TTI: 5-5598-05

Texas A&M Transportation Institute

Guidelines on Design and Construction of High Performance Thin HMA Overlays

Implementation Product 5-5598-05-P3 & P4

Cooperative Research Program

TEXAS A&M TRANSPORTATION INSTITUTE
COLLEGE STATION, TEXAS

in cooperation with the
Federal Highway Administration and the
Texas Department of Transportation
http://tti.tamu.edu/documents/5-5598-05-P3-P4.pdf

GUIDELINES ON DESIGN AND CONSTRUCTION OF HIGH PERFORMANCE THIN HMA OVERLAYS

by

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Product 5-5598-05-P3 & P4
Project 5-5598-05
Project Title: Continued Implementation of High Performance Thin Overlays in Texas Districts

Performed in cooperation with the
Texas Department of Transportation
and the
Federal Highway Administration

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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Guidelines on Design and Construction of High Performance Thin HMA Overlays

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Tommy Blackmore

Tom Scullion

WORSHOP NOTES

Guidelines on the Use and Inspection of Thin Surface Mixes in TxDOT's Maintenance and Pavement Preservation Programs

WORKSHOP INSTRUCTORS:
Tom Scullion, PE
Tommy Blackmore
Cindy Estakhri, PE

April 2016

Texas Transportation Institute
The Texas A&M University System

Texas Department of Transportation

Class Overview

Part I – Morning 10:00 to noon

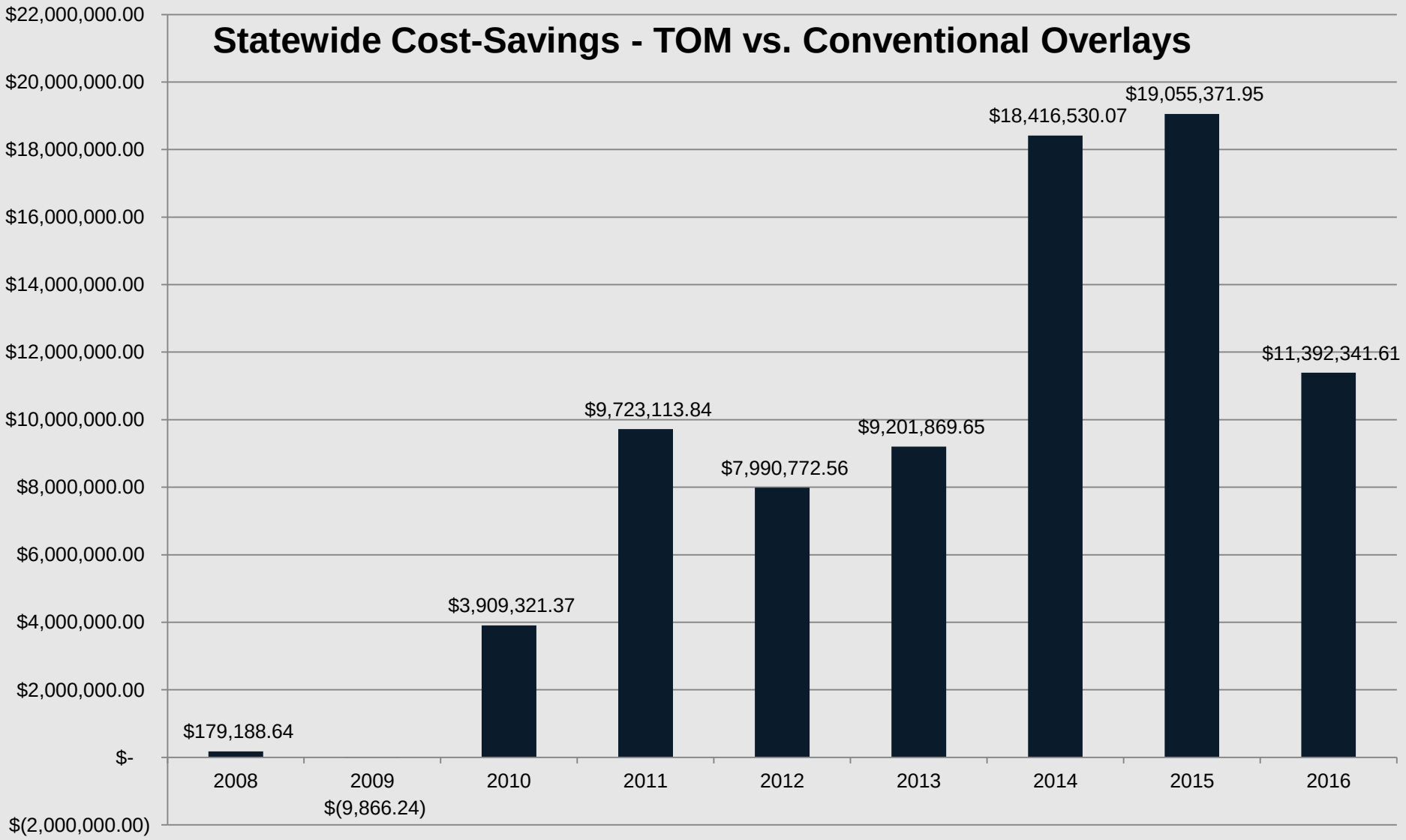
- Why Thin Overlays
- Types of Thin Overlays
- Materials Selection
- Specifications
- Mix Design
- Site Selection
- Houston Candidates

Part II – Afternoon 1:00-3:00

- Project Inspection
- Tack Coat/Bonding Underseals
- Mixture Placement and Compaction
  - Weather/Temperature
  - Good Practices
  - Haul Distances
  - Managing Windrows
- Acceptance Testing

Why TO's? Problems with Dense Graded Overlays Item 341

Why Thin Overlays? Cost



Why Thin Overlays Good Performance

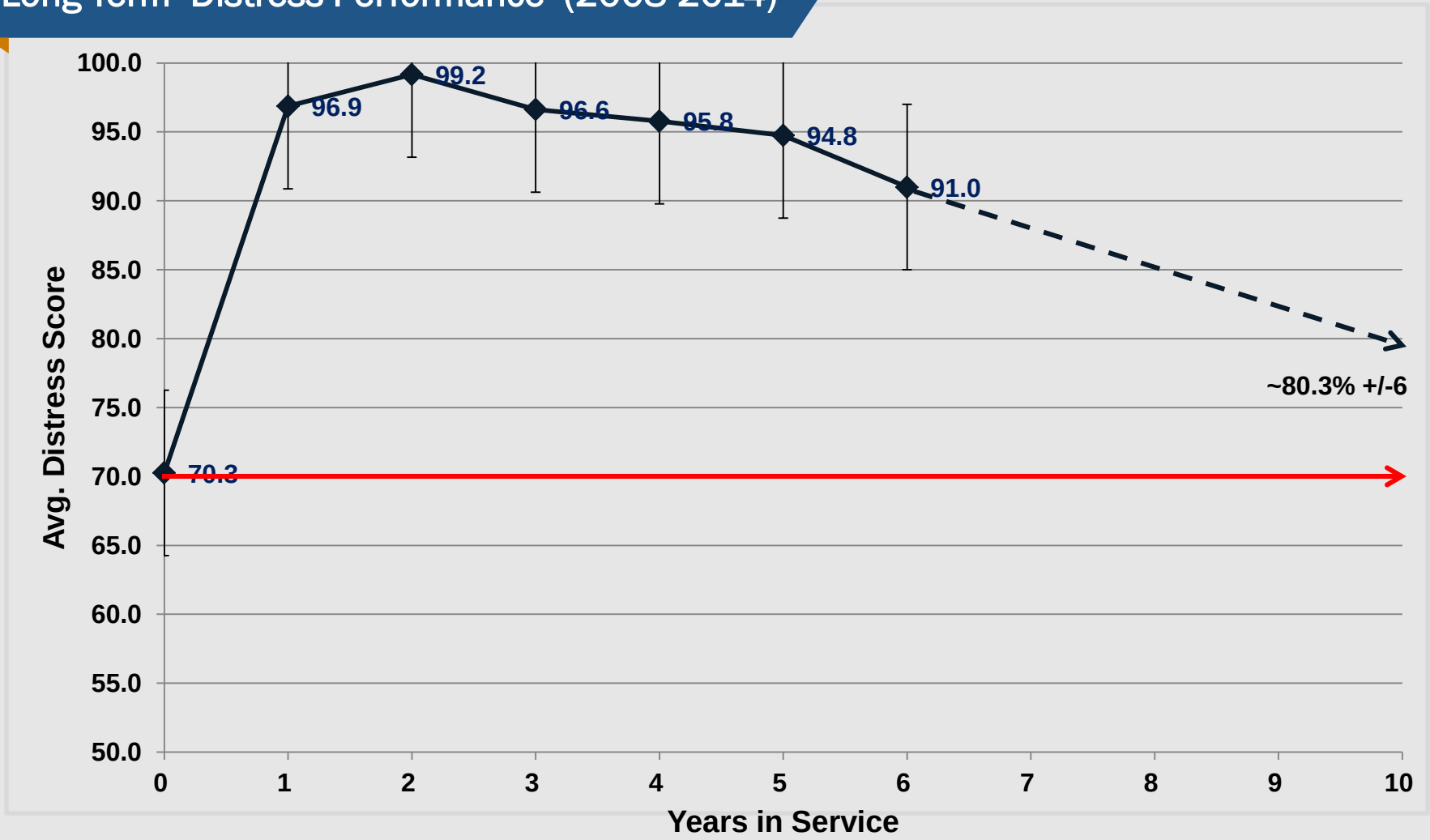
- Rut/Crack resistance
- Skid resistance
  - SAC B – High 30's to Mid 40's
  - SAC A – High 40's to Low 50's
- Smoothness (IRI improvement)
  - Typically 25-35% improvement – depends on pre-existing conditions
- Sound Abatement
  - 2 to 6 times reduction in noise
  - 96.5-98dB = PFC

IH-35 (ADT >100k):
Before/After

Mike Arellano; Austin District

Long-Term Performance – TOMs, Austin District

Long-Term Distress Performance (2008-2014)



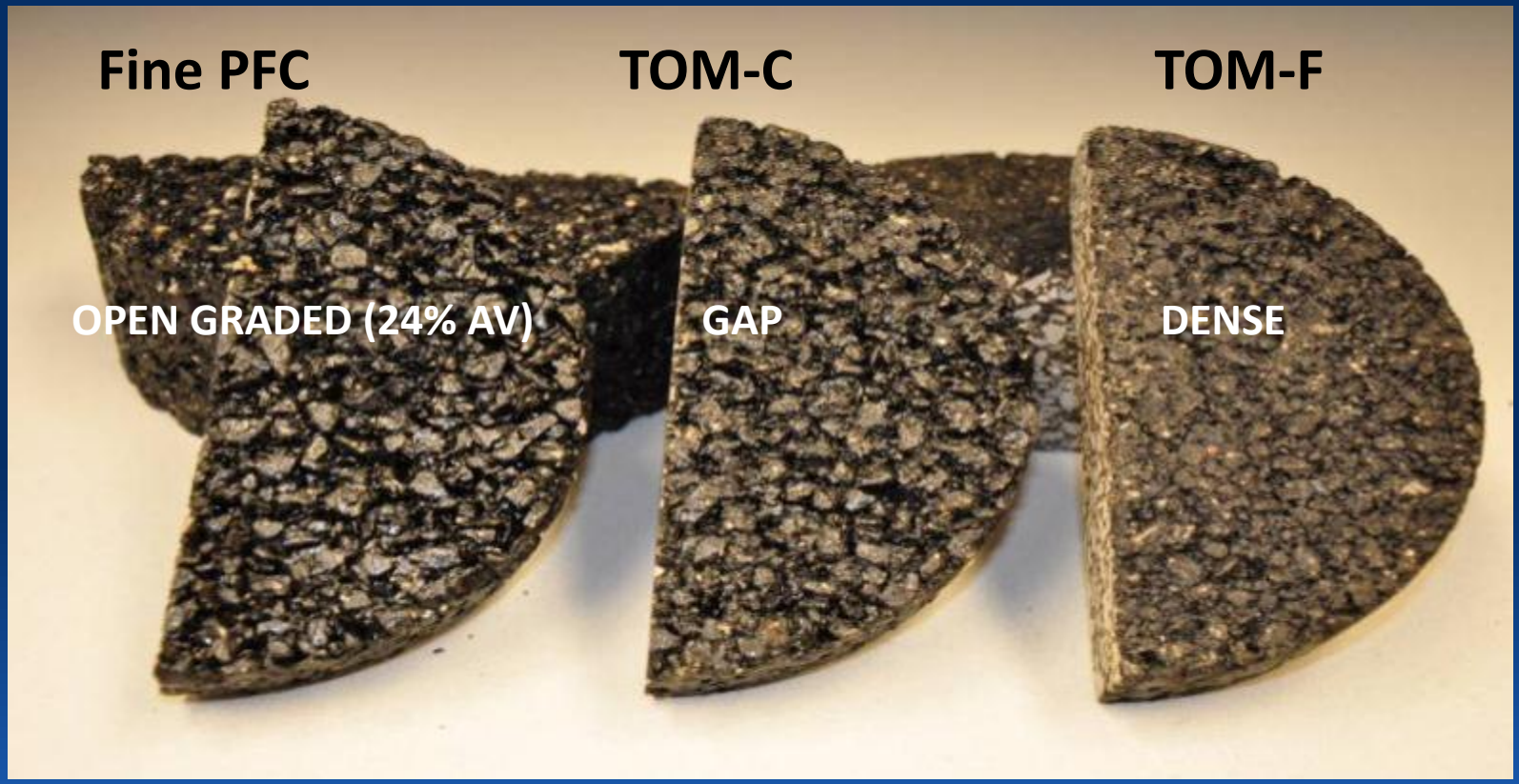
Types of Thin Overlays

Aggregate Components

Grade 5 (1/4 inch)

Screenings

Mixture Types

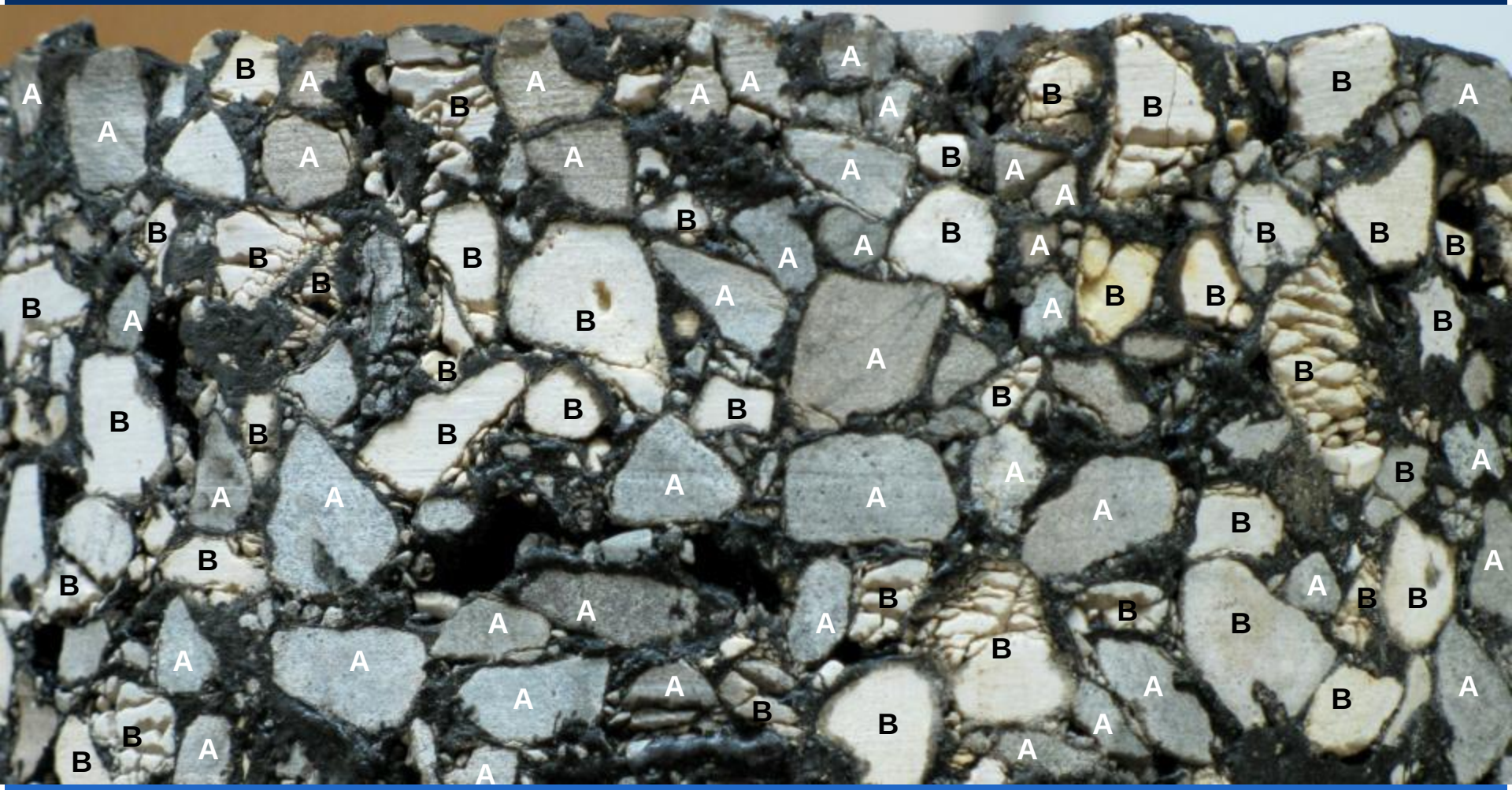


- 30% Cost savings over traditional mixes - lifts of 1 inch or less
- Pass Rutting (HWTT) and Cracking (OT) performance tests
- Mandate PG 76-22 SAC A Grade 5 Rock + Screenings
- Structurally Sound Pavements ONLY

Key Components of Mix Design and Material Properties

- High-quality aggregate – SAC A for high volume roads
- PG 70 or 76 (Polymer Modified binders)
- RAP and RAS (shingles) not allowed
- Minimum binder content (Over 6%)
- Pay for binder separately ??
- Performance test requirements
- Warm mix additives (for long haul distances)

SAC A and SAC B blending



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Mix Design and Specifications

TOM-C and TOM-F Specification

Item 347

Thin Overlay Mixtures (TOM)

Texas Department of Transportation

1. DESCRIPTION

Construct a thin surface course composed of a compacted mixture of aggregate and asphalt binder mixed hot in a mixing plant. Produce a thin surface course with a minimum lift thickness of 1/2 in. for TOM Type F mixture and 3/4 in. for TOM Type C mixture.

