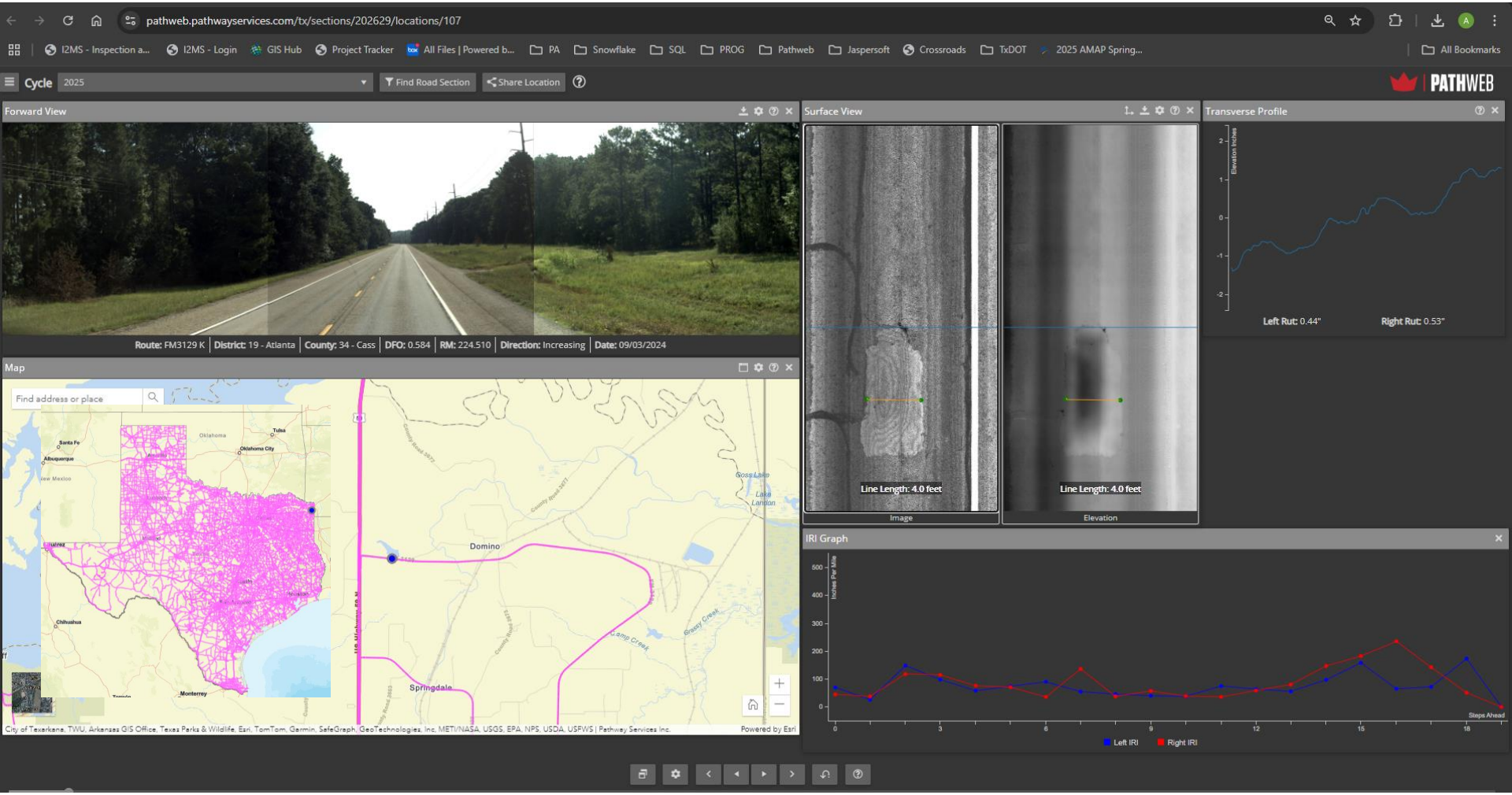
CIR strategy for FM 3129
Atlanta District

CSJ 3195-01
Cass County,
from US 59
to Paper mill (first 1.3 miles only)

