SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

SHRP2 Renewal Project R06D Advanced Methods to Identify Asphalt Pavement Delamination

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U.S. Department of Transportation
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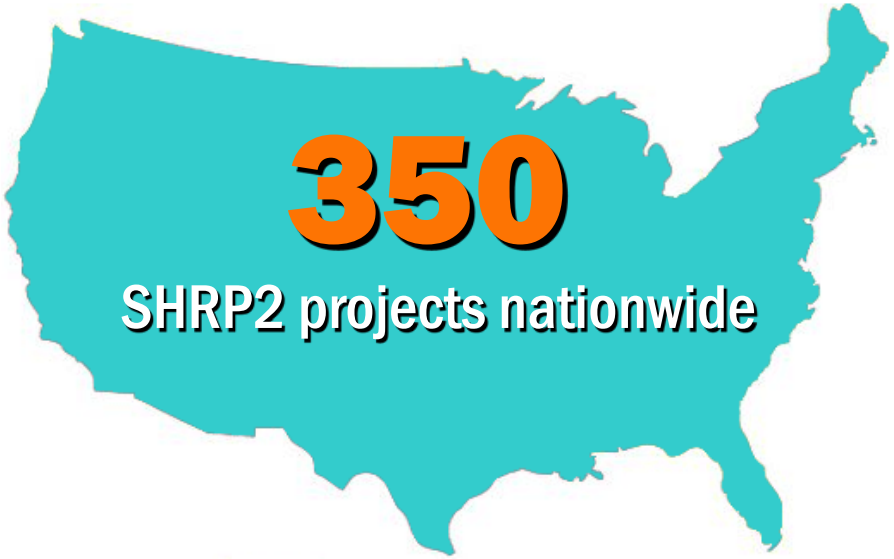
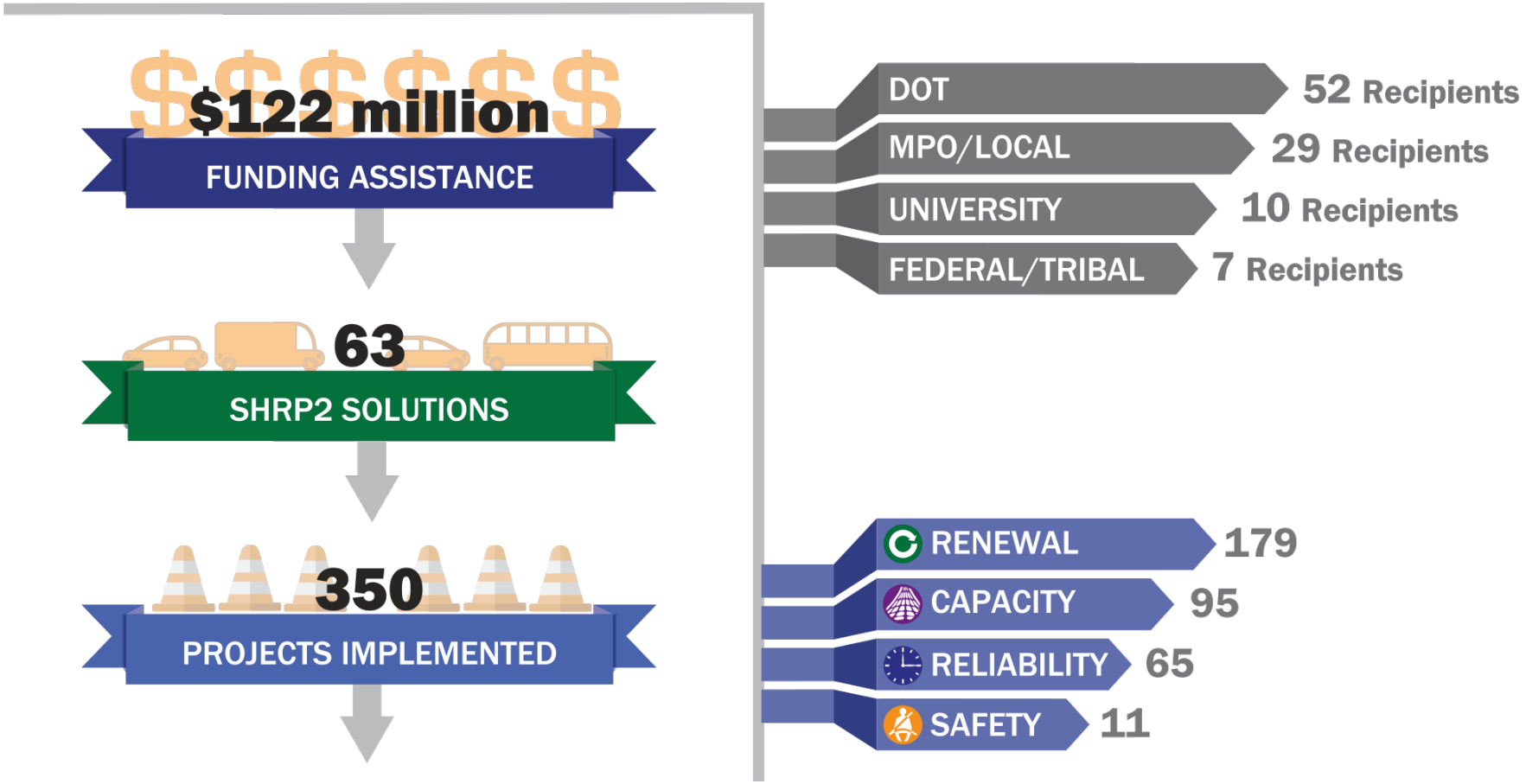
American Association of State Highway and Transportation Officials
AASHTO