Higher Aggregate Quality Requirements

Table 1
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	Tex-499-A (AQMP)	A[1]
Deleterious material, %, Max	Tex-217-F, Part I	1.5
Decantation, %, Max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, %	Tex-461-A	Note[2]
Los Angeles abrasion, %, Max	Tex-410-A	30
Magnesium sulfate soundness, 5 cycles, %, Max	Tex-411-A	20
Crushed face count,[3] %, Min	Tex-460-A, Part I	95
Flat and elongated particles @ 5:1, %, Max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, %, Max	Tex-107-E	3
Combined Aggregate[4]		
Sand equivalent, %, Min	Tex-203-F	45

1. Surface Aggregate Classification of "A" is required unless otherwise shown on the plans.
2. Used to estimate the magnesium sulfate soundness loss in accordance with Section 347.2.1.1.2., "Micro-Deval Abrasion."
3. Only applies to crushed gravel.
4. Aggregates, without mineral filler or additives, combined as used in the job-mix formula (JMF).

Thermal Imaging Requirement

4.7.1.1. **When Using a Thermal Imaging System**. The Contractor may pave any time the roadway is dry and the roadway surface temperature is at least 32°F; however, the Engineer may restrict the Contractor from paving surface mixtures if the ambient temperature is likely to drop below 32°F within 12 hr. of paving. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 347.4.7.3.1.2., "Thermal Imaging System."

Bogus delete this

4.7.1.1. **When Using a Thermal Imaging System**. The Contractor may pave any time the roadway is dry and the roadway surface temperature is at least 32°F; however, the Engineer may restrict the Contractor from paving surface mixtures if the ambient temperature is likely to drop below 32°F within 12 hr. of paving. Provide output data from the thermal imaging system to demonstrate to the Engineer that no recurring severe thermal segregation exists in accordance with Section 347.4.7.3.1.2., "Thermal Imaging System.

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Critical Requirement

4.7.2. **Tack Coat**. Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate

Trackless Tack strongly recommended

Houston's Plan Notes 1 of 2

Item 347: Thin Overlay Mixture (TOM)

Provide an asphalt binder PG 76-22. Substitution of the PG binder is not allowed.

Place mixture at the compacted lift thickness of one (1) inch.

Provide 100% SAC "A" aggregate. Blending of coarse aggregate is not allowed. A maximum of 25% SAC "B" screening material can be used.

Do not use RAP and RAS in the mixture.

A Pave-IR system or Thermal camera system is mandatory for this project. The contractor must demonstrate that the mixture is being placed with no severe thermal segregation.

Provide a mix which lasts more than 500 cycles in the Overlay Tester.

For breakdown rolling use two steel-wheel rollers working in tandem without excessive breakage of the aggregate and provide a smooth surface and uniform texture, keeping the rollers as close as possible to the lay-down machine. Do not use pneumatic-tire rollers. Use a steel wheel as the finish roller.

Houston's Plan Notes 2 of 2

Water flow measurements as per Tx Method 246 are mandatory for setting rolling patterns. The contractor must report the selected patterns to TxDOT and show that it meets the water flow requirements

ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/TMS/200-F_series/pdfs/bit246.pdf

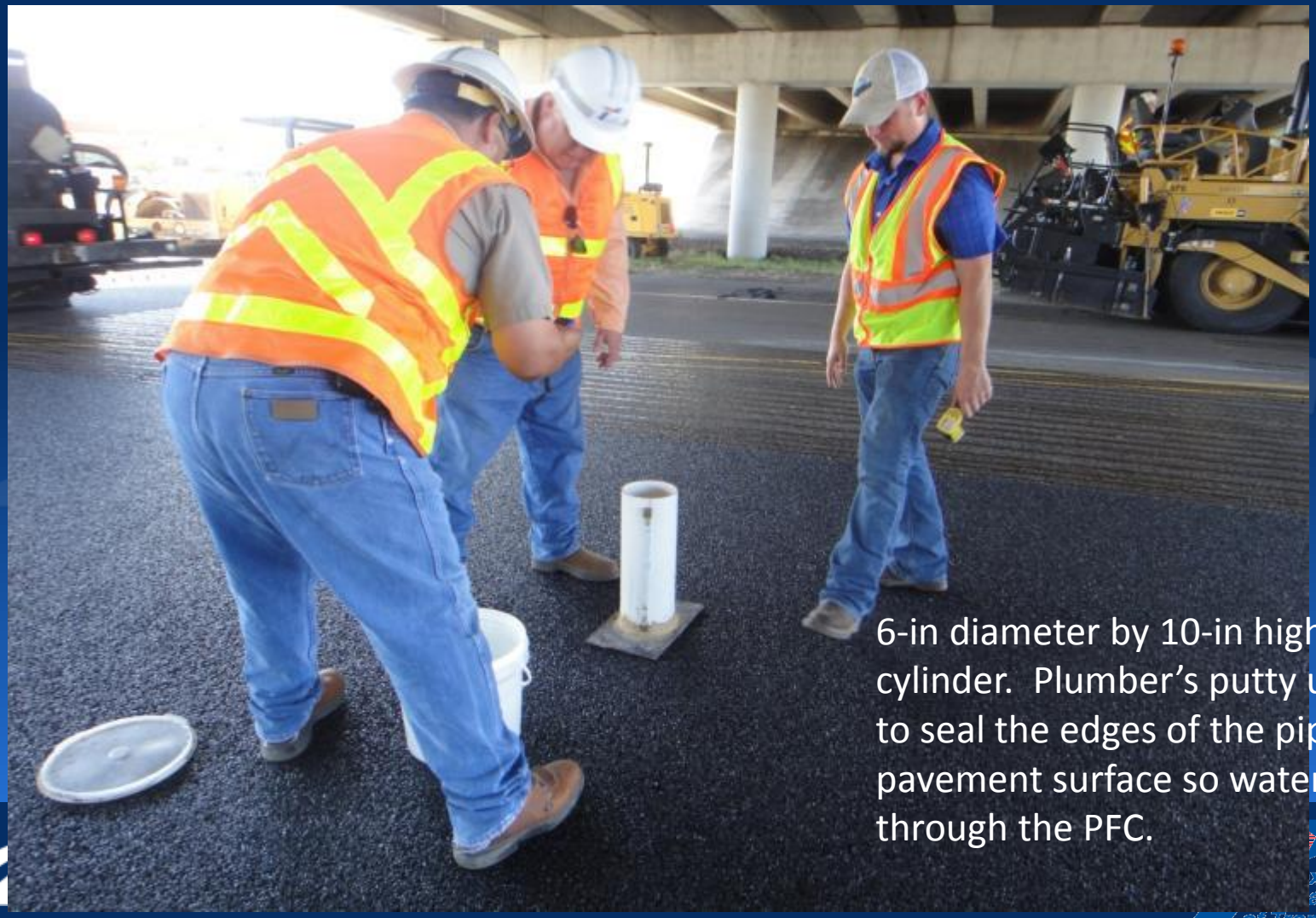
Avoid excessive compaction where water flows of greater than 10 minutes are not allowed, the final surface must have acceptable macro-texture.

The tack coat must be a hot applied trackless tack.

All construction joints must be placed under the paint stripes between the lanes. (No joints near wheel paths)

Performance test will be required on all mix design and trial batch samples, for each mold 6 samples at optimum asphalt content at 7% air voids content each will be 6 inches in diameter by 2.4 inches thick (Hamburg sized samples). The samples are to be sent to the Texas Transportation Institute (TTI) for Hamburg Wheel Test and Overlay test. This work is subsidiary to the various bid items.

Typical Water Flow – 6 seconds for PFC



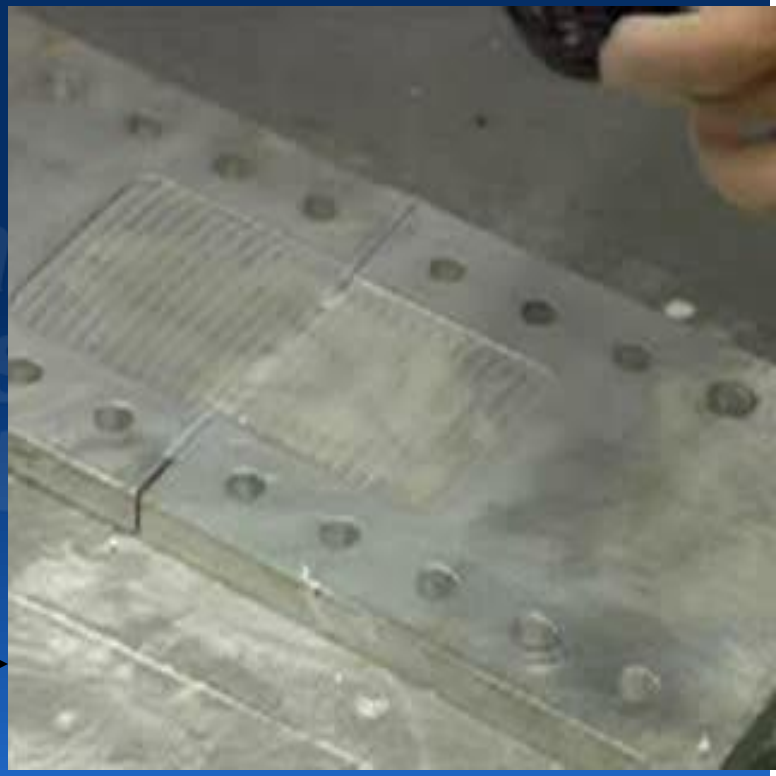
6-in diameter by 10-in high cylinder. Plumber's putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.

New Approaches to Mix Design

Balancing Rutting and Reflection Cracking Requirements

Rutting test

Standard prep



Reflection Cracking test

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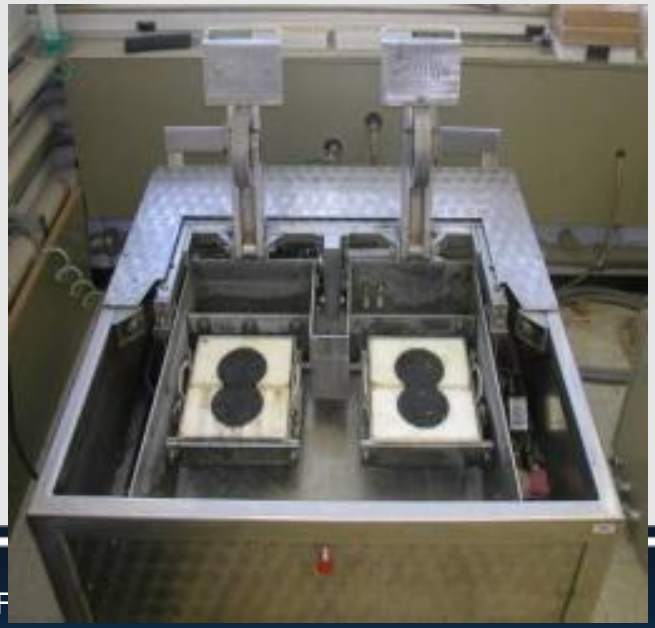
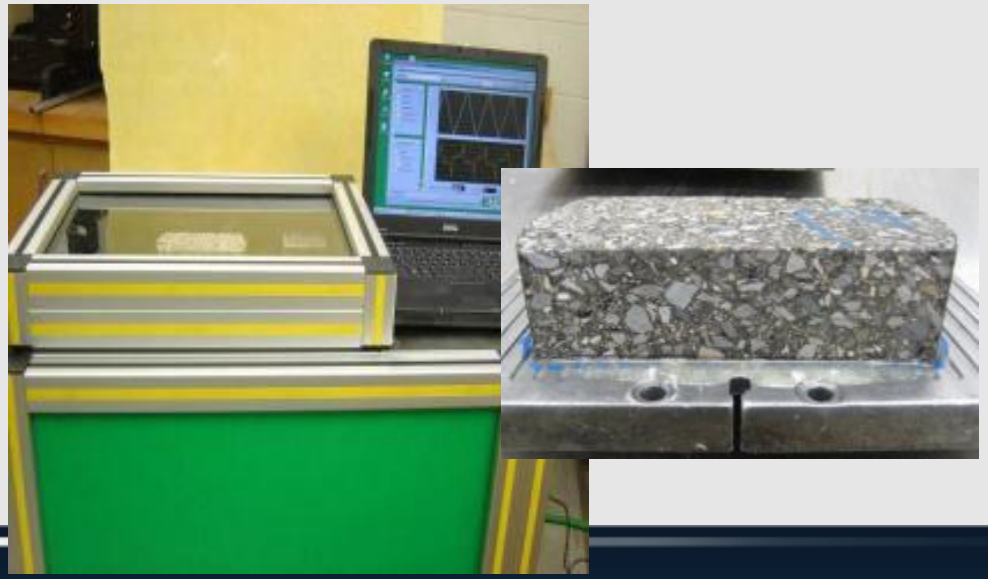
Mix Design & Material Properties

Laboratory Mixture Design Properties

Mixture Property	Test Method	Requirement
Target laboratory-molded density, % (TGC)	Tex 207 F	97.5[1]
Design gyrations (Ndesign for SGC)	Tex-241-F	50[2]
Hamburg Wheel test, passes at 12.5 mm rut depth for PG 70 mixtures	Tex-242-F	15,000 Min
Hamburg Wheel test, passes at 12.5 mm rut depth for PG 76 mixtures	Tex-242-F	20,000 Min
Tensile strength (dry), psi.	Tex-226-F	85-200
Overlay test, number of cycles	Tex-248-F	300 Min
Drain-down, %	Tex-235-F	0.20 Max





Century Asphalts TOM Mix for Houston
HWTT = 5.4 and 3.9 mm OT =1000 cycles

Conventional vs. TOM Surface Mixes

Properties	*Conventional HMA*	*TOM-C*	*TOM-F*
Gradation	Dense	GAP	Dense
Polymer Modified AC	Maybe	Yes	Yes
High Quality Aggr.	Maybe	Yes	Yes
AC Content	~ 4.8 – 5.2%	6.0% min	6.5% min
RAP	Yes	No	No
RAS	Yes	No	No
Rutting Requirement	Yes	Yes	Yes
Cracking Requirement	No	Yes	Yes

Fine PFC Specification

Item 342

Permeable Friction Course (PFC)

Texas Department of Transportation

1. DESCRIPTION

Construct a hot-mix asphalt (HMA) surface course composed of a compacted permeable mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant.

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Table 4
Master Gradation Limits (% Passing by Weight or Volume) and Laboratory Mixture Design Properties

Sieve Size	PG 76 Mixtures		A-R Mixtures		Test Procedure
	Fine (PFC-F)	Coarse (PFC-C)	Fine (PFCR-F)	Coarse (PFCR-C)	
3/4"	–	100.0[1]	100.0[1]	100.0[1]	Tex-200-F
1/2"	100.0[1]	80.0-100.0	95.0-100.0	80.0-100.0	
3/8"	95.0-100.0	35.0-60.0	50.0-80.0	35.0-60.0	
#4	20.0-55.0	1.0-20.0	0.0-8.0	0.0-20.0	
#8	1.0-10.0	1.0-10.0	0.0-4.0	0.0-10.0	
#200	1.0-4.0	1.0-4.0	0.0-4.0	0.0-4.0	
Mixture Properties					
Asphalt binder content, %	6.0-7.0	6.0-7.0	8.0-10.0	7.0-9.0	–
Design gyrations (Ndesign)	50	50	50	50	Tex-241-F
Lab-molded density, %	78.0 Max	82.0 Max	82.0 Max	82.0 Max	Tex-207-F
Hamburg Wheel test,[2] passes at 12.5 mm rut depth	10,000 Min[3]	Note[2]	Note[2]	Note[2]	Tex-242-F
Overlay tester,[2] number of cycles	200 Min	Note[2]	Note[2]	Note[2]	Tex-248-F
Drain-down, %	0.10 Max	0.10 Max	0.10 Max	0.10 Max	Tex-235-F
Fiber content, % by wt. of total PG 76 mixture	0.20[4]-0.50	0.20[4]-0.50	–	–	Calculated
Lime content, % by wt. of total aggregate	1.0[5]	1.0[5]	1.0[5]	1.0[5]	Calculated
CRM content, % by wt. of A-R binder	–	–	15.0 Min	15.0 Min	Calculated
Boil test[6]	–	–	–	–	Tex-530-C
Cantabro loss, %	20.0 Max	20.0 Max	20.0 Max	20.0 Max	Tex-245-F