July 11, 2024

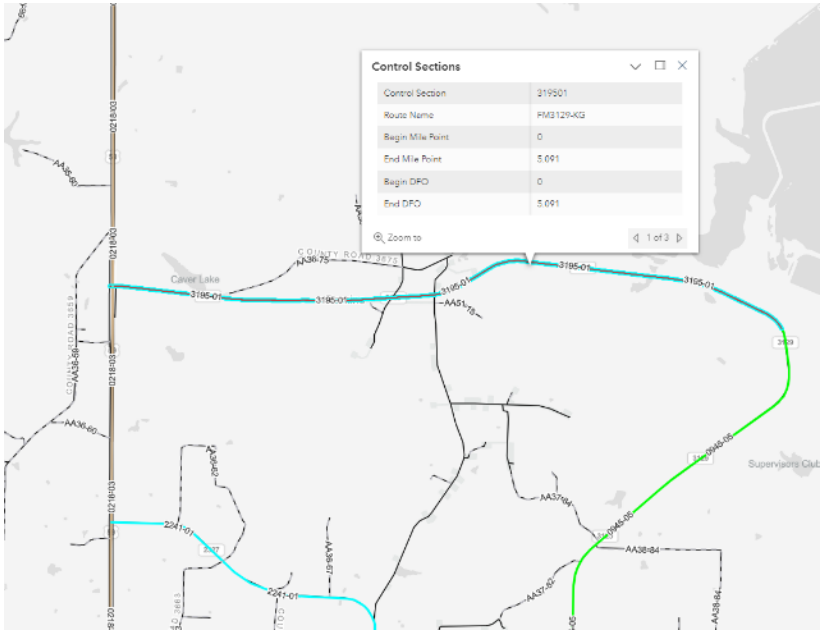

pathweb.pathwayservices.com/tx/sections/202629/locations/107
Cycle
2025
Find Road Section
Share Location
PATHWEB
Forward View
Route: FM3129 K | District: 19 - Atlanta | County: 34 - Cass | DFO: 0.584 | RM: 224.510 | Direction: Increasing | Date: 09/03/2024
Surface View
Line Length: 4.0 feet
Image
Line Length: 4.0 feet
Elevation
Transverse Profile
Left Rut: 0.44"
Right Rut: 0.53"
Map
Find address or place
Domino
Springdale
IRI Graph
Left IRI
Right IRI

Information from District

Location, scope, typical sections, traffic

Location and Prelim. Strategy

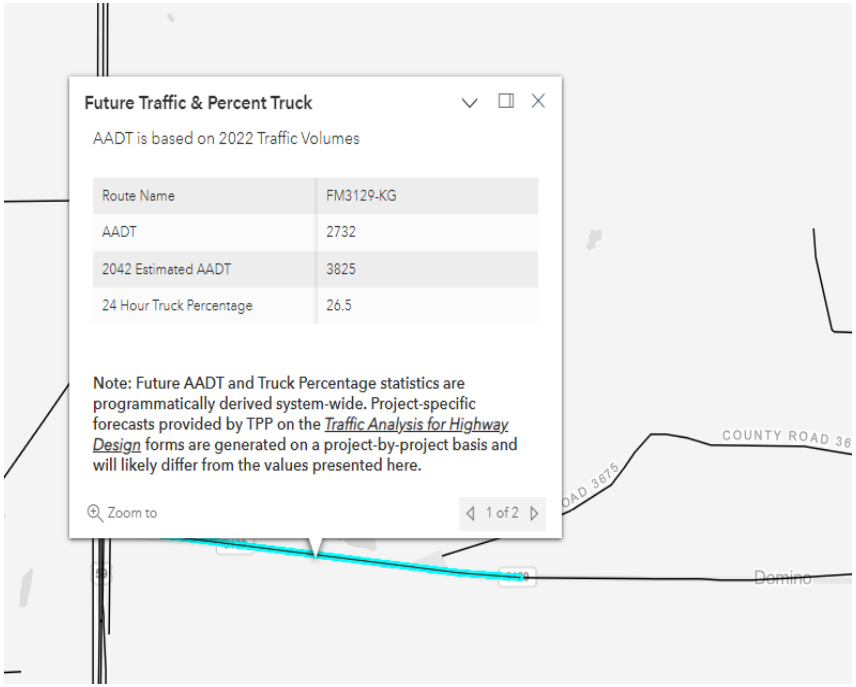
- Near Domino
- CIR planned in lanes only
- 1st 1.3 miles up to concrete section only
- Prelim. Design strategy
  - Mill 2”
  - CIR existing 4”
  - Place 2” HMA



Project location
(~19 mi. S of Texarkana)

Traffic Estimates

- From Statewide planning map:
  - Beginning ADT – 2732
  - Ending ADT – 3825
  - 26.5% trucks
  - ATHWLD – 14,220 lbs.
  - TF = 1.43
  - **Cumulative 20 yr. ESALs – 3.787 M**
- From PWIM 2024:
  - Beginning ADT – 4619
  - Ending ADT - 8342
  - 27.2% trucks
  - ATHWLD – 13,900 lbs.
  - TF = 1.53
  - **9.69 M 20-yr. ESALS**
- **Design based on PWIM 2024**



