



Advanced Methods to Identify Asphalt Pavement Delamination--R06D

Recap of Research & Proof of Concept Peer Exchange

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Virtual Peer Exchange
Sept. 28-29, 2021



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SHRP2 R06D Study



Goal is identify and develop NDT technology that can:

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

Identified 3 NDT technologies: GPR, IE and SASW

Selected vendors: 3D-Radar & Olson Engineering

Study was completed in 2013

Asphalt Delamination





R06D Research Overview

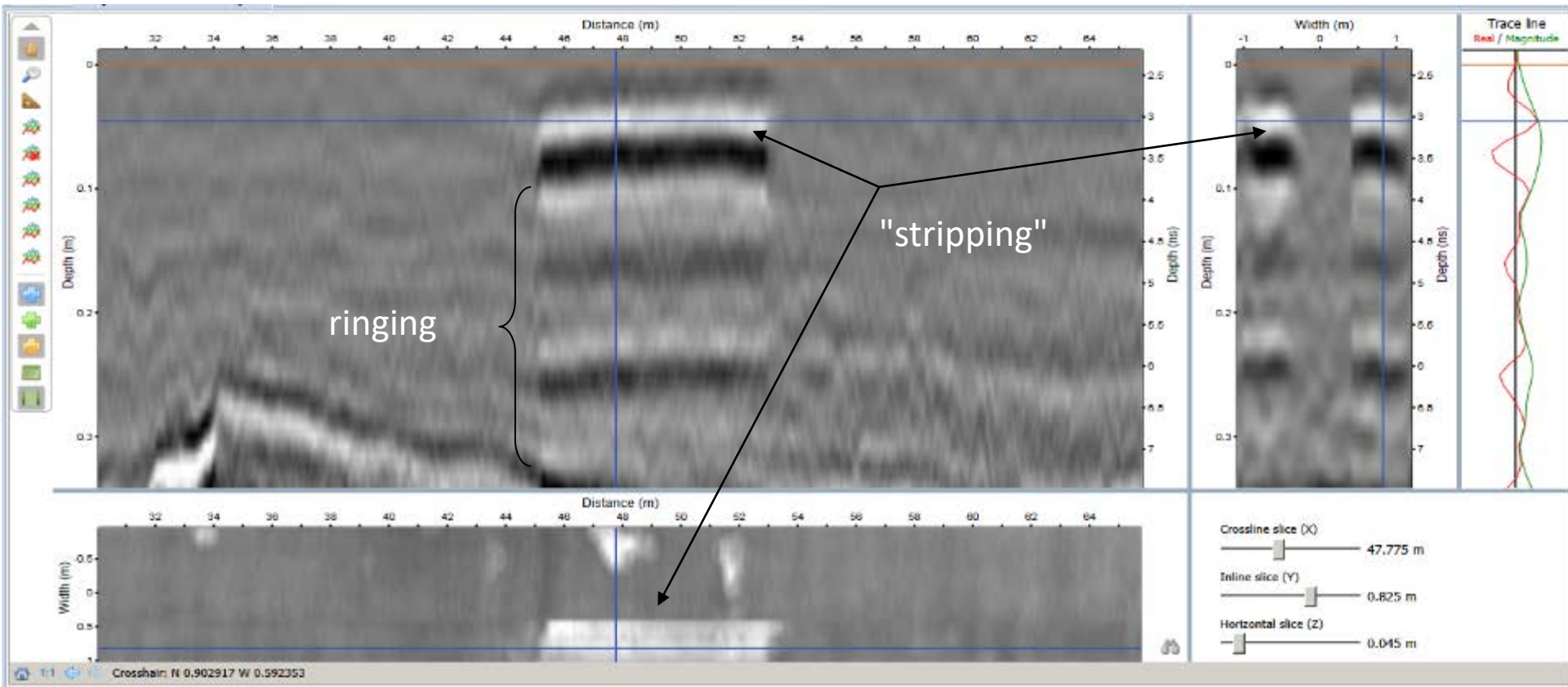


1. Identify candidate NDT technologies
2. Evaluate potential to meet the goals
3. Select NDT technologies with high potential to achieve goals
4. Promote development of hardware and software
5. Validate equipment improvements
6. Examine performance in field conditions
7. Demonstrate NDT to interested agencies

