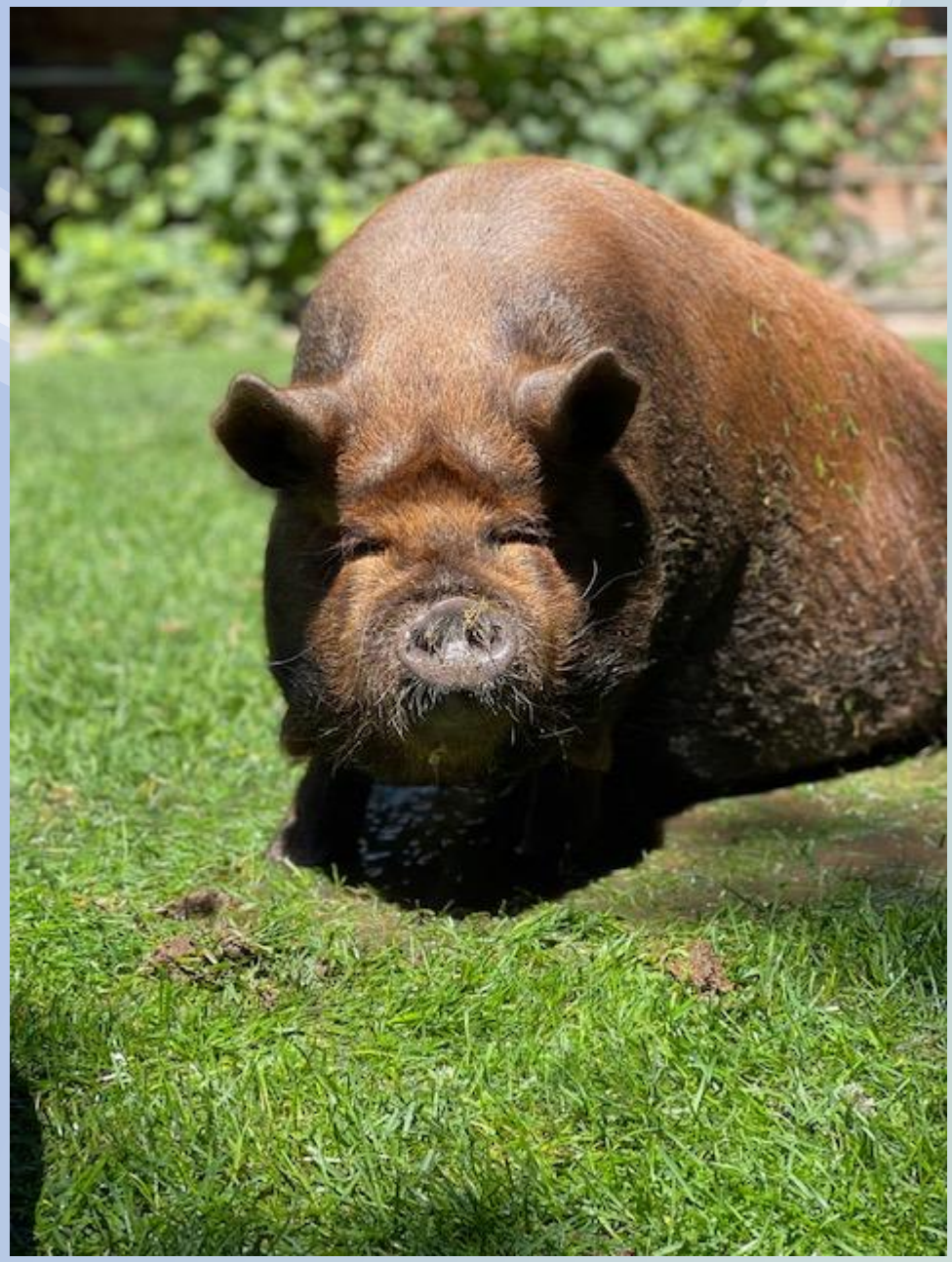
Idaho's 1st RAP Chip Seal



Aggregate Supply in District 4

Adrienne Woods, D4 Geologist

- We are running out of quality aggregate
- Contractors are hauling 50-150 miles $
- There has even been rumblings of hauling aggregates from Utah $
- D4 needs to think out of the BOX $$

Idea is Born: Collaboration

- Initial Concept, 2018
  - D4 started talking about RAP Chip Seal
    - Adrienne let's keep RAP
    - Kandace let's do a chip seal
  - Started to look for projects to obtain RAP
    - I-84, HMA to PCCP
  - 2020, Contract was written to retain RAP for future use

FHWA requires a usage plan when keeping RAP

2023- 2025 Brainstorm/Research

- Project found for the RAP Chip Seal
  - SH 77, Nibbs Creek
- Kloepfer, sub-contractor, was interested in the RAP Pilot Project
- D4 Planning, came up with funds to support a change order
- John Arambarri, ITD Pavement Engineer, recommends submission to PG3 for support

Development of SP

- Idaho Asphalt offers to provide a RAP Chip Seal Design

- Western is on board
- Kloepfer agrees to do work
- Change Order is started

- D4 Rewrites Specification to blend 404 and 403
  - Wanted some control
  - Let contractor utilize their best practices
  - Added Embedment