Fine PFC vs Conventional PFC

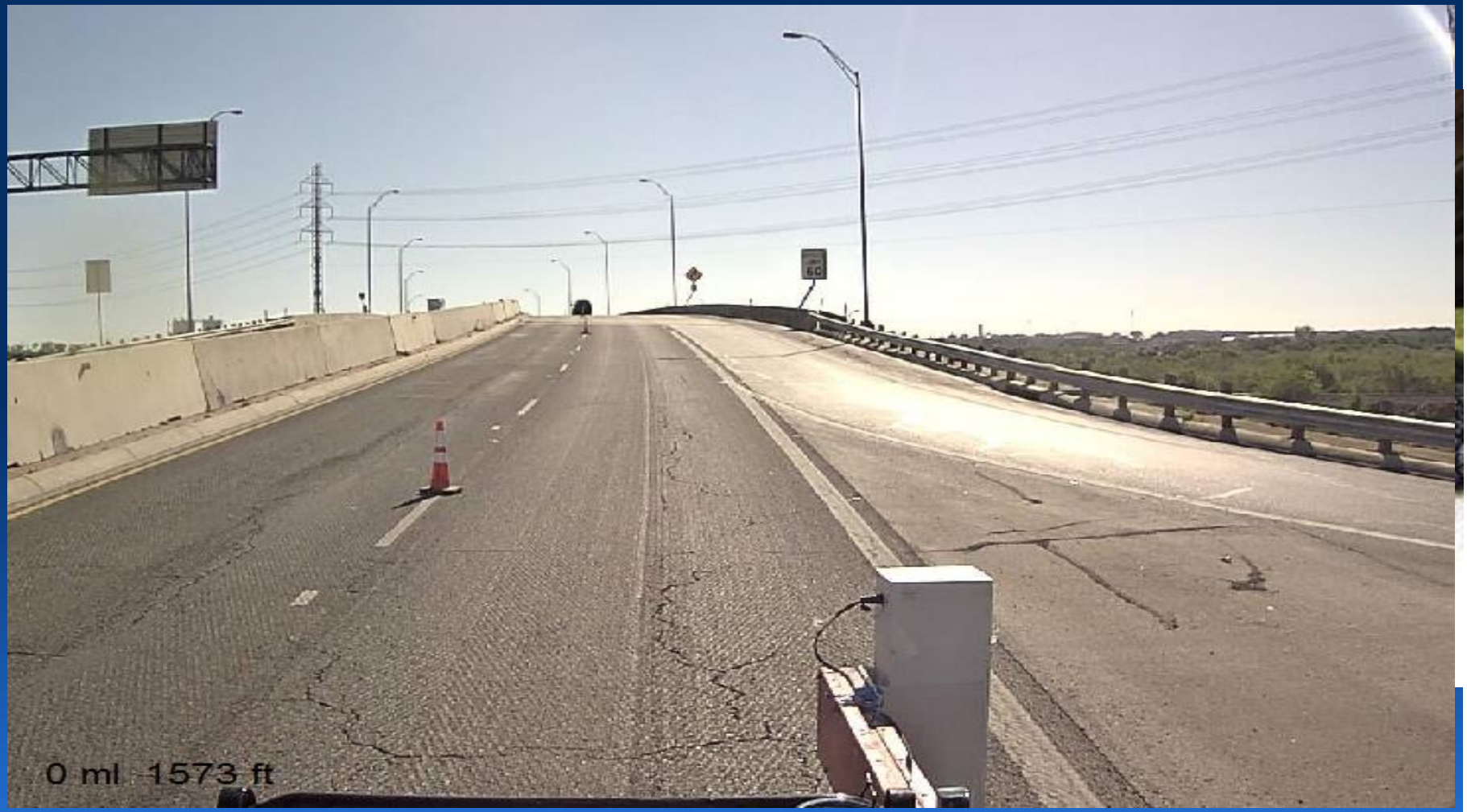
Thin (<1 inch) Overlays

Type 1 Fine PFC (Item 342) 0.75 to 1 inch
Safety/drainage/noise/bleeding

Type 2 TOM-F (Item 347) 0.5 to 1 inch
Rut/crack/urban areas/ultra thin

Type 3 TOM-C (Item 347) 0.75 to 1 inch
Rut/crack resistance/skid/high speed

Good Candidates for TOM C –



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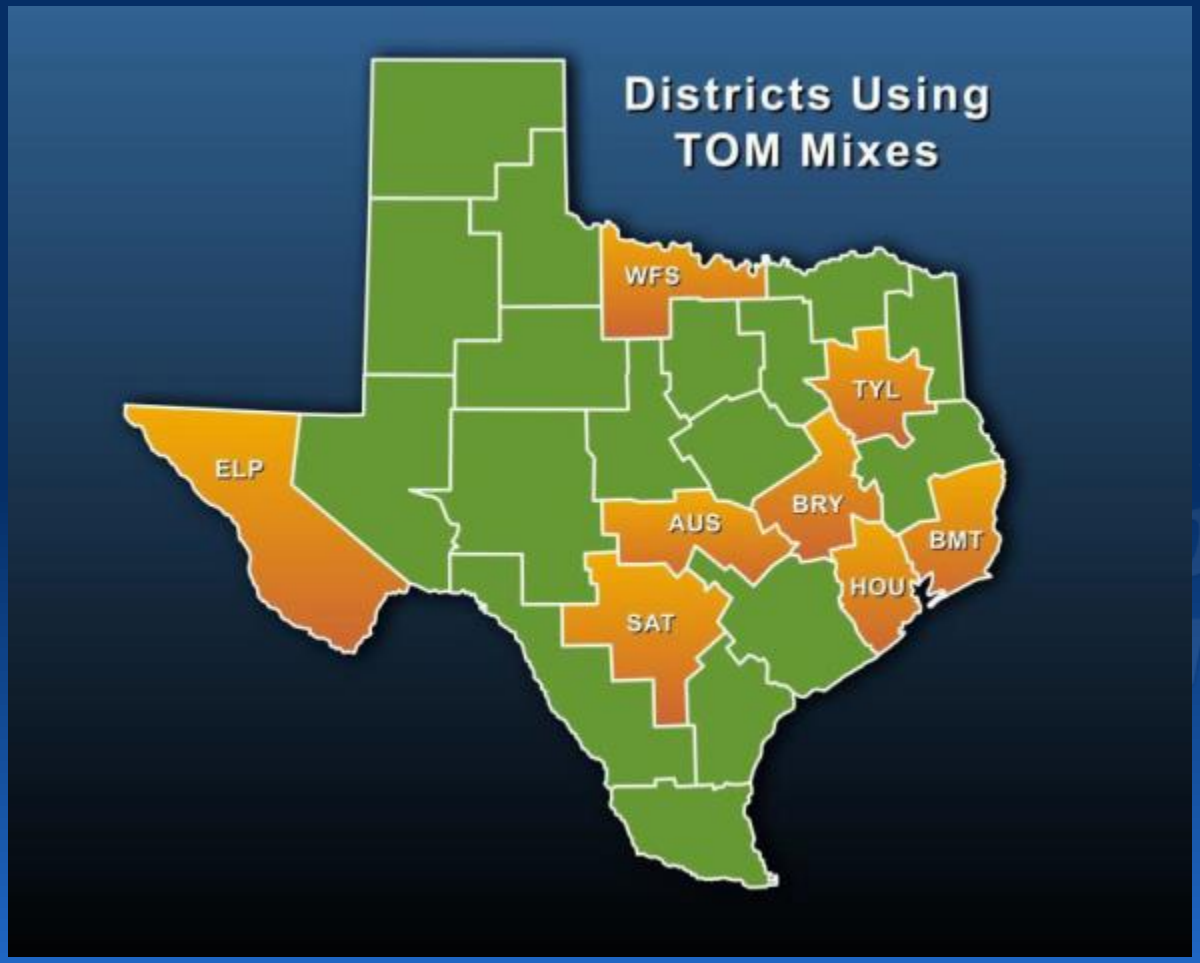
District Use of TOM-C



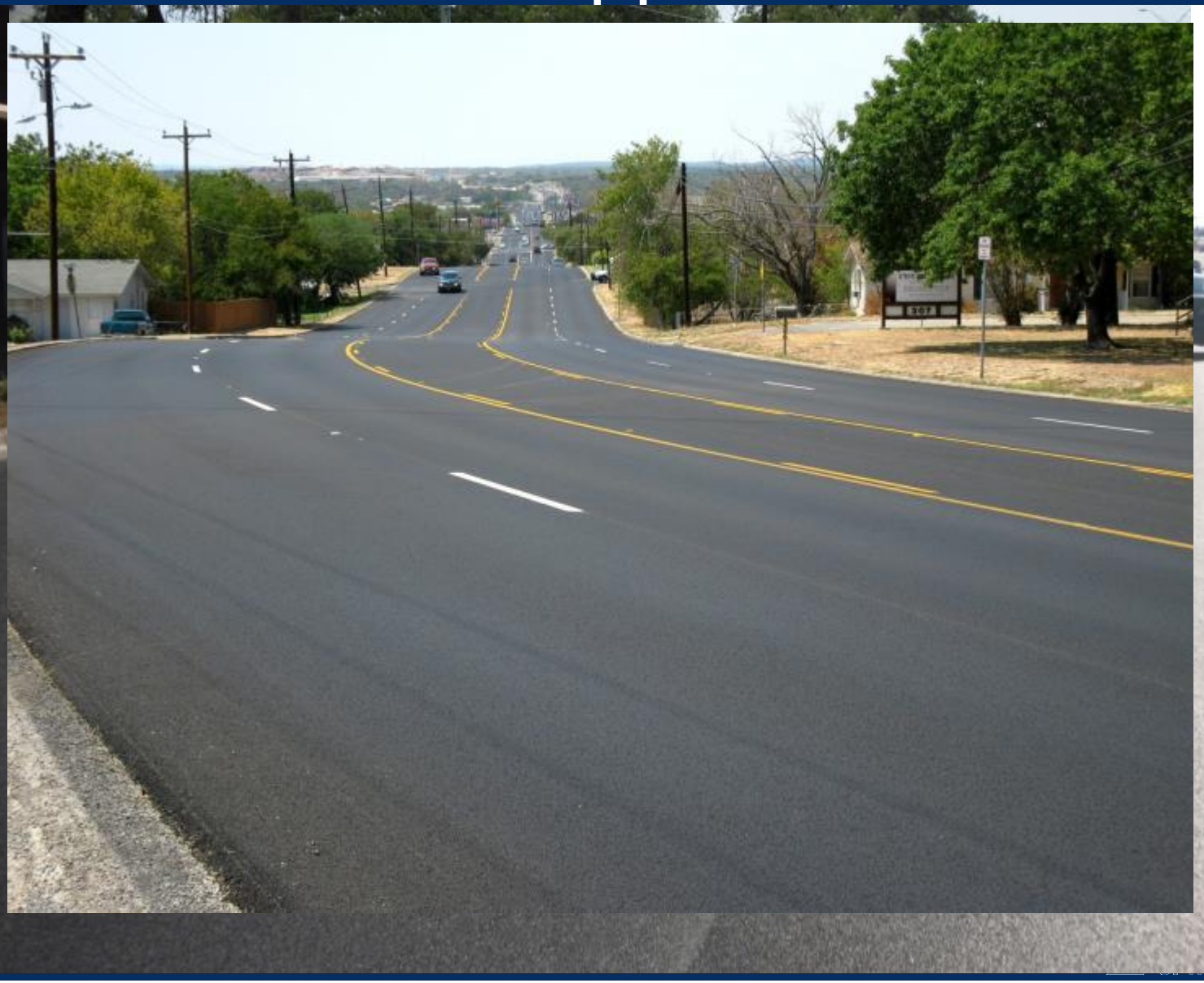
Houston Projects

- **US 59 Main lanes**
- **US 59 Frontage Roads**
- **IH 45**
- **FM 1488**
- **FM 1887**

Upcoming

- **FM 1960**

Successful High Volume Traffic TOM-C Applications



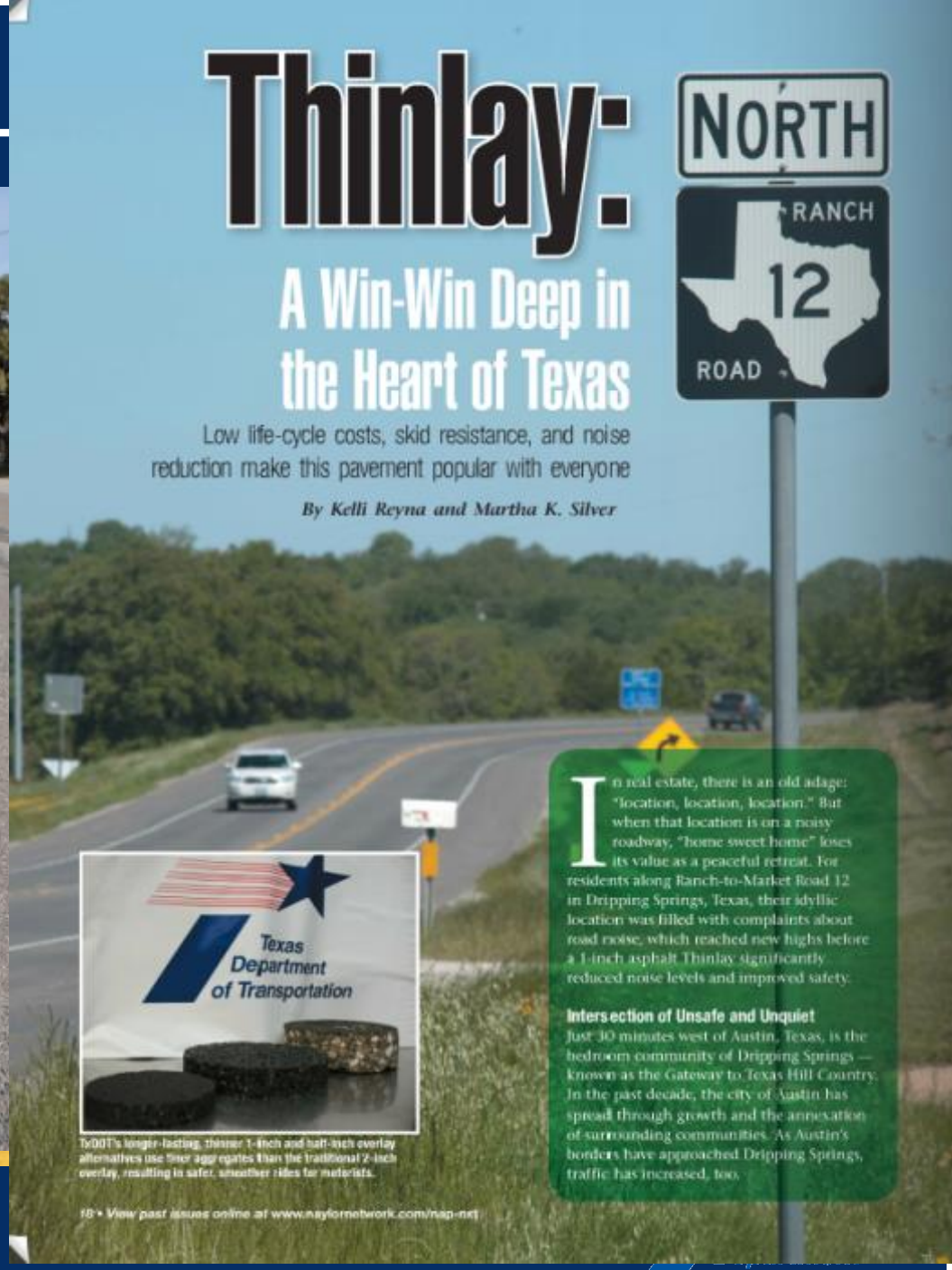
Successful Low T

Thinlay:

A Win-Win Deep in the Heart of Texas

Low life-cycle costs, skid resistance, and noise reduction make this pavement popular with everyone

By Kelli Reyna and Martha K. Silver



In real estate, there is an old adage: "location, location, location." But when that location is on a noisy roadway, "home sweet home" loses its value as a peaceful retreat. For residents along Ranch-to-Market Road 12 in Dripping Springs, Texas, their idyllic location was filled with complaints about road noise, which reached new highs before a 1-inch asphalt Thinlay significantly reduced noise levels and improved safety.

Intersection of Unsafe and Unquiet

Just 30 minutes west of Austin, Texas, is the bedroom community of Dripping Springs — known as the Gateway to Texas Hill Country. In the past decade, the city of Austin has spread through growth and the annexation of surrounding communities. As Austin's borders have approached Dripping Springs, traffic has increased, too.

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TxDOT's longer-lasting, thinner 1-inch and half-inch overlay alternatives use finer aggregates than the traditional 2-inch overlay, resulting in safer, smoother rides for motorists.

18 • View past issues online at www.naylornetwork.com/nap-nxt/

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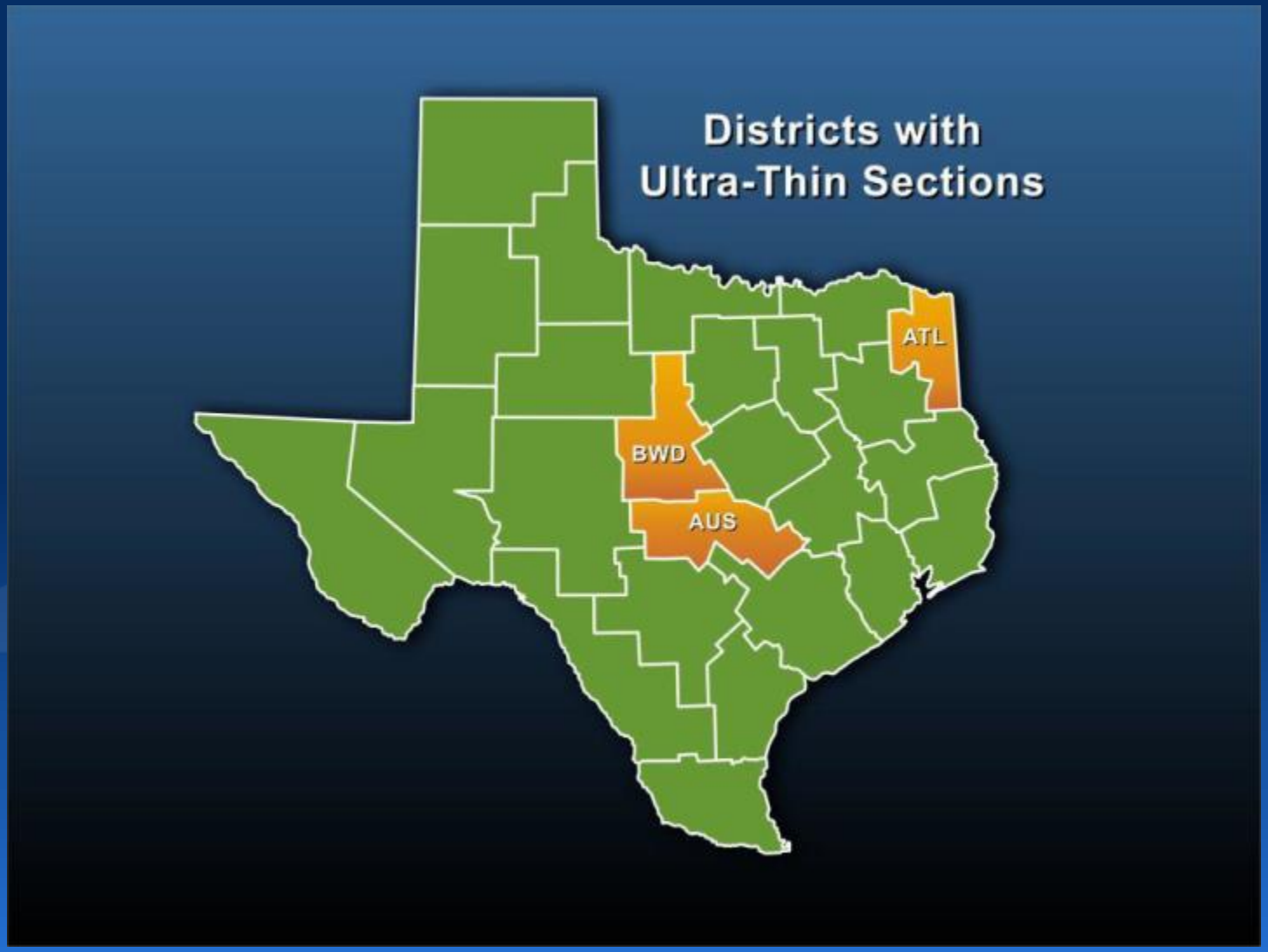
of Transportation

