WYDOT'S PAVEMENT MANAGEMENT SYSTEM

Prepared By:
Ethan Crockett, PE, Pavement Management and Research Engineer
Kyle Creswell, EIT, Pavement Management Assistant Engineer

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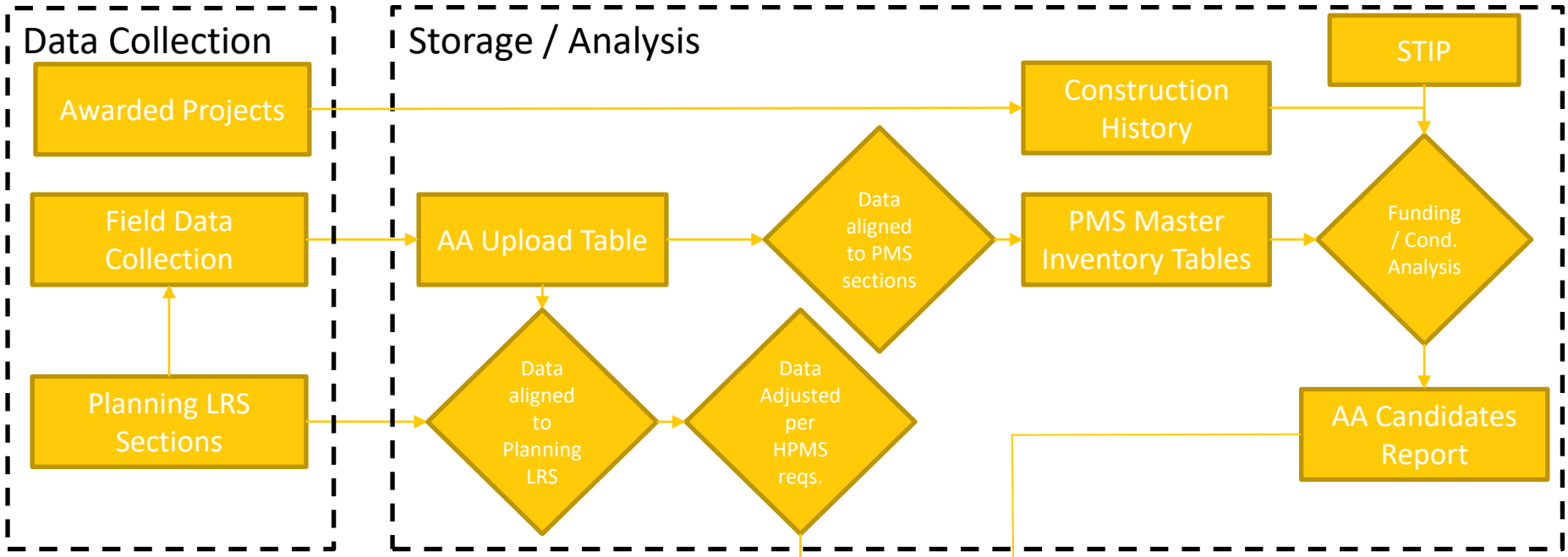
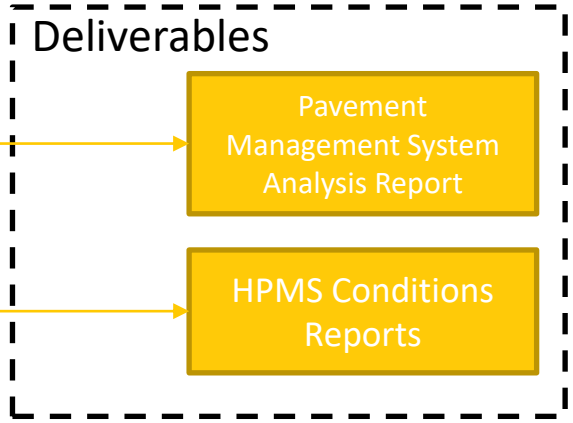
Pavement Management System

Overview and Flow Chart



Process Flow

- Data collected from field collection, Planning LRS sections, and the Awarded Projects
- Field data is then aligned to both planning and pavement management sections
  - HPMS Data is aligned per HPMS specific requirements (Section length, Federal Audit section locations)
  - PMS Data is combined with Construction history to create 7th year projected projects based on condition and funding.
- Aligned data is submitted in their respective reports



