	Patching - PCC Partial Depth	4	SqFt	$45
Restorative		**PCI Before: 48 After: 74**	**-**	**Total**	**$26,316**
RPW	001	Crack Sealing - PCC	108	Ft	$207
RPW	001	Joint Seal (Localized)	7,248	Ft	$13,916
RPW	001	Patching - PCC Full Depth	523	SqFt	$38,915
RPW	001	Slab Replacement - PCC	1,248	SqFt	$49,911
Restorative		**PCI Before: 60 After: 71**	**-**	**Total**	**$102,949**
RY321	001	Surface Treatment	1,925	SqFt	$1,001
Preventive		**PCI Before: 84 After: 86**	**-**	**Total**	**$1,001**
RY321	003	Patching - AC Shallow	25	SqFt	$194
RY321	003	Surface Treatment	48	SqFt	$25
Preventive		**PCI Before: 79 After: 79**	**-**	**Total**	**$219**

Branch	Section	Treatment	Quantity	Unit	Cost
RY321	006	Crack Sealing - AC	10	Ft	$12
Preventive		**PCI Before: 86 After: 88**	**-**	**Total**	**$12**
RY321	007	Crack Sealing - AC	37	Ft	$47
RY321	007	Surface Treatment	1,116	SqFt	$581
Preventive		**PCI Before: 82 After: 83**	**-**	**Total**	**$627**
RY321	008	Crack Sealing - AC	287	Ft	$362
Preventive		**PCI Before: 81 After: 81**	**-**	**Total**	**$362**
RY927	004	Joint Seal (Localized)	25,730	Ft	$49,402
RY927	004	Patching - PCC Partial Depth	113	SqFt	$1,207
Preventive		**PCI Before: 70 After: 76**	**-**	**Total**	**$50,609**
RY927	005	Patching - PCC Partial Depth	26	SqFt	$276
RY927	005	Slab Replacement - PCC	1,802	SqFt	$72,083
Preventive		**PCI Before: 74 After: 79**	**-**	**Total**	**$72,360**
RY927	007	Joint Seal (Localized)	13,567	Ft	$26,048
RY927	007	Patching - PCC Full Depth	13,935	SqFt	$1,035,638
RY927	007	Patching - PCC Partial Depth	1,166	SqFt	$12,446
Restorative		**PCI Before: 48 After: 76**	**-**	**Total**	**$1,074,132**
RY927	008	Joint Seal (Localized)	6,283	Ft	$12,064
RY927	008	Patching - PCC Full Depth	410	SqFt	$30,517
RY927	008	Patching - PCC Partial Depth	104	SqFt	$1,119
Preventive		**PCI Before: 63 After: 76**	**-**	**Total**	**$43,700**
TLA	002	Crack Sealing - AC	69	Ft	$87
Preventive		**PCI Before: 86 After: 86**	**-**	**Total**	**$87**
TLA	003	Crack Sealing - AC	45	Ft	$56
TLA	003	Surface Treatment	41	SqFt	$21
Preventive		**PCI Before: 89 After: 94**	**-**	**Total**	**$78**
TLA	005	Patching - AC Shallow	24	SqFt	$192
TLA	005	Surface Treatment	328	SqFt	$171
Preventive		**PCI Before: 72 After: 81**	**-**	**Total**	**$363**
TLA	009	Crack Sealing - AC	4,708	Ft	$5,931
TLA	009	Patching - AC Deep	764	SqFt	$9,030
TLA	009	Patching - AC Shallow	1,391	SqFt	$11,056
TLA	009	Surface Treatment	44,985	SqFt	$23,392
Restorative		**PCI Before: 39 After: 58**	**-**	**Total**	**$49,409**

Table F.2. Recommended maintenance by treatment (DLH)

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
APGA	001	BLOCK CR	M	Crack Sealing - AC	15,140	Ft	$19,076
APGA	001	JT REF. CR	M	Crack Sealing - AC	1,657	Ft	$2,088
APGA	001	L & T CR	M	Crack Sealing - AC	5,087	Ft	$6,409
APGA	001	L & T CR	H	Crack Sealing - AC	62	Ft	$78
APGA	003	ALLIGATOR CR	L	Crack Sealing - AC	51	Ft	$65
APGA	003	BLOCK CR	M	Crack Sealing - AC	2,779	Ft	$3,501
APGA	003	JT REF. CR	M	Crack Sealing - AC	2,516	Ft	$3,171
APGA	003	JT REF. CR	H	Crack Sealing - AC	86	Ft	$108
APGA	003	L & T CR	M	Crack Sealing - AC	2,717	Ft	$3,423
APGA	003	L & T CR	H	Crack Sealing - AC	183	Ft	$231
APGA	005	L & T CR	M	Crack Sealing - AC	39	Ft	$50
APGA	010	L & T CR	M	Crack Sealing - AC	3,565	Ft	$4,492
APGA	011	ALLIGATOR CR	L	Crack Sealing - AC	15	Ft	$19
APGA	011	L & T CR	M	Crack Sealing - AC	205	Ft	$258
APGA	013	ALLIGATOR CR	L	Crack Sealing - AC	15	Ft	$19
APGA	013	L & T CR	M	Crack Sealing - AC	460	Ft	$579
APTR	002	ALLIGATOR CR	L	Crack Sealing - AC	96	Ft	$121
APTR	002	BLOCK CR	M	Crack Sealing - AC	8,121	Ft	$10,233
APTR	002	BLOCK CR	H	Crack Sealing - AC	7,657	Ft	$9,648
APTR	002	L & T CR	M	Crack Sealing - AC	46	Ft	$58
APTR	002	L & T CR	H	Crack Sealing - AC	31	Ft	$38
CTA1	001	ALLIGATOR CR	L	Crack Sealing - AC	623	Ft	$784
CTA1	001	BLOCK CR	M	Crack Sealing - AC	245	Ft	$309
CTA1	001	JT REF. CR	M	Crack Sealing - AC	161	Ft	$203
CTA1	001	L & T CR	M	Crack Sealing - AC	1,401	Ft	$1,765
CTA2	002	ALLIGATOR CR	L	Crack Sealing - AC	395	Ft	$497
CTA2	002	L & T CR	M	Crack Sealing - AC	1,352	Ft	$1,704
CTA2	002	L & T CR	H	Crack Sealing - AC	79	Ft	$100
CTA3	001	L & T CR	M	Crack Sealing - AC	106	Ft	$134
CTA3	002	ALLIGATOR CR	L	Crack Sealing - AC	57	Ft	$72
CTA3	002	L & T CR	M	Crack Sealing - AC	1,269	Ft	$1,599
CTA3	002	L & T CR	H	Crack Sealing - AC	50	Ft	$62
CTA3	003	L & T CR	M	Crack Sealing - AC	501	Ft	$632
CTA5	001	ALLIGATOR CR	L	Crack Sealing - AC	52	Ft	$66
CTA5	001	BLOCK CR	M	Crack Sealing - AC	3,095	Ft	$3,900
CTA5	001	JT REF. CR	M	Crack Sealing - AC	167	Ft	$211
CTA5	001	L & T CR	M	Crack Sealing - AC	233	Ft	$294