NCAT R06D Research Sections



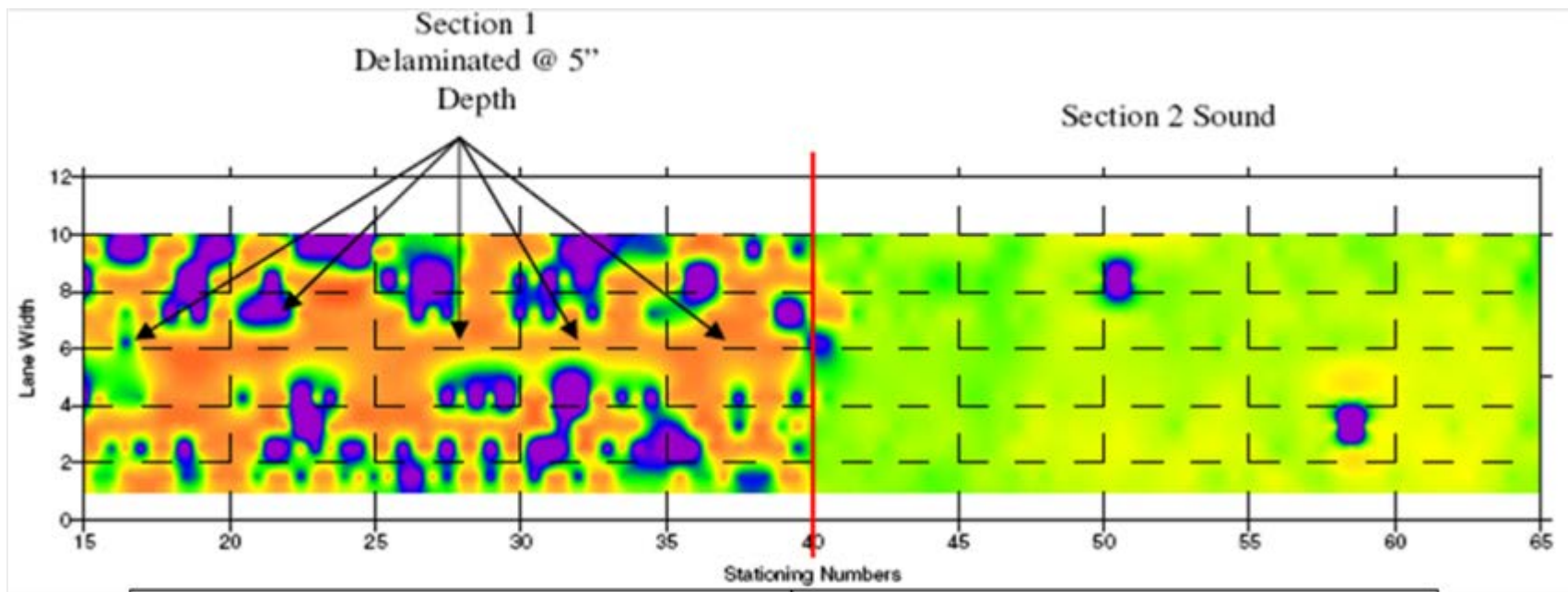
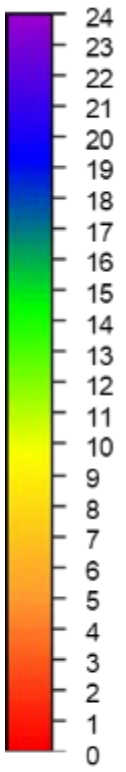
GPR Data Display (NCAT test track section)