WYDOT's Pavement Inventory

Data Collection

WYDOT PMS Department Collects data from 3 general sources:

1. Planning
   - PMS Department receives up-to-date LRS location data Funding classifications and district IDs and Shape files from Planning
2. 3rd party condition collection
   - Complete roadway data is collected every 2 years
   - Data is collected continuously on the LRS; reported in 528ft segments for HPMS sections and 200ft segments pavement management sections.
3. Awarded Projects
   - Awarded projects are given to the Pavement Management department for input into construction history. These projects are removed from subsequent optimization analysis in the PMS analysis report.

WYDOT's Pavement Inventory

Storage / Analysis - Overview

WYDOT Field data is stored and analyzed with software provided by Agile Assets

- Agile Assets provides the following services :
  - Construction History back to 1918
  - Pavement Condition Data since 1996
  - Automated since 2016
  - Most Current Pavement Condition Information
  - Performance Models
  - Decision Trees for Project Selection

Collected field data is stored as-collected in Agile Assets before being aligned according to WYDOT requirements

- WYDOT Pavement Management Sections are variable with the below general guidelines:
  - Funding Class – Interstate, Non-Int. NHS, and Non-NHS
  - District
  - Surface Type/Thickness
  - Base Type/Thickness
  - Approximate ADT/Truck ADT
  - Lane Width (approximately)
  - Speed Limit (approximately)
  - Length (manageable construction lengths)

WYDOT's Pavement Inventory

Storage / Analysis – WYDOT PMS

WYDOT divides 6,806 centerline miles of Roadway into 1,700 unique sections across 5 Districts

WYDOT selects Project candidates based on:

- Current road conditions (PQR, Crack %, Friction, etc.)
  - PQR is the predominant decision making metric as it combines all relevant road distresses into a single useable value.
- Agile Assets degradation curves with a 7 year projection (Linear, Inverse Exponential, Hyperbolic, etc.)
- Agile Assets Decision trees
- Projects are assigned a treatment severity: 1S, 2S, 3S, 4S (See Table 1 and Figure 1)

Table 1: Treatment Severities

1S – Preventative
- •Maintenance: Chip Seals, and Patching
- •Microsurface
- •Thin overlay (< 2")

2S – Minor Rehabilitation
- •Asphalt Placed thickness: 2" – 3"
- •Interstate 80 Asphalt Placed thickness: 2" – 4"

3S – Major Rehabilitation
- •Asphalt Thickness Placed: > 3"
- •Interstate 80 Asphalt Placed thickness: 4"
- •Whitetopping

4S – Full Reconstruction
(not recommended by PMS)

Good Condition – PQR ≥ 3.5

Fair Condition – 2.5 ≤ PQR < 3.5

Poor Condition – PQR < 2.5

Figure 1: Treatment Severity Examples

Performance Models (Equations)

Storage / Analysis – Degradation Model Example

Figure 2: Comparison of Degradation Curves

WYDOT's Pavement Inventory

Storage / Analysis – Additional PMS Deliverables

WYDOT PMS also provides:

- 10 year condition projection evaluation
  - Generated from the same data as the Optimization report but shows historical trends (Figure 3)

WYDOT Provides Field Engineers a list of recommended projects:

- all PMS Sections
- all Project candidates by PQR
- Partial list of the worst candidates by distress type (Figure 4)
  - Worst is defined as >1.5 Std. Dev. from statewide average values

