APPENDIX A

2021 Pavement Condition Index (PCI) Study

COMMERCIAL SERVICE AIRPORT

SIOUX FALLS REGIONAL/ JOE FOSS FIELD AIRPORT (FSD)

Airport Summary

2021 SOUTH DAKOTA AIRPORT PAVEMENT CONDITION INDEX (PCI) STUDY

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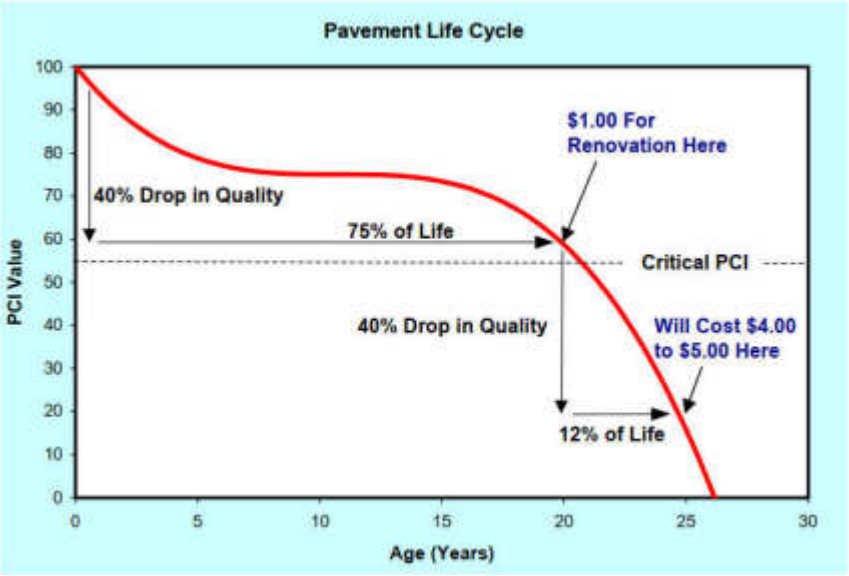
AIRPORT PAVEMENT EVALUATION

The PCI is a numerical indicator that rates the surface condition of the pavement on a 0-100 scale, with 100 being good condition and 0 being failed condition. The Pavement Life Cycle figure below illustrates how pavement typically deteriorates and the relative cost of rehabilitation at various times throughout its life. Maintaining and preserving a pavement in good condition versus rehabilitating a pavement in fair to poor condition is four to five times less expensive and increases pavement useful life. In order to extend the life of the pavement, the SDDOT will incorporate preventive maintenance strategies including crack sealing, rejuvenator, slurry seal coats, or joint seal replacement as part of their annual statewide airport pavement maintenance project. Major rehabilitation projects will likely include a mill and overlay or large scale panel replacement projects, which will likely be a standalone AIP project.

Standard PCI		Typical Repair Strategy
100	Good	PREVENTIVE MAINTENANCE
85	Satisfactory	
70	Fair	MAJOR REHABILITATION
55	Poor	
40	Very Poor	
25	Serious	RECONSTRUCTION
10	Failed	



TYPICAL ASPHALT DISTRESS TYPES

Alligator Cracking. Alligator cracking is a distress caused by repeated aircraft loading that causes cracking initially at the bottom of the asphalt, before propagating upward first as parallel cracks, then interconnecting into sharp-angled pieces resembling alligator skin.

Depressions. Depressions are pavement areas with slightly lower elevation than surrounding pavement. Many times, this is only noticeable after rain, when water pools at the bottom of the depression. This water can cause hydroplaning.

Longitudinal/Transverse Cracking. Longitudinal/Transverse cracks (L & T cracks) can be caused by poorly constructed lane joints, shrinkage of the AC surface in low temperatures, or cracks reflecting from cracks below the surface layer.

Patch. Patches are considered distresses no matter their severity.

Raveling/Weathering. Raveling and weathering are distresses characterized by the wearing away of coarse aggregate, and asphalt binder and fine aggregate respectively.

Distress Severity at HSR

- Low
- Medium
- High

TYPICAL CONCRETE DISTRESS TYPES

Corner Break. A corner break is a break that intersects the joints at less than half of the slab length on each side. This is usually caused by load repetition, loss of support below the corner, and curling stress.