Traffic from Statewide Planning Map

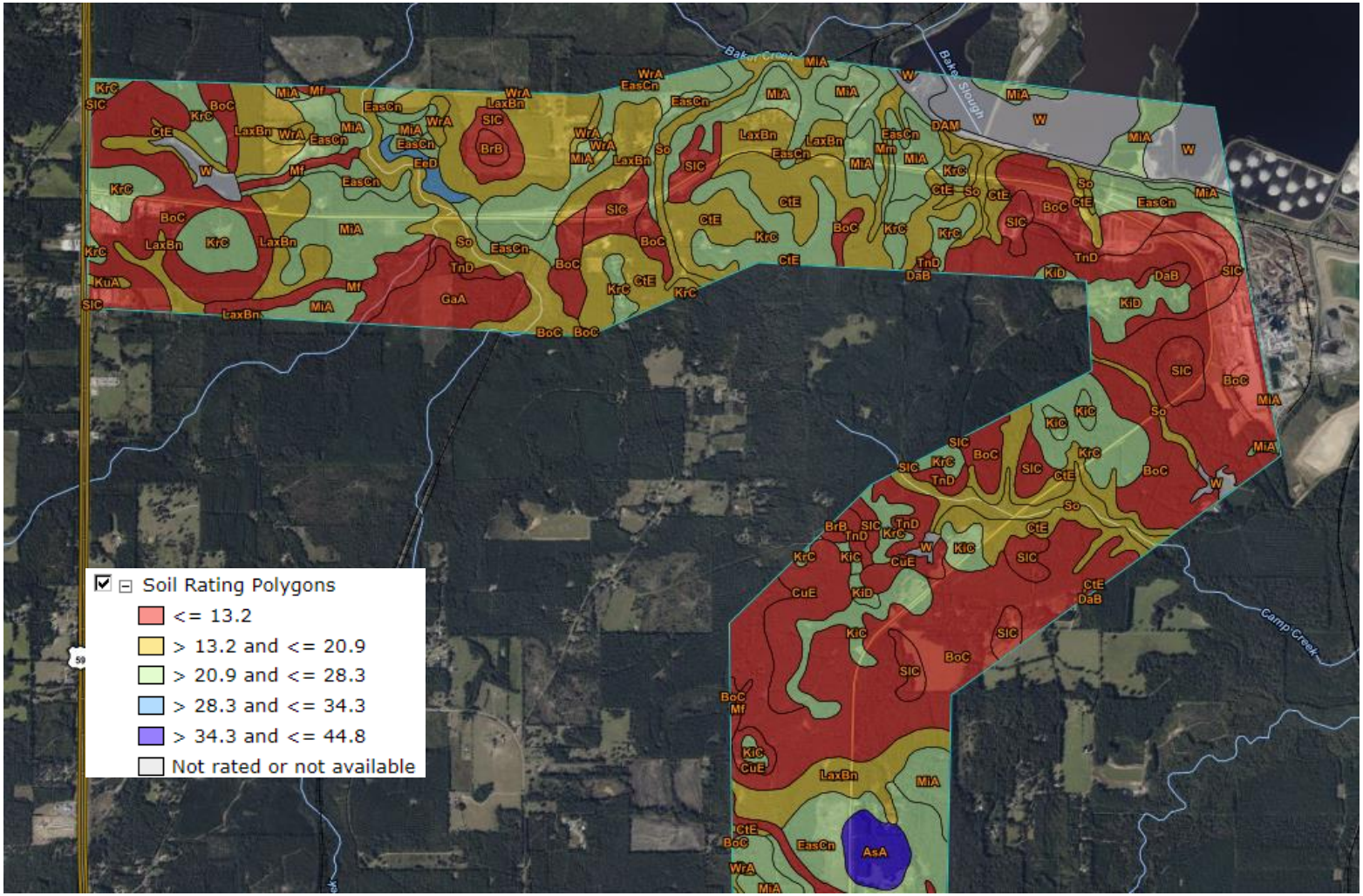
Other Observations

- EB leads to paper mill, heavier traffic towards mill
- First 1.3 miles considered from US59 towards Paper mill, up to concrete section
- Cores showed 12” of HMA
- With defects 4” to 6”