GPR by 3D Radar



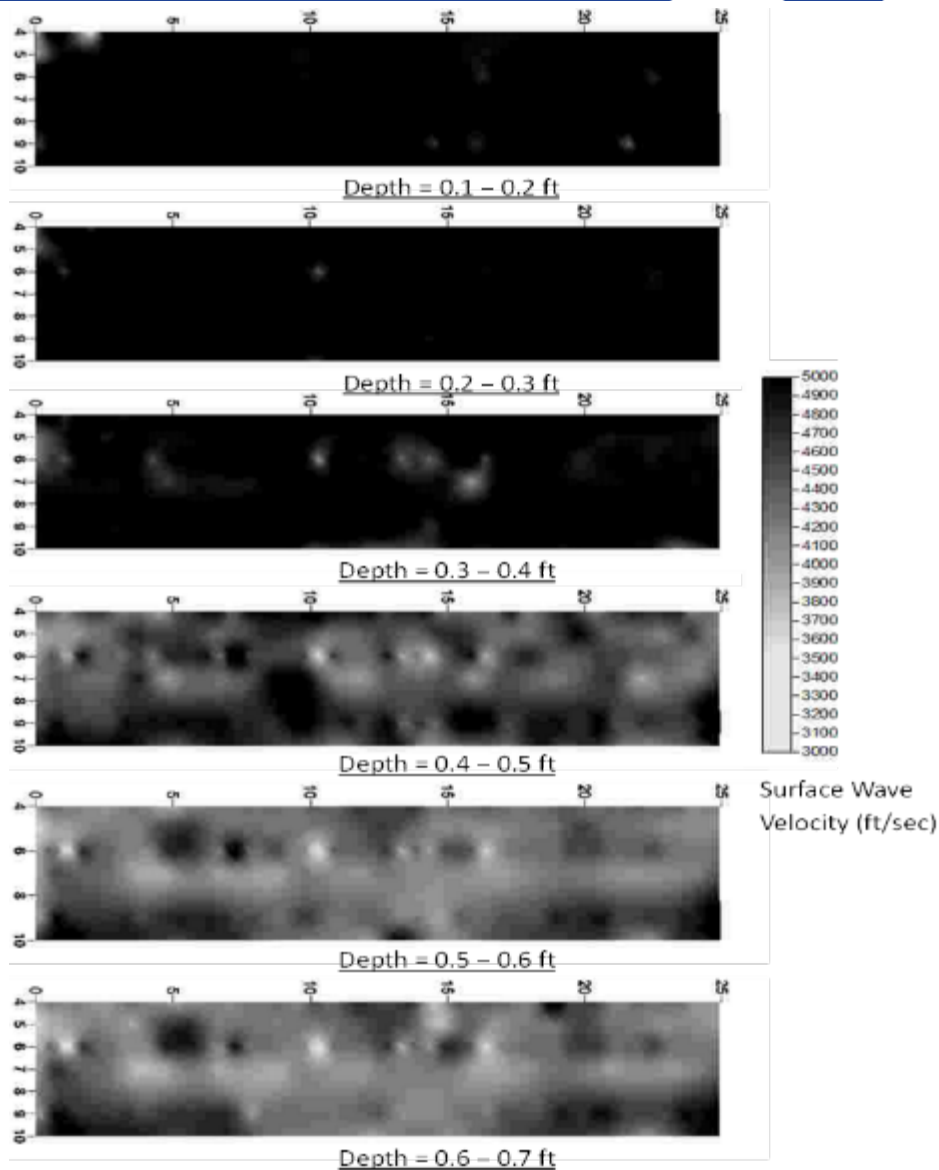
IE Data Display (NCAT test track section)