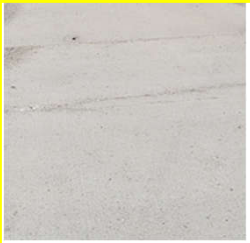
Durability Cracking. Durability cracking is caused by environmental factors such as the freeze-thaw cycle. Typically appears as cracks parallel to a joint or linear crack, often accompanied by dark discoloring in the affected area.

Joint Spalling. Joint spalling is breakdown of slab edges near the side of the joint. The spall usually intersects the joint at the angle. This distress is usually caused by cracking due to incompressible materials, or due to excessive stresses at the joint, or repeated loading.

Shattered Slab. A shattered slab is a slab broken into 4 or 5 pieces with high-severity cracks, or 6 or more pieces with at least 15% medium- or higher severity cracks.

Corner Spall. Corner spalling is the raveling/breakdown of a slab at the corner of the slab. Unlike a corner break, which occurs vertically through the slab, spalling usually angles downward to intersect the joint.

Joint Seal Damage. Joint seal damage is anything allowing soil or rocks to accumulate in the joints, or allowing significant water infiltration. Incompressible materials in the joints can prevent the slab from expanding, and can cause buckling or spalling.

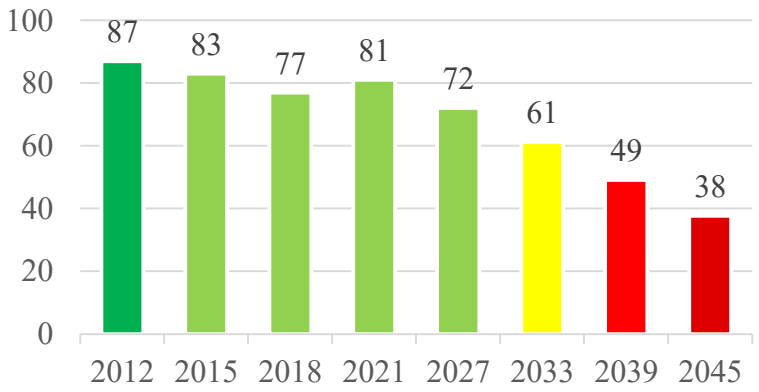


Linear Cracking. Linear cracks divide the slab into two or three pieces, and are caused by load repetition, curling stress, and shrinkage stress. Medium- and high-severity distresses are usually considered major structural distresses.

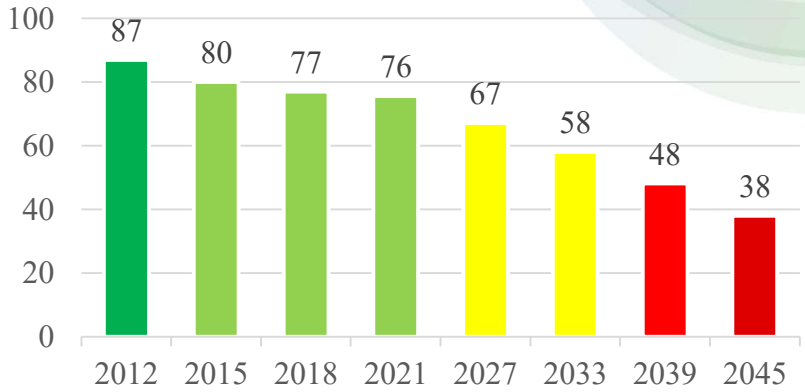
Small Patch. A small patch is defined as any patch smaller than 5 ft^2.

HISTORICAL PCI & FORECASTED PCI (DO NOTHING APPROACH)