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
CTD	001	BLOCK CR	M	Crack Sealing - AC	20,308	Ft	$25,588
CTD	001	BLOCK CR	H	Crack Sealing - AC	726	Ft	$915
CTD	001	L & T CR	M	Crack Sealing - AC	263	Ft	$332
PTA	001	ALLIGATOR CR	L	Crack Sealing - AC	4,505	Ft	$5,676
PTA	001	BLOCK CR	M	Crack Sealing - AC	2,495	Ft	$3,144
PTA	001	L & T CR	M	Crack Sealing - AC	126	Ft	$159
PTA	002	ALLIGATOR CR	L	Crack Sealing - AC	6,870	Ft	$8,656
PTA	002	BLOCK CR	M	Crack Sealing - AC	8,334	Ft	$10,501
PTA	002	BLOCK CR	H	Crack Sealing - AC	667	Ft	$840
PTA	002	L & T CR	M	Crack Sealing - AC	12,654	Ft	$15,944
PTA	002	L & T CR	H	Crack Sealing - AC	547	Ft	$689
PTA	003	BLOCK CR	M	Crack Sealing - AC	3,042	Ft	$3,833
PTA	003	L & T CR	M	Crack Sealing - AC	199	Ft	$252
PTA	004	L & T CR	M	Crack Sealing - AC	94	Ft	$119
PTA	005	ALLIGATOR CR	L	Crack Sealing - AC	51	Ft	$63
PTA	005	BLOCK CR	M	Crack Sealing - AC	10,902	Ft	$13,736
PTA	005	L & T CR	M	Crack Sealing - AC	4,713	Ft	$5,939
PTC	001	BLOCK CR	M	Crack Sealing - AC	7,315	Ft	$9,217
PTC	003	JT REF. CR	H	Crack Sealing - AC	427	Ft	$538
PTC	003	L & T CR	H	Crack Sealing - AC	11	Ft	$13
PTC	005	BLOCK CR	M	Crack Sealing - AC	49,026	Ft	$61,773
PTC	005	BLOCK CR	H	Crack Sealing - AC	2,780	Ft	$3,503
PTC	005	L & T CR	H	Crack Sealing - AC	391	Ft	$492
RY321	006	L & T CR	M	Crack Sealing - AC	10	Ft	$12
RY321	007	L & T CR	M	Crack Sealing - AC	37	Ft	$47
RY321	008	L & T CR	M	Crack Sealing - AC	287	Ft	$362
TLA	002	ALLIGATOR CR	L	Crack Sealing - AC	23	Ft	$29
TLA	002	L & T CR	M	Crack Sealing - AC	46	Ft	$58
TLA	003	L & T CR	M	Crack Sealing - AC	45	Ft	$56
TLA	009	ALLIGATOR CR	L	Crack Sealing - AC	14	Ft	$18
TLA	009	L & T CR	M	Crack Sealing - AC	4,693	Ft	$5,913
				Total:	**201,915**	**Ft**	**$254,415**
APGA	002	LINEAR CR	M	Crack Sealing - PCC	582	Ft	$1,117
APGA	002	SHAT. SLAB	M	Crack Sealing - PCC	309	Ft	$594
APGA	004	LINEAR CR	M	Crack Sealing - PCC	513	Ft	$986
APGA	006	LINEAR CR	M	Crack Sealing - PCC	2,901	Ft	$5,570
APGA	006	SHAT. SLAB	M	Crack Sealing - PCC	1,865	Ft	$3,580

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
APGA	007	LINEAR CR	M	Crack Sealing - PCC	1,778	Ft	$3,414
APGA	007	SHAT. SLAB	M	Crack Sealing - PCC	889	Ft	$1,707
APGA	008	LINEAR CR	M	Crack Sealing - PCC	258	Ft	$495
APGA	008	SHAT. SLAB	M	Crack Sealing - PCC	344	Ft	$661
APGA	009	LINEAR CR	M	Crack Sealing - PCC	1,678	Ft	$3,223
APGA	009	SHAT. SLAB	M	Crack Sealing - PCC	1,119	Ft	$2,148
APGA	012	LINEAR CR	M	Crack Sealing - PCC	965	Ft	$1,853
APGA	012	SHAT. SLAB	M	Crack Sealing - PCC	193	Ft	$371
APGA	014	LINEAR CR	M	Crack Sealing - PCC	35	Ft	$68
APTR	001	LINEAR CR	M	Crack Sealing - PCC	232	Ft	$445
CTB	001	LINEAR CR	M	Crack Sealing - PCC	112	Ft	$214
PTC	001P	LINEAR CR	M	Crack Sealing - PCC	23	Ft	$44
PTC	001P	SHAT. SLAB	M	Crack Sealing - PCC	23	Ft	$44
RPE	001	LINEAR CR	M	Crack Sealing - PCC	212	Ft	$407
RPW	001	LINEAR CR	M	Crack Sealing - PCC	108	Ft	$207
				Total:	**14,139**	**SqFt**	**$27,148**
APGA	002	FAULTING	M	Grinding (Localized)	137	Ft	$684
				Total:	**137**	**SqFt**	**$684**
APGA	002	JT SEAL DMG	H	Joint Seal (Localized)	4,865	Ft	$9,342
APGA	002	JT SEAL DMG	M	Joint Seal (Localized)	327	Ft	$628
APGA	006	JT SEAL DMG	H	Joint Seal (Localized)	11,757	Ft	$22,573
APGA	007	JT SEAL DMG	H	Joint Seal (Localized)	5,745	Ft	$11,030
APGA	008	JT SEAL DMG	H	Joint Seal (Localized)	26,829	Ft	$51,512
APGA	009	JT SEAL DMG	H	Joint Seal (Localized)	11,344	Ft	$21,780
APGA	009	JT SEAL DMG	M	Joint Seal (Localized)	2,836	Ft	$5,445
APGA	012	JT SEAL DMG	H	Joint Seal (Localized)	2,104	Ft	$4,040
APGA	012	JT SEAL DMG	M	Joint Seal (Localized)	3,156	Ft	$6,060
APTR	001	JT SEAL DMG	H	Joint Seal (Localized)	2,263	Ft	$4,346
APTR	001	JT SEAL DMG	M	Joint Seal (Localized)	3,112	Ft	$5,975
CTA1	002	JT SEAL DMG	M	Joint Seal (Localized)	1,660	Ft	$3,188
PTC	001P	JT SEAL DMG	H	Joint Seal (Localized)	345	Ft	$662
RPA1	001	JT SEAL DMG	H	Joint Seal (Localized)	1,821	Ft	$3,497
RPW	001	JT SEAL DMG	M	Joint Seal (Localized)	7,248	Ft	$13,916
RY927	004	JT SEAL DMG	M	Joint Seal (Localized)	25,730	Ft	$49,402
RY927	007	JT SEAL DMG	M	Joint Seal (Localized)	13,567	Ft	$26,048
RY927	008	JT SEAL DMG	M	Joint Seal (Localized)	6,283	Ft	$12,064
				Total:	**130,993**	**SqFt**	**$251,504**

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
CTA1	001	ALLIGATOR CR	M	Patching - AC Deep	51	SqFt	$593
CTA2	002	ALLIGATOR CR	M	Patching - AC Deep	115	SqFt	$1,363
CTA3	002	ALLIGATOR CR	M	Patching - AC Deep	37	SqFt	$435
CTA3	002	SWELLING	M	Patching - AC Deep	648	SqFt	$7,655
PTA	002	ALLIGATOR CR	M	Patching - AC Deep	716	SqFt	$8,464
PTA	002	RUTTING	M	Patching - AC Deep	383	SqFt	$4,525
PTA	005	ALLIGATOR CR	M	Patching - AC Deep	105	SqFt	$1,252
PTC	005	ALLIGATOR CR	M	Patching - AC Deep	572	SqFt	$6,753
TLA	009	ALLIGATOR CR	H	Patching - AC Deep	47	SqFt	$557
TLA	009	ALLIGATOR CR	M	Patching - AC Deep	563	SqFt	$6,659
TLA	009	RUTTING	H	Patching - AC Deep	154	SqFt	$1,813
				Total:	**3,391**	**SqFt**	**$40,070**
APGA	003	PATCHING	M	Patching - AC Shallow	215	SqFt	$1,710
APGA	003	RAVELING	H	Patching - AC Shallow	2,287	SqFt	$18,186
APGA	003	WEATHERING	H	Patching - AC Shallow	74,058	SqFt	$588,760
APGA	010	WEATHERING	H	Patching - AC Shallow	1,098	SqFt	$8,729
APGA	011	PATCHING	M	Patching - AC Shallow	23	SqFt	$182
APGA	013	RAVELING	H	Patching - AC Shallow	26	SqFt	$205
CTA1	001	RAVELING	H	Patching - AC Shallow	13	SqFt	$102
CTA2	002	RAVELING	H	Patching - AC Shallow	71	SqFt	$568
CTD	001	RAVELING	H	Patching - AC Shallow	101	SqFt	$806
CTD	001	WEATHERING	H	Patching - AC Shallow	14,440	SqFt	$114,798
PTA	001	RAVELING	H	Patching - AC Shallow	6	SqFt	$50
PTA	002	RAVELING	H	Patching - AC Shallow	744	SqFt	$5,912
PTA	002	WEATHERING	H	Patching - AC Shallow	820	SqFt	$6,521
PTC	001	WEATHERING	H	Patching - AC Shallow	384	SqFt	$3,053
PTC	005	WEATHERING	H	Patching - AC Shallow	10,417	SqFt	$82,816
RY321	003	RAVELING	H	Patching - AC Shallow	25	SqFt	$194
TLA	005	OIL SPILLAGE	N/A	Patching - AC Shallow	20	SqFt	$166
TLA	005	RAVELING	H	Patching - AC Shallow	3	SqFt	$26
TLA	009	DEPRESSION	M	Patching - AC Shallow	64	SqFt	$504
TLA	009	WEATHERING	H	Patching - AC Shallow	1,327	SqFt	$10,553
				Total:	**106,143**	**SqFt**	**$843,840**
APGA	002	LARGE PATCH	M	Patching - PCC Full Depth	1,352	SqFt	$100,516
APGA	002	LINEAR CR	H	Patching - PCC Full Depth	1,522	SqFt	$113,081
APGA	007	LARGE PATCH	H	Patching - PCC Full Depth	625	SqFt	$46,450
APGA	007	LARGE PATCH	M	Patching - PCC Full Depth	5,625	SqFt	$418,050