KN 22217 SH77 Nibbs Cr to Rice Cr

IDAHO TRANSPORTATION DEPARTMENT

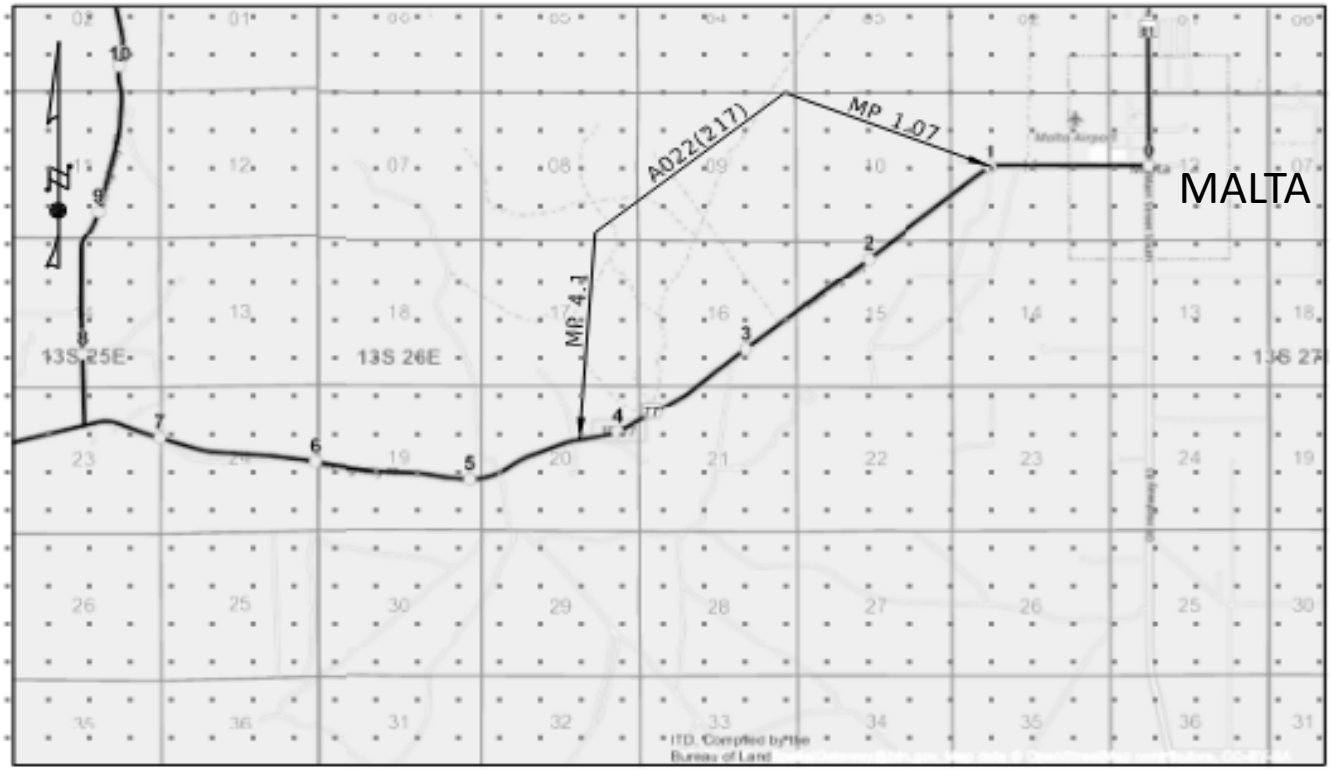
PLAN AND PROFILE OF PROPOSED SH-77

FEDERAL AID PROJECT NO. A022(217)

KEY NO. 22217

CASSIA COUNTY

February 2023



Nibbs Cr to Rice Cr
M.P. 1.07 M.P. 4.1
SEGMENT CODE 002300

DESIGN DESIGNATION

ADT 2027	360
ADT 2047	490
DHV 2027	20
DHV 2047	30
D	60/40%
V	55 MPH
TRUCKS:	
ADT 2027	90
ADT 2047	120
DHV 2027	0
DHV 2047	10

Project Overview

- Idaho SH 77
- Low volume, 2 lanes
- 6 lane miles
- Last resurface 2024
- Treatment
  - 100% RAP Chip Seal with PMRE
  - 100% RAP Chip Seal with CRS 2P

Slide by Todd Shields

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Preserving Our Transportation Assets

PG3 Pooled Fund Preservation Study

- Monitor next 2-3 years, NCAT & MinnosotaDOT Study, results published
- Virtual training provided by PG3
- Attend additional preconstruction meeting
- Equipment calibrations
- Construct 2, 500 ft. Test Sections
  - CRS-2P is control
  - PMRE is test section

Horizontal Impact Crusher

Power Screen 590

Top Deck 19/32”

Bottom Deck 7/32”

Top View of RAP Piles by James Bennett

RAP Stockpiles after Screened

Stockpile Measure

VOLUME 984 yd^3

WEIGHT 984 t

Collected By: Adrienne.Woods@itd.idaho.gov
Collect Date: Jun 5, 2025, 10:33 AM
Scaling: EPS
Conversion: 1 t/yd^3
Notes:

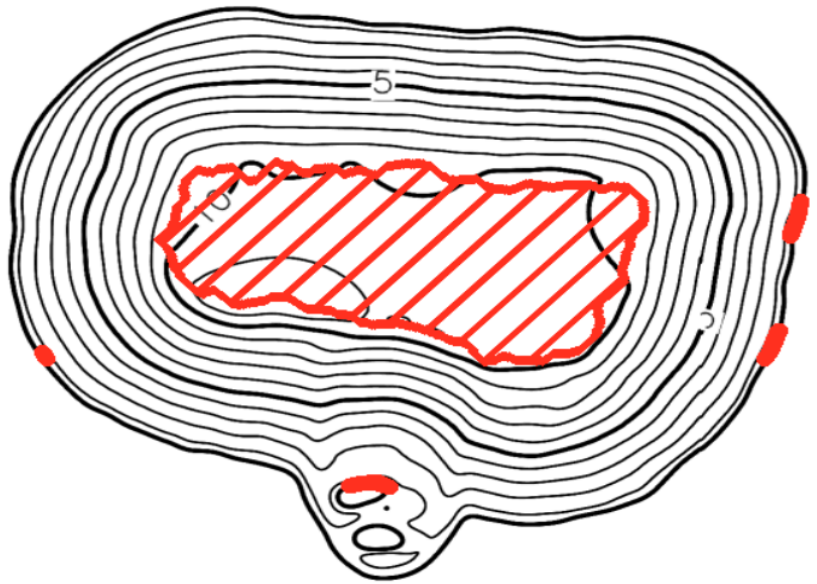
Pile: Pile 20
Site: D4_Source (D4_Source)
Product: Chips for Seal Coat (Chips_Seal_Coat)