SHRP2 at a Glance

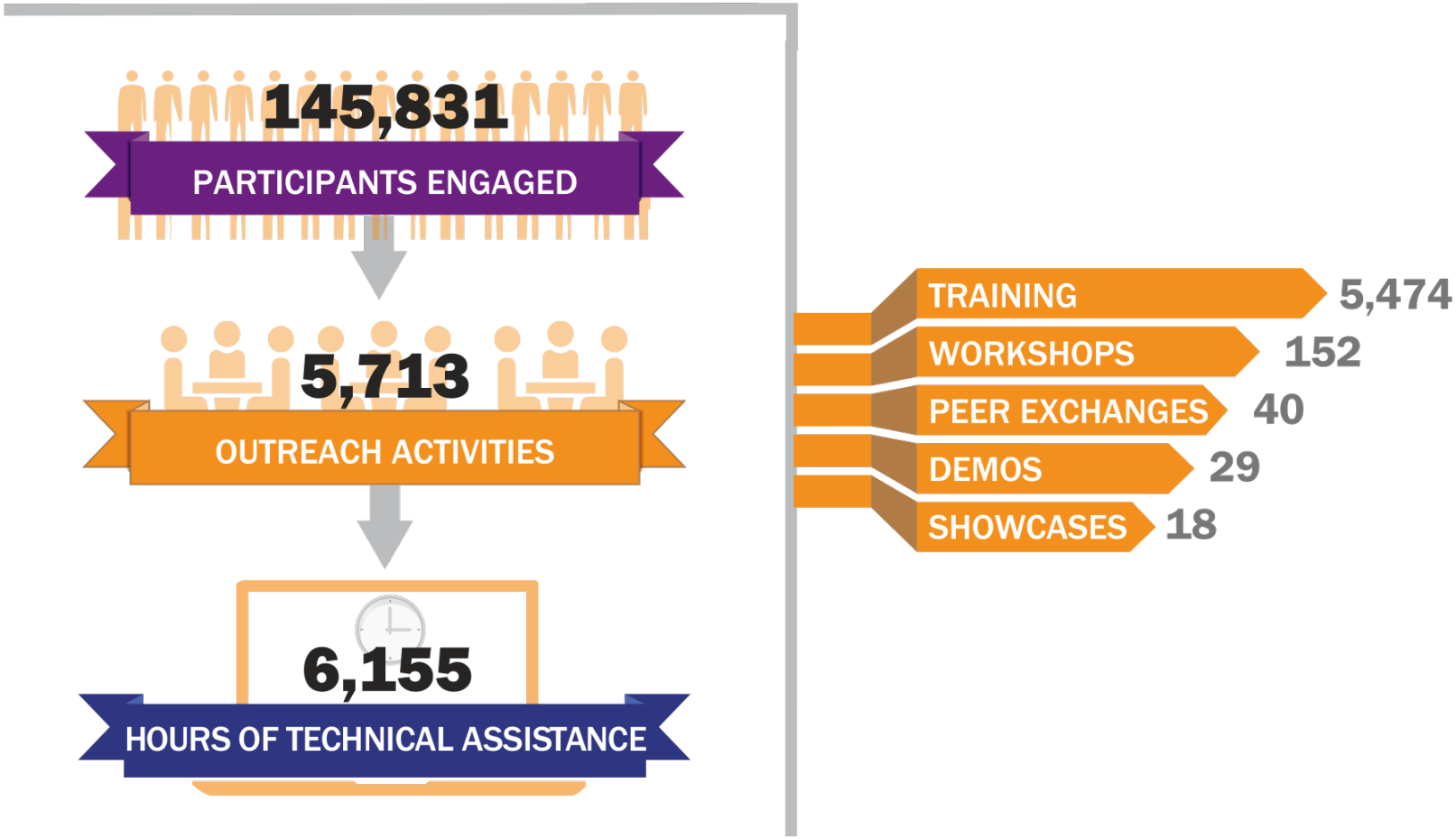
- **SHRP2 Solutions** – 63 products
- **Solution Development** – processes, software, testing procedures, and specifications
- **Field Testing** – refined in the field
- **Implementation** – 350 transportation projects; adopt as standard practice
- **SHRP2 Education Connection** – connecting next-generation professionals with next-generation innovations