Good Candidates for TOM-F Mixes

- As a maintenance alternative for seal coats.
- Sections where an additional seal coat is not a good option.
- FM 2920 Tomball
  - April 2016

½ to ¾ inch thick

Where ½-in TOM-F Overlays Used



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Successful Uses of TOM-F Mixes

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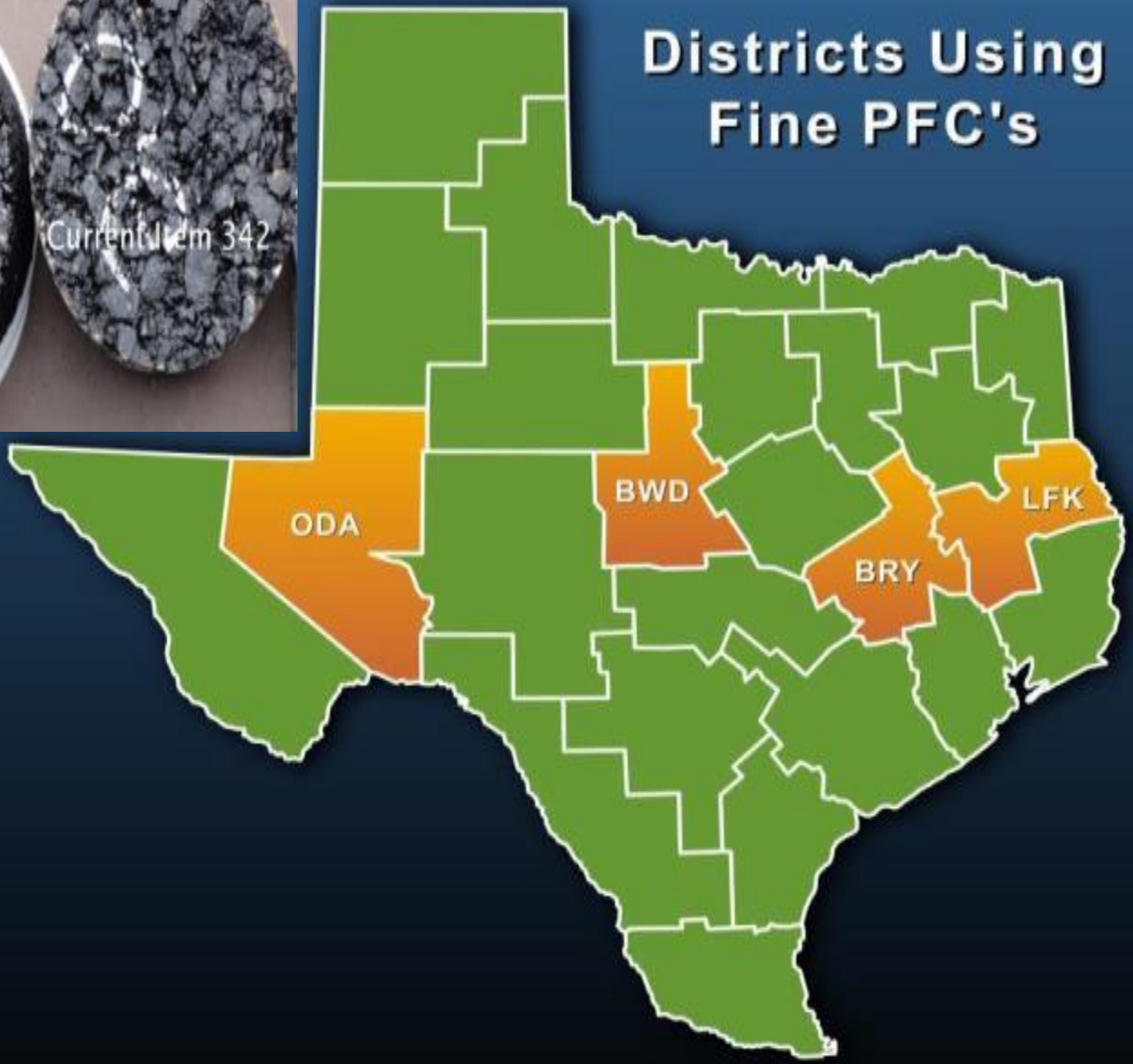
Districts Using Fine PFC's



July 2012 Full Scale Project Brownwood

- Full scale project US 183, Brownwood, to correct bleeding surface trt.
- 8.75 miles, 5000 tons, $97/ton (Zack Burkett), CSJ 6231-69-001

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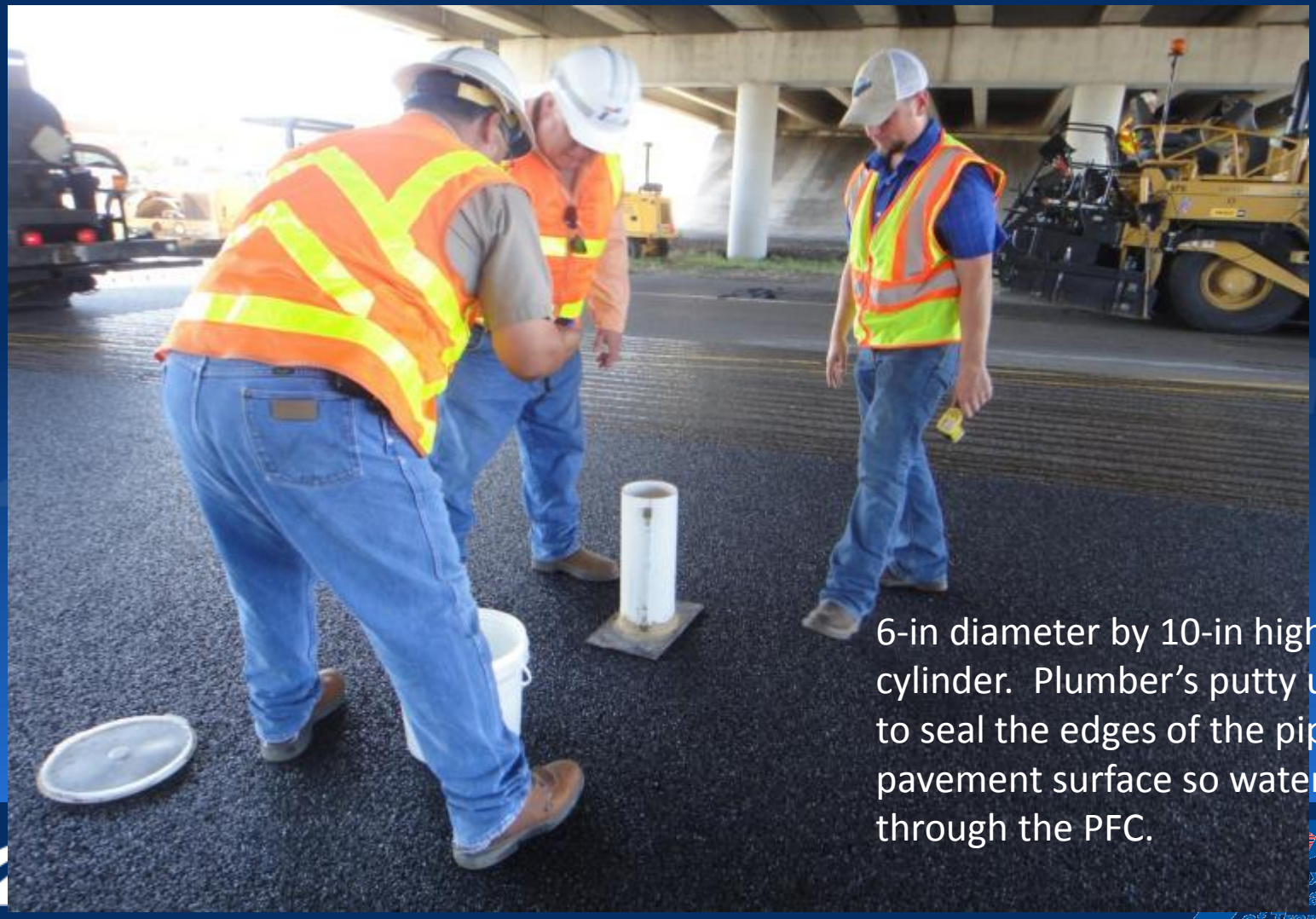
Sept 2012

Cost ~ $3.50 sy yd

Typical Water Flow – 6 seconds



6-in diameter by 10-in high cylinder. Plumber's putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.

Video showing typically traffic

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What's next for Fine PFC

Looking to place Fine PFC over deteriorated existing coarse PFC

Site Selection

Pavement Selection Considerations

- Use on structurally sound pavements – Pavements needing extensive base repair or requiring structural improvement should be avoided.
- Use on pavements requiring only restoration of the surface wearing course properties, such as skid resistance, elimination of surface distresses, improve ride quality, reduce noise.

Good Candidates

- Shallow rutting < ½ in
- Top down cracking
- Longitudinal cracking
- Raveling
- Highly oxidized surface
- Polished surface – restore skid
- Acceptable ride quality (or level up also needed)
- Where cross slope correction not required
- Overlay not needed on shoulders
- CRCP Concrete pavements (Repair failures)
- JCP Concrete (Check joint movement)
- Bridge decks
- Where low noise surface is desired
- Both low and high volume traffic roadways

Candidate Evaluation Process

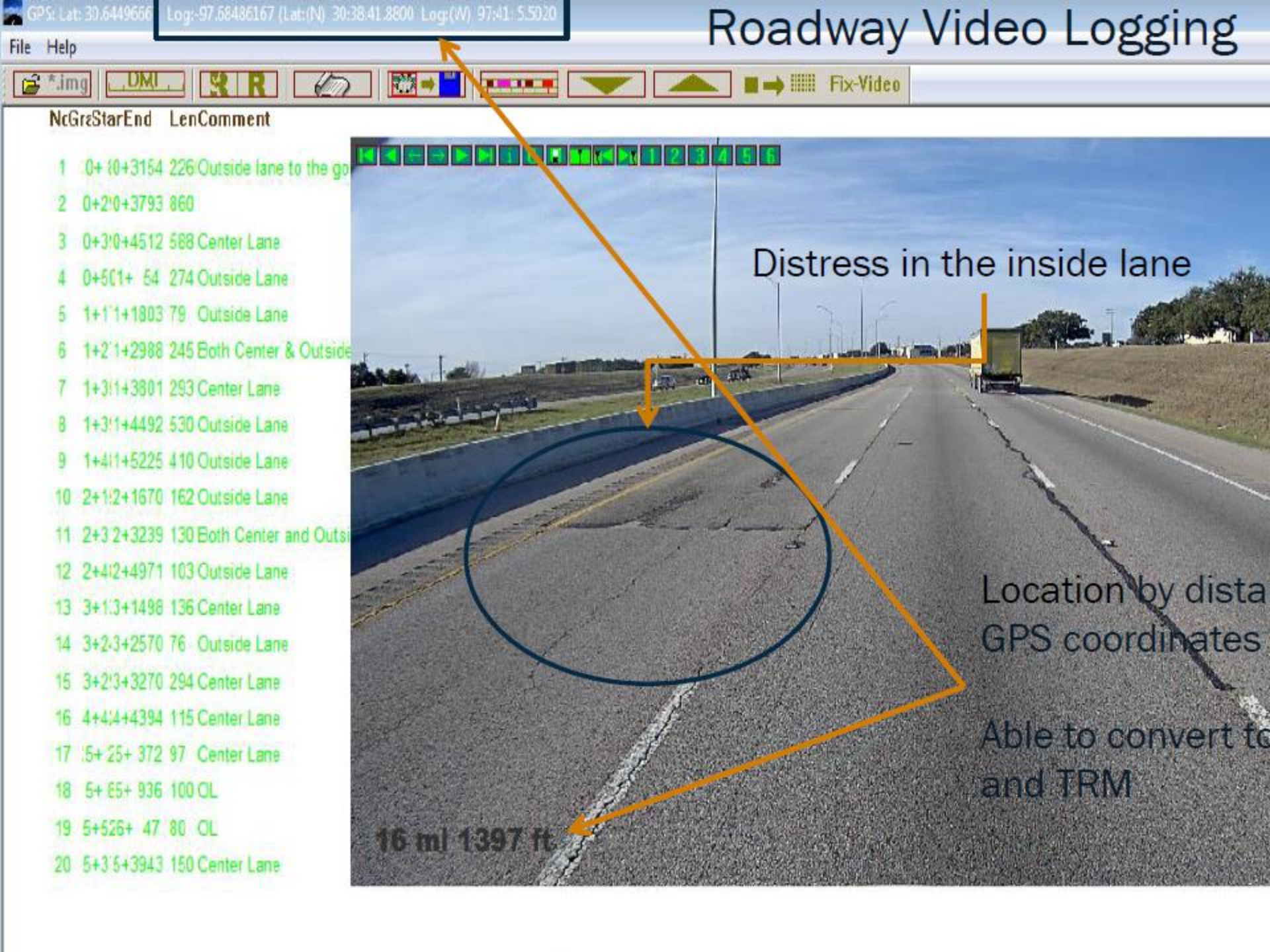
- Is it a good Candidate for a TOM
  - Video Log (always)
  - GPR (Flexible) (if needed)
  - FWD (Flexible) (if needed)
  - TPAD (Concrete – especially Jointed) (if needed)
- If so:
  - what prep work is needed
    - Do I need a level up and/or chip seal?
    - Which areas need patching/milling
  - What problem areas are identified
    - Driveways
    - Intersections

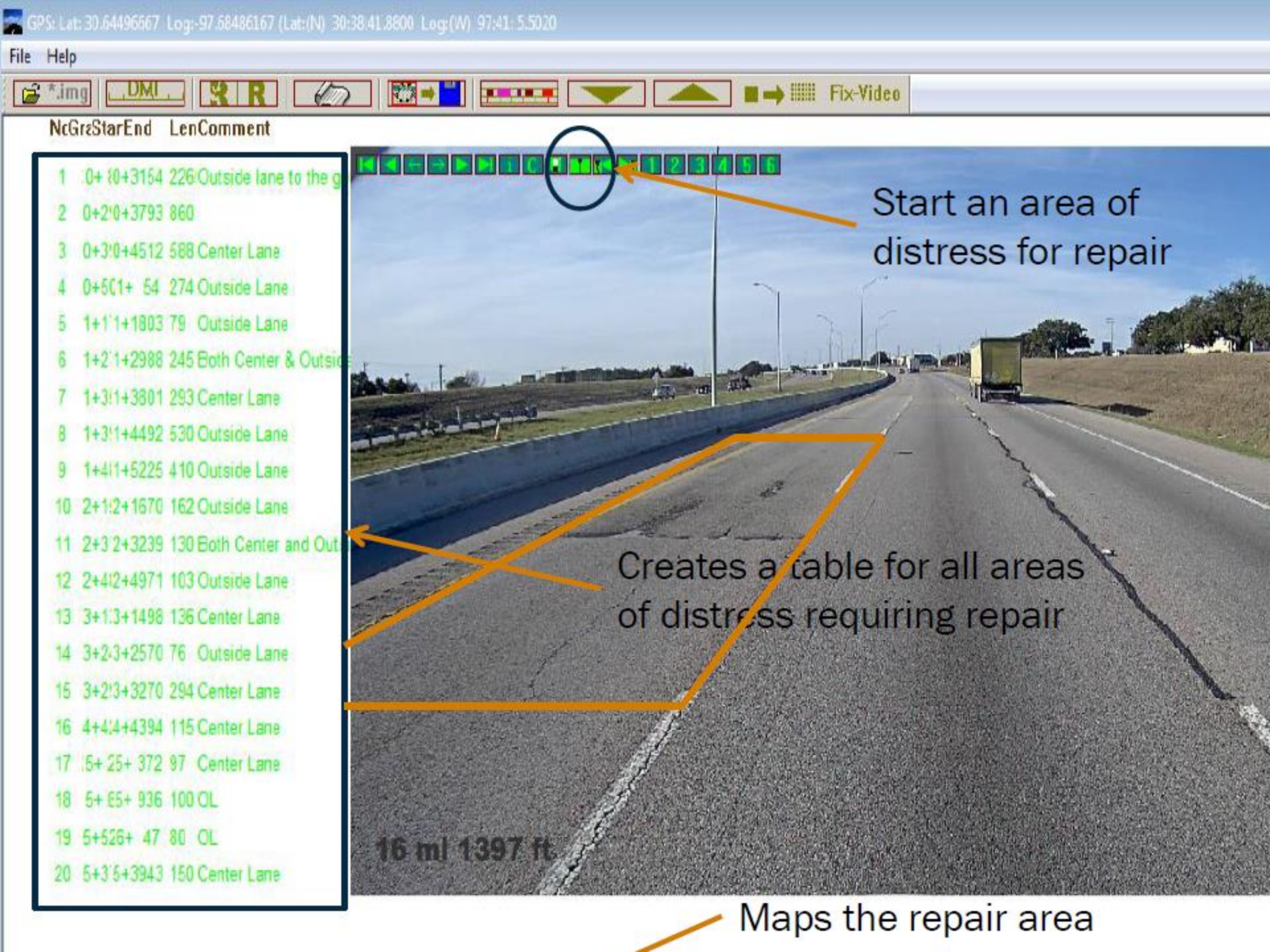
Surface Preparation (Austin District)

- Preparing and Repairing
  - Perform crack sealing and spot repair in highly distressed areas
  - Milled-in shoulder texturing and raised profile markings will reflect through – remove or fill
  - Mill and fill areas with fatigue cracking or shallow rutted areas with a fine dense-graded mix
    - Helps match existing surface
    - Promotes better ride with thin overlay
- Level-up
  - Should get a 25 to 35% improvement in IRI
  - If roughness > 120 in/mile, place level-up