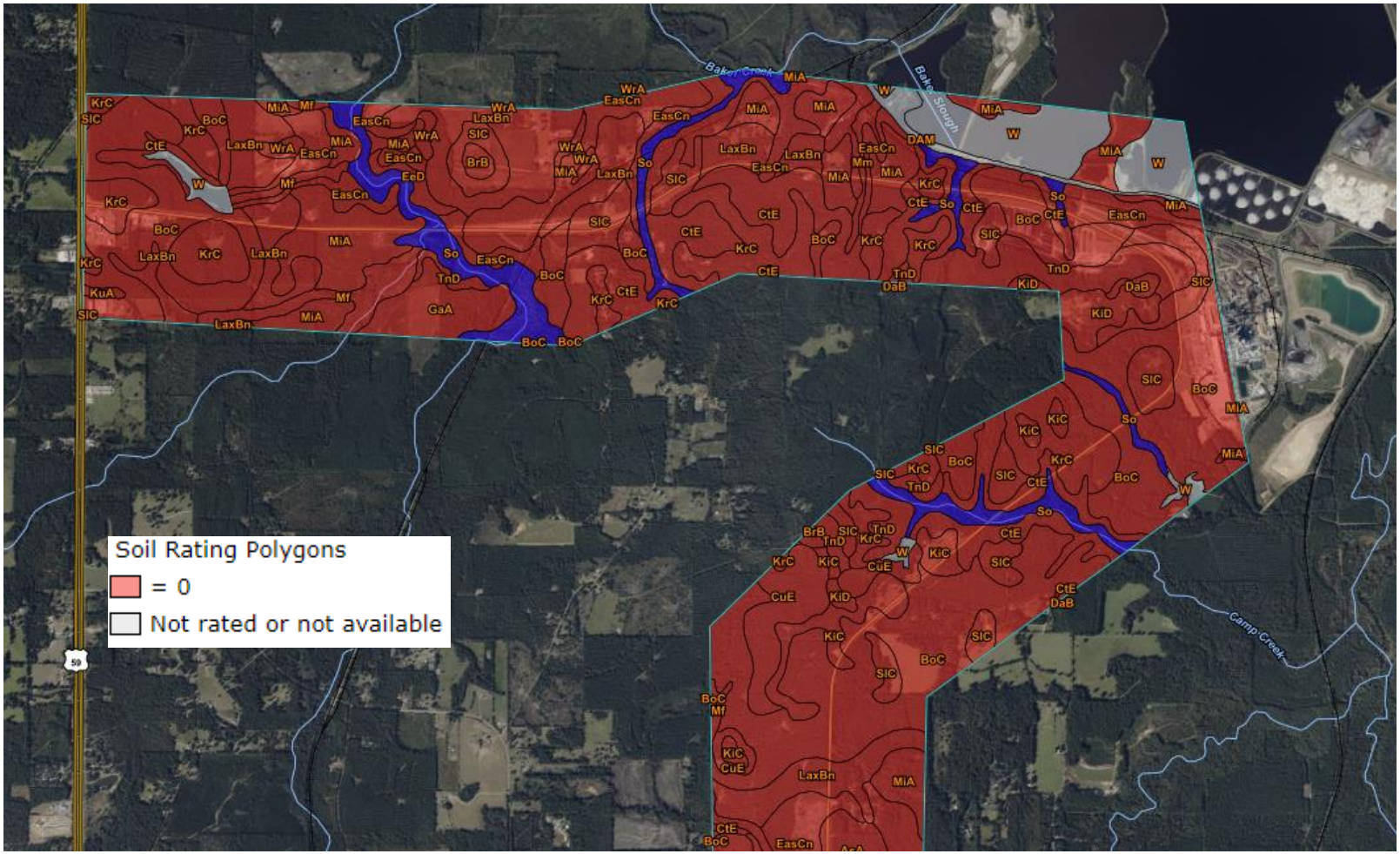
Background Information

Soils maps, GPR, FWD, roadway sampling

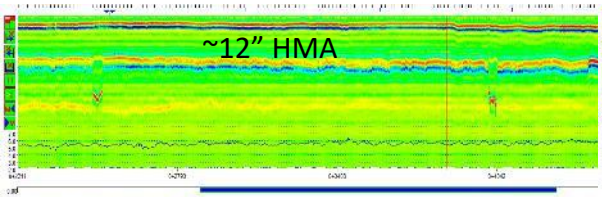
Soils Maps – Variable PI throughout

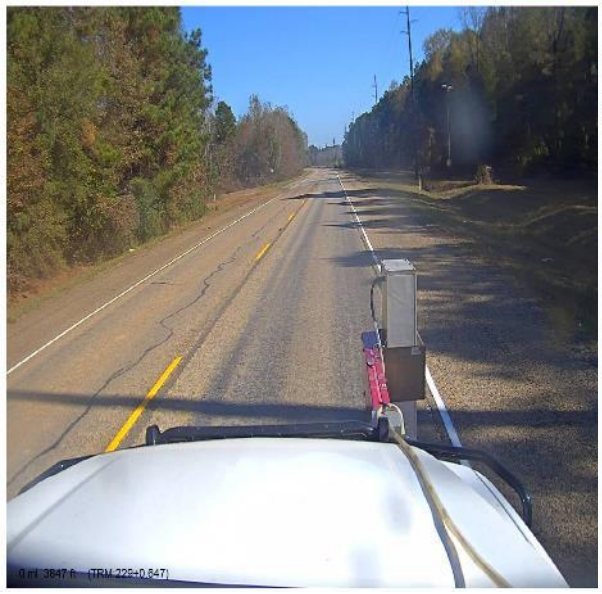


Soils Maps - Sulfates

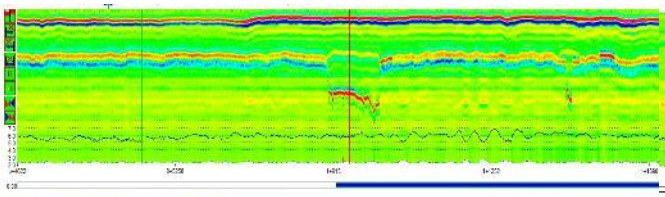


GPR Summary
TYP ~12” HMA with some sealcoats
Shoulder appears similar to lane

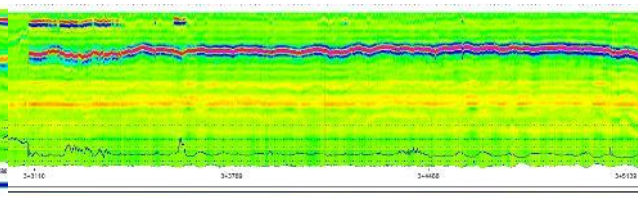




Typical EB



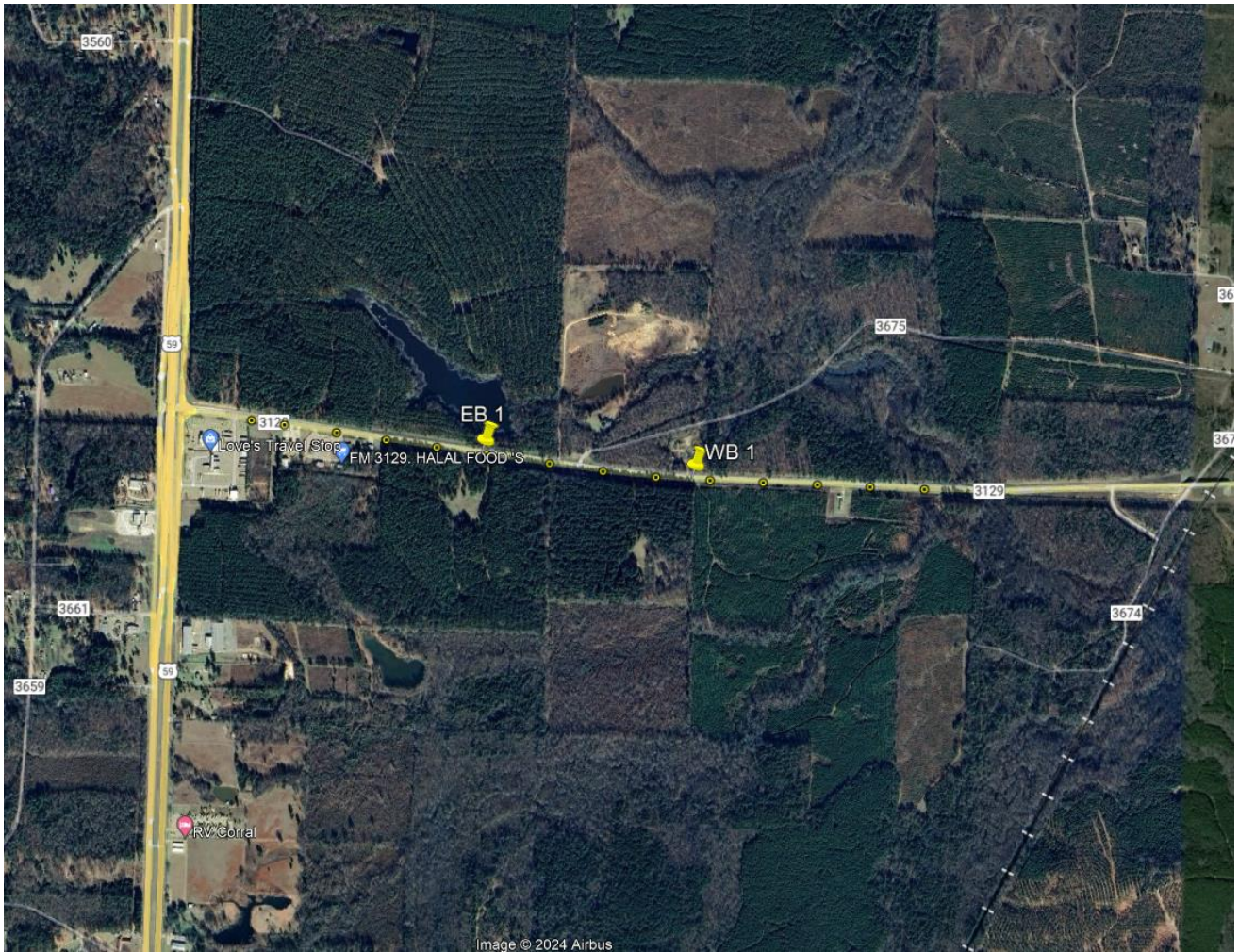
Localized patches 18” HMA



GPR on Shoulder

Sample Locations

2 Locations – EB and WB



EB 1 – Structure Check / Full Sample

- Rutting in both wheel paths (3/4”)
- Fatigue cracking
- Stripping and cracking on center line joint
- Long crack on shoulder joint
- Shoulder 10’
- Area is very flat with standing water

Direction towards mill (EB) is in worse condition than WB.

Sampled material in better condition as it was easier to mill.