SHRP2 Implementation: Moving Us Forward



SHRP2 Implementation: Moving Us Forward



Focus Areas

Safety: fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving

Reliability: reducing congestion and creating more predictable travel times through better operations

Capacity: planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community

Renewal: rapid maintenance and repair of the deteriorating infrastructure using already-available resources, innovations, and technologies

SHRP2 Implementation Assistance Program

Proof of Concept Pilot	Lead Adopter Incentive	User Incentive
To evaluate product readiness.	To help offset costs associated with product implementation and risk mitigation.	To support implementation activities, such as conducting internal assessments, changing processes, and organizing peer exchanges.

PROOF OF CONCEPT REQUIREMENTS:

- Participate in a Technology Showcase/Demo
- Prepare work plan activities
- Work with FHWA/AASHTO/SME
- Availability of equipment (owned or lease)
- Execute work plan and provide updates
- Participate in peer exchanges

Advanced Methods to Identify Pavement Delamination (R06D)

CHALLENGE:

- Several pavement distresses can be attributed to delamination.
- Primarily caused by debonding & stripping.
- Identifying the extent and severity of delamination is difficult.
- Coring is a destructive method providing limited value as part of a pavement evaluation.
- NDT methods are needed for comprehensive, rapid evaluation and detection.

RESEARCH GOAL:

Identify and develop NDT technology that can:

- Detect & quantify delamination in HMA
- Operate at reasonable traveling speed
- Cover full-lane width

R06D Test Sections at NCAT Test Track

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Section 9	Section 10
Top 2-inch lift	Full bond	Full bond	Full bond	Partial No bond	No bond	partial stripping	Full bond	Full bond	Full bond	Full bond
Bottom 3-inch lift	no bond	Full bond	Full bond	Full bond	Full bond	Full bond	Full bond	partial Stripping	partial No bond	No bond
Existing surface	PCC	PCC	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA

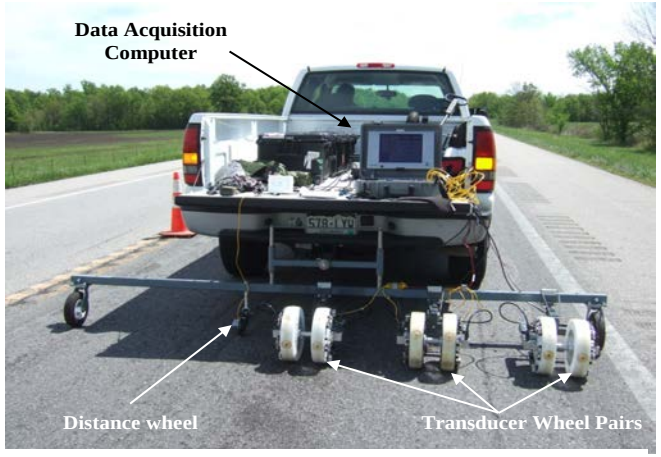
Advanced Methods to Identify Pavement Delamination (R06D)

Solutions

- Ground-penetrating radar (GPR) antenna array with frequency sweep
- 3-D Radar

GPR Antenna Array

- Impact echo (IE) and seismic analysis of surface waves (SASW) rolling wheel scanning system
- Olson Engineering