Video Log

Roadway Video Logging




GPS: Lat: 30.64496667 Log:-97.68486167 (Lat:(N) 30:38:41.8800 Log:(W) 97:41: 5.5020
File Help
*.img
DMI
R
Fix-Video
NoGraStarEnd LenComment
1 0+ 0+3154 226 Outside lane to the g
2 0+2 0+3793 860
3 0+3 0+4512 588 Center Lane
4 0+5 1+ 54 274 Outside Lane
5 1+1 1+1803 79 Outside Lane
6 1+2 1+2988 245 Both Center & Outsi
7 1+3 1+3801 293 Center Lane
8 1+3 1+4492 530 Outside Lane
9 1+4 1+5225 410 Outside Lane
10 2+1 2+1670 162 Outside Lane
11 2+3 2+3239 130 Both Center and Out
12 2+4 2+4971 103 Outside Lane
13 3+1 3+1498 136 Center Lane
14 3+2 3+2570 76 Outside Lane
15 3+2 3+3270 294 Center Lane
16 4+4 4+4394 115 Center Lane
17 5+ 5+ 372 97 Center Lane
18 5+ 5+ 936 100 OL
19 5+52 6+ 47 80 OL
20 5+3 5+3943 150 Center Lane
1 2 3 4 5 6
Start an area of distress for repair
Creates a table for all areas of distress requiring repair
16 mi 1397 ft
Maps the repair area

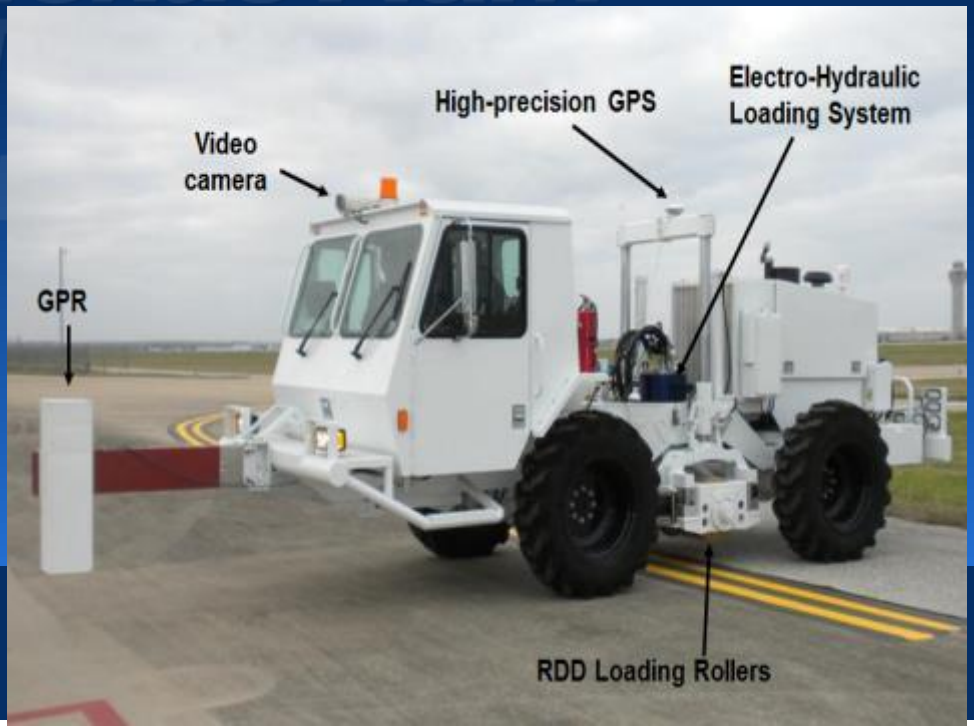
Pavement Selection Consideration for TOMs

Does the Projects have any near surface defects

- Ground Penetrating Radar (GPR): Determine existing pavement thickness, including HMA and base course thickness, near surface defects (stripping)

Pavement Selection Consideration for TOMs

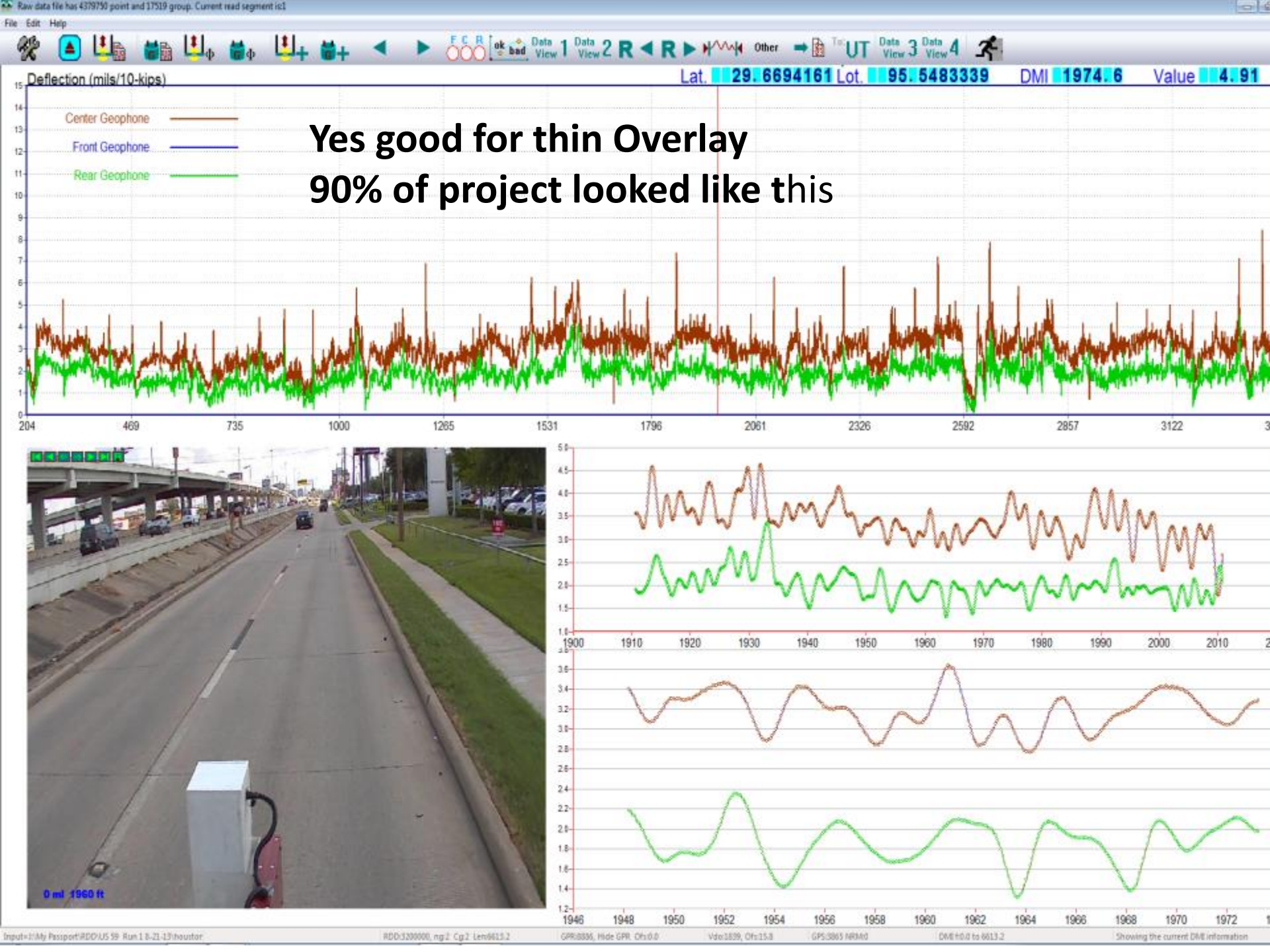
- Is the project structurally OK
  - Falling Weight Deflectometer (Flexible): or TPAD Testing (Concrete)
    Pavement response to determine overall pavement capacity and subgrade support



US 59 Frontage Road BW 8 to Bissonnet to South Gessner

Case 1

Is this JCP a candidate for a Thin Overlay


Raw data file has 4379750 point and 17519 group. Current read segment is:1
File Edit Help
Deflection (mils/10-kips)
Lat. 29.6694161 Lot. 95.5483339 DMI 1974.6 Value 4.91
Center Geophone
Front Geophone
Rear Geophone
Yes good for thin Overlay
90% of project looked like this
0 mi 1960 ft


Deflection (mils/10-kips)
Lat. 29.6802319 Lot. 95.5367013 DMI 7254.0 Value 2.46
Center Geophone
Front Geophone
Rear Geophone
Problem area voided
6867
6903
6939
6975
7012
7048
7084
7120
7156
7192
7228
7264
7300
1 mi 1740 ft
6960
6970
6980
6990
7000
7010
7020
7030
7040
7050
7060
7070
7006
7008
7010
7012
7014
7016
7018
7020
7022
7024
7026
7028
7030
7032

Structurally Deficient – Not Good Candidates

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DO NOT
ENTER
DO NOT
ENTER

Case Study on FM 1960

- Is it a Good candidate
- What areas of Concern


surface
Bottom HMA
Bottom CTB
3+2716
3+3076
3+3436
3+3796
3+4160
3+4520
3+4882
3+5242
4+324
4+684
4+1044
3 mi 4849 ft

Transition from wide shoulder also start of poor surface mix about 1.25 miles east of US 59

Poor Surface Mix raveling (thermal segregation) at least 60% of section

Typical narrow shoulder section
Full edge paving Mill 1 inch

Typical Wide shoulder section Possible only Pave 18 inches inside shoulder and taper mix

Few localized bumps must be milled flat

Few areas with wide cracks

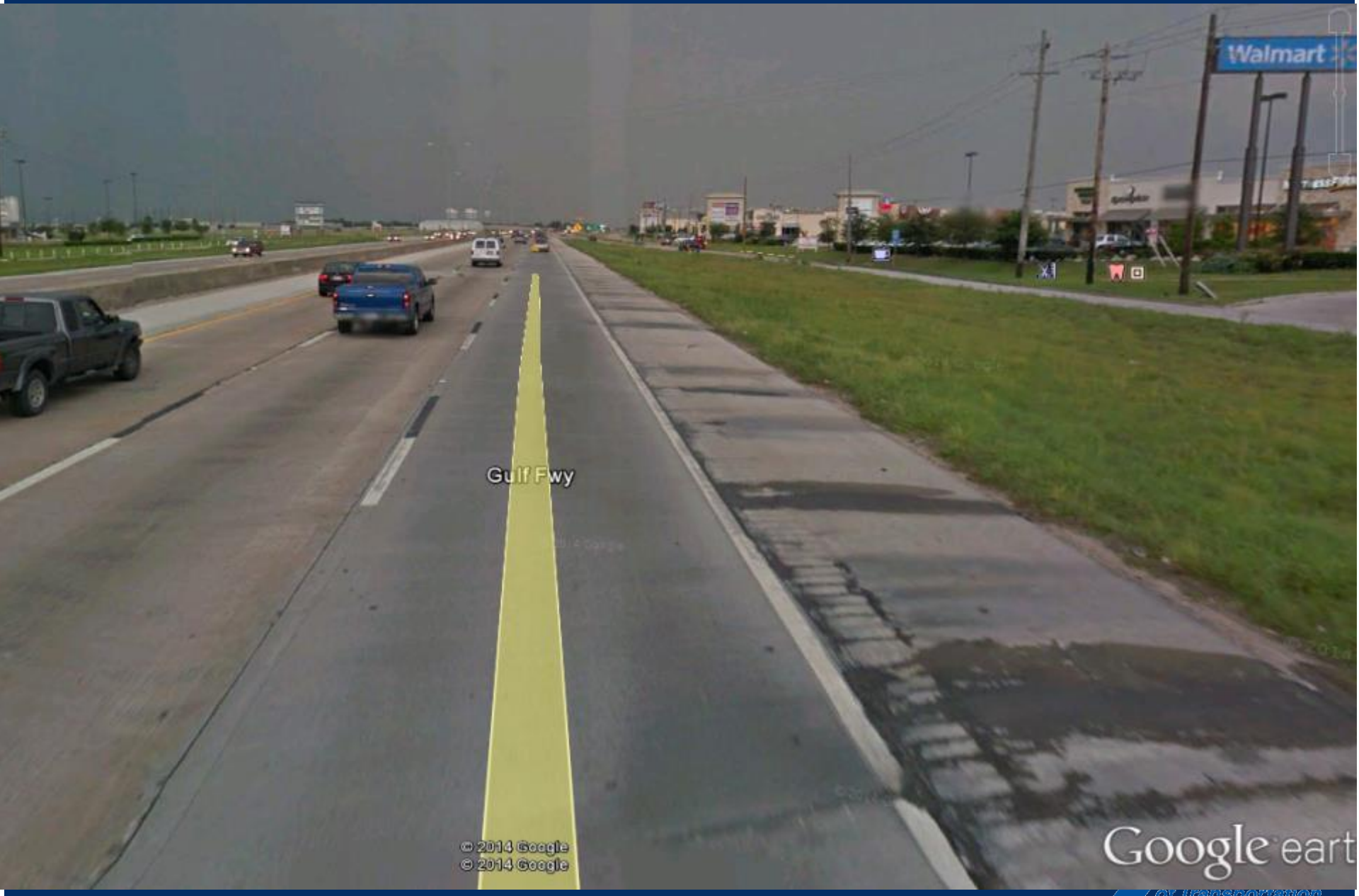
Patch any failures or locations with loose material

Many major intersections

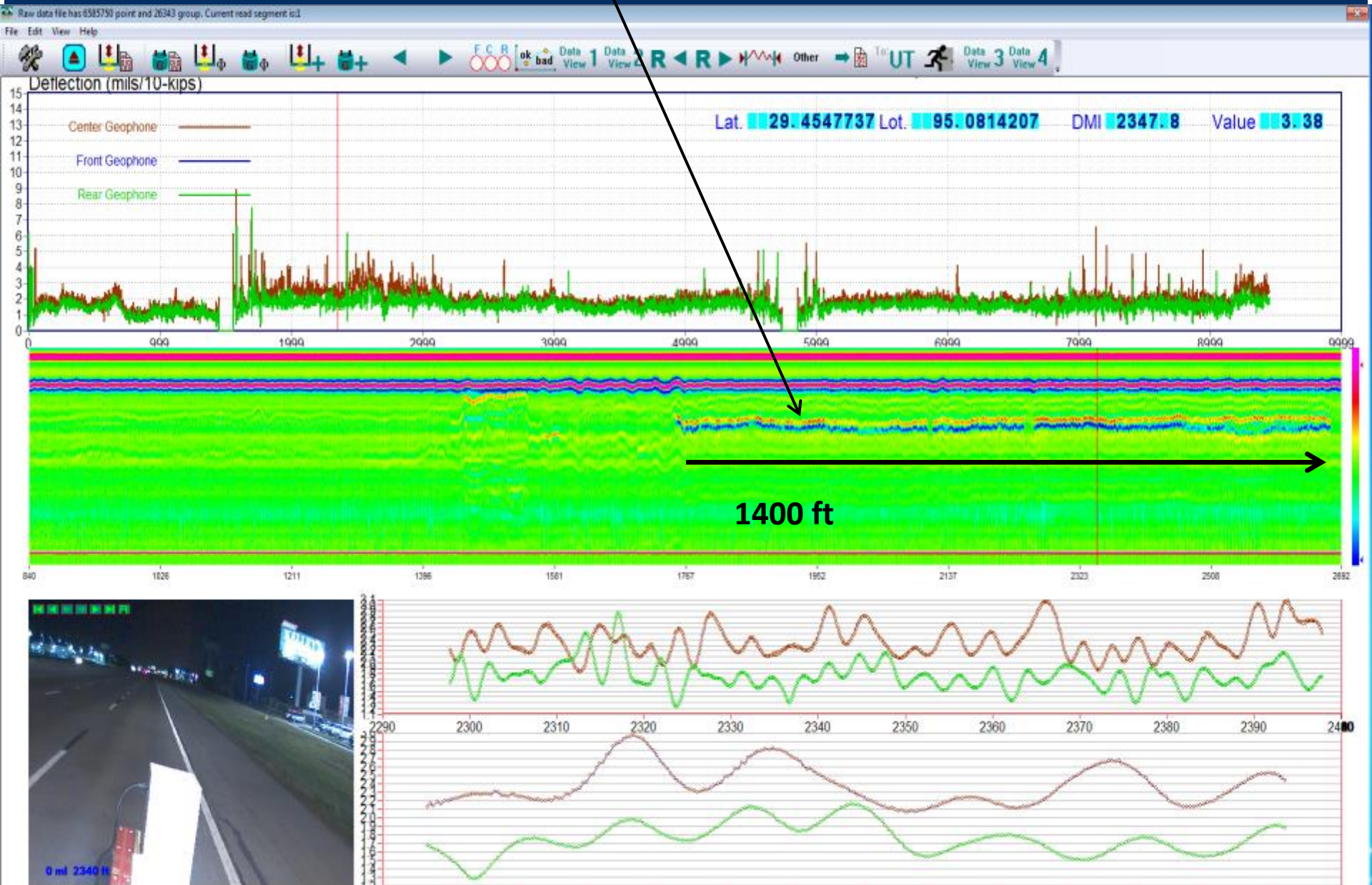
Lots of traffic loops etc

Case Study 2
IH 45

Trapped Water under outside lane ?