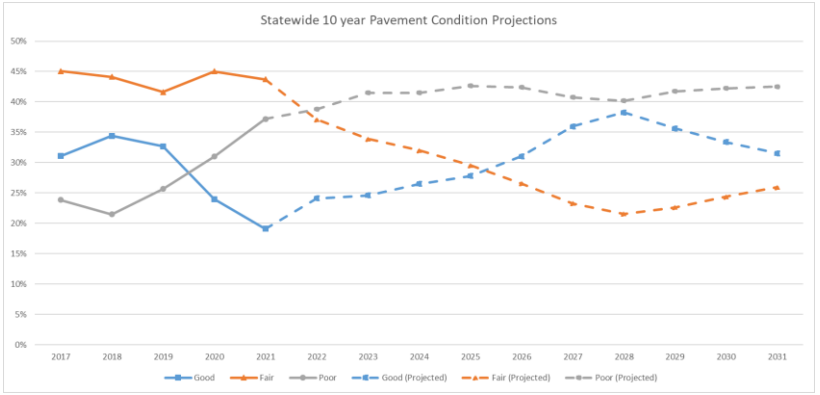


Figure 3: Projected Road conditions

At a glance this is a distress level worth correcting

Table 2.4: Rutting Concerns

Rutting Concerns, RUT Ind. < 64

Ordered by: District, Route, Start Milepost

Dist #	Fund Class	Route	Start MP	End MP	PMS Section Description	WC	Pv Thk	ADT	Trk ADT	Frict #	IRI Ind.	RUT Ind.	FLT Ind.	% Crack Ind.	RR Ind.	PQR Ind.	PQR Year 7	Rehab Year	Cand Treat	STIP Treat	STIP Year	PQR (G,F,P) Year 7
1	Non	ML1111	401.76	403.02	PINE BLUFFS EAST-NEBR ST LN	ASP	5	570	92	50	51	63	100	96	53	28	74.2	1972		2S	2023	G
1	Non	ML18	50.28	53.22	LTL SNAKE RVR N(BAGGS S-COLO)	ASP	7	774	134	42	64	57	100	92	64	30	74.2	1991		2S	2023	G
1	Int	ML180	4.12	7.30	SOUTH GREELEY HWY	ASP	6	2883	198	38	57	54	100	92	58	21	20.0	2009	3S			P
1	Non	ML217	0.00	4.42	ACCESS RD MISSILE ST C	ASP	2	271	40	39	52	62	99	87	54	20	20.0	1960	2S			P
1	NHS	ML23	325.20	327.36	NORTH LARAMIE(3RD STR)	ASP	7	2102	198	40	63	62	99	98	63	44	74.2	2015		2S	2023	G
1	NHS	ML23	327.39	328.48	LARAMIE(3RD STR)JCT WY130/230	ASP	6	7062	451	57	34	49	99	86	42	20	77.6	2014		2S	2025	G
1	NHS	ML23	400.00	400.93	SOUTH LARAMIE(3RD STR)	ASP	5	6023	535	59	54	46	99	86	55	20	77.2	2014		2S	2025	G
1	NHS	ML26	1.38	3.45	LARA(SNOWY RANGE RD)JCT WY130	ASP	9	2376	169	49	50	62	100	98	52	34	72.6	2018		2S	2022	G
1	Non	ML26	3.45	11.50	LAKE HATTIE(LARA-WOODS LNDG)	ASP	6	1172	102	52	62	59	100	96	62	35	72.6	2018		2S	2022	G
2	Non	ML1401	116.90	124.88	LANCE CRK E(JCT WY271&WY272)	ASP	6	65	23	58	66	57	100	96	66	38	22.0	2003	1S			P
2	Non	ML1401	124.88	133.34	LANCE CREEK-JCT US18/20/85	ASP	4	53	20	53	73	46	100	97	72	44	28.5	2007	1S			P
2	Non	ML1606	111.68	111.88	GLENDO CONN(I25 E-WY319 W)	ASP	5	665	106	54	0	54	100	87	19	20	20.0	1976	3S			P
2	NHS	ML21	38.60	44.77	LAMONT-MUDDY GAP JCT S	ASP	8	957	384	64	79	63	100	100	79	75	77.6	2003		2S	2025	G
2	NHS	ML21	80.18	88.00	ALCOVA HILL WEST(ALCOVA)	ASP	7	1240	412	53	74	59	100	78	74	20	20.0	2002	3S			P
2	NHS	ML21	94.08	98.00	GOVT BRDG(ALCOVA-CASPER)	ASP	7	1537	410	46	77	49	100	82	77	25	20.0	2014	3S			P
2	NHS	ML21	98.00	102.90	CASP NARROWS(JCT WY487)	ASP	6	1781	478	43	75	62	100	87	75	34	20.9	2014	3S			P
2	NHS	ML21	115.37	115.74	CASPER(CY AVE)POPLAR STREET	ASP	7	6908	481	47	29	45	100	84	38	20	81.8	2009		3S	2024	G
2	Int	ML25	100.73	108.74	CASSA ROAD	ASP	8	3135	678	60	83	59	100	91	84	47	28.6	2006	3S			P