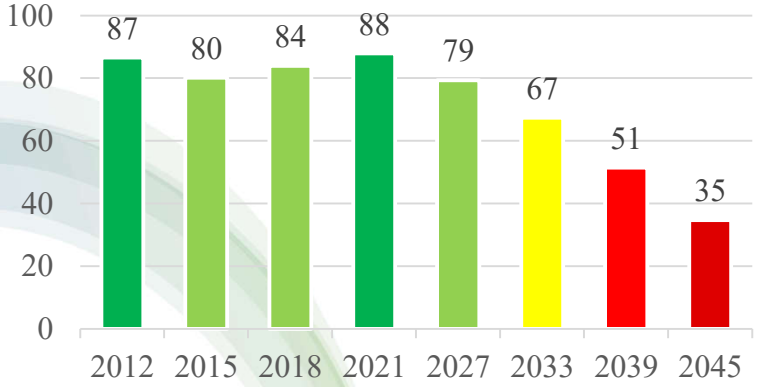
Area Weighted Overall PCI



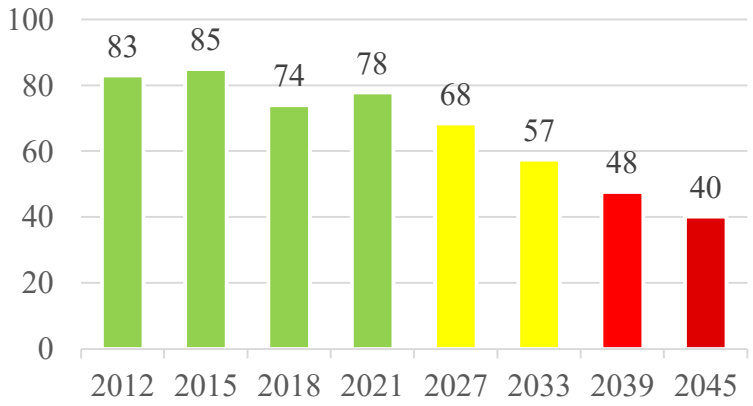
Area Weighted PCI for Taxiways



Area Weighted PCI for Runways



Area Weighted PCI for Aprons



PAVEMENT FUNDING ASSESSMENT

A Maintenance and Repair (M&R) planning analysis was performed in order to determine the most cost-effective treatment and suggest the optimum utilization of available M&R funds over a 20-year period. Using the existing conditions and pavement deterioration models, an initial funding needs was determined with a goal to maintain the average network PCI at or above the established Critical PCI values for each airport type and Facility use while optimizing the funds globally across the SDDOT Aviation System. **The analysis showed that to maintain the overall average network PCI at or above Critical PCI, a total of $159,167,000 M&R funds are needed at Sioux Fall Regional/ Joe Foss Field Airport over a 20 year period. Table below shows the unlimited budget funding needs through 2041 for the Sioux Fall Regional/ Joe Foss Field Airport.** The future cost of work includes 3 percent inflation factor and are calculated based on the unit costs extracted from recent projects completed throughout the state.

YEAR	PAVEMENT SECTION ID	IMPROVEMENT TYPE	MAINTENANCE COST	ESTIMATE TOTAL COST	AVERAGE PCI CONDITION BEFORE	AVERAGE PCI CONDITION AFTER
2022						
	1210, 1520, 1710, 2010, 4205, 4320, 4510, 6180, 6185	(ST-SS)	$ 221,000	$ 4,145,000	77	83
	6230, 6305, 6310	RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 3,924,000		62	100
2023						
	6220, 6225	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 6,591,000	$ 6,591,000	62	100
2024						
	1610	(ST-SS)	$ 4,000	$ 4,000	87	92

PAVEMENT FUNDING ASSESSMENT

YEAR	PAVEMENT SECTION ID	IMPROVEMENT TYPE	MAINTENANCE COST	ESTIMATE TOTAL COST	AVERAGE PCI CONDITION BEFORE	AVERAGE PCI CONDITION AFTER
2025						
	1215, 1505, 1510, 1515, 1910, 6230	(ST-SS), (SS-FS), (ST-SS), (ST-SS), (SS-FS), (SS-FS)	$ 44,000		86	91
	115, 155, 160, 170, 1205, 1805, 1810, 605, 610, 615, 620, 6235, 810, 905	RESURFACING, RESURFACING, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, RESURFACING	$ 12,898,000	$ 12,942,000	63	100
2027						
	1520, 1710, 2010, 4320, 6180, 6185	(ST-SS)	$ 105,000		79	84
	110, 1005, 1210, 1310, 1605, 1705, 611, 625	RESURFACING, RECONSTRUCTION, RESURFACING, RESURFACING, RESURFACING, RESURFACING, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 5,551,000	$ 5,656,000	49	100
2028						
	115, 160, 1205, 605, 615, 905	(SS-FS)	$ 114,000		88	95
	120, 1315, 1606, 1706, 1950, 612, 630, 6130, 705, 805	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, RECONSTRUCTION	$ 9,047,000	$ 9,161,000	47	100