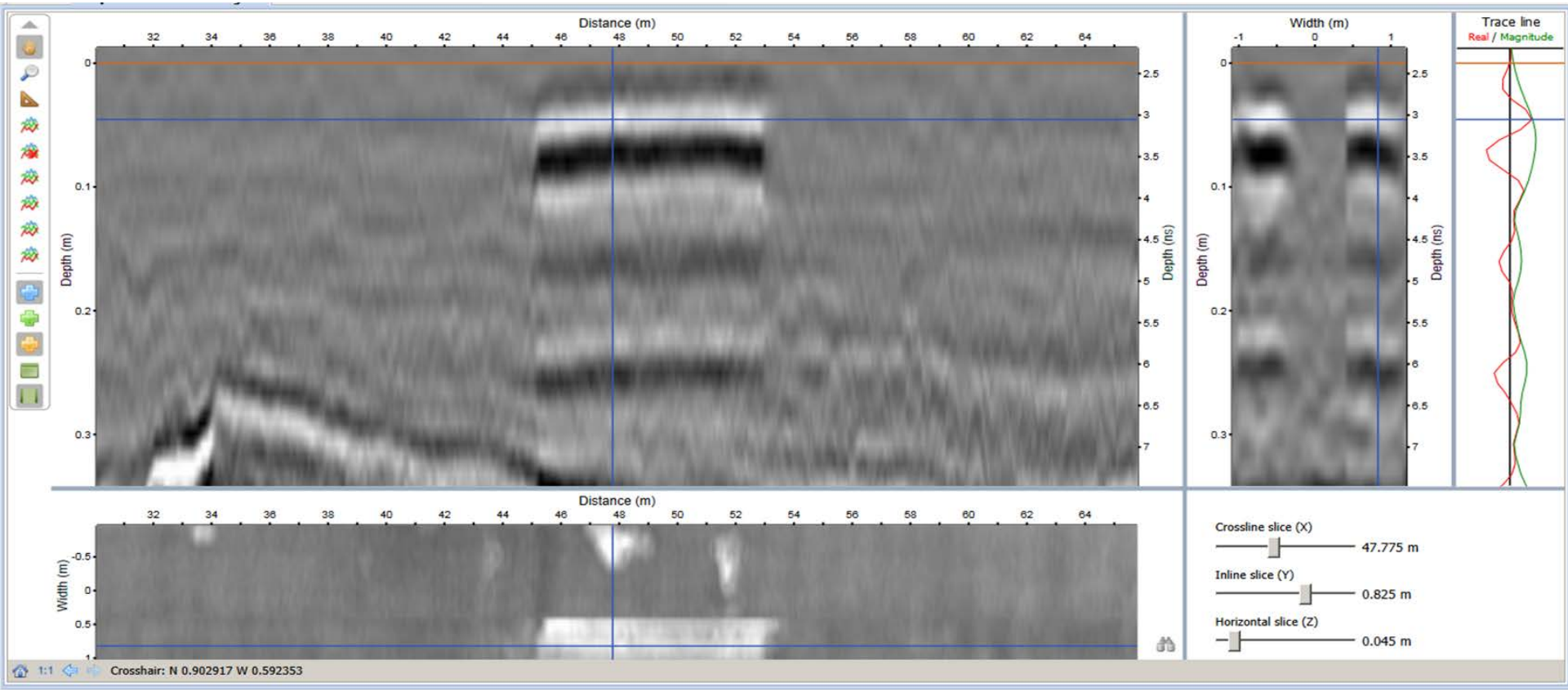


IE/SASW Scanning System

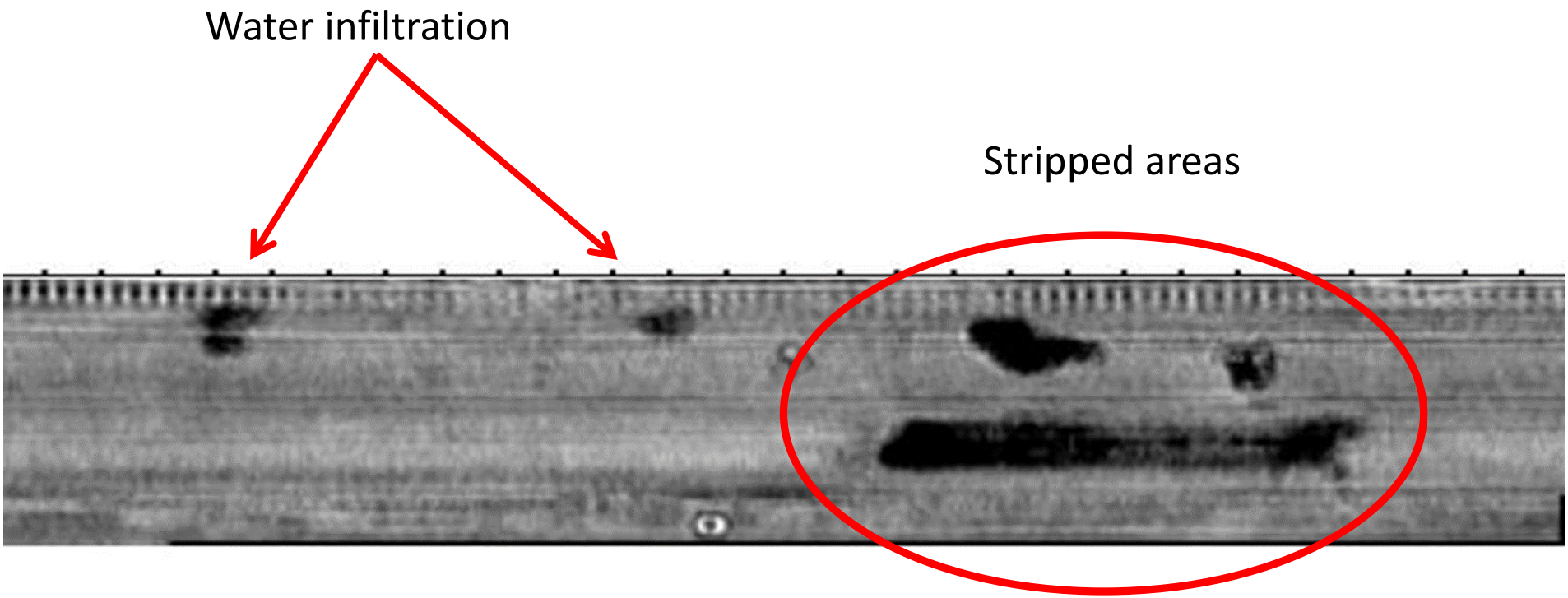
GPR - Ground Penetrating Radar

GPR - Ground Penetrating Radar