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
APGA	009	CORNER BREAK	M	Patching - PCC Full Depth	301	SqFt	$22,379
APGA	012	CORNER BREAK	M	Patching - PCC Full Depth	125	SqFt	$9,266
APTR	001	LARGE PATCH	M	Patching - PCC Full Depth	341	SqFt	$25,391
APTR	001	LINEAR CR	H	Patching - PCC Full Depth	507	SqFt	$37,712
CTB	001	CORNER BREAK	M	Patching - PCC Full Depth	186	SqFt	$13,815
PTC	001P	CORNER BREAK	H	Patching - PCC Full Depth	23	SqFt	$1,680
PTC	001P	CORNER BREAK	M	Patching - PCC Full Depth	45	SqFt	$3,360
RPE	001	LINEAR CR	H	Patching - PCC Full Depth	348	SqFt	$25,864
RPW	001	DURABIL. CR	M	Patching - PCC Full Depth	238	SqFt	$17,689
RPW	001	LARGE PATCH	M	Patching - PCC Full Depth	285	SqFt	$21,226
RY927	007	LARGE PATCH	H	Patching - PCC Full Depth	820	SqFt	$60,920
RY927	007	LARGE PATCH	M	Patching - PCC Full Depth	13,115	SqFt	$974,718
RY927	008	LARGE PATCH	H	Patching - PCC Full Depth	410	SqFt	$30,517
				Total:	**25,869**	**SqFt**	**$1,922,634**
APGA	002	CORNER SPALL	H	Patching - PCC Partial Depth	104	SqFt	$1,115
APGA	002	CORNER SPALL	M	Patching - PCC Partial Depth	18	SqFt	$197
APGA	002	JOINT SPALL	H	Patching - PCC Partial Depth	28	SqFt	$296
APGA	002	JOINT SPALL	M	Patching - PCC Partial Depth	200	SqFt	$2,133
APGA	004	CORNER SPALL	H	Patching - PCC Partial Depth	14	SqFt	$151
APGA	004	CORNER SPALL	M	Patching - PCC Partial Depth	14	SqFt	$151
APGA	004	SMALL PATCH	M	Patching - PCC Partial Depth	14	SqFt	$151
APGA	006	CORNER SPALL	H	Patching - PCC Partial Depth	34	SqFt	$372
APGA	006	CORNER SPALL	M	Patching - PCC Partial Depth	34	SqFt	$372
APGA	006	JOINT SPALL	H	Patching - PCC Partial Depth	70	SqFt	$744
APGA	006	JOINT SPALL	M	Patching - PCC Partial Depth	56	SqFt	$595
APGA	006	SCALING	M	Patching - PCC Partial Depth	849	SqFt	$9,075
APGA	006	SMALL PATCH	H	Patching - PCC Partial Depth	34	SqFt	$372
APGA	007	JOINT SPALL	H	Patching - PCC Partial Depth	41	SqFt	$438
APGA	008	CORNER SPALL	H	Patching - PCC Partial Depth	203	SqFt	$2,175
APGA	008	CORNER SPALL	M	Patching - PCC Partial Depth	129	SqFt	$1,384
APGA	008	JOINT SPALL	H	Patching - PCC Partial Depth	222	SqFt	$2,373
APGA	008	JOINT SPALL	M	Patching - PCC Partial Depth	666	SqFt	$7,120
APGA	008	SMALL PATCH	M	Patching - PCC Partial Depth	18	SqFt	$198
APGA	009	CORNER SPALL	H	Patching - PCC Partial Depth	51	SqFt	$536
APGA	009	CORNER SPALL	M	Patching - PCC Partial Depth	25	SqFt	$268
APGA	012	JOINT SPALL	M	Patching - PCC Partial Depth	50	SqFt	$533
APTR	001	CORNER SPALL	H	Patching - PCC Partial Depth	41	SqFt	$440
APTR	001	CORNER SPALL	M	Patching - PCC Partial Depth	14	SqFt	$147

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
APTR	001	JOINT SPALL	H	Patching - PCC Partial Depth	83	SqFt	$880
APTR	001	JOINT SPALL	M	Patching - PCC Partial Depth	66	SqFt	$704
APTR	001	SMALL PATCH	M	Patching - PCC Partial Depth	14	SqFt	$147
CTA1	002	CORNER SPALL	M	Patching - PCC Partial Depth	11	SqFt	$110
CTA1	002	JOINT SPALL	M	Patching - PCC Partial Depth	25	SqFt	$264
CTB	001	CORNER SPALL	H	Patching - PCC Partial Depth	15	SqFt	$165
CTB	001	CORNER SPALL	M	Patching - PCC Partial Depth	31	SqFt	$331
CTB	001	JOINT SPALL	H	Patching - PCC Partial Depth	46	SqFt	$496
PTC	001P	CORNER SPALL	H	Patching - PCC Partial Depth	2	SqFt	$20
PTC	001P	JOINT SPALL	H	Patching - PCC Partial Depth	5	SqFt	$60
PTC	001P	JOINT SPALL	M	Patching - PCC Partial Depth	9	SqFt	$97
RPA1	001	JOINT SPALL	H	Patching - PCC Partial Depth	17	SqFt	$180
RPE	001	SMALL PATCH	M	Patching - PCC Partial Depth	4	SqFt	$45
RY927	004	CORNER SPALL	M	Patching - PCC Partial Depth	113	SqFt	$1,207
RY927	005	CORNER SPALL	H	Patching - PCC Partial Depth	26	SqFt	$276
RY927	007	SMALL PATCH	M	Patching - PCC Partial Depth	1,166	SqFt	$12,446
RY927	008	SMALL PATCH	H	Patching - PCC Partial Depth	89	SqFt	$959
RY927	008	SMALL PATCH	M	Patching - PCC Partial Depth	15	SqFt	$160
				Total:	**4,668**	**SqFt**	**$49,887**
APGA	002	SHAT. SLAB	H	Slab Replacement - PCC	8,932	SqFt	$357,271
APGA	006	SHAT. SLAB	H	Slab Replacement - PCC	4,973	SqFt	$198,912
APGA	009	SHAT. SLAB	H	Slab Replacement - PCC	3,730	SqFt	$149,200
PTC	001P	SHAT. SLAB	H	Slab Replacement - PCC	350	SqFt	$14,000
RPW	001	SHAT. SLAB	H	Slab Replacement - PCC	1,248	SqFt	$49,911
RY927	005	ASR	H	Slab Replacement - PCC	1,802	SqFt	$72,083
				Total:	**21,034**	**SqFt**	**$841,377**
APGA	003	RAVELING	M	Surface Treatment	6,862	SqFt	$3,568
APGA	003	WEATHERING	M	Surface Treatment	130,388	SqFt	$67,801
APGA	010	WEATHERING	M	Surface Treatment	53,802	SqFt	$27,977
APGA	011	RAVELING	M	Surface Treatment	256	SqFt	$133
APGA	011	WEATHERING	M	Surface Treatment	34,090	SqFt	$17,727
APTR	002	WEATHERING	M	Surface Treatment	3,552	SqFt	$1,847
CTA1	001	RAVELING	M	Surface Treatment	161	SqFt	$84
CTA1	001	WEATHERING	M	Surface Treatment	34,463	SqFt	$17,920
CTA2	002	RAVELING	M	Surface Treatment	153	SqFt	$79
CTA2	002	WEATHERING	M	Surface Treatment	3,730	SqFt	$1,939
CTD	001	WEATHERING	M	Surface Treatment	97,787	SqFt	$50,849
CTD	002	WEATHERING	M	Surface Treatment	407	SqFt	$211