PAVEMENT FUNDING ASSESSMENT

YEAR	PAVEMENT SECTION ID	IMPROVEMENT TYPE	MAINTENANCE COST	ESTIMATE TOTAL COST	AVERAGE PCI CONDITION BEFORE	AVERAGE PCI CONDITION AFTER
2029						
	155, 1610, 620, 810	(SS-FS), (ST-SS), (SS-FS), (SS-FS)	$ 66,000		92	95
	150, 4110, 4205, 4420, 4510, 4520, 4610	RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 8,081,000	$ 8,147,000	51	100
2030						
	110, 1005, 1210, 1215, 1505, 1510, 1515, 1910, 6230	(SS-FS), (SS-FS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (ST-SS), (SS-FS), (SS-FS)	$ 104,000		84	89
	4215, 4305, 4410, 6210	RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 8,759,000	$ 8,863,000	49	100
2031						
	1310, 1315, 1605, 1705	(SS-FS)	$ 12,000	$ 860,000	93	97
	2010	RESURFACING	$ 848,000		69	100
2032						
	1520, 1606, 1710, 4205, 4320, 4510, 6180, 6185	(ST-SS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (ST-SS)	$ 183,000	$ 1,665,000	81	87
	135	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 1,482,000		70	100
2033						
	115, 150, 160, 1205, 4215, 605, 615, 905	(SS-FS), (SS-FS), (SS-FS), (SS-FS), (SS-FS), (SS-FS), (SS-FS), (SS-FS)	$ 157,000	$ 11,377,000	82	87
	4605, 6215	RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 11,220,000		40	100
2034						
	155, 1610, 620, 810	(SS-FS), (ST-SS), (SS-FS), (SS-FS)	$ 76,000	$ 31,991,000	87	91
	2005, 4106, 6135	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 31,915,000		52	100

PAVEMENT FUNDING ASSESSMENT

YEAR	PAVEMENT SECTION ID	IMPROVEMENT TYPE	MAINTENANCE COST	ESTIMATE TOTAL COST	AVERAGE PCI CONDITION BEFORE	AVERAGE PCI CONDITION AFTER
2035						
	110, 1005, 1210, 1215, 1505, 1510, 1910, 2010, 6230	(SS-FS), (SS-FS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (SS-FS), (SS-FS), (SS-FS)	$ 126,000		82	85
	140, 1515, 4115, 4900, 6150	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 15,533,000	$ 15,659,000	67	100
2036						
	1310, 1315, 1605, 1705, 4605	(SS-FS)	$ 15,000		87	92
	105, 6115, 6155, 6205	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 9,604,000	$ 9,619,000	69	100
2037						
	1520, 1606, 1710, 4205, 4320, 4510, 6180, 6185	(ST-SS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (ST-SS)	$ 212,000		76	81
	1305, 4105, 4505, 4905, 505	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 2,490,000	$ 2,702,000	54	100
2038						
	115, 150, 160, 1205, 1515, 4215, 605, 615, 905	(SS-FS)	$ 189,000		77	81
	1905, 4310, 710	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 5,700,000	$ 5,889,000	46	100