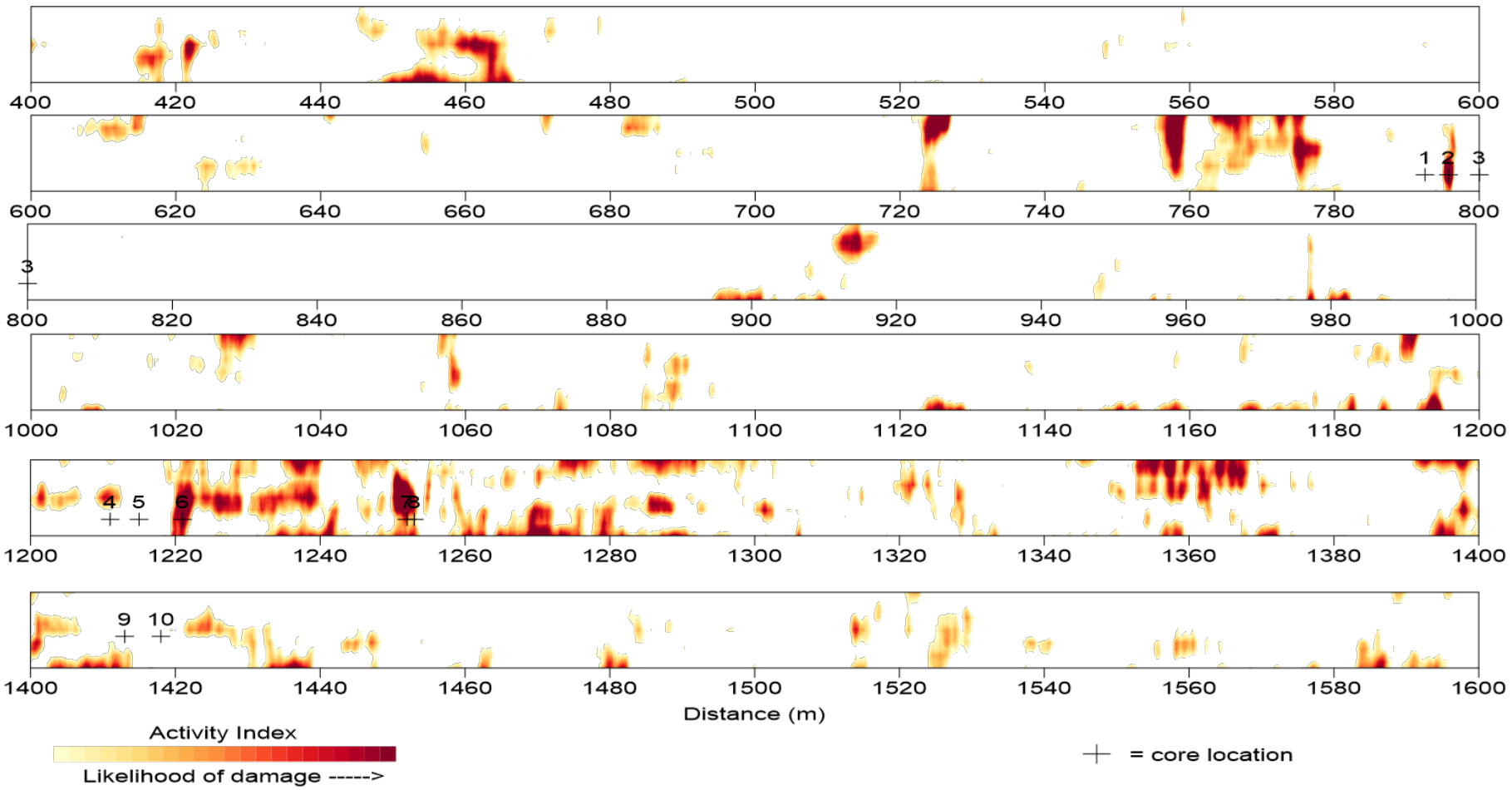
GPR at NCAT Test Track



GPR Depth Slice



Project Length Analysis – Single Pass



IE/SASW – Mechanical Surface Waves