Toe Coverage Confidence
high

Surface Coverage Confidence
high

Areas not seen by camera

Contour | 3D



PowerScreen Volumes CY

984	RAP Cover Coat	27%
2111	Fines (blotter)	59%
512	Oversized	14%

Idaho Asphalt Volunteered to do the Mix Design

Table III: RAP Properties

Binder Content of RAP (ASTM D2172, Method B)			
By Weight of Total Mix (%)		5.49	
By Weight of Dry Aggregate (%)		5.81	
Sieve Size		RAP Gradation	Recovered Aggregate
U.S.	Metric (mm)	% Passing	
1”	25.4	100	100
¾”	17.8	100	100
1/2"	12.5	91	93
3/8”	9.5	81	85
5/16”	8.0	71	76
¼”	6.3	60	69
#4	4.75	53	60
#8	2.36	34	42
#16	1.180	20	30
#30	0.600	11	22
#50	0.300	6	16
#100	0.150	2	11
#200	0.075	1.1	7.8

Idaho Asphalt
Dave Zhai

- Average Chip = 8.13mm
- Quality
  - LAWare 18%
  - Id Deg 5%
- Application Rates
  - 24 lbs/yd2
  - 0.48 gal/yd2

4. Mcleod Mix Design

Based on the gradation in Table V:

M = Medium Particle Size, inches for Chip Seal Agg: **0.320** in

Aggregate Properties (Measured by IAS)

- Flakiness Index (FI): **18%**
- Loose Unit Weight (W): **72.02 lb/ft^3**
- Bulk Specific Gravity (G): **2.446**
- % Absorption (A): **0.42%** (0.0042)

The average least dimension (ALD):

$H = M/(1.139285 + 0.011506*FI)$
$= 0.320/(1.139285 + 0.011506 * 18)$
$=$ **0.237** in

Voids in loose aggregate (V)

$V = 1-(W/(62.4*G))$
$= 1-(72.02/(62.4*2.446))$
$=$ **0.528**

Contractor RAP Cover Coat QC

Test	Test Method	Frequency	Point of Sampling	Specifications
Moisture Content on RAP	Modified AASHTO T 255 (Constant mass at 140F)	1 test minimum per 400 ton	From stockpile	Cover Coat Aggregate See Modified Gradation Table above.
Gradation on RAP	AASHTO T 27/11	1 test minimum per 400 ton	From stockpile	Provide to Engineer for Information only.
Cleanness Value on RAP	Idaho T-72	1 test minimum per 400 ton	From stockpile	Provide to Engineer for information only.
Asphalt Content and Gradation	AASHTO T 308 & T 30	1 test minimum per 1000 ton	From stockpile	Provide to Engineer for information only.
Fracture Count on Extracted Aggregate	AASHTO T 335	1 test minimum per 1000 ton	From stockpile	Provide to Engineer for information only.

Kloepfer QC Test Data

404 Class B

Horizontal Impact Crusher / Power Screen 590 At the Declo State Yard

After Last Screen Change 19/32" SO 7/32"

DATE	Wash	TEST #	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200	CV	1FF	2FF	% H2O	S
5/28/2025	*	1	100	100	83	4	0	0	0	0	0	0.0	86	97%	96%	2.1	
5/28/2025	T-27	2	100	99	80	5	1	1	1	1	0	0.0					
5/28/2025	*	3	100	100	83	5	1	1	1	1	0	0.0	86	97%	96%	1.8	
5/29/2025	*	4	100	98	72	6	2	1	1	1	0	0.3	89	97%	96%	1.4	
5/29/2025	*	5	100	98	76	7	2	1	1	1	0	0.2	89	97%	96%	1.5	
5/29/2025	*	6	100	98	74	6	2	1	1	1	0	0.2				1.4	
5/30/2025	*	7	100	99	76	6	3	2	1	1	1	0.5	86	96%	97%	1.9	
5/30/2025	*	8	100	99	79	6	3	2	1	1	1	0.5	86	96%	97%	1.9	
6/2/2025	*	9	100	99	84	5	4	2	1	1	0	0.1	86	97%	96%	2.1	
TOTAL			900.0	890.2	707.0	49.9	17.5	10.3	7.6	6.1	3.7	1.92	608	6.8	6.74	14.1	
			9	9	9	9	9	9	9	9	9	9	7	7	7	8	
			3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200	CV	1FF	2FF	H2O	
AVG			100.0	99	79	6	2	1	1	1	0	0.2133	87	97%	96%	1.8	

Summary of RAP Test Data

Sieve Size	% Passing			Spec.
	Design	Actual	T-30	Cl-B
½”	100	100	99	100
3/8”	74	79	88	40-90 (85)
#4	4	6	28	0-6
#8	1	2	19	0-3
#200	.3	.2	4.4	0-2
NCAT			3.7	
FF			97	70
CV		87		80