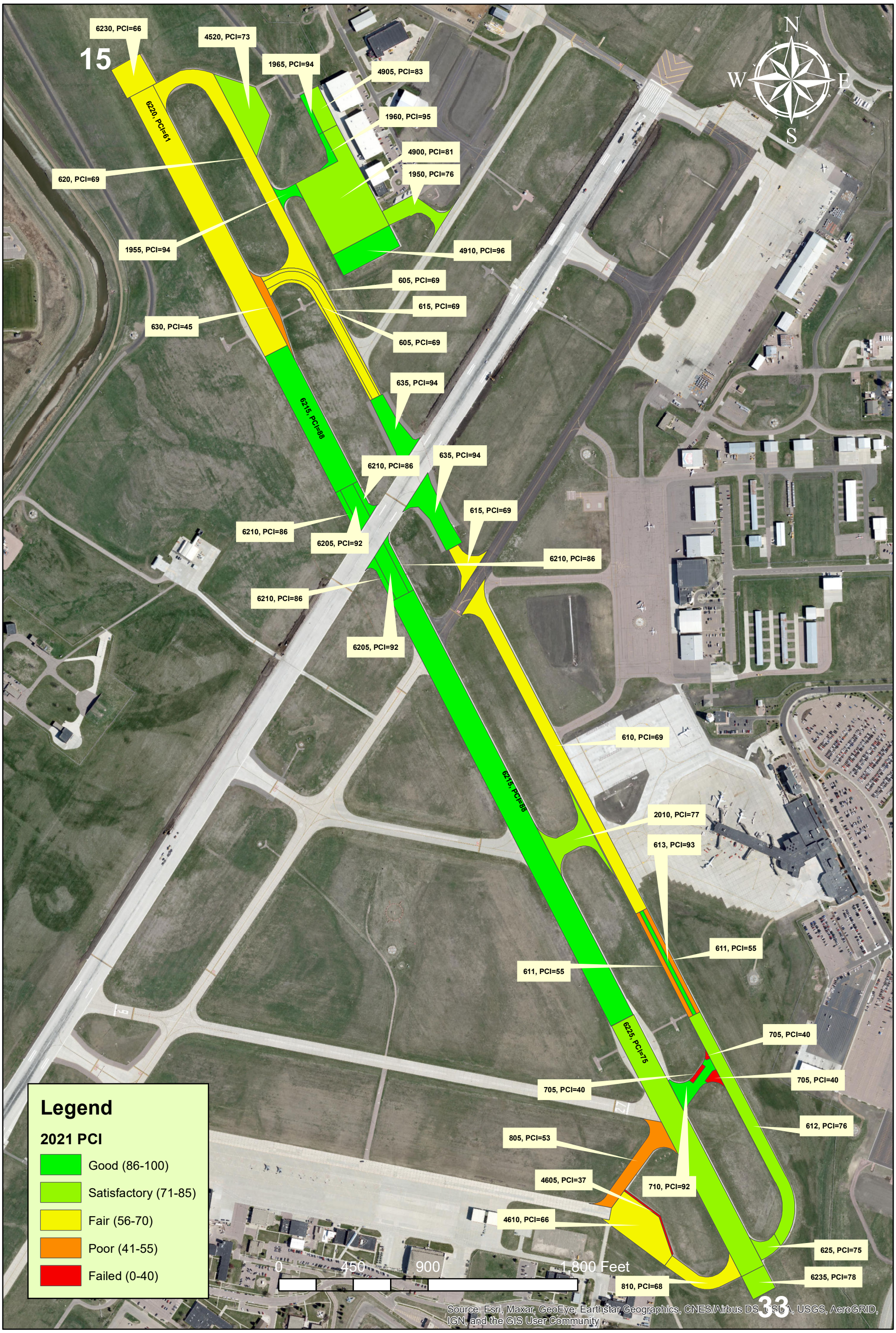
PAVEMENT FUNDING ASSESSMENT

YEAR	PAVEMENT SECTION ID	IMPROVEMENT TYPE	MAINTENANCE COST	ESTIMATE TOTAL COST	AVERAGE PCI CONDITION BEFORE	AVERAGE PCI CONDITION AFTER
2039						
	155, 1610, 620, 810	(SS-FS), (ST-SS), (SS-FS), (SS-FS)	$ 88,000		83	87
	165, 1955, 1965, 4130, 4210, 4315, 4405, 613, 635	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 17,947,000	$ 18,035,000	53	100
2040						
	110, 1005, 1210, 1215, 1505, 1510, 1910, 2010, 4505, 6230	(SS-FS), (SS-FS), (SS-FS), (ST-SS), (SS-FS), (ST-SS), (SS-FS), (SS-FS), (SS-FS), (SS-FS)	$ 154,000		78	82
	125, 1960, 4220, 4225	JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR, RECONSTRUCTION, RECONSTRUCTION	$ 2,716,000	$ 2,870,000	35	100
2041						
	1310, 1315, 1605, 1705, 4310, 4605	(SS-FS)	$ 55,000		81	86
	1710, 6120	RESURFACING, JOINT SEAL REPLACEMENT AND CONCRETE SLAB REPAIR	$ 2,936,000	$ 2,991,000	69	100

Note:
ST-SS Emulsified Asphalt Seal Coat. Work includes route and seal cracks, markings, and friction testing.
SS-FS Surface Seal – Fog Seal. Work includes route and seal cracks and markings.
The average PCI before and after are calculated only for the sections listed in the table.