Branch	Section	Distress Type	Severity	Treatment	Estimated Quantity	Unit	Cost
PTA	001	RAVELING	M	Surface Treatment	630	SqFt	$327
PTA	001	WEATHERING	M	Surface Treatment	60,138	SqFt	$31,271
PTA	002	WEATHERING	M	Surface Treatment	50,856	SqFt	$26,445
PTA	004	WEATHERING	M	Surface Treatment	5,900	SqFt	$3,068
PTC	001	WEATHERING	M	Surface Treatment	47,616	SqFt	$24,760
PTC	002	WEATHERING	M	Surface Treatment	537	SqFt	$279
PTC	003	WEATHERING	M	Surface Treatment	32,000	SqFt	$16,640
PTC	005	WEATHERING	M	Surface Treatment	171,882	SqFt	$89,379
RY321	001	WEATHERING	M	Surface Treatment	1,925	SqFt	$1,001
RY321	003	RAVELING	M	Surface Treatment	48	SqFt	$25
RY321	007	WEATHERING	M	Surface Treatment	1,116	SqFt	$581
TLA	003	WEATHERING	M	Surface Treatment	41	SqFt	$21
TLA	005	WEATHERING	M	Surface Treatment	328	SqFt	$171
TLA	009	WEATHERING	M	Surface Treatment	44,985	SqFt	$23,392
				Total:	**783,654**	**SqFt**	**$407,497**

Appendix G

Maintenance Repair Guidelines

General Comments

Ongoing inspections are the cornerstone of a maintenance management program. Crack sealing prevents surface water from entering the pavement structure and helps prevent the introduction of incompressible material into the paving joints and cracks, reducing the chances for spalls and further pavement deterioration.

Preservation of a pavement system will require a combination of preventive, sustaining, and restorative maintenance repairs. Preventive maintenance is primarily an inspection program, sustaining maintenance is an ongoing maintenance function, whose purpose is to seal newly formed cracks in areas where the sealant is in otherwise satisfactory condition. Restorative repairs are major work items, often performed under contract that typically involves complete removal and replacement of existing sealant.

Maintenance Activities

Flexible (Asphalt) Pavement

Longitudinal and transverse (L&T) cracks at medium severity (>¼" wide) should be filled with a good quality crack filler material. High-severity cracks must normally be patched. Cracks rated at low severity may be narrow-unsealed cracks or sealed cracks up to 3 inches wide. The PCI procedure does not distinguish between narrow unfilled cracks and wider filled cracks. When 25 percent or more of total crack quantity is at medium or high severity, a restorative program becomes cost-effective. When medium- or high-severity cracking constitutes less than 25 percent of the total, sustaining maintenance is usually more cost-effective.

Medium- and high-severity existing patches should be replaced with new patches. Small areas (usually less than 100 square feet per patch) of alligator cracking and rutting at medium and high severity may also be repaired by patching. Larger patches should be considered if equipment can be made available to accomplish the work. Patching to repair up to 10 percent of the surface of a pavement section that is otherwise serviceable can result in significant cost savings as compared to rehabilitation of the entire section.

PCC (Concrete) Pavement

Joint seal damage at medium and high severity should be repaired. If medium- and high-severity damage is limited to less than about 25 percent of total joint length, sustaining maintenance is recommended. If medium and high-severity damage exceeds about 25 percent of the total joint length, joint sealant should be removed and replaced under a restorative repair project.

Longitudinal/transverse/diagonal (LTD) cracks at low and medium severity should be considered for sealing as part of the joint sealing project. High-severity LTD cracks require sealing, patching, or slab replacement, depending on the extent of deterioration.

Small patches are most often placed to repair medium- and high-severity spalls or to replace deteriorated older patches. Restorative small patches are typically partial depth repairs, usually to load transfer steel. Large patches and corner breaks at medium and high severity should be repaired by full-depth large patches.

High-severity LTD cracks and shattered slabs are candidates for patching and slab replacement. Low-severity shattered slabs can be left in place pending further deterioration.

Pavement Failure

Before maintenance and repairs are attempted, it helps to have an understanding of the way pavement performs and deteriorates.

Environmental/Age-Related Deterioration

Seasonal temperature changes cause expansion and contraction of the pavement materials, causing the pavement to move up to 1 foot per 1,000 feet. Much of this movement can be witnessed as the opening and closing of existing transverse cracks.

The pavement thickness and type of subgrade plays a large role in the formation and spacing interval of transverse cracks. If the subgrade material is smooth or rounded, the pavement surface will move relatively freely, the transverse cracks will usually be spaced far apart (>60 feet). If the subgrade material is rough or angular the pavement surface will not move freely and transverse cracks will be spaced more closely (<40 feet). The distance between transverse cracks will also depend on the pavement thickness, as a thicker pavement can resist cracking for longer lengths, but around 50 feet is typical for general aviation airport pavements.

Age related distress deals with the pavement oxidation or loss of volatile components to the atmosphere. An oxidized pavement becomes more brittle with time. Surface treatments and seal coats are designed, in part, to provide a protective barrier and prevent this type of oxidation.

Materials Related Deterioration

Subsurface water can have the greatest impact on pavement deterioration. A wet subgrade greatly reduces the ability of a pavement to support wheel loads, and the results often show up as rutting and cracking. The fine materials in a wet base can be pumped up through the cracks and eventually result in a loss of subgrade support. This loss of support can be evidenced as corner breaks and faulting. Moisture inside a pavement system expands when it freezes; creating stresses that push and tear at the pavement. The following thaw cycles will leave voids in the pavement structure that enable further rutting and breaking. Repeated freeze/thaw cycles will eventually cause pavement to disintegrate. One of the best ways to assure pavement longevity is to provide drainage and keep the subgrade dry.

Aggregate is the biggest component of any pavement structure, and it is the contact between the aggregate particles that actually transfers the load and provides the strength. Aggregate durability and shape are major factors affecting pavement performance. Durability is the ability of the aggregate to perform satisfactorily over time and resist the detrimental effect of nature. Sharp, well-angled aggregate that interlock, compact densely, and resists movement are the most desirable.

Air Voids

Well-distributed interconnected air voids allow escape paths for freezing water and generally reduce susceptibility to freeze/thaw damage. In PCC pavements, closely spaced interconnected air voids provide the greatest degree of protection.

Asphalt pavements, on the other hand, only tolerate air voids as necessary. Air voids allow for expansion of the asphalt binder, but also allow water penetration into the pavement. Interconnected air voids are undesirable here because the voids allow air to penetrate the asphalt layers and oxidize the binder. As air voids increase, durability and flexibility decrease, but stability and skid resistance increase. Asphalt pavements should be designed and compacted so that air voids are not interconnected. The air voids should allow only for the expansion of the asphalt and aggregate without, bleeding, and air voids should be kept low enough to prevent water and air from penetrating the asphalt layers.

Binders

Regardless of whether the pavement is asphalt or concrete, the binder material is mixed with the aggregate to coat all particles with a thin film. An asphalt coating allows the pavement to be flexible and still resist large movements. Durability of the asphalt pavement is increased by a thicker film because it is more resistant to age hardening; however, too thick of a film and the asphalt acts like a lubricant, promoting ruts, shoving, and bleeding. Specifications control aggregate and binder mix quantities, but each mix should be customized for materials available locally.

With a concrete pavement, the aggregate supports the load, but the cement binder interlocks with the aggregate to inhibit all movement. Hydration is the term for the chemical reaction of portland cement with water, and in the hydration process, dry cement particles react with water, to form gels, and then crystals, that grow and bond with the aggregate to form a rigid interlocking structure. Hydration can continue for years, but much of the ultimate strength will be reached within 28 days. Hydration is a sensitive chemical process, and typically, any admixtures used to accelerate the hydration process will reduce durability, and their use should be considered carefully or avoided.