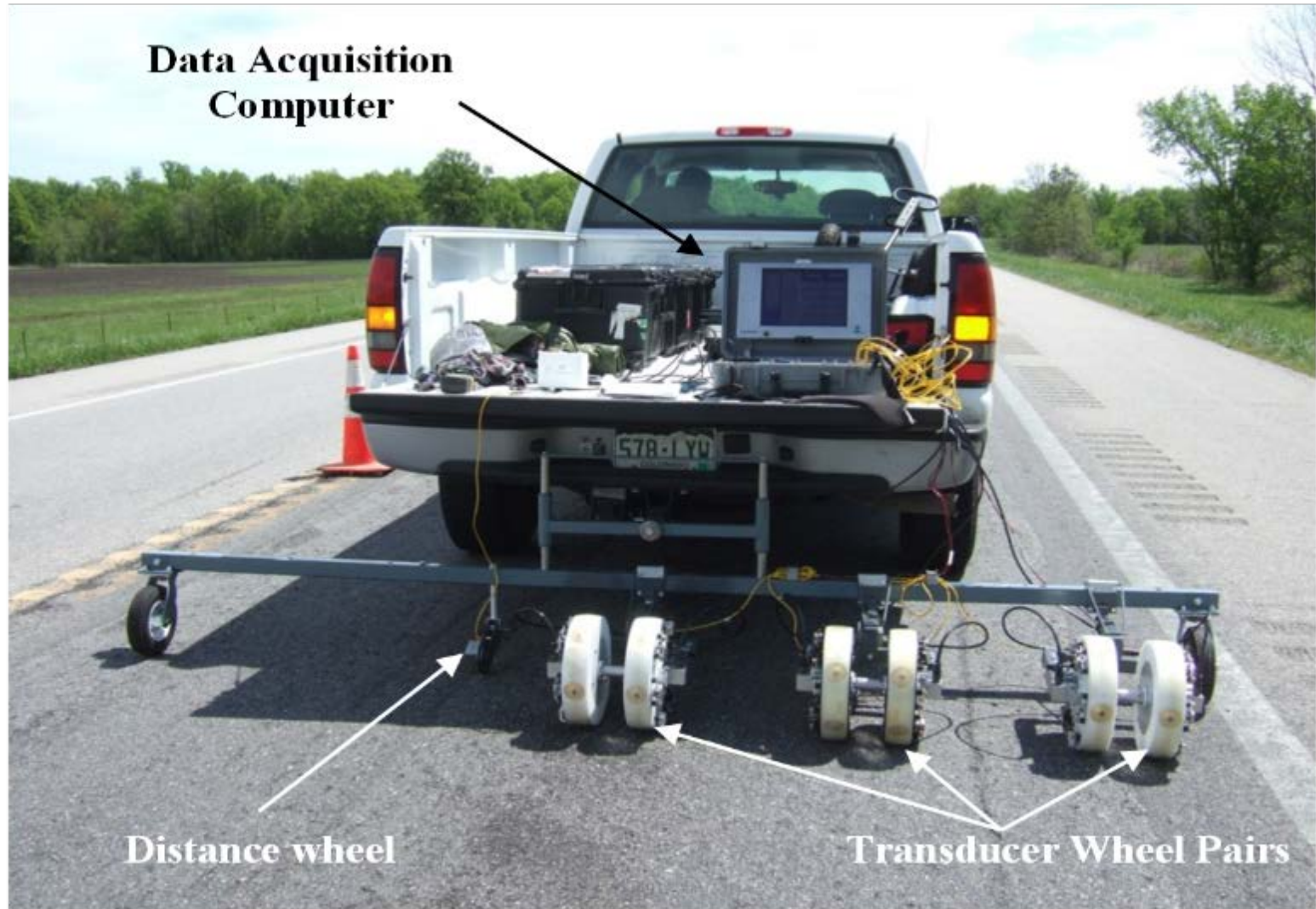
Section 1	Section 2
No bond	Full bond
5-inch depth	control

Thickness Color Scale (in)

SASW Data Display (NCAT test track section)



SASW-IE Rolling Meter by Olson Engineering



IAP and Peer Exchange

Implementation Assistance Program (IAP) – Proof of Concept

Kick-off meeting in March 2016.

Six agencies selected for IAP: CA, FL (Infrasense), KY (KTC), MN (Infrasense), TX (TTI), NM (TTI)

Objective: evaluate equipment/operation, analysis software, and field correlation

Peer Exchange

Nine States attended (6 IAP + PA, AL, NJ)

Hosted by MnDOT

August 1-3, 2018

- Equipment demonstration
- IAP State findings
- Vendor presentations
- Future next steps discussion

What – How