Screened/Crushed RAP Cover Coat

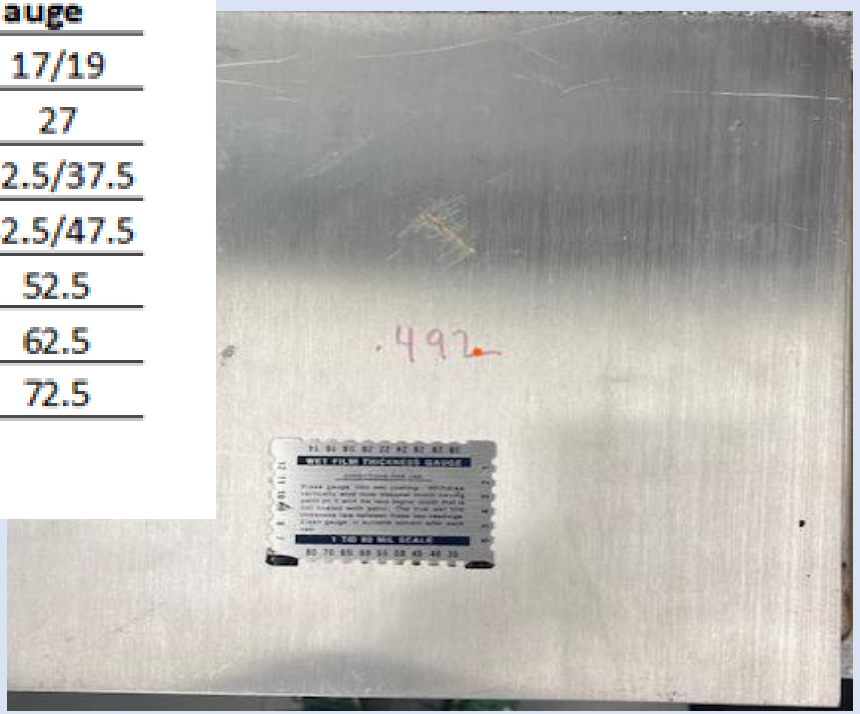
Test Section in SP

- Before starting full production:
  - Construct an on-site test section that is a minimum of 1000 feet long and a maximum of one distributor load
  - Field verify the spread rate of binder and RAP aggregate
  - Adjust rates as necessary to ensure embedment of 50% but not to exceed 70% after brooming

Verify Field Application Rates

1.250 x lbs = chips/SY

Rate	Mil	Gauge
0.10	18	17/19
0.15	27	27
0.20	36	32.5/37.5
0.25	44	42.5/47.5
0.30	53	52.5
0.35	62	62.5
0.40	71	72.5
0.45	80	



Pre Job Meeting July 28 8:00

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Preserving Our Transportation Assets

Stockpile at Nearby Maintenance Facility

Moisture:
2.0% morning
1.3% afternoon

Water just ran thru the stockpile

Go Time with PMRE, July 28 at 11:15

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Preserving Our Transportation Assets

Start

Visual Inspection of Test Sections

PMRE Application Rates/Emulsions

Test Sections:

.45 @ 24 & 22lbs

.42 & .40 @ 23lbs

Production:

.40 @ 23lbs

.38 @ 23lbs

PMRE:

2 lanes @ 3000 ft (0.38gal/sy @ 23lbs/sy)

PMRE

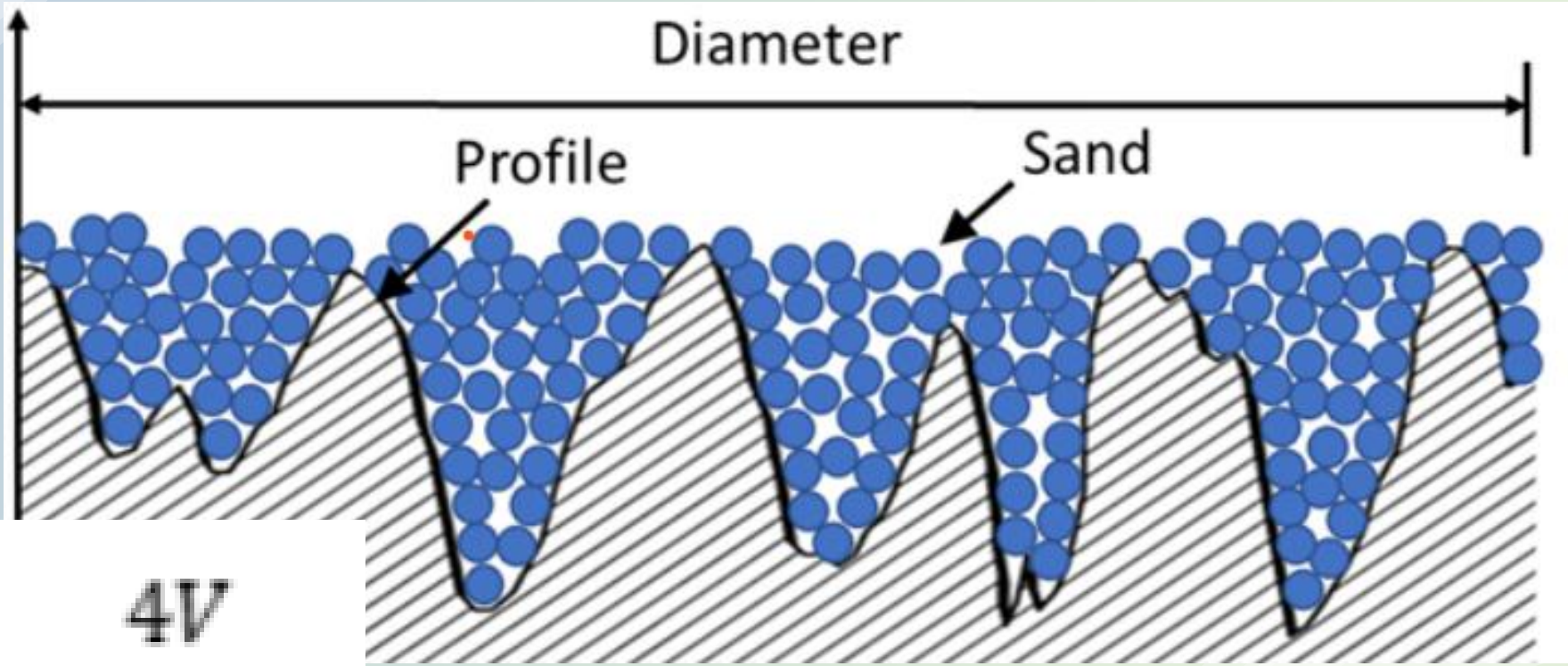
Chips were still moving at the end of the day