Stress Distribution/Load Related Deterioration

PCC (rigid) and asphalt (flexible) pavements differ in the way loads are distributed. A concrete slab resists bending and transfers loads evenly, an asphalt pavement is designed to bend, and gradually spreads loads over wider areas. Rutting is a subgrade failure caused by a compressive yielding of the subgrade.

Load-related cracks can start at the top or bottom of a pavement section. In asphalt sections, load-related (fatigue) cracks start at the bottom. If a load-related crack reaches the surface, it usually indicates significant structural deficiency. In PCC pavement, corner breaks are caused by top tension, and the crack propagates downward. Mid-slab LTD cracks are examples of bottom tension.

Spalls can be caused by either wheel loads or environmental factors, anytime there is movement between adjacent slabs. If a small rock is allowed into a joint, a differential movement between adjacent slabs can cause a spall. Spalling can be minimized by keeping joint and crack sealant intact.

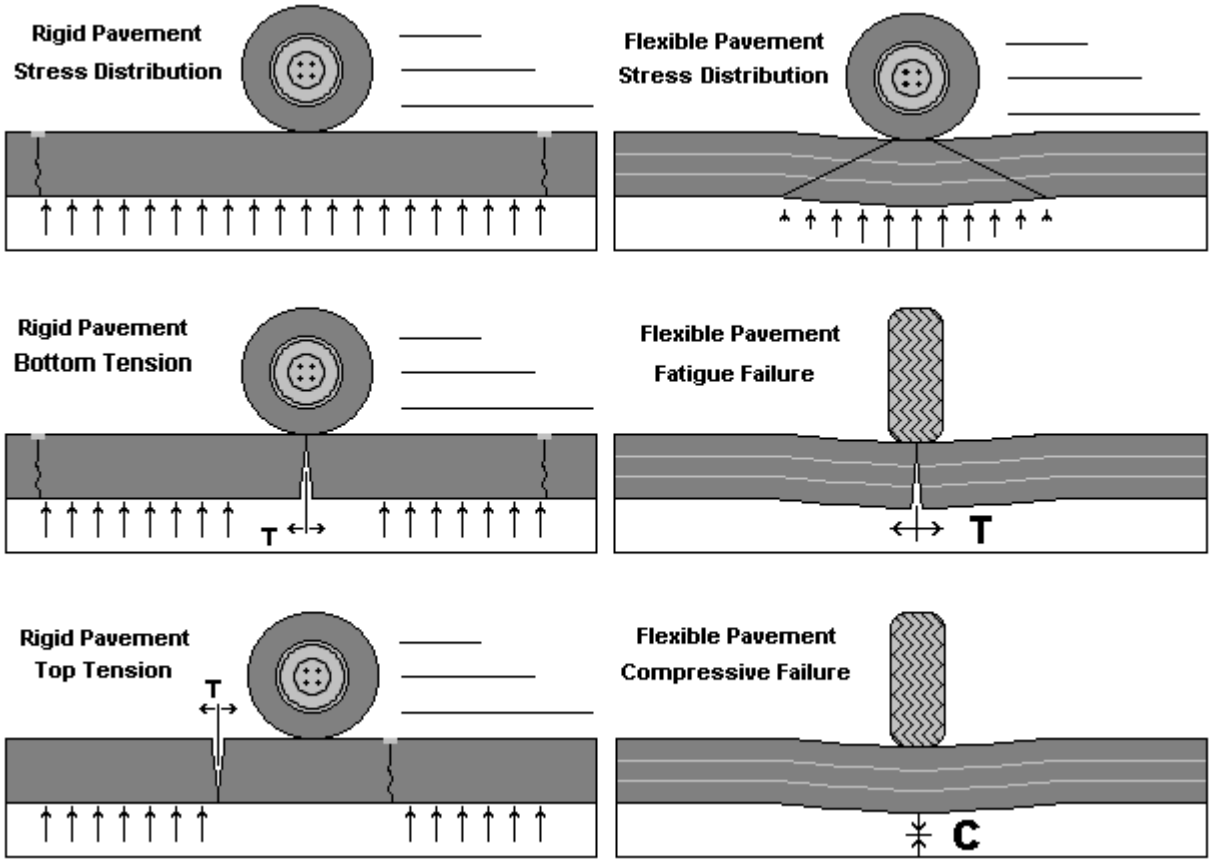

Figure 1. Pavement failure.

Points to Remember

Pavement wears out.

The longer a pavement remains in service, the greater the effort needed to keep it in service. A good maintenance and repair program will increase service life significantly, but cannot be expected to extend service life indefinitely.

Pavement moves.

Pavement moves in response to temperature changes. Transverse cracks can vary from nearly closed in the summer to open an inch or more in winter. This movement cannot be prevented. It must be understood and provided for during design and construction. The changing crack widths will dictate the reservoir size required for sealant. Measure cracks at their widest and narrowest states, then prepare adequate (½ - 1½ inch) sealant reservoirs for crack sealing projects.

Longitudinal joints and cracks are important.

The most important reason for sealing cracks is to deny surface water access to the pavement and subgrade. Most water drains from centerline to shoulders. Longitudinal cracks, which run parallel to the centerline provide the greatest potential to divert water into the pavement structure, and must be sealed.

Sealing is not always the best answer.

The FAA maximum allowable open trench width on aircraft movement areas is three-inches; therefore, any crack wider than three-inches should be patched. A severe spall or a crack that has settled below the pavement elevation indicates a failure. If the pavement has disintegrated to the point that aggregate interlock is lost, sealant alone will not be sufficient, and patching should be considered.

Maintenance and repairs must be done correctly.

To achieve optimum results from repairs, proper preparation, use of quality materials, and proper application are essential. Any shortcuts will reduce the quality and effectiveness of the repairs. A rule of thumb is that proper maintenance will last twice as long as an unprepared area. Good maintenance takes time and deserves high-quality materials.

Schedule maintenance and repair activities carefully.

Any pavement defect can be corrected. Concentrate on repairs that are cost-effective, operationally important, and that extend service life. Some surface blemishes can be ignored safely, and many structural problems are beyond economical correction. When future rehabilitation is imminent, maintenance activities should be limited to only those that ensure continued safety and minimize foreign object damage (FOD) potential.

Equipment

Many excellent pavement repair and sealing products are available. Specialized tools and equipment help ensure quality repairs. This section reviews equipment compatible with airport needs.

Air Compressor

Used to remove sand and debris from prepared cracks and joints, the compressor should have a sustained capacity of 120 cubic feet per minute with a nozzle velocity of 100 psi. Trailer-mounted compressors typically have capacities in this range.

Concrete Saw

A saw capable of making a minimum 3-inch deep cut is required. The saw should be capable of making cuts in asphalt or concrete. Gasoline-powered 5-25 hp wheel mounted saws typically are preferred for this type of work, but electric and pneumatic tools are also available.

Heating Kettle

Applying sealant is the most time-consuming operation, and a sealing machine with heating and pressure application capabilities is a critical item in a sealing program. The capacity of the sealing equipment dictates the rate at which a crew progresses. For large sealing projects, a minimum 100 gallons/per hour sustained capacity is recommended. The unit should be a double boiler type, with mechanical agitators or continuous recirculation.

Router

A concrete saw can be used to prepare joints, but for random cracking, a mechanical router with a vertical impact mechanism is preferred. When cracks are being routed, this activity will dictate speed of the crew. Crack routers in the 25hp range are commonly used and are available from a variety of manufacturers.

Sand Cleaner

A sand blaster helps to clean loose particles and dust from prepared cracks. The unit must have sufficient force to expose fresh, vital pavement to bond with sealant and patching materials.

Vibratory Roller or Plate Compactor

Required to properly compact plant mixed and packaged patching materials. Small rollers are best for pothole type applications, plate compactors are best for large areas.

Other Equipment

Other general use equipment that can be helpful in a maintenance program includes bucket loaders, dump trucks, water tanks, and a power sweeper unit.

Materials

Pavement repair materials are constantly being introduced and improved. This section provides information on products compatible with airport needs.

Joint and Crack Sealer

Hot poured, pressure injected, polymeric rubberized asphalt sealant meeting ASTM D3405 specifications is suitable for most joint and crack sealing requirements. This product is relatively inexpensive, durable, and suitable for both PCC and asphalt pavements. Other, more expensive, hot applied sealants that promise longer life are being developed for specialty applications, and twin component cold applied sealants, similar to URASEAL 200, have also been used with success. Contact your local distributor.