Figure 4: Sample Distress candidate table

RUT easily stands out as the worst distress while PQR presents the combined effect of all distresses

WYDOT's Pavement Inventory

Deliverables – WYDOT PMS Funding Assignment

Funding for projects is assigned to each district according to its needs:

- All potential projects are grouped into a weighted average according to the following
  - Funding Class, Distress level, ADT values
  - Special Funding Assignments (Figure 6)
  - Previous STIP Assignments
- District funding is then recommended after iteratively evaluating the previous data and is summarized by (Figure 5)
  - Improvement targets are Summarized as mileage goals for each district
  - Mileage is set based on the allotted Funding

	Statewide		Interstate		Non-Int NHS		Non-NHS	
District	Funding	Miles	Funding	Miles	Funding	Miles	Funding	Miles
Dist 1 Total	**$38,914,362**	**56**	**$17,625,301**	**31**	**$5,636,120**	**8**	**$15,652,941**	**17**
1S	$7,319,456	23	$4,424,852	14	$1,343,890	4	$1,550,714	5
2S	$17,567,010	24	$9,827,010	14	$2,470,506	3	$5,269,494	6
3S	$14,027,896	10	$3,373,439	2	$1,821,725	1	$8,832,732	6
Dist 2 Total	**$47,624,098**	**46**	**$15,560,419**	**13**	**$18,174,036**	**18**	**$13,889,643**	**15**
1S	$3,063,706	9	$625,610	2	$1,243,628	4	$1,194,467	4
2S	$9,367,921	11	$365,899	0	$4,038,681	5	$4,963,340	6
3S	$35,192,472	26	$14,568,909	11	$12,891,727	9	$7,731,836	6
Dist 3 Total	**$38,225,755**	**44**	**$11,192,683**	**13**	**$11,546,997**	**17**	**$15,486,075**	**14**
1S	$4,818,262	15	$1,138,588	4	$3,118,973	10	$560,701	2
2S	$8,937,456	11	$2,815,667	4	$2,936,736	3	$3,185,053	4
3S	$24,470,038	18	$7,238,428	5	$5,491,288	4	$11,740,322	9
Dist 4 Total	**$38,055,886**	**39**	**$14,621,598**	**15**	**$6,958,318**	**8**	**$16,475,970**	**16**
1S	$3,461,450	11	$1,310,107	4	$1,123,027	3	$1,028,316	3
2S	$7,499,398	9	$2,811,109	3	$1,714,410	2	$2,973,878	3
3S	$27,095,038	20	$10,500,382	8	$4,120,881	3	$12,473,775	9
Dist 5 Total	**$27,179,899**	**44**	**$0**	**0**	**$15,207,853**	**30**	**$11,972,047**	**14**
1S	$8,720,610	27	$0	0	$7,144,973	22	$1,575,636	5
2S	$7,844,319	9	$0	0	$3,486,909	4	$4,357,410	5
3S	$10,614,970	8	$0	0	$4,575,970	3	$6,039,000	4

Figure 5: Full Pavement Funding Strategy

Final Funding Allotments												
By Class	Original Allocated amount	Required Amount		By Condition	Interstate			NHS Routes			Non-NHS	
Interstate	$47,888,193	$	59,000,000	1S	$7,499,157	$	-	$13,974,492	$	-	$5,909,835	$ -
NHS Routes	$62,402,622	$	-	2S	$15,819,686	$	-	$14,647,243	$	-	$20,749,175	$ -
Non NHS	$79,709,185	$	-	3S	$35,681,157	$	-	$28,901,590	$	-	$46,817,666	$ -

Figure 6: Final Funding Allotment Recommendations

QUESTIONS?

Contact Info:
Ethan Crockett, PE, Pavement Management and Research Engineer
Email: ethan.crockett@wyo.gov
Phone: (307) 777-4726