Next day tore shoe bottom

Sand Patch Test

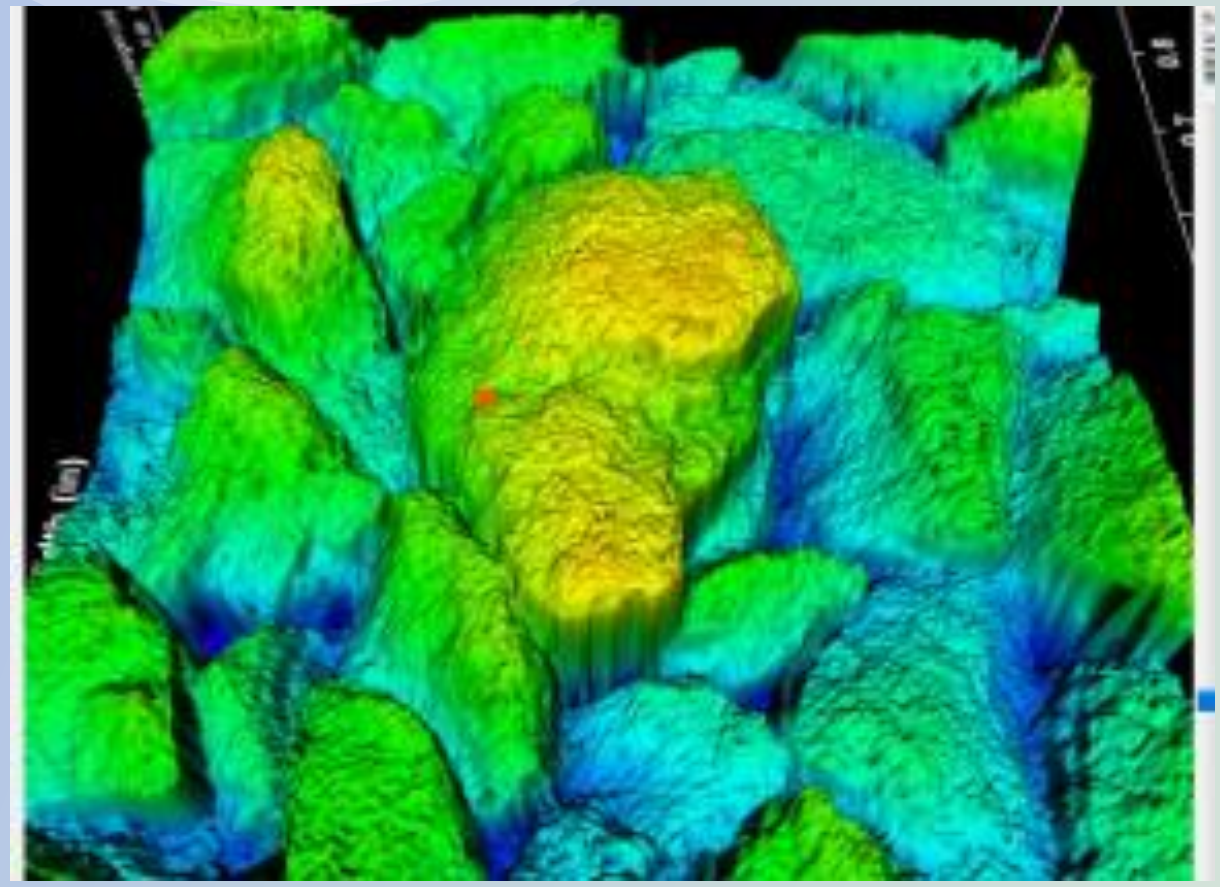
Estimate field embedment

ASTM E965 **Sand Patch Test**



$$Texture\ depth = \frac{4V}{\pi D^2}$$

AMES Laser Texture Scanner
Provided by Idaho Asphalt



AMES LTS % Embedment = 61 SH77

MPD = mean profile depth

No.	Coordinates [DMS]		Section	MPD [mm]	ASTM E1845 Embedment [%]
1				1.644	
2				2.041	
3				3.767	
4				2.891	
5	42° 16' 47.61" N	113° 26' 11.23" W	Section 1	2.936	58%
6	42° 16' 47.53" N	113° 26' 09.89" W	Section 2	2.529	63%
7	42° 16' 47.61" N	113° 26' 10.09" W	Section 2	3.799	46%
8	42° 16' 47.93" N	113° 26' 10.33" W	Section 2	2.589	62%
9	42° 16' 47.74" N	113° 26' 10.30" W	Section 2	3.601	49%
10	42° 16' 50.21" N	113° 26' 03.35" W	Section 3	2.114	69%
11	42° 16' 50.04" N	113° 26' 02.91"W	Section 3	2.539	63%
12	42° 16' 50.94" N	113° 26' 01.36" W	Section 3	3.343	52%
13	42° 16' 50.78" N	113° 26' 01.04" W	Section 3	2.953	57%
14	42° 16' 52.01" N	113° 25' 58.78" W	Section 3	2.456	64%
15	42° 16' 52.28" N	113° 25' 59.16" W	Section 3	3.146	55%
16	42° 16' 47.40" N	113° 26' 12.79" W	Section 1	2.213	67%
17	42° 16' 47.50" N	113° 26' 12.60" W	Section 1	2.723	60%
18	42° 17' 02.39" N	113° 25' 36.35" W	Section 4	3.038	56%
19	42° 17' 02.54" N	113° 25' 36.30" W	Section 4	3.374	52%
20	42° 17' 16.53" N	113° 25' 12.95" W	Section 4	4.476	37%
21	42° 17' 16.67" N	113° 25' 12.97" W	Section 4	2.865	59%
22	42° 17' 24.73" N	113° 24' 59.37" W	Section 4	2.791	60%
23	42° 17' 24.92" N	113° 24' 59.44" W	Section 4	3.882	45%
24	42° 17' 36.77" N	113° 24' 39.09" W	Section 4	3.995	44%
25	42° 17' 36.63" N	113° 24' 39.10" W	Section 4	2.83	59%
26				3.086	56%
27	42° 17' 43.76" N	113° 24' 27.71" W	Section 4	3.589	49%
28	42° 18' 02.15" N	113° 23' 56.31" W	Section 4	3.978	44%
29	42° 18' 01.93" N	113° 23' 55.77" W	Section 4	3.458	51%
30	42° 18' 14.24" N	113° 23' 35.81" W	Section 4	2.651	61%
31	42° 18' 14.30" N	113° 23' 35.70" W	Section 4	3.856	45%

July 29 9:00 Switch to CRS 2P

Preserving Our Transportation Assets

Application Rates/Emulsions
CRS-2P

Production:

.40, .41, .42 & .43 @ 23lbs

.42 @ 23, 22, 21, 20 & 19lbs

started to run low on chips

Changes were marked with stakes

July 30, After Sweeping

After sweeping no Chip loss

Upclose

HYDROTIMER

Outflow meter

Drainage Capability

Macro texture, surface voids

Bottom ring simulates tire footprint

After 0-1 Sec = Good Skid Resistance

Idaho Asphalt: Truck Mounted Laser (macro texture before and after)