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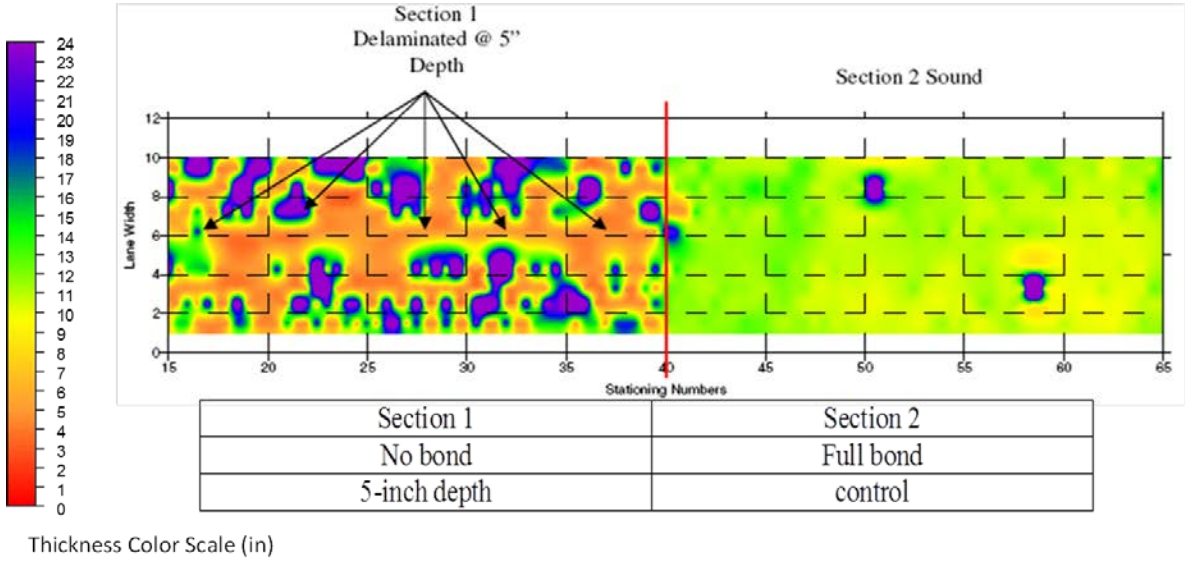
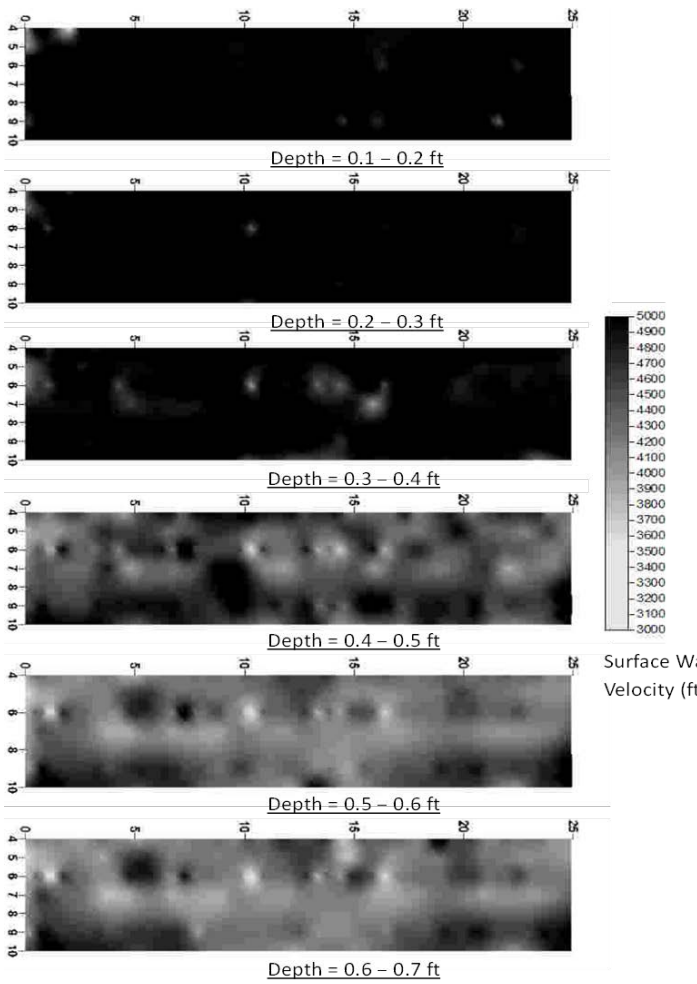
IE / SASW at NCAT Test Track