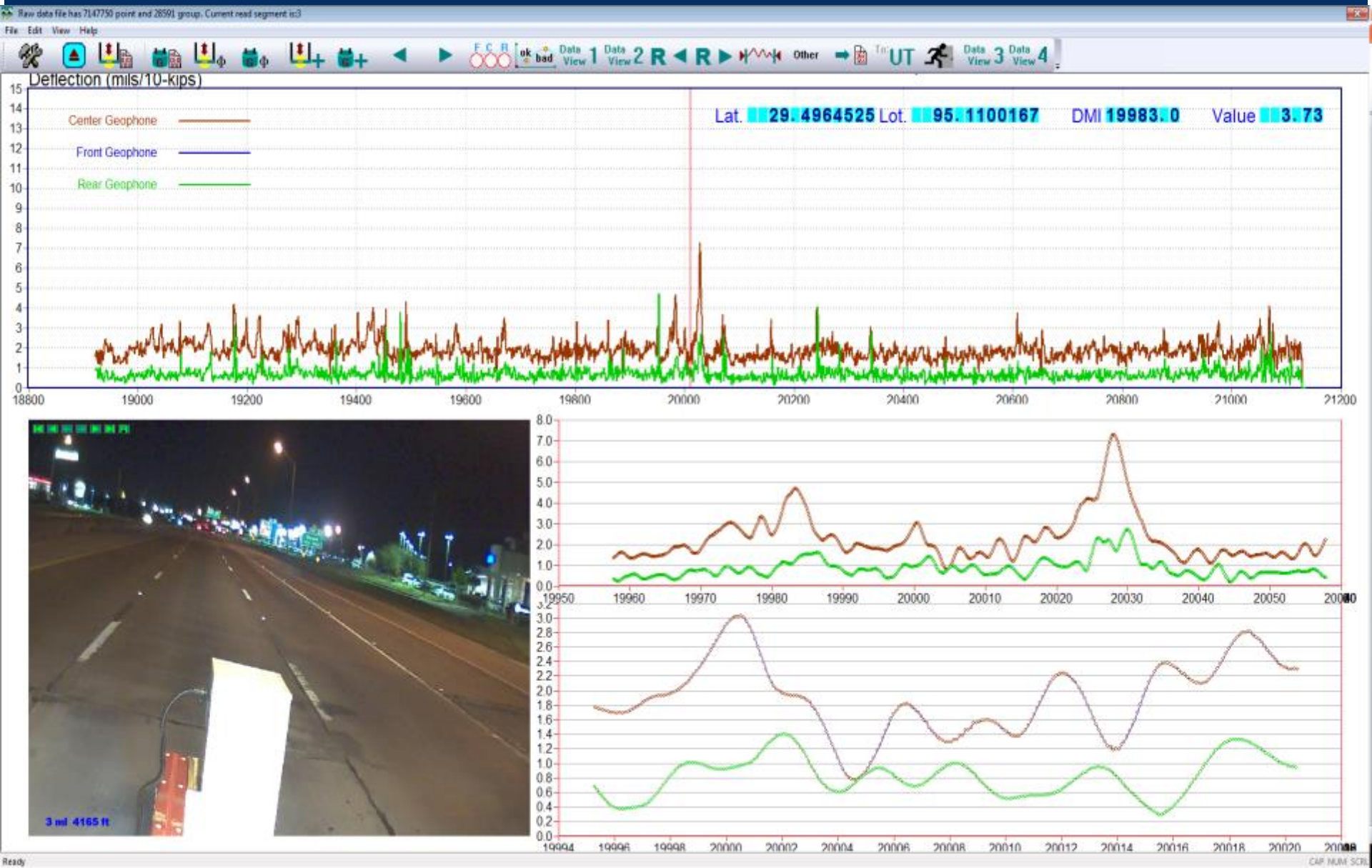


Drill Dry Hole what is this (Moisture/Uretek/grout)



Is this patch stable

NB problem patch

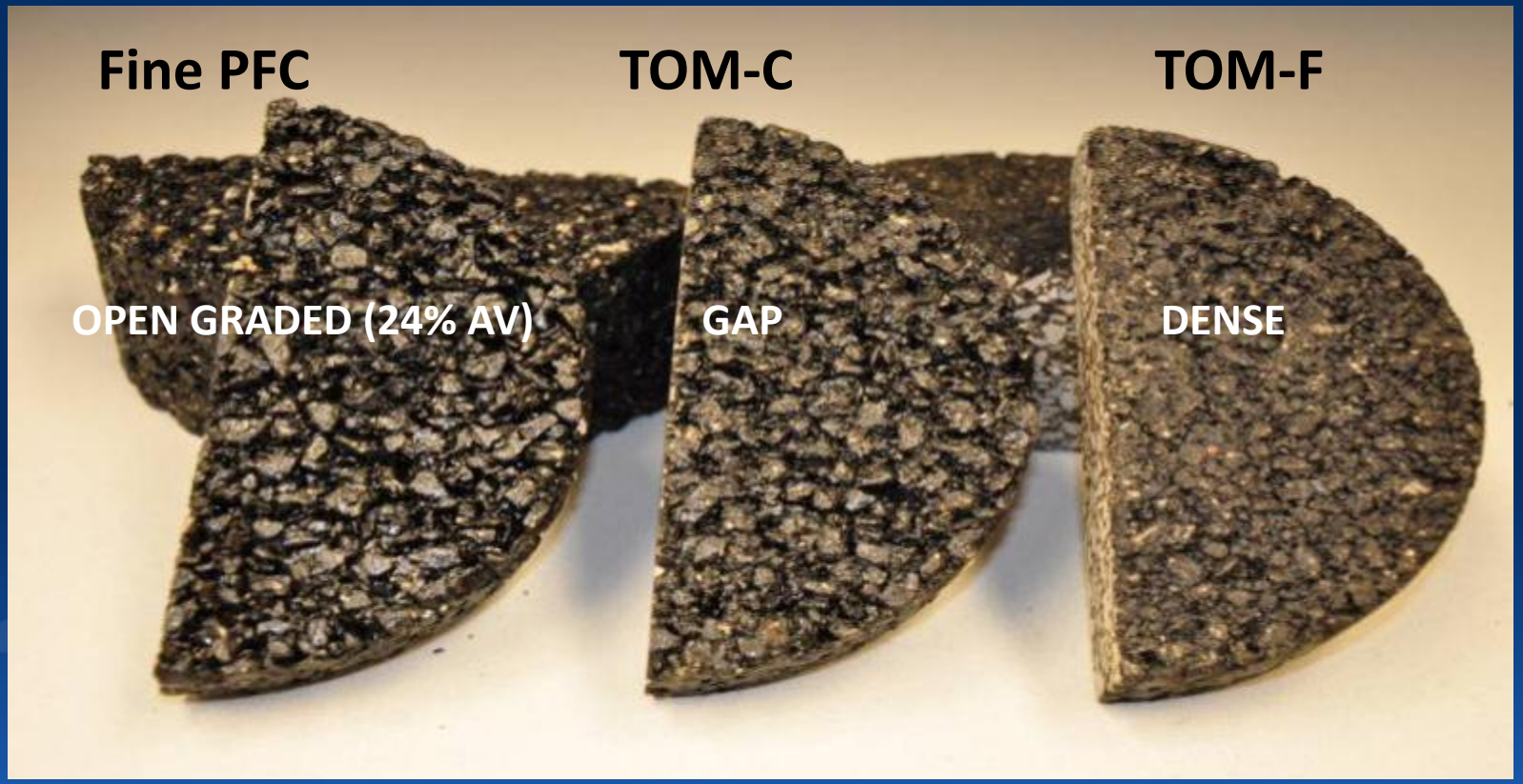


End of Part I of Class

Part II of Class
Project Inspection

- Surface prep
- HMA bonding
- Compaction
- Acceptance

Mixture Types



- 30% Cost savings over traditional mixes - lifts of 1 inch or less
- Pass Rutting (HWTT) and Cracking (OT) performance tests
- Mandate PG 76-22 SAC A Grade 5 Rock + Screenings

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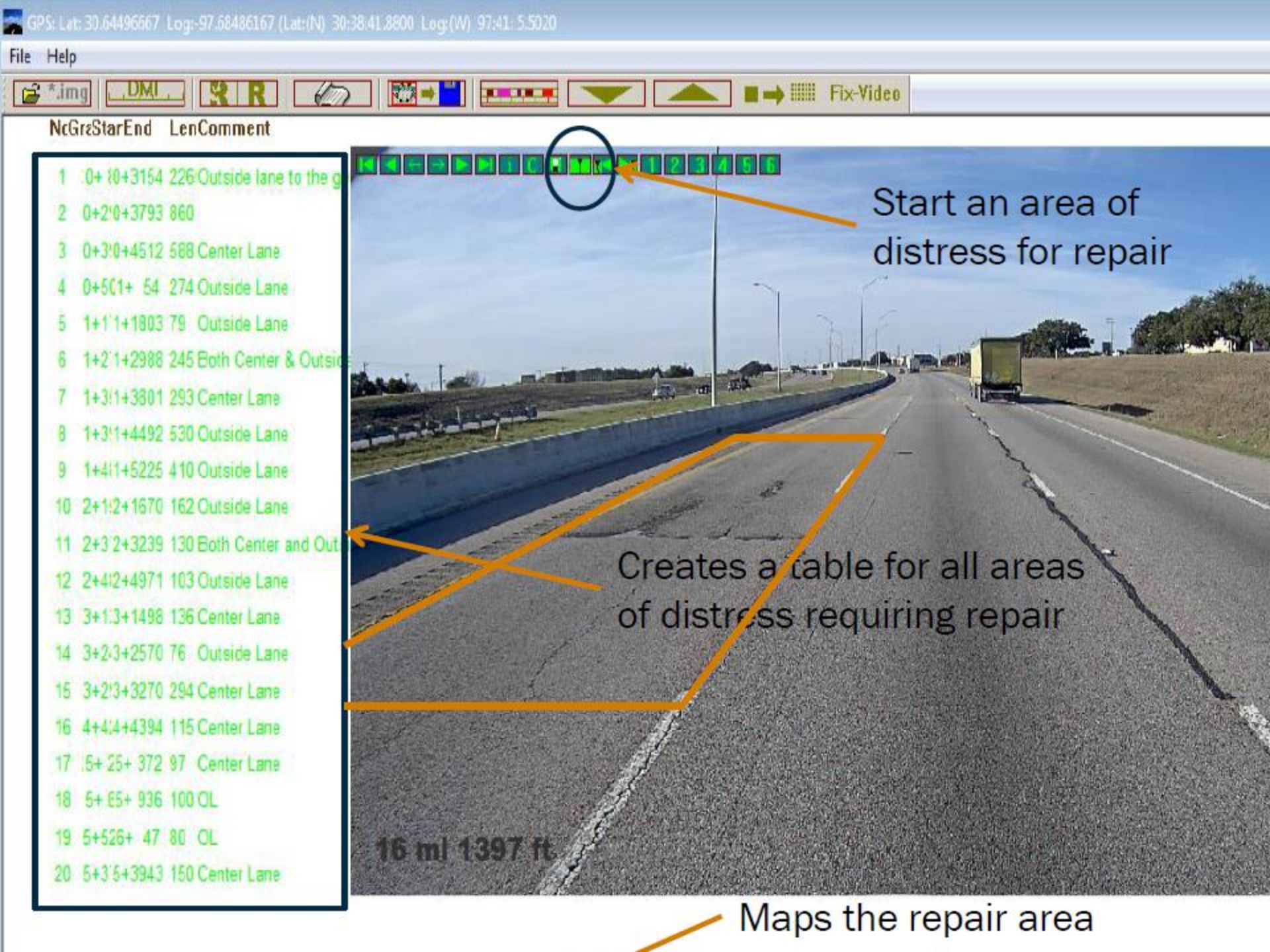
Thin (<1 inch) Overlays

Type 1 Fine PFC (Item 342) 0.75 to 1 inch
Safety/drainage/noise/bleeding

Type 2 TOM-F (Item 347) 0.5 to 1 inch
Rut/crack/urban areas/ultra thin

Type 3 TOM-C (Item 347) 0.75 to 1 inch
Rut/crack resistance/skid/high speed


GPS: Lat: 30.64496667 Log:-97.68486167 (Lat:(N) 30:38:41.8800 Log:(W) 97:41: 5.5020
File Help
*.img
DMI
R
Fix-Video
NoGraStarEnd LenComment
1 0+ 0+3154 226 Outside lane to the g
2 0+2 0+3793 860
3 0+3 0+4512 588 Center Lane
4 0+5 1+ 54 274 Outside Lane
5 1+1 1+1803 79 Outside Lane
6 1+2 1+2988 245 Both Center & Outsi
7 1+3 1+3801 293 Center Lane
8 1+3 1+4492 530 Outside Lane
9 1+4 1+5225 410 Outside Lane
10 2+1 2+1670 162 Outside Lane
11 2+3 2+3239 130 Both Center and Out
12 2+4 2+4971 103 Outside Lane
13 3+1 3+1498 136 Center Lane
14 3+2 3+2570 76 Outside Lane
15 3+2 3+3270 294 Center Lane
16 4+4 4+4394 115 Center Lane
17 5+ 5+ 372 97 Center Lane
18 5+ 5+ 936 100 OL
19 5+52 6+ 47 80 OL
20 5+3 5+3943 150 Center Lane
1 2 3 4 5 6
Start an area of distress for repair
Creates a table for all areas of distress requiring repair
16 mi 1397 ft
Maps the repair area

Houston's Plan Notes 1 of 2

Item 347: Thin Overlay Mixture (TOM)

Provide an asphalt binder PG 76-22. Substitution of the PG binder is not allowed.

Place mixture at the compacted lift thickness of one (1) inch.

Provide 100% SAC "A" aggregate. Blending of coarse aggregate is not allowed. A maximum of 25% SAC "B" screening material can be used.

Do not use RAP and RAS in the mixture.

A Pave-IR system or Thermal camera system is mandatory for this project. The contractor must demonstrate that the mixture is being placed with no severe thermal segregation.

Provide a mix which lasts more than 500 cycles in the Overlay Tester.

For breakdown rolling use two steel-wheel rollers working in tandem without excessive breakage of the aggregate and provide a smooth surface and uniform texture, keeping the rollers as close as possible to the lay-down machine. Do not use pneumatic-tire rollers. Use a steel wheel as the finish roller.

Houston's Plan Notes 2 of 2

Water flow measurements as per Tx Method 246 are mandatory for setting rolling patterns. The contractor must report the selected patterns to TxDOT and show that it meets the water flow requirements

ftp://ftp.dot.state.tx.us/pub/txdot-info/cst/TMS/200-F_series/pdfs/bit246.pdf

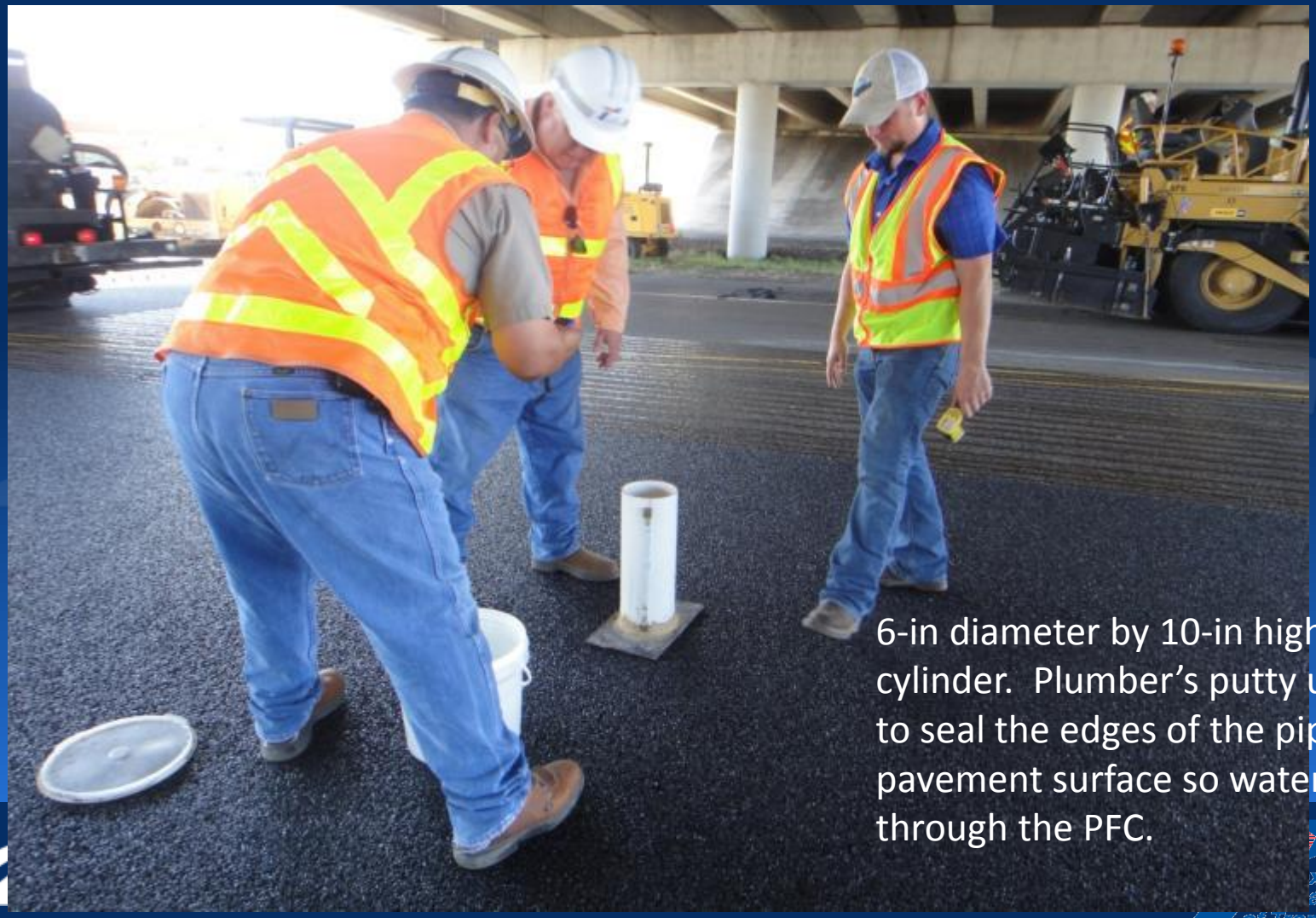
Avoid excessive compaction where water flows of greater than 10 minutes are not allowed, the final surface must have acceptable macro-texture.

The tack coat must be a hot applied trackless tack.

All construction joints must be placed under the paint stripes between the lanes. (No joints near wheel paths)

Performance test will be required on all mix design and trial batch samples, for each mold 6 samples at optimum asphalt content at 7% air voids content each will be 6 inches in diameter by 2.4 inches thick (Hamburg sized samples). The samples are to be sent to the Texas Transportation Institute (TTI) for Hamburg Wheel Test and Overlay test. This work is subsidiary to the various bid items.

Typical Water Flow – 6 seconds for PFC



6-in diameter by 10-in high cylinder. Plumber's putty used to seal the edges of the pipe to pavement surface so water flows through the PFC.