Flexible Pavement Patch

Long-term patches should be made with a high-quality plant mixed hot asphalt having a ¾-inch maximum aggregate size and meeting FAA P401, or highest quality highway specifications. High-performance plant mixed cold patching products that can be stockpiled on-site have been developed. Low-quality packaged materials available from local hardware type stores should be avoided and only be used for temporary patches that maintain safety and service.

PCC Pavement Patch

Permanent patches in PCC pavement should be made with a minimum 6-bag mix of hi-early air-entrained cement with 1-inch maximum size aggregate. Concrete should have zero slump and a coarse texture. As with asphalt patches, low-quality packaged materials should only be used as temporary patches to maintain safety and service until a more permanent repair can be made.

Techniques

Crack Sealing

- Cracks over ¼ inches wide should be sealed. Cracks wider than 3 inches should be patched.
- Sealant depth above the backer rope should be equal to the width of the reservoir, or as recommended by the manufacturer.
- Routed cracks should be sand blasted, to prepare the vertical edges for bonding with the sealant. Clean cracks with compressed air prior to sealing.
- Backing material should always be placed into the cracks. Commercial products are available, and several sizes of rope should always be available to accommodate various crack sizes.
- Apply sealant after placing the backer rope. Follow the manufacturer's instructions. Sealant should be applied to within ¼ inch of the pavement surface.
- The final activity is to clean the surrounding pavement areas. A vacuum sweeper works well for this. Allow the sealant time to set, before using a broom.

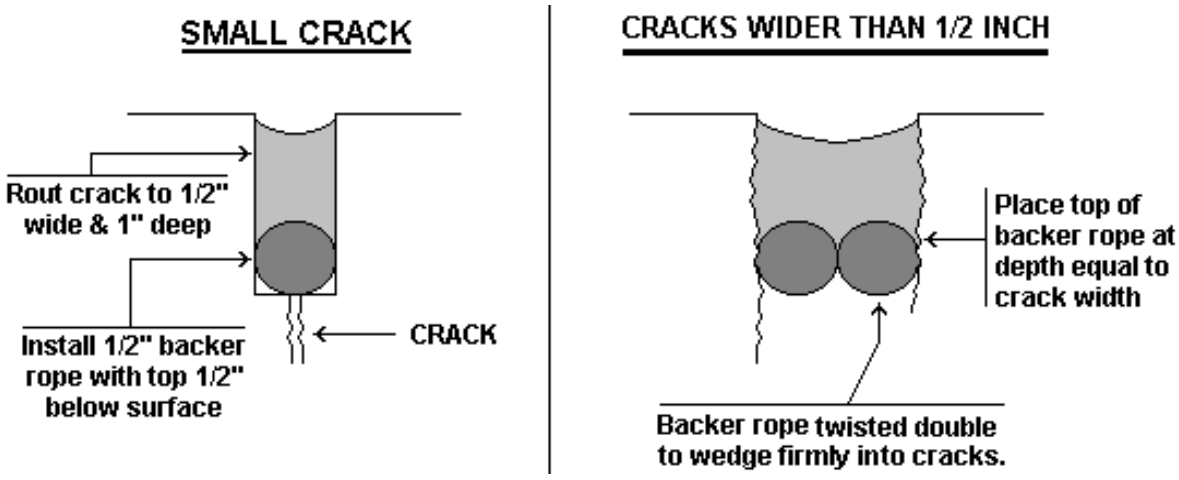

Figure 2. Crack sealing.

Note:
This crack sealing technique is meticulous in its design and procedure. It has a proven record of performance. Using backer rope forces the sealant into a predictable shape—narrow in the center and wide on the sides. This sealant profile allows the sealant to firmly bond with the vertical edges, yet stretch easily with pavement movement. In an effort to minimize labor requirements and reduce crack-sealing costs, an alternative procedure, the overband technique, is presented on the following page. This procedure can produce good results for up to 5 years.

Always remember that, within reasonable limits, thinner sealant material will stretch more easily with the pavement movement, and stay bonded longer.

Overband Technique

A latex modified, fiber reinforced, asphalt cement sealant using the techniques outlined below.

Material

- Blend grade 20 or equivalent asphalt cement with latex rubber at 5 percent by weight of asphalt.
- Again, at 5 percent by weight of asphalt, add polyester fibers into agitator tank.
- Maintain blended asphalt temperature at least 20 degrees below flash point.
- Continuously recycle hot blended asphalt through pumps and hoses when heating kettle is in standby mode.

Application

- Sealant should be applied to dry pavement, with ambient temperatures above 40 degrees.
- Cracks should be sand cleaned and blown free of debris immediately before sealing.
- Application of sealant immediately follows cleaning of the crack.
- Sealant should be pressure applied from a wand-type applicator with a special "overband" nozzle.
- Seat the sealant with a steel-wheeled roller immediately after placement.
- In wider cracks, a backer rope is recommended to limit material quantities required.

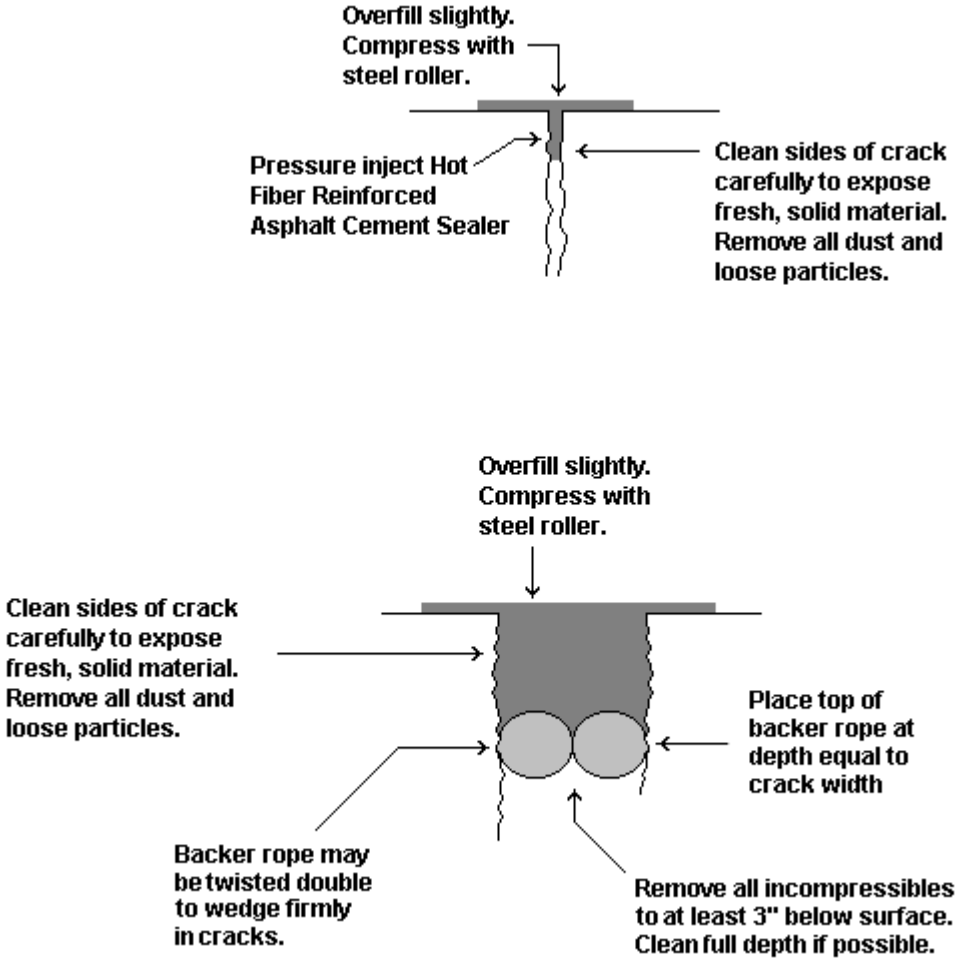

Figure 3. Overband sealing.