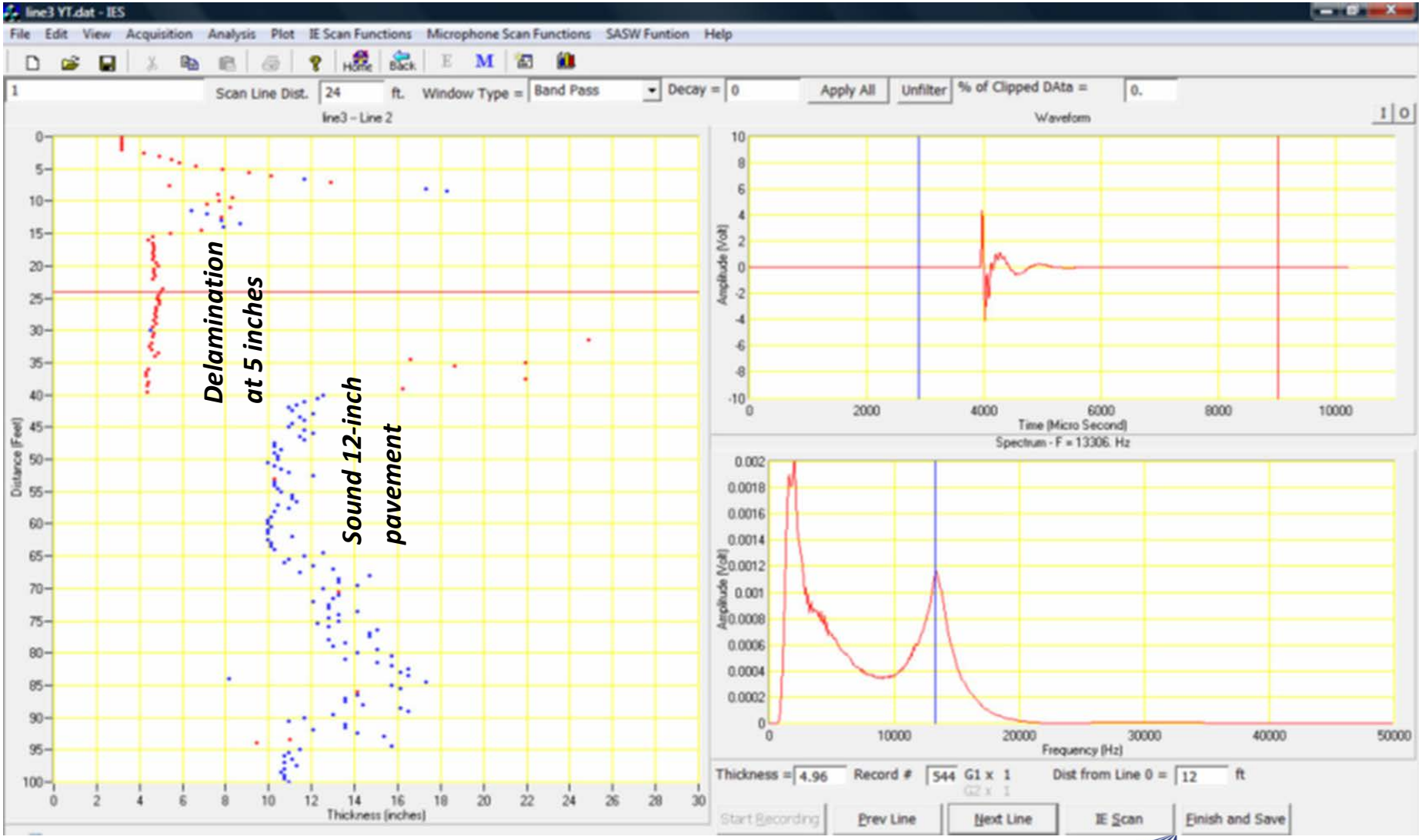
Section 1	Section 2
No bond	Full bond
5-inch depth	control