Keys to Successful Construction

- Preparation
  - Spot Repair: Isolated failures
  - Level-Up: Areas with greater than 120 in/mile
  - Milling: Recommend micromilling for smaller peak to valley

Surface Preparation

- Preparing and Repairing
  - Perform crack sealing and spot repair in highly distressed areas
  - Milled-in shoulder texturing and raised profile markings will reflect through – remove or fill
  - Mill and fill areas with fatigue cracking or shallow rutted areas with a fine dense-graded mix
    - Helps match existing surface
    - Promotes better ride with thin overlay
- Level-up
  - Should get a 25 to 35% improvement in IRI
  - If roughness > 120 in/mile, place level-up

Milling

- Milling recommended if
  - Pavement highly oxidized/stiff
  - Cross-slope corrections needed
  - Minor to moderate ride issues
  - Extensive thermal or top-down cracking (>40 percent by area)
  - Extensive recent crack seal
  - Micromilling recommended if milling required - creates a finer finish with small peak-to-valley depths to prevent compaction and ride issues

Plant Inspection/Role of Inspector

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Plant Inspection

- Proportioning aggregates
- Metering Asphalt
- Setting Feeding Unit
- Pugmill Mixer
- Mixing Time
- **Checks on Asphalt Content**

Sampling and Testing

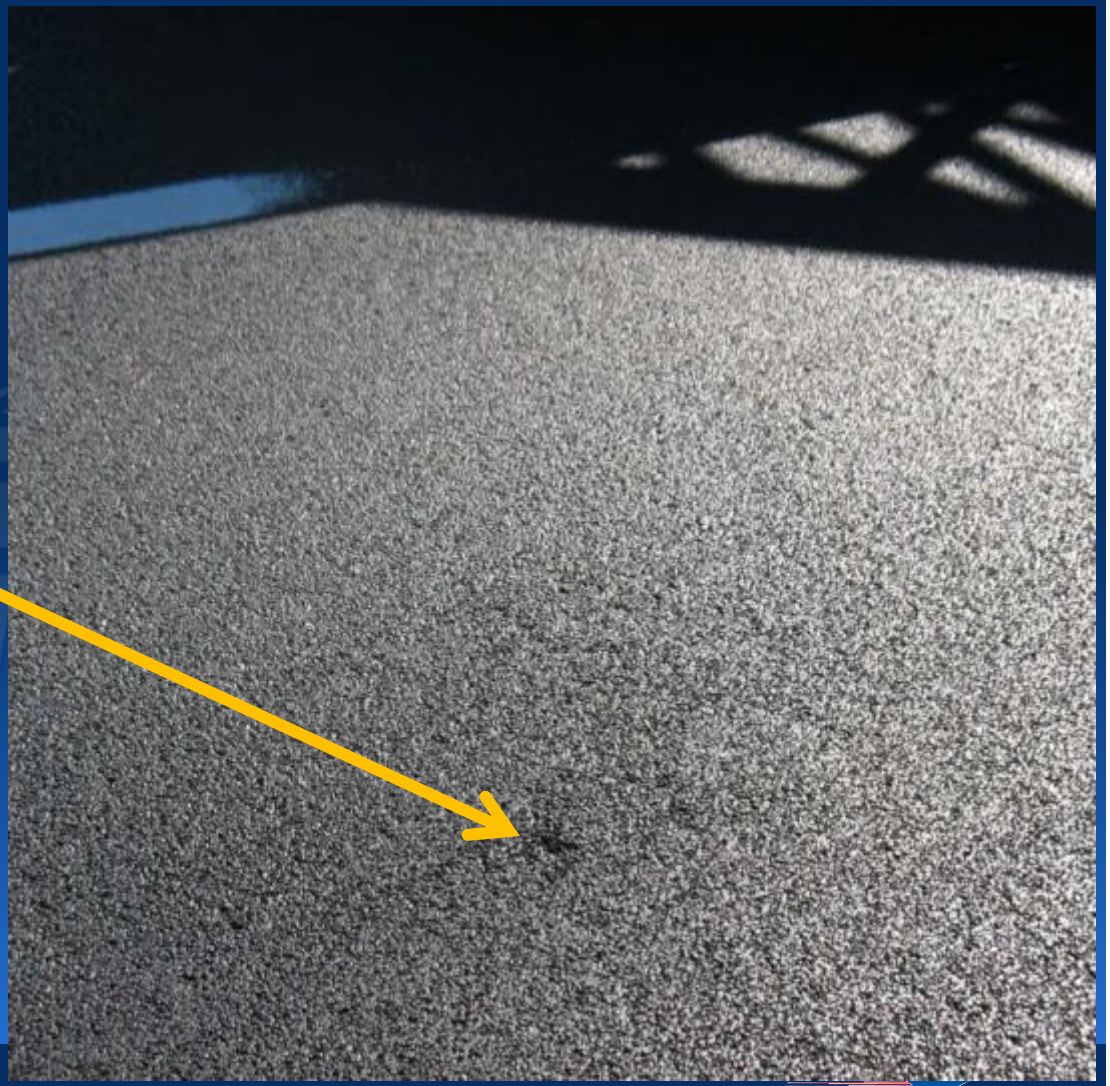
- Purpose of tests
- Sampling Schedule
- Testing Trial Batch

4.4.2.1.13. **Trial Batch Testing**. Test the trial batch to ensure the mixture produced using the proposed JMF1 meets the mixture requirements in Table 8. Ensure the trial batch mixture is also in compliance with the Hamburg Wheel test, Overlay test, and drain-down requirements listed in Table 7. Use a Department-approved laboratory to perform the Hamburg Wheel test on the trial batch mixture or request that the Department perform the Hamburg Wheel test. Obtain and provide approximately 50 lb. of trial batch mixture in sealed containers, boxes, or bags labeled with the CSJ, mixture type, lot, and sublot number for the Overlay test. The Engineer will be allowed 10 working days to provide the Contractor with Hamburg Wheel test and Overlay test results on the trial batch. Provide the Engineer with a copy of the trial batch test results.

Production

- Keep Plant clean to prevent clumps = Pop outs
- Load Temperatures =

  315 – 330 F



Tack Coats/Bonding/Underseals

Seal and Bond

- Bond is critical for thin overlays
- TOM-C is somewhat open graded, so a good seal is important to prevent moisture infiltration.

4.7.2. **Tack Coat**. Clean the surface before placing the tack coat. The Engineer will set the rate between 0.04 and 0.10 gal. of residual asphalt per square yard of surface area. Apply a uniform tack coat at the specified rate

Trackless Tack Strongly Recommended

Tack Coats

- Bonding
  - On existing HMA, apply non-tracking tack, chip seal, or use spray paver.
  - Apply non-tracking tacks at 0.03 to 0.06 gal/sy

23.9 19.0 14.8 10.7 9.6 9.3 25.6 15.1 21 29 grams
.056 .044 .035 .025 .022 .021 .060 .036 .05 .068 gal/sq yard

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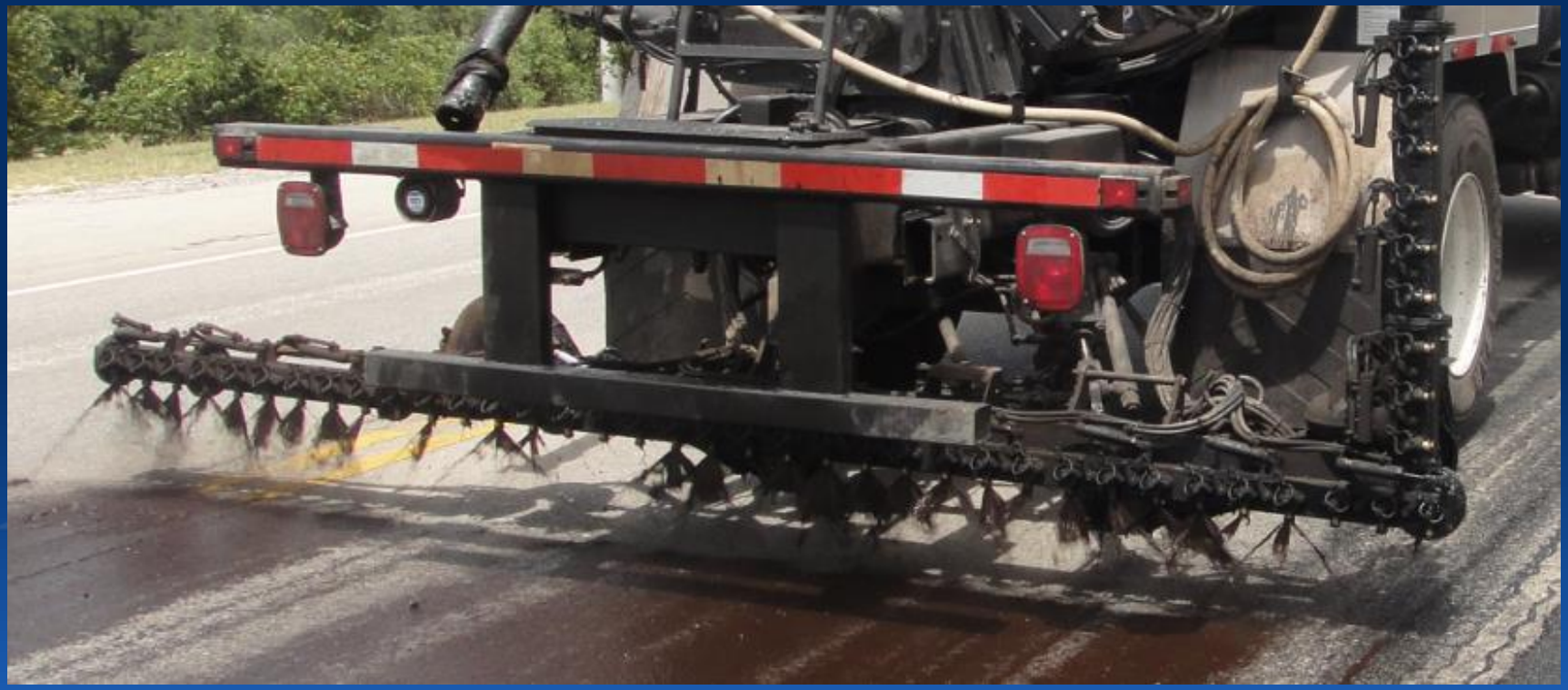
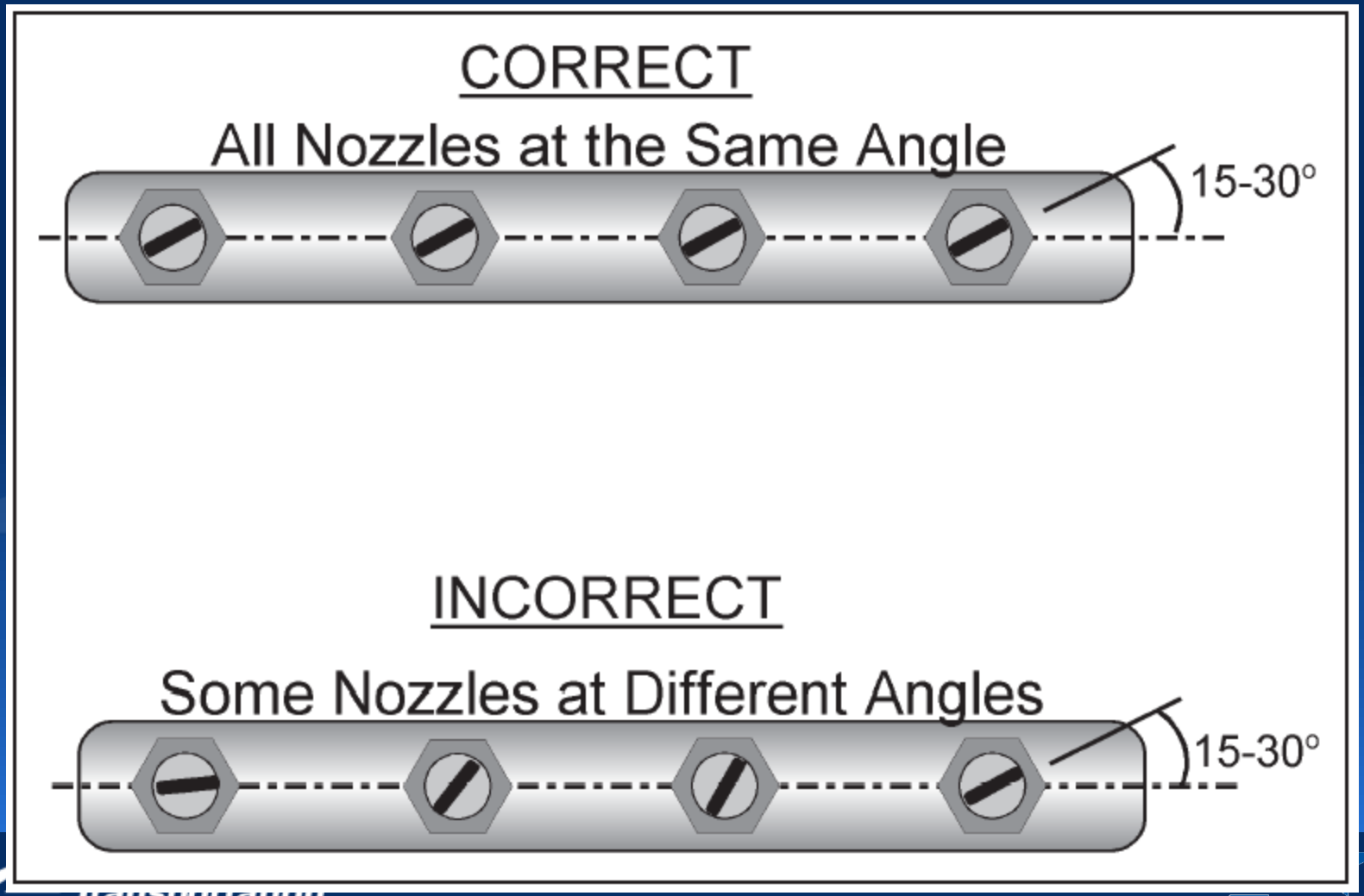
Problems with the spray bar



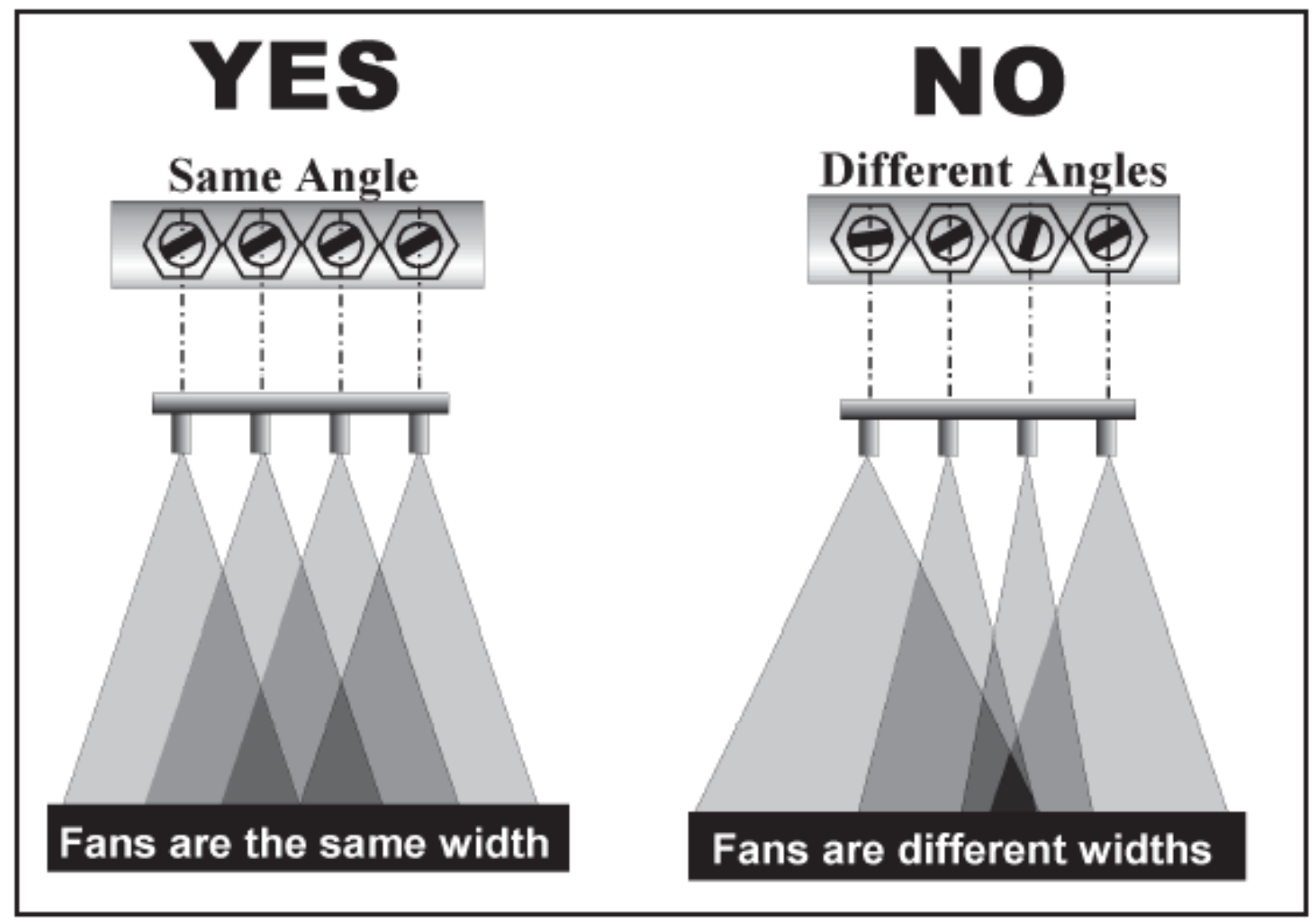
Check Nozzle Angles



Poor Nozzle Alignment

Proper Nozzle Alignment

Check Nozzle Angles



Real problems with heavy shot rates under Roadtec loads

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Underseals

- Underseals (chip seals/interlayers)
  - Only if significant unsealed cracks
  - If milling will expose underlying cracking
  - If overlaying newly widened sections
  - Use polymer modified binder in chip seal
  - Design chip seal with smaller aggregate (Grade 4 or 5)
  - Use proper chip seal construction practices

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Seal Coat and Bonding Best Practices

- Light aggregate rates when using underseals
- Prefer heavy tacks - prevent bonding issues in areas with too much aggregate
- Windrow and transfer material with a shuttle buggy in the adjacent lane
- VERY clean surface to promote good bonding
- Take cores to verify bond and thickness