WB 1 – Structure Check / Full Sample

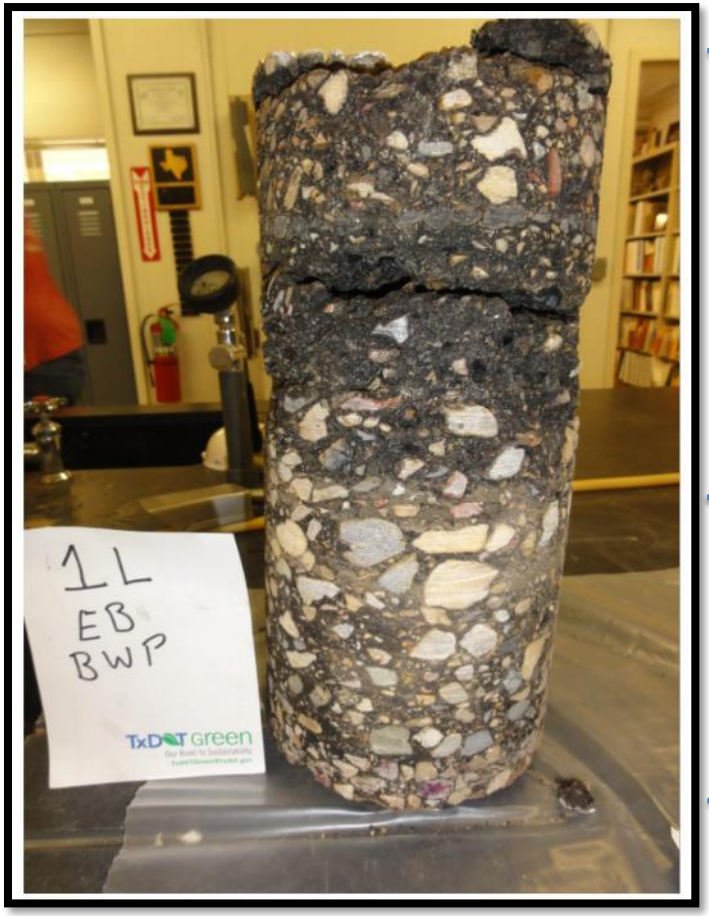
- Road is in better condition, but milled finer (harder to mill)
- ½” rutting in WPs
- Some fatigue cracking
- Transverse cracks
- Very wet, flat area with standing water

FWD Summary 2021 - 2024

Direction	EB 2021	EB 2024	WB 2021	WB 2024
AVG Normalized Deflection (mils)	5.01	10.43	4.39	9.59
Adjusted mean HMA E (ksi)	286.7	**251.9**	501.3	**325.9**
Adjusted mean base E (ksi)	112.0	**114.18**	133.2	**115.7**
Adjusted mean Subgrade E (ksi)	36.1	18.46	23.14	18.65
Absolute error/sensor	4.62	5.43	6.54	5.61

- Deflections are similar in both directions
- 2021 testing in January, 2024 testing end of April
- Base reported as Iron Ore, FWD shows high stiffness for that material type
- Subgrade E is higher than county average (12 ksi)
- Lower asphalt layers show low stiffness in some spots, may be in poor – 6 to 11”

FWD of split HMA



Top 6”:
2024: Between 331 ksi and 264 ksi

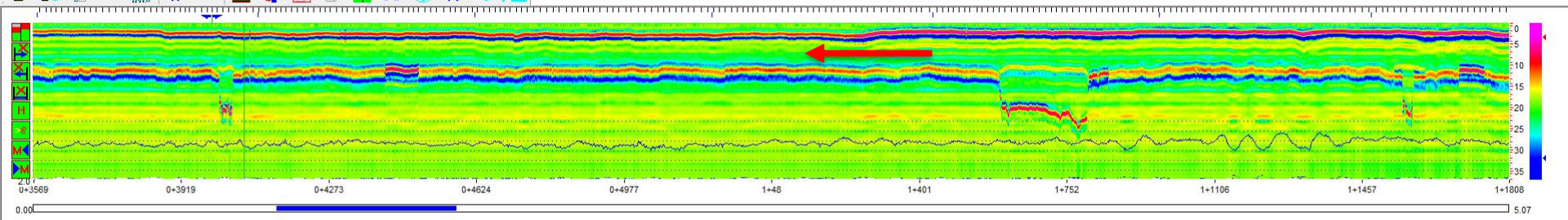
Bottom 5”:
2024: Between 327 ksi and 248 ksi

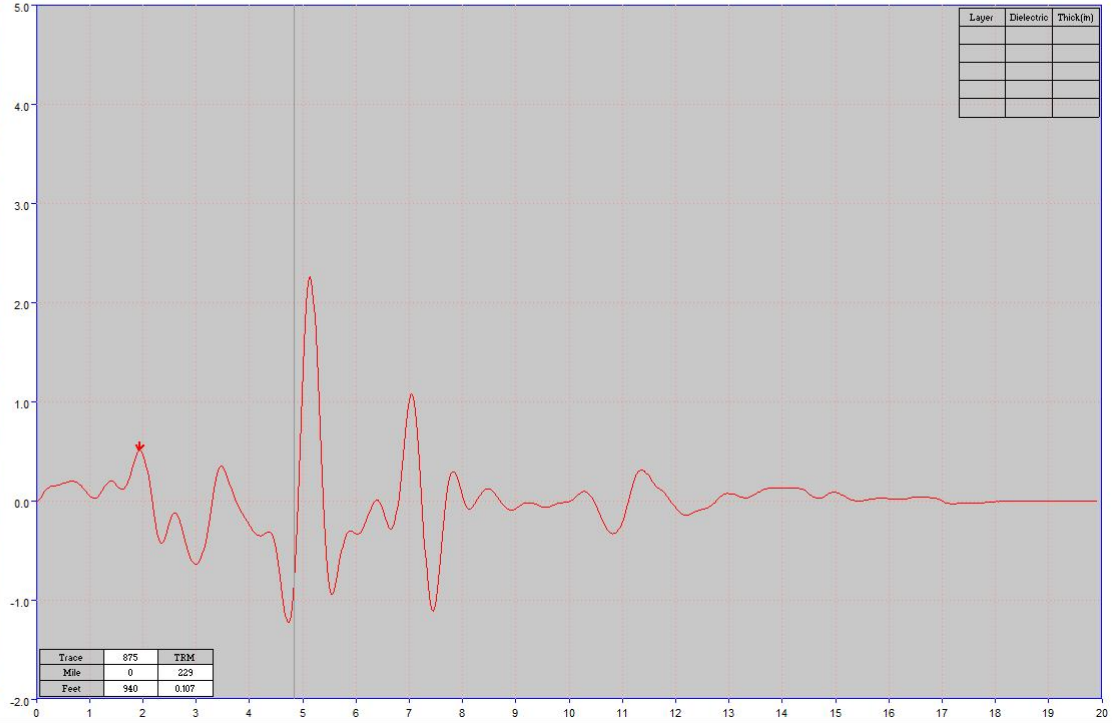
3 areas noted with E values below 60 ksi