Patching (Asphalt Pavement)

Cracks wider than 3 inches should be patched. Cracks with secondary cracking and vertical movement should also be patched. Failed existing patches should be replaced. Patching can also repair small areas of alligator cracking and rutting. A patch differs from sealant in that it restores load-bearing capacity. Therefore, it must be constructed carefully to distribute stresses evenly and perform as an integral piece of the surrounding pavement. The patch must be wide enough to ensure that it bonds to fresh, vital pavement on all sides, and deep enough to reach fresh underlying layers, but never less than 3 inches.

- Examine the distressed area and mark the patch outline. This examination may require a pick or chisel to test the pavement integrity in and around the distressed area.
- The patch area should be cut out with a vertical saw cut not less than 3 inches deep.
- The enclosed pavement should then be removed, leaving the vertical sawed edges undamaged and providing a relatively even, flat floor at the appropriate depth.
- The sides and bottom should be sand cleaned and blown out with compressed air

- The sides and bottom should then be painted with a rapid curing asphalt tack coat. The tack coat may be sprayed on or applied with a brush or rag. Care should be taken to achieve complete coverage without allowing excess material to “pool” on the bottom.
- Allow tack coat to cure (about 2 to 4 hours) until it reaches a gummy consistency, which readily retains the impression of a fingerprint.
- Place hot mixed asphalt concrete evenly and mound slightly above surrounding pavement. Allow approximately ¼ inch of compaction for each inch of patch depth.
- Compact in place with vibratory roller or plate compactor. Asphalt concrete should not be compacted in layers greater than 6 inches. If patch depth is greater than 6 inches, asphalt concrete should be placed and compacted in successive layers.
- In deep, narrow patches such as at joint reflective cracks, a sand asphalt mix may be required in lower layers to allow movement and prevent bridging the adjacent slabs.
- Considerable judgment is required in placing the asphalt concrete to achieve a fully compacted patch without creating a bump or depression. The ¼ inch per inch factor is a rule of thumb. Actual compression will vary with the mix. Experimentation and experience are required to achieve optimum results.

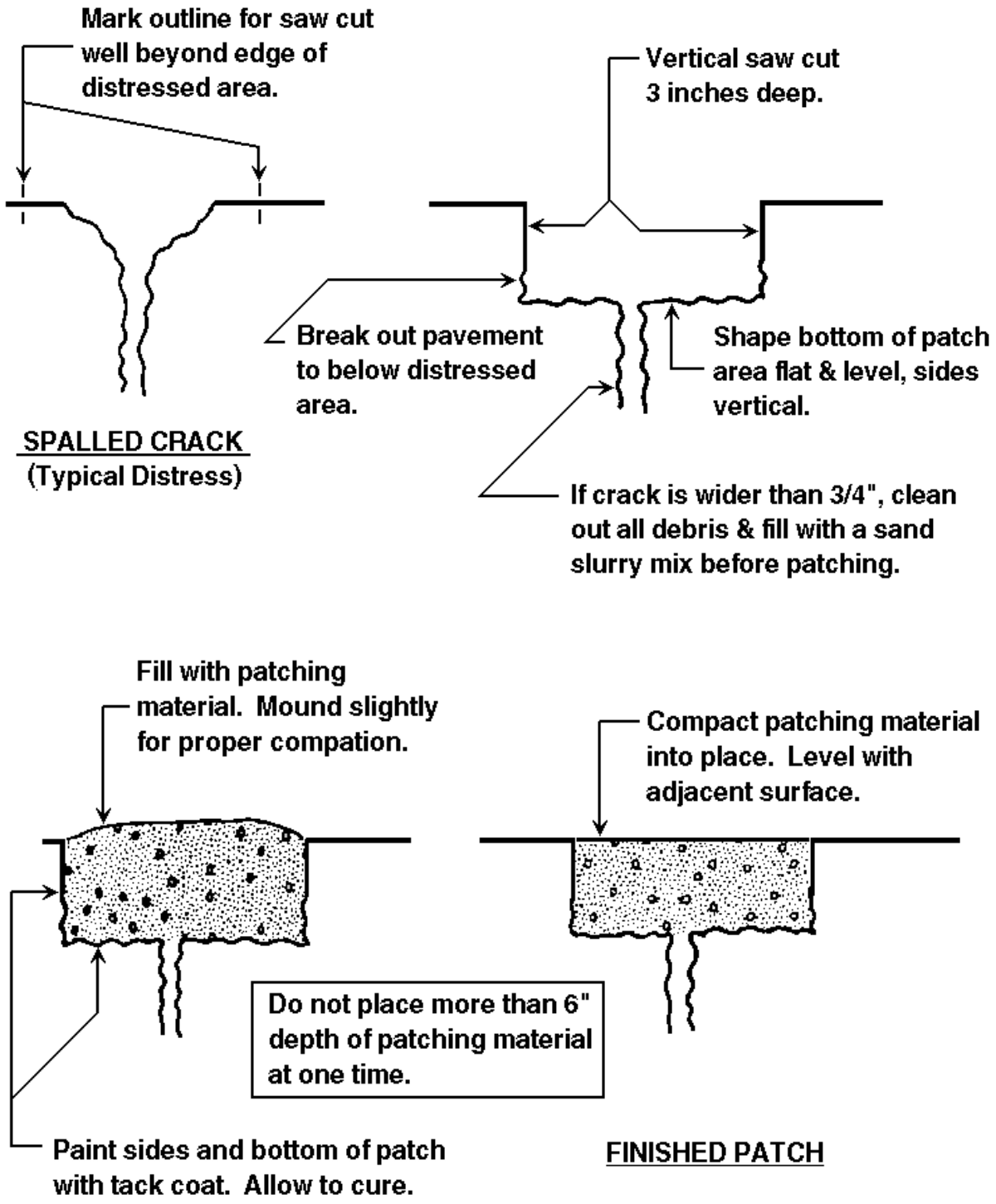

Figure 4. AC patch.

Patching (PCC)

The technique outlined here simulates a thin bonded PCC overlay. This procedure has been proven in service throughout the country.

- Examine the distressed area and mark the patch outline. This examination may require a pick or chisel to test pavement integrity in and around the distressed area.
- Saw cut the area to a depth of 2 inches. The enclosed area is then chipped or jack hammered to solid pavement, but not less than a 2-inch nominal depth.
- The sides and bottom are sand cleaned and air-blasted to expose vital, clean concrete.
- A 25 percent solution of muriatic acid is applied to all exposed surfaces within the patch.
- The muriatic acid solution is thoroughly flushed from the patch area with water.
- Compressed air is used to remove excess water from the area, but exposed concrete must be maintained in a moist condition.
- The sides and bottom of the area are then coated with approximately a 1/16-inch layer of cement grout applied at the consistency of paste. The grout acts as an adhesive to bond the fresh concrete to existing concrete.
- If the patch is adjacent to joints, the continuity of the joint must be maintained by placing inserts approximately the shape of the desired joint against the wall of the patch.
- Before concrete grout begins to dry, concrete is placed in the patch area and is compacted into position with hand tampers or a vibrating plate tamper.
- When the patch has been struck to the proper slope and elevation, a surface texture is applied to approximate the texture of adjacent pavement.
- Joint edges may be edged slightly to remove sharp edges. The patch should be covered with polyethylene or sprayed with a curing compound.
- Clean the surrounding pavement before concrete spillover has a chance to set up.
- The patch may be open to traffic in 72 hours.