Roadtec feeding paver and also dropping stuff

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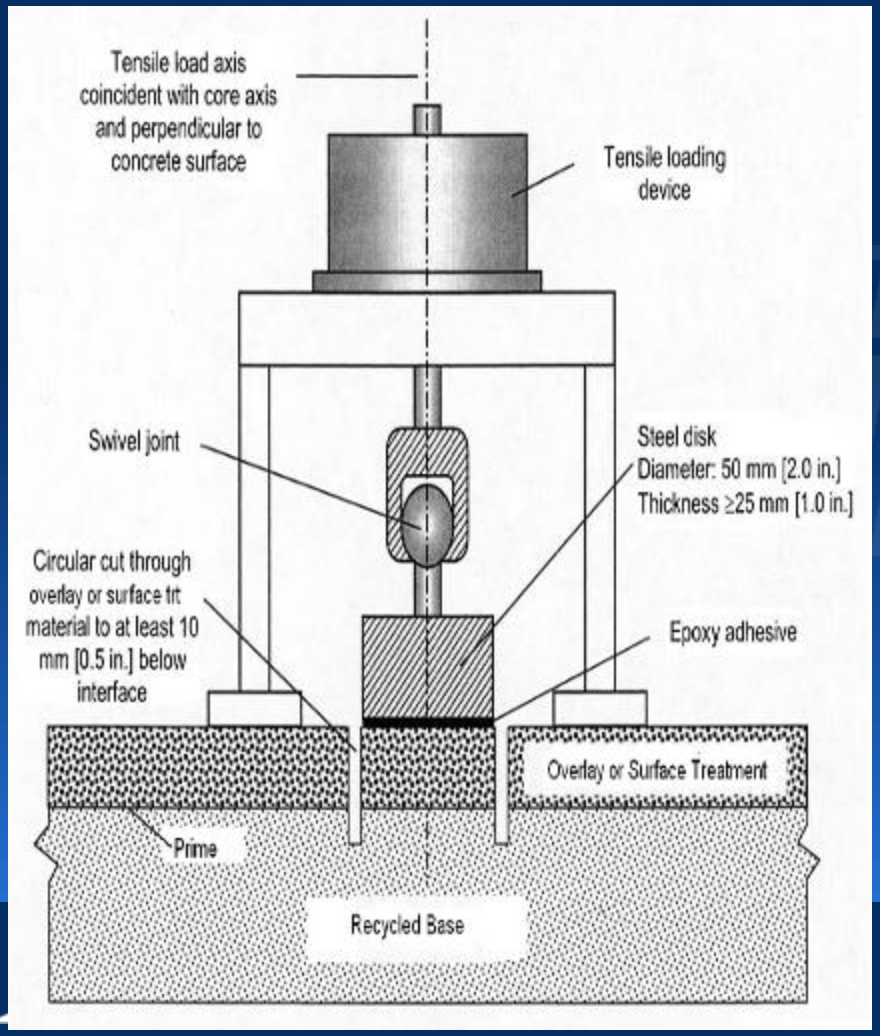
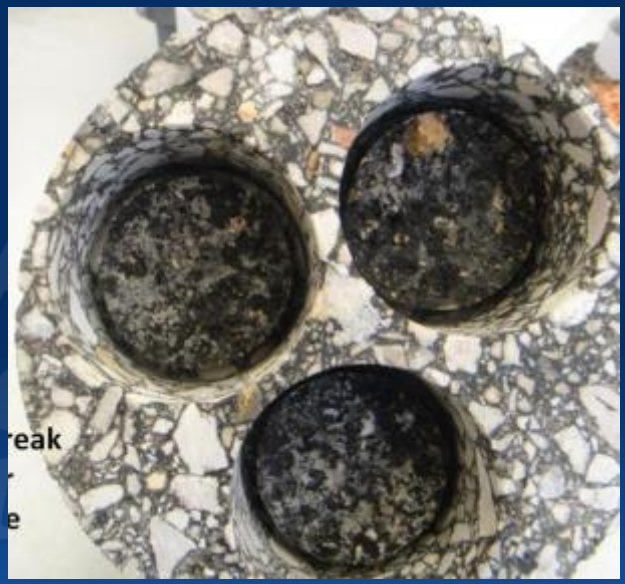
Direct Tensile Bond Test
ASTM C-1583



Sequence in the Bond strength test



Thin Overlay did not Bond to Traffic Loops…..mill them out!!

Placement and Compaction

Good Paving Practices

- Laydown Machine Operation
- Rollers
- Materials Transver vs traditional pick up
- Pave IR

Mixture Placement

Best Practice

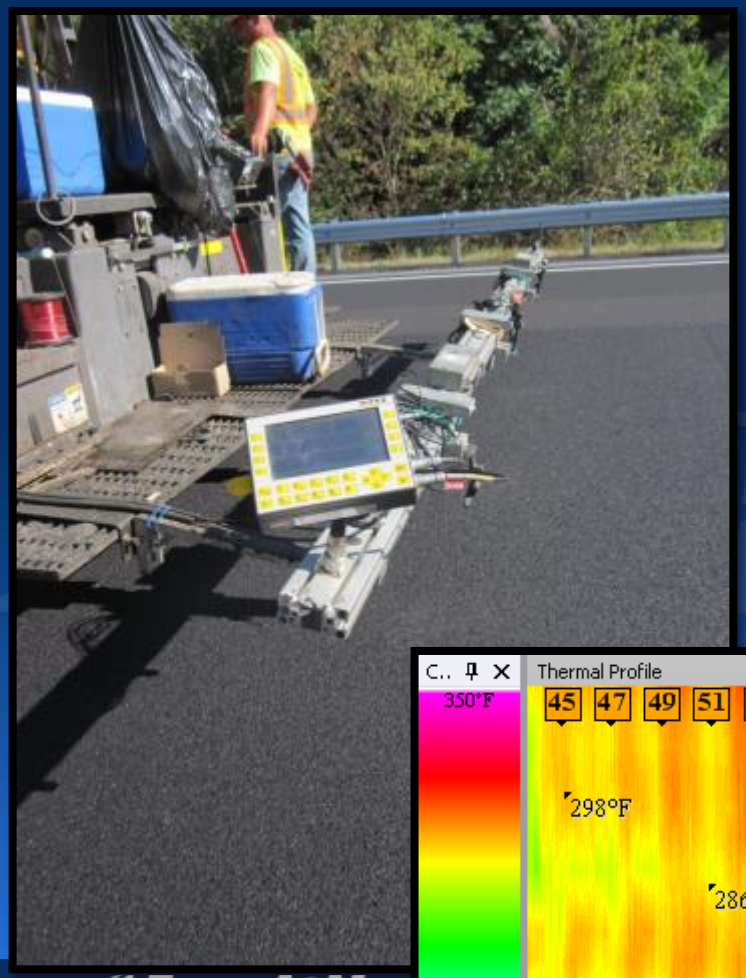
- Use a shuttle buggy to maintain temperature
- Use insulated truck and trapped
- WMA additive helped as a compaction aid in cooler temperatures
- District may require WMA for hauls greater than 50 miles

Temperature Requirements

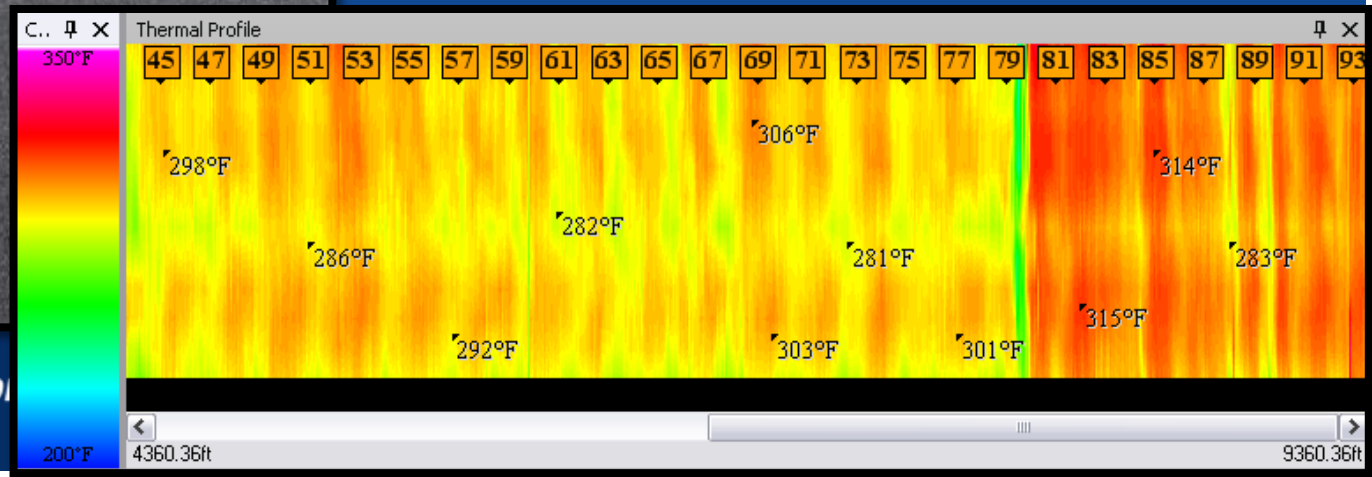
- Item 347 allows the following:
  - Roadway temperature of 32F when using thermal imaging system *NOT RECOMMENDED!!!*
  - *Use the following Plan Note:*

  - When not using thermal imaging system, surface temperature should be min 60F

Thermal Profile – SR 220

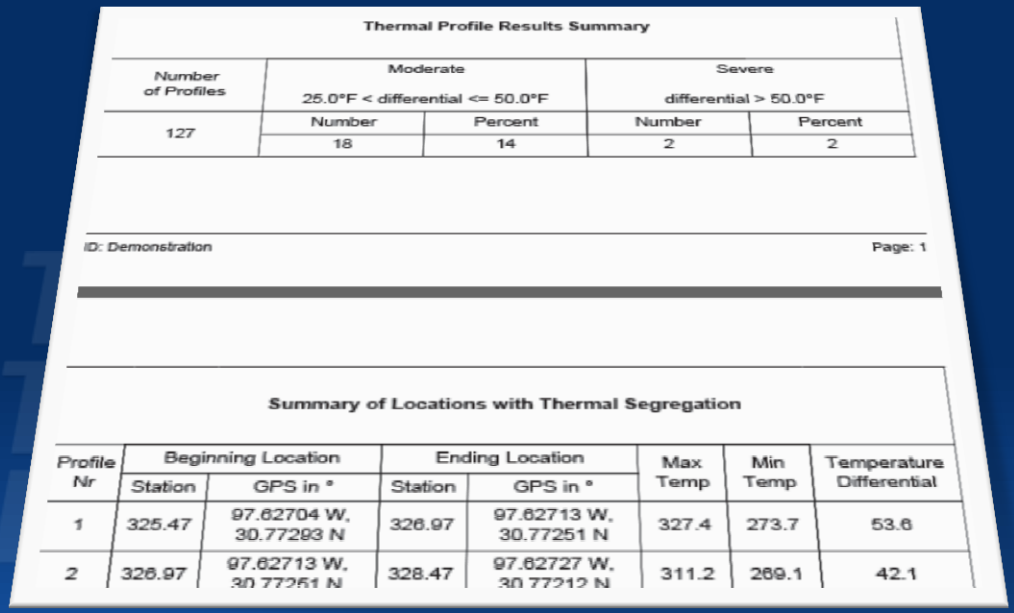


- Good thermal uniformity
- Δ T between 18 and 28 °F
- Paver idle 7% of time due to paver stops
- AVG speed 26.9 ft/min



Post-Process view and report from IR Profile

- View and annotate profile
- Histograms
- Project metrics
  - Paver speed
  - Idle time
  - Total duration



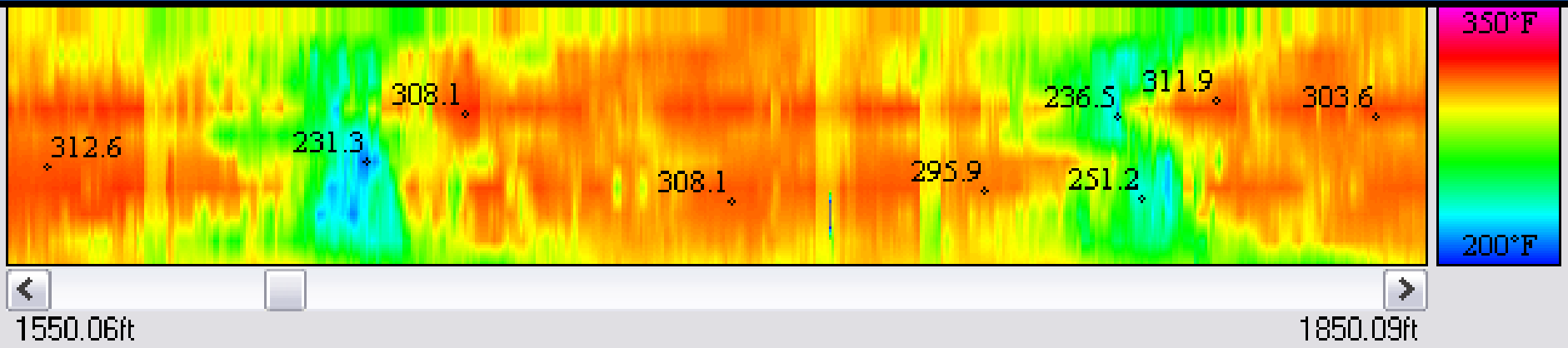
Thermal Profile Results Summary

Number of Profiles	Moderate 25.0°F < differential <= 50.0°F		Severe differential > 50.0°F	
	Number	Percent	Number	Percent
127	18	14	2	2

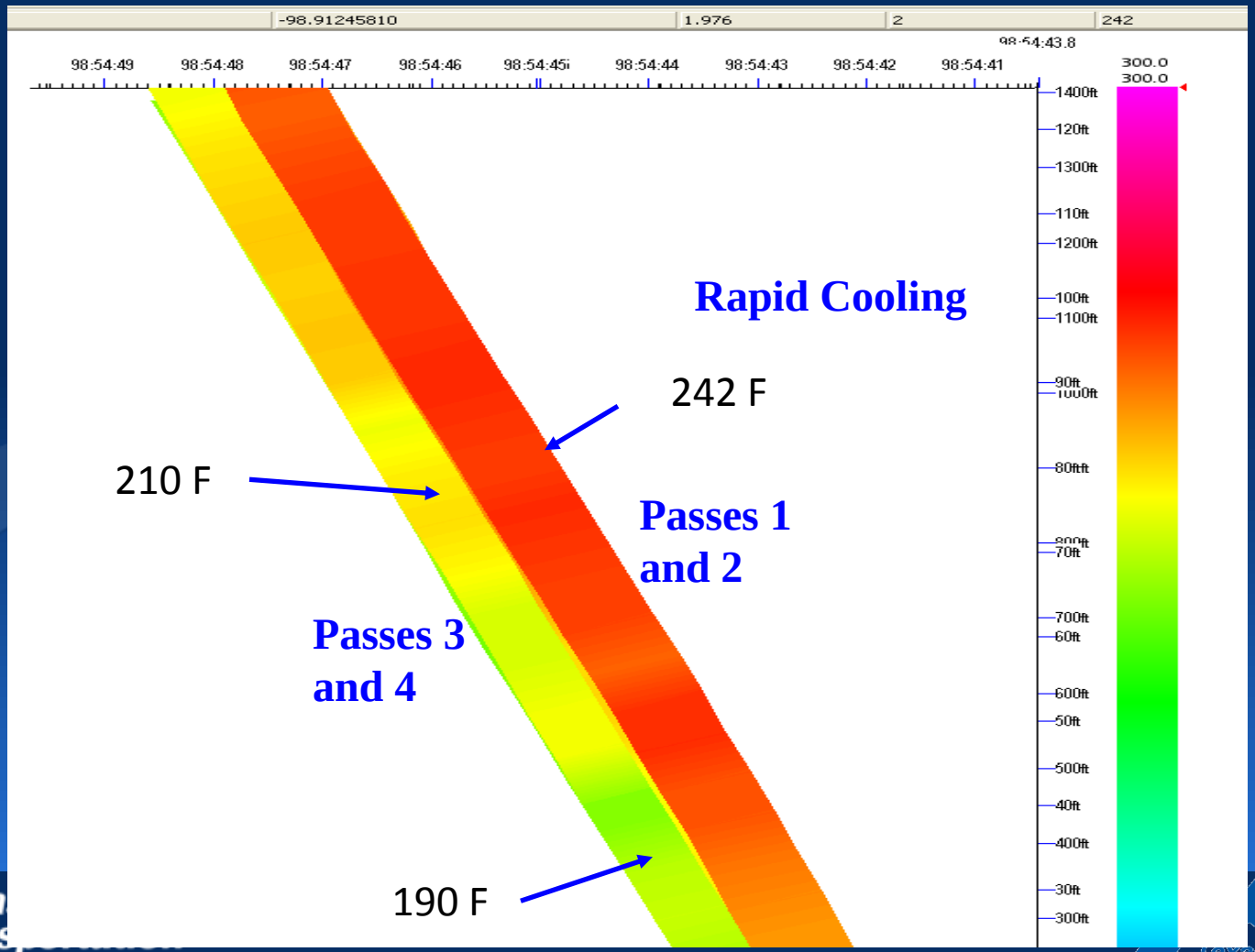
ID: Demonstration — Page: 1

Summary of Locations with Thermal Segregation

Profile Nr	Beginning Location		Ending Location		Max Temp	Min Temp	Temperature Differential
	Station	GPS in °	Station	GPS in °			
1	325.47	97.62704 W, 30.77293 N	326.97	97.62713 W, 30.77251 N	327.4	273.7	53.6
2	326.97	97.62713 W, 30.77251 N	328.47	97.62727 W, 30.77212 N	311.2	269.1	42.1



Measured temperature drops on thin lifts Need 2 rollers working in echelon



Placement and Compaction

- Limit hand work
  - Irregularities shows up more dramatically in thin overlays
- No pneumatics…. Closes surface
  - Macrotexture for skid resistance is diminished
  - Cools too quick to take out impressions
- Rollers should be right behind the paver Harsh mix and cools quickly

Compaction

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Compaction

- Recommend dual rollers in tandem
- TOM-C (3 passes – each pass is one vibratory/one static)
- TOM-F mixes 3-5 static passes
- Fine PFC, 1 to 3 static passes
- Need adequate release agents (mix very sticky)

SH 73 Beaumont's first TOM-C

- Rolling Crown
- Over-compaction

Day 1 Problems Streaking + No water flow

Day 1 > 15 mins

Paving Operation

Rolling Crown was an Issue

Adjustments to Rolling pattern

- Two rollers side by side in main lanes
- Smaller roller only doing edge
- Change to vib up static back
- Water flow 4 mins
- Texture good

Acceptance Testing

Acceptance Testing

- Acceptance in the Field
  - Water Flow Test (Tex 246-F)
    - (Flow rate > 2 minutes) for TOMs
    - < 20 secs for PFC

Water Flow (mins)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
6.0
7.0
8.0
9.0
10.0
11.0
12.0
Air Voids %

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