16-1-42-0-1

File Tools Output KML Google Map Keeped Result

C:\Users\C-Bierman\Texas A&M Transportation fm3129 sb ol.PRJ | fm3129 sb ol.DAT | GPR:14608 VID:1957 GPS:297 FWD:49 | 0.00 to 5.07 mile V:6.0568 B: 0.1207 | T:11-19-2020(13:11:45) C: 11/4/2019(:25:40 PM) | 1920X1080





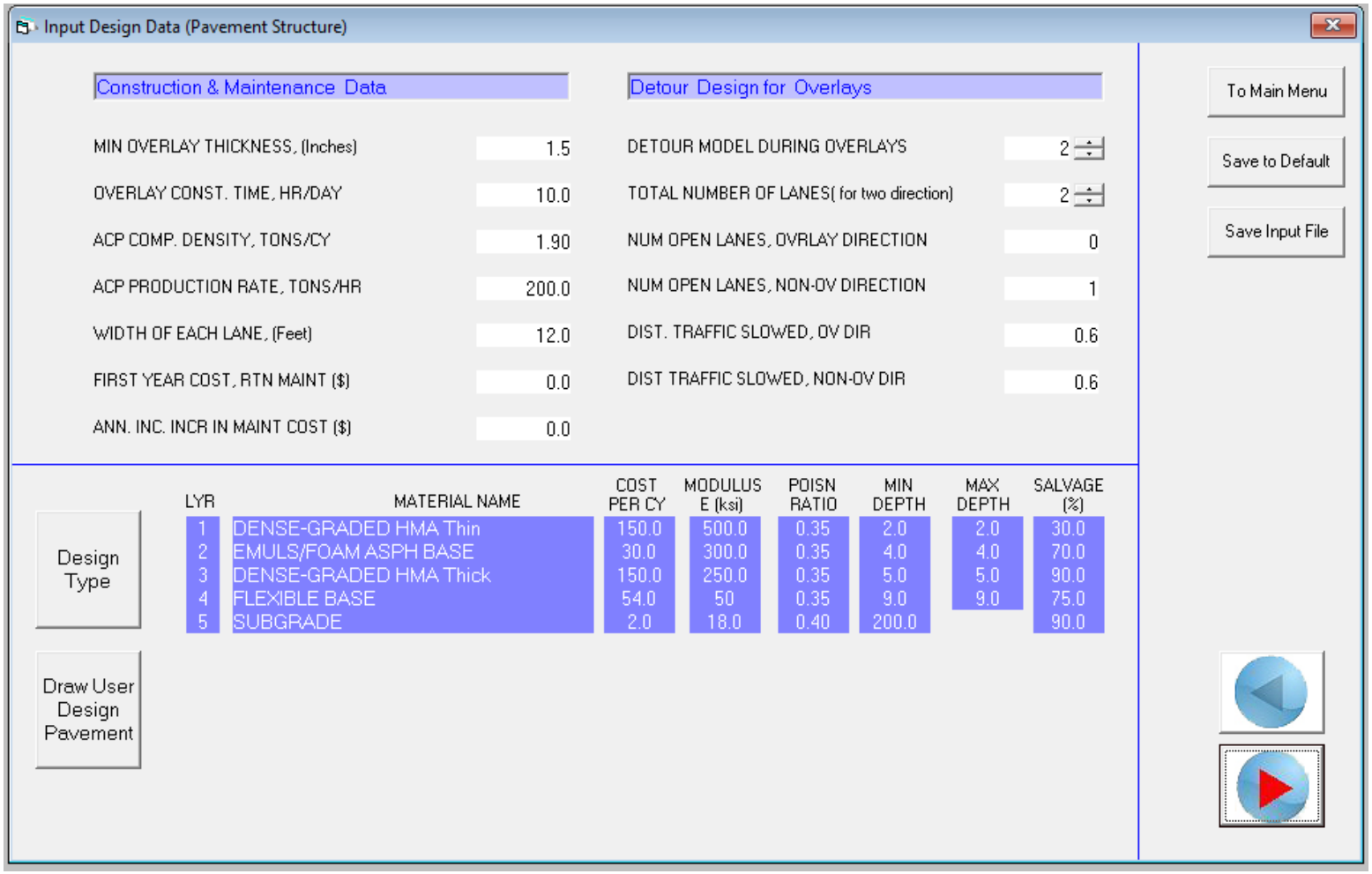
Pavement Design Strategies

Preliminary FPS design options

Current Assumptions

- 11” of existing HMA
- 9” of flex base
- Subgrade E = 18 ksi; Flexbase ksi = 50 ksi
- Mill off 2” of HMA, CIR 4”
- Final surface should be 2” HMA
- 20 year traffic = 9.69 m ESALS
- 13,900 lbs ATHWLD

FPS design inputs



FPS design results

FPS Pavement Design Result

Problem	001	District	19	Atlanta	Section	01	Highway	FM 3129	Confidence Level:	C
Control	3195	County	34	CASS	Job	029	Date	7/10/2024	No. of Best Designs	1

Design Type: PAVEMENT DESIGN TYPE # 7 -- USER DEFINED PAVEMENT

Best Design No.	Design: 1					
Material Arrangement	BMCM					
Total Cost	28.15					
No. of Layers	4					
Layer Depths (inches)	2.0 4.0 5.0 9.0					
No. of Perf. Periods	2					
Perf. Time (years)	16, 28					
Overlay Policy (inches)	2.0					
	Check Design	Check Design	Check Design	Check Design	Check Design	Check Design

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FPS design with 100 ksi base

FPS Pavement Design Result

Problem	001	District	19	Atlanta	Section	01	Highway	FM 3129	Confidence Level: C
Control	3195	County	34	CASS	Job	029	Date	7/11/2024	No. of Best Designs 1

Design Type PAVEMENT DESIGN TYPE # 7 -- USER DEFINED PAVEMENT

Best Design No.	Design: 1					
Material Arrangement	BMCM					
Total Cost	23.32					
No. of Layers	4					
Layer Depths (inches)	2.0 4.0 5.0 9.0					
No. of Perf. Periods	1					
Perf. Time (years)	20					
Overlay Policy (inches)						
	Check Design	Check Design	Check Design	Check Design	Check Design	Check Design

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Mix Designs

Lab results to support pavement strategies

Lab Mix Designs

Remove 2” of HMA, CIR 4” and replace 4”

- Tex-134-E foamed asphalt design
  - 100% EB material 2” to 6”
  - Used PG 64-22 Wright out of Henderson
  - “House” lime and Type I/II cement