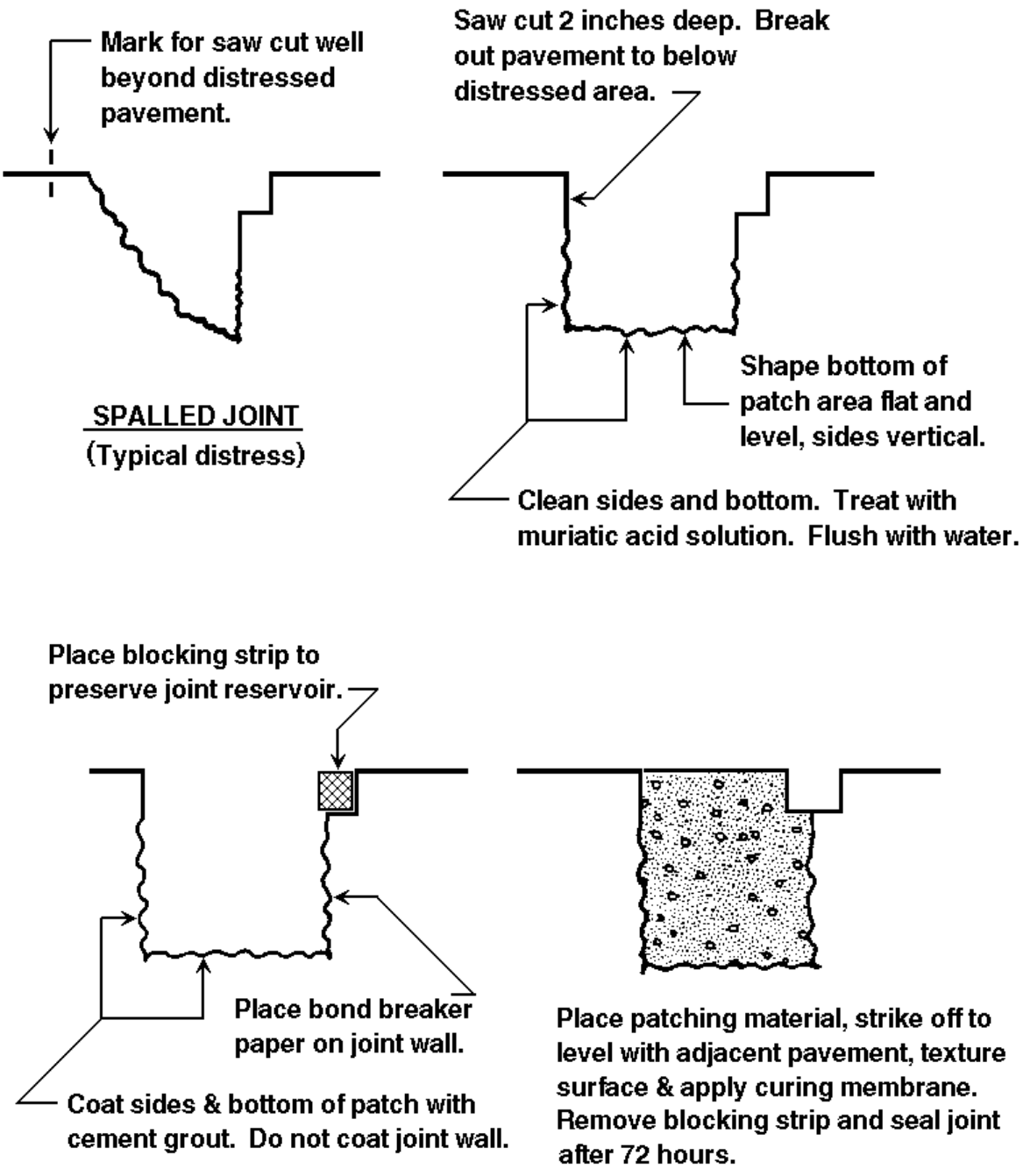

Figure 5. PCC patch.

Joint Repair (PCC)

Seal joints in PCC pavement when existing sealant has deteriorated to a degree that allows water and incompressibles to enter the joint. Hairline cracks are not yet candidates for sealing.

- Rout a reservoir for the sealant. Sealant reservoir should be ½ inch wide and 1 inch deep.
- For cracks wider than ½ inch, the reservoir should be ¼ inch wider than the crack. Depth should be such that sealant above the backer rope is at most equal to reservoir width, or as recommended by manufacturer.
- Routed cracks should be sand cleaned, using fine sand at reduced pressure. Proper cleaning will expose fresh, vital pavement on the vertical crack edge.
- Immediately prior to sealing, cracks should be cleaned with compressed air. Ensure that all sand, debris, and incompressibles are removed from the crack. A small hand-held hook or plowing tool may be needed to dislodge some particles. Water cleaning is not recommended, simply because the drying time delays the sealing operation.
- After cleaning with compressed air, a backing material should be placed into the crack. The backer rope may be any compressible substance compatible with bituminous sealant material that will wedge into cracks at a designated depth and support the sealant. Several sizes should be immediately available in the field to accommodate various crack sizes.
- Sealant should be pressure applied with a wand type applicator to within ¼ inch of the pavement surface. Follow the equipment manufacturer's instructions.
- The final activity is to clean the surrounding pavement area. A vacuum sweeper works well. Brooms should not be used until the sealant has taken an initial set.

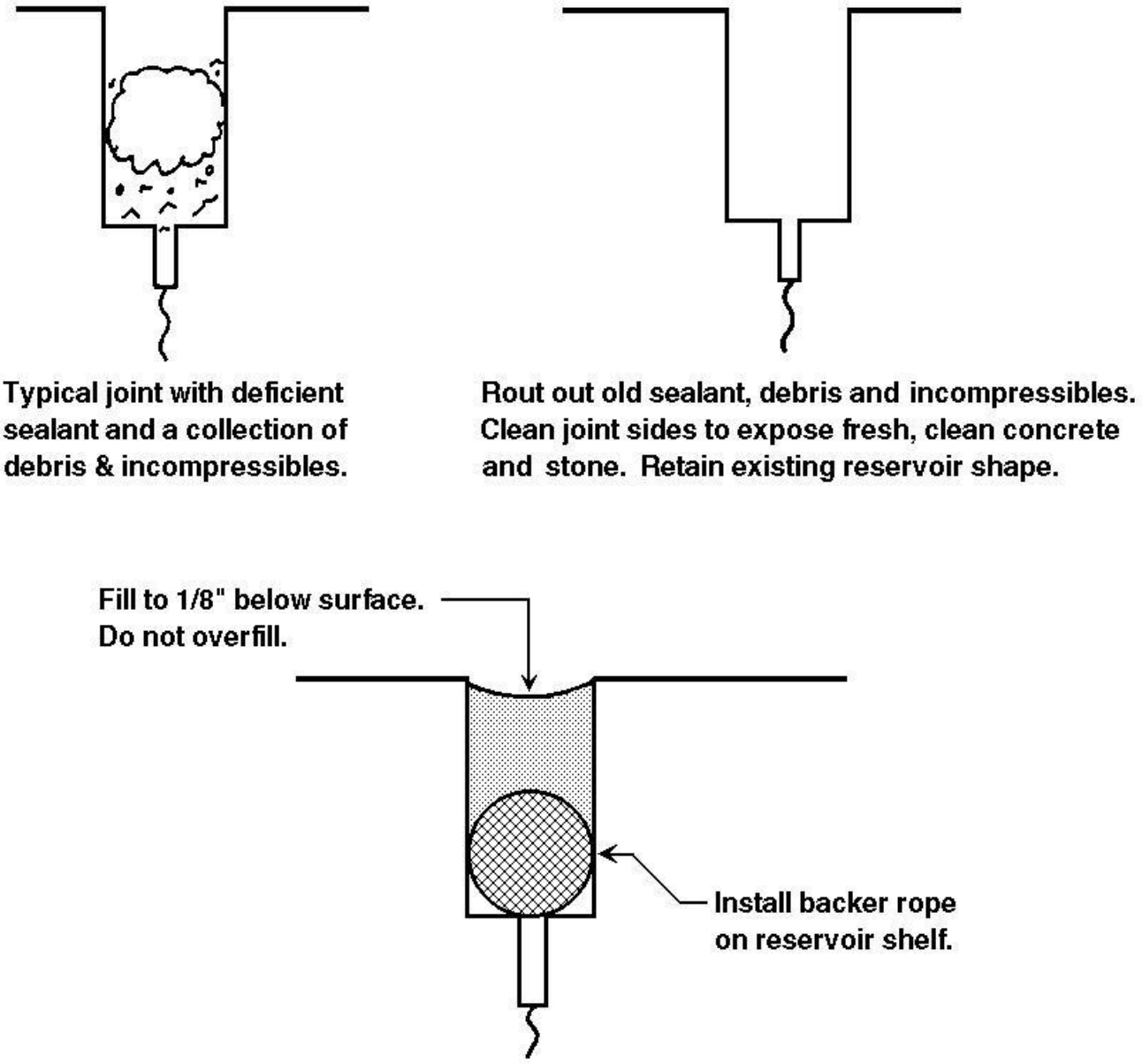

Figure 6. PCC joint/crack repair.

Table 1. Maintenance and “drive by” inspection log.

Inspection Date	Inspector	Pavement location (branch/section)	Change in condition (new distress type, increased quantity or severity)	Maintenance performed since last inspection