Sioux Falls Regional Airport (FSD)

2021 Pavement Condition Index (PCI) Study



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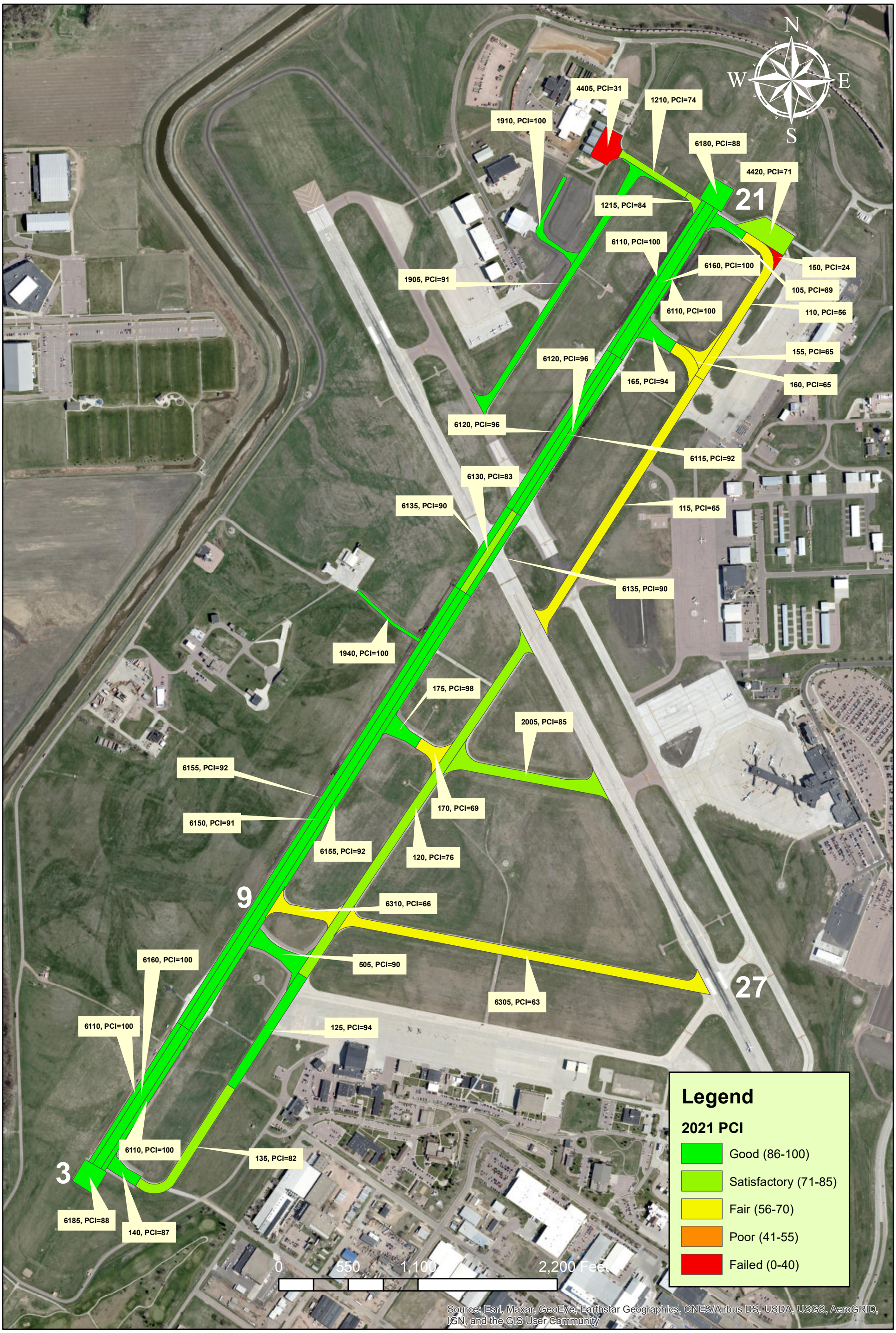

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