  - Mixed with 3% moisture before compaction – 30 gyrations
  - Active RAP test, rap is active

Active RAP test

- Quick lab test to determine the activity/quality of RAP
- Sample at 70 °C compacted in SGC, soaked 24 hrs, then IDT measured for strength
- >14.5 psi IDT is considered “active” RAP
- Active RAP is good for mixing into new HMA
- For CIR, active RAP has stability concerns, recommended to add fines
- Greater concern when using emulsion

Mix Design Results – Foamed Asphalt

Mix	CIR design			
Material	100% RAP			
Max dry density (pcf)	110			
Optimum moisture (%)	9.2			
Asphalt Rate (%)	1.6	1.8	2.0	2.2
Lime Rate (%)	1	1	1	1
Dry IDT (psi) (min. 50)	46	50	53	56
Moisture conditioned IDT (psi) (min. 30)	44	46	52	51

- Treatment with 1% lime + 2.0% foamed asphalt meets minimum values and demonstrates almost no loss in strength after moisture conditioning

Mix Design Results – Cement or lime

Mix	CIR design	
Material	100% RAP	
Max dry density (pcf)	110	
Optimum moisture (%)	9.2	
Asphalt Rate (%)	2.0	2.0
Treatment	1% Cement	1% Lime
Dry IDT (psi) (min. 50)	54	53
Moisture conditioned IDT (psi) (min. 30)	52	52

- Lime may have better resistance to stripping, no difference in strengths

Density investigations

Tex 113-E	**Adding 3% water**
• MDD = 110 pcf • OMC = 9.2% • OMC is very high for RAP • Very flat curve and not representative	Bulk Specific Gravity (30 gyr): • Bulk density = 122.0 pcf (dried) • Compaction = 86.3% (Rice) Rice Gmm = 2.27 Max Density = 141.4 pcf ASTM D2726 provides more representative density target

- Use 122 pcf as initial target
- Consider using growth curve for field compaction

Summary

Selected design and FDR Materials Information

Summary and way forward

- CIR design recommendation:
  - Mill 2”
  - CIR 4” with 1% lime and 2% asphalt
  - Surface with 2” HMA surfacing
- Construction requirements:
  - Add 3% water at mill head
  - Use 122.0 pcf as MDD
  - Consider field growth curve to validate density
- If further testing is an option:
  - Cores to investigate lower half of HMA
  - Auger to get quality of base and subgrade
- Development of construction specification required