Idaho Asphalt: Truck Mounted Laser

Surface Systems & Instruments: CS9300 Inertial Profiler

5 lasers: vertical displacement of vehicle and surface macrotexture

Zero Speed System: 0-100mph

SSI now has CS9500 that can measure the entire width of the roadway

Idaho Asphalt: Embedment Summary

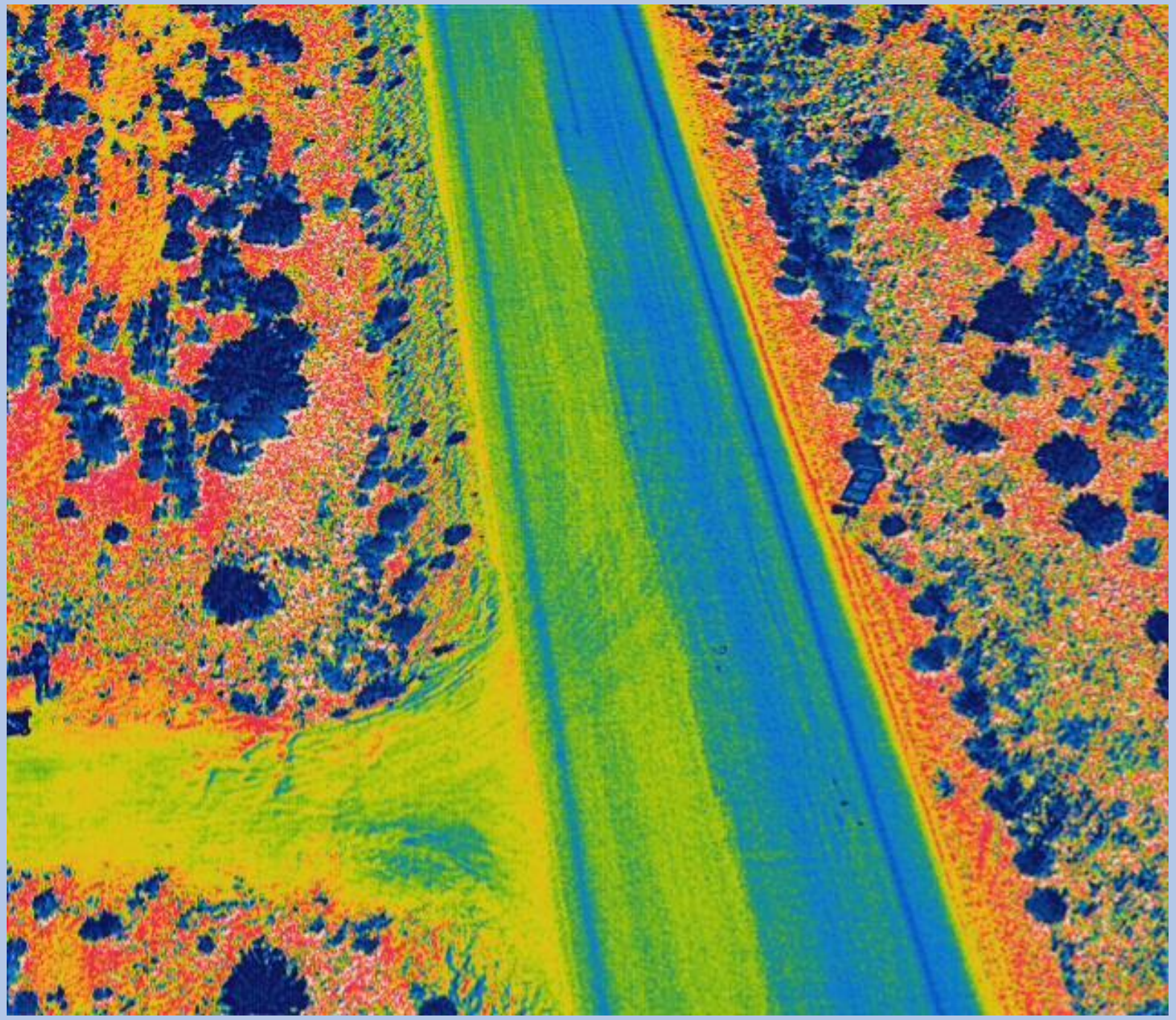
Before Chip Seal					
Lane 1 NB			Lane 2 SB		
IWP		OWP	IWP		OWP
Laser 1	Laser 2	Laser 3	Laser 1	Laser 2	Laser 3
0.744	0.571	1.116	0.685	0.620	0.645
0.698	0.577	0.678	0.690	0.555	0.720
0.733	0.650	0.710	0.645	0.571	0.694
0.731	0.649	0.677	0.684	0.600	0.676
0.669		0.795	0.631		0.684

Mean Profile Depth (mm)											
After Chip Seal											
Lane 1 NB						Lane 2 SB					
IWP				OWP		IWP				OWP	
Laser 1	% Embedment	Laser 2	% Embedment	Laser 3	% Embedment	Laser 1	% Embedment	Laser 2	% Embedment	Laser 3	% Embedment
2.520	52%	2.550	51%	2.810	46%	2.147	59%	2.187	59%	2.651	50%
2.910	44%	2.610	50%	2.265	57%	2.296	56%	2.168	59%	2.709	48%
2.529	52%	2.431	54%	2.829	46%	2.238	58%	2.292	56%	2.744	48%
3.077	41%	3.039	42%	3.159	40%	2.810	46%	2.879	45%	3.235	38%
2.708				2.766		2.377				2.835	
2.367				2.413		2.102				2.468	
61%				60%		65%				59%	