IE report



SASW report

Real-time IE Output During Test



SASW Project Report Concept

LANE SECTION	DEPTH = < 0.25 ft			DEPTH = 0.25 to 0.50 ft			DEPTH = 0.50 to 0.75 ft		
(MP) (direction)	VELOCITY >4500 fps	4000 to 4500	< 4000	VELOCITY >4500 fps	4000 to 4500	< 4000	VELOCITY >4500 fps	4000 to 4500	< 4000
35.1 EB	90	8	2	85	12	3	75	20	5
35.2 EB	92	7	1	86	11	3	77	18	5
35.3 EB	90	7	3	85	13	2	40	40	30
35.4 EB	92	7	1	55	35	10	10	30	60
35.5 EB	91	8	1	86	13	1	76	20	4
35.6 EB	90	7	3	86	11	3	75	19	6

Advanced Methods to Identify Pavement Delamination (R06D)

Benefits

- GPR with frequency sweep antenna array
  - Can identify variations in the pavement, isolate the depth of discontinuity, and provide a relative degree of severity.
  - Operates at reasonable speed and full-lane width in a single pass.
  - Multi-functional NDT (pavement, bridge decks, embankment,…)
- IE/SASW scanner
  - Can identify variations in the pavement; width depends on system configuration and the depth of discontinuity.
  - Multi-functional NDT tool (pavement and bridge deck delamination)
  - Excellent forensic tool for project level analysis

Advanced Methods to Identify Pavement Delamination (R06D)

The Future

Product demand will drive software development to make data analysis more efficient and effective.

- Real-time display detail
- Automated signal identification in distressed areas

Coming Soon: R06D Technology Showcase

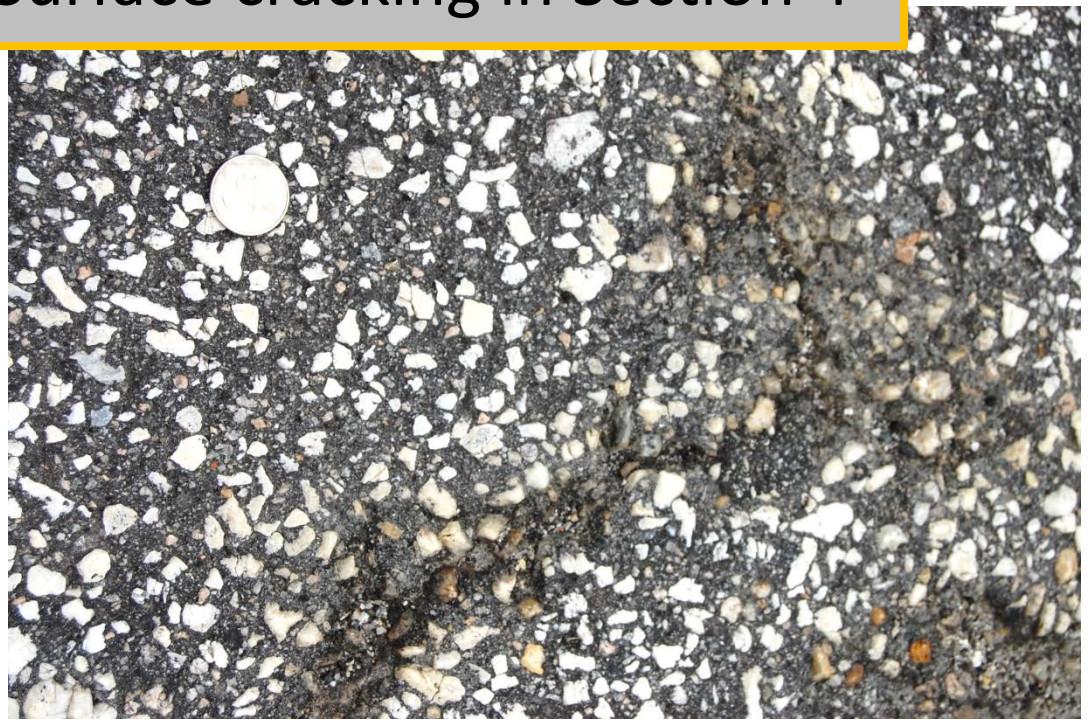
Showcase at NCAT Pavement Test Track Auburn, AL 2016

A product showcase will be held later this year to demonstrate R06D tools.

- Held at National Center for Asphalt Technology (NCAT) Test Track at Auburn University in Auburn, AL
- To be announced August – September
- All agencies that submit an application to participate in Round 7 of the Implementation Assistance Program on R06D will be encouraged to participate in the showcase.

Showcase at NCAT Pavement Test Track
Auburn, AL 2016

Surface cracking in Section 4



Section 1 begins here

For More Information on R06D

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