ASTM E1845 % Embedment = 61

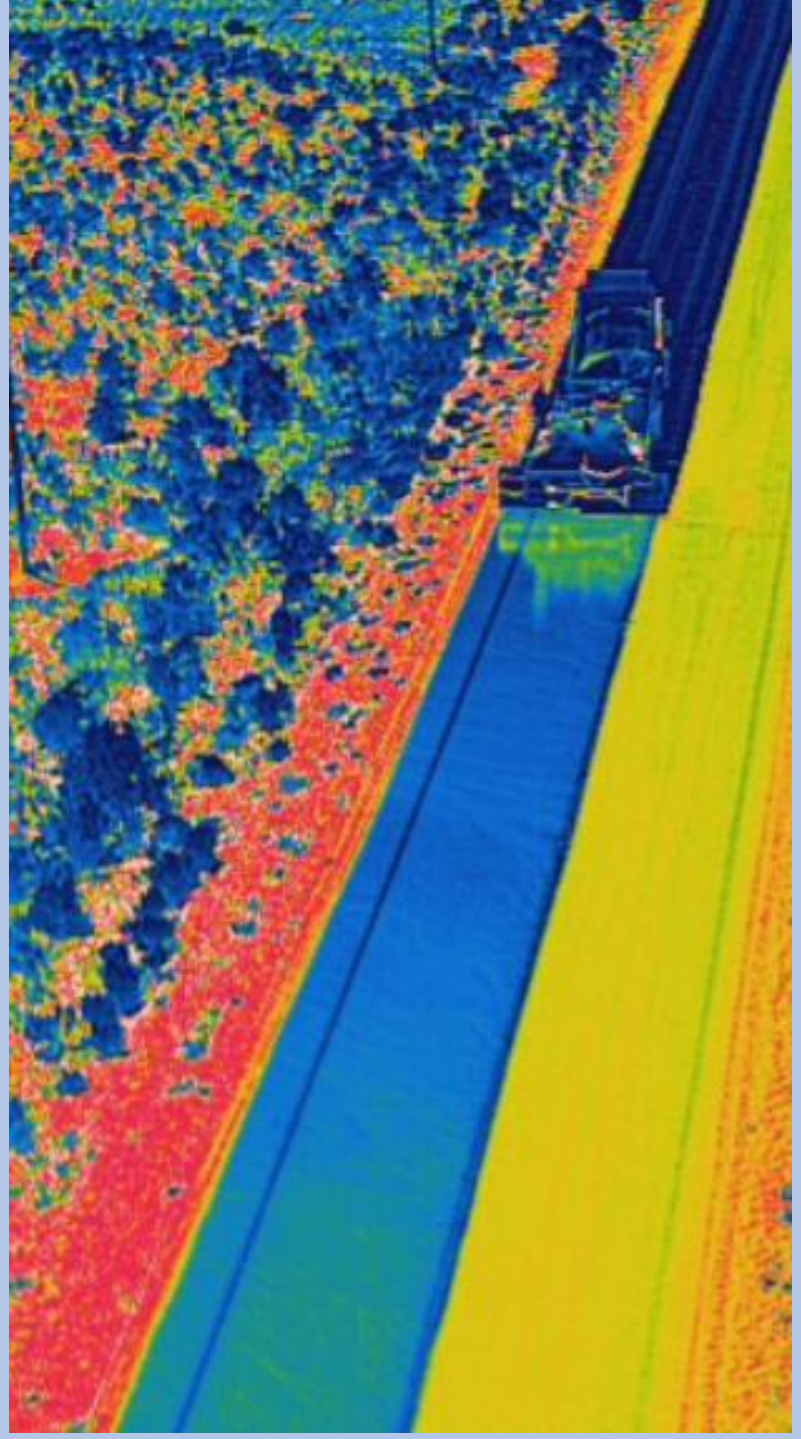
NB = 48% SB = 52%

Thermal



Thermal Video

Distortion owing to drone position

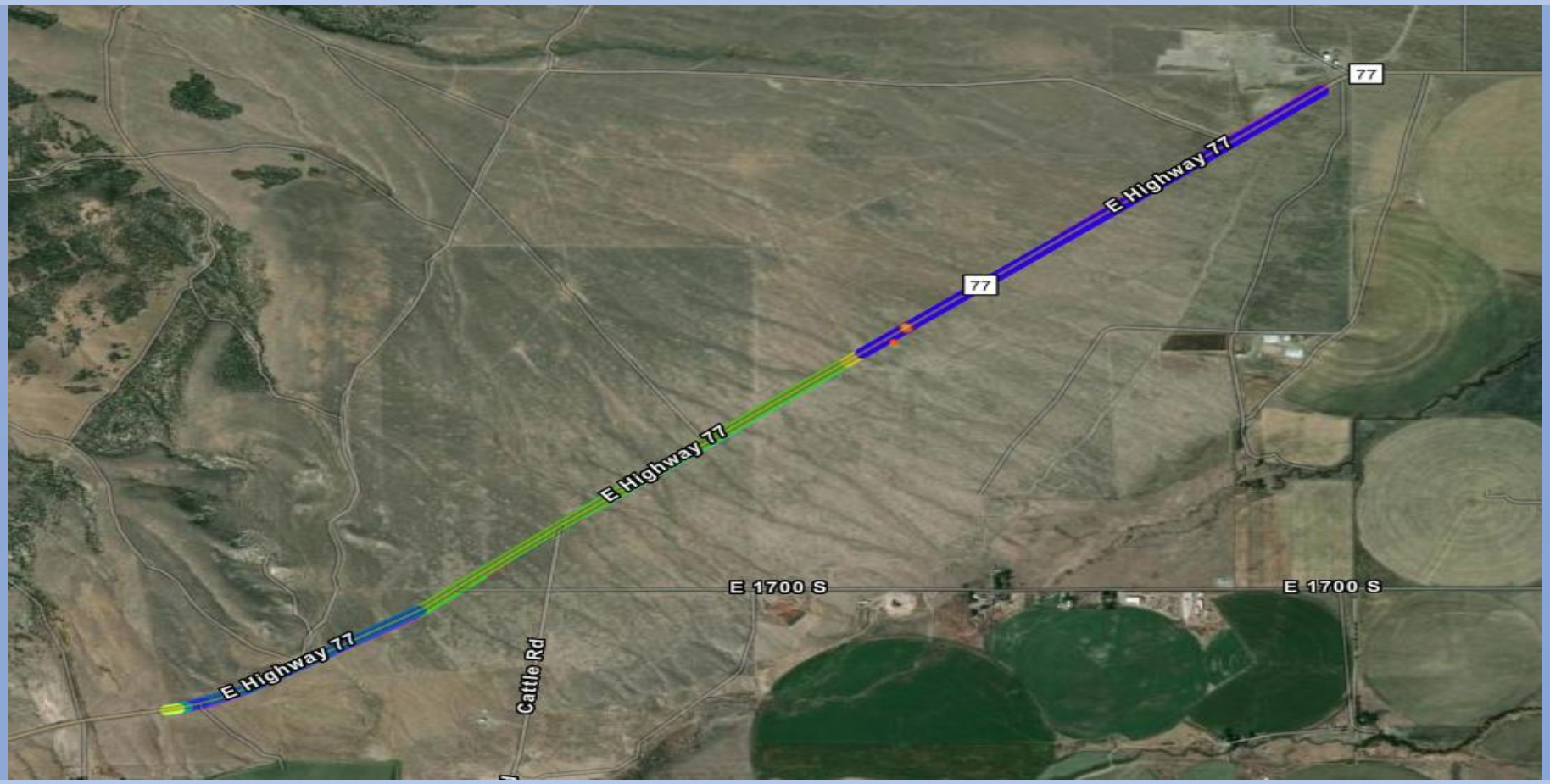


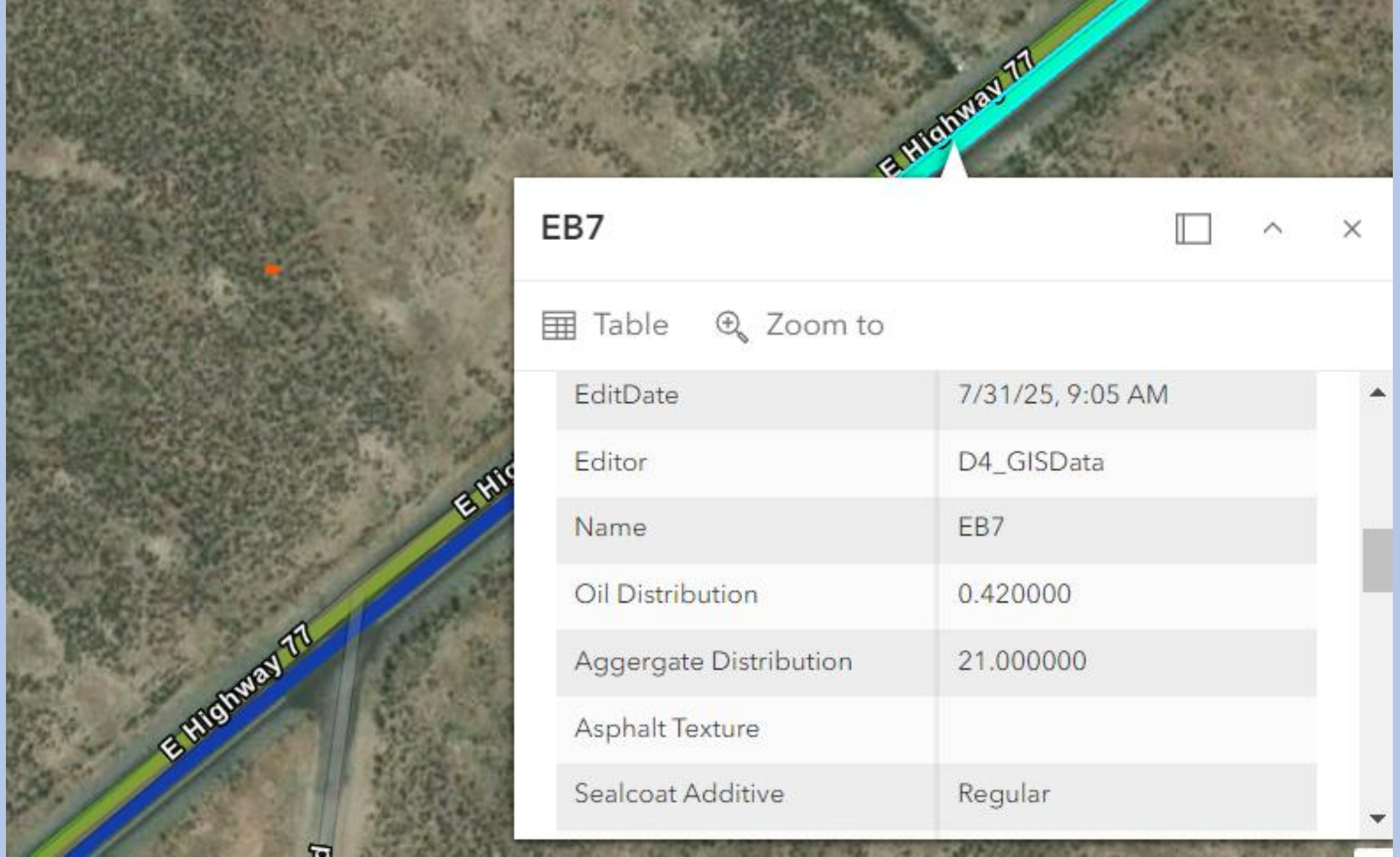
Chips on cold emulsion

No tracking of PMRE

Project Test Area Signs of RAP SealCoat

GIS with Application Rates by Sean Hlousek





EB7

Table Zoom to

EditDate	7/31/25, 9:05 AM
Editor	D4_GISData
Name	EB7
Oil Distribution	0.420000
Aggergate Distribution	21.000000
Asphalt Texture	
Sealcoat Additive	Regular

Unintended Consequences

- Safety
  - No Dust
  - Contrast to lines
  - No flying chips
- Quiet ride
- Public Interest
- Public Approval


After

4.5.26 CRS-2P

Close-up

Double chip seal
at meet line

No failure

PMRE No Line

Starting to See Wheel Path

No bleeding

RAP coating starting to ware off

Go Team!

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Preserving Our Transportation Assets

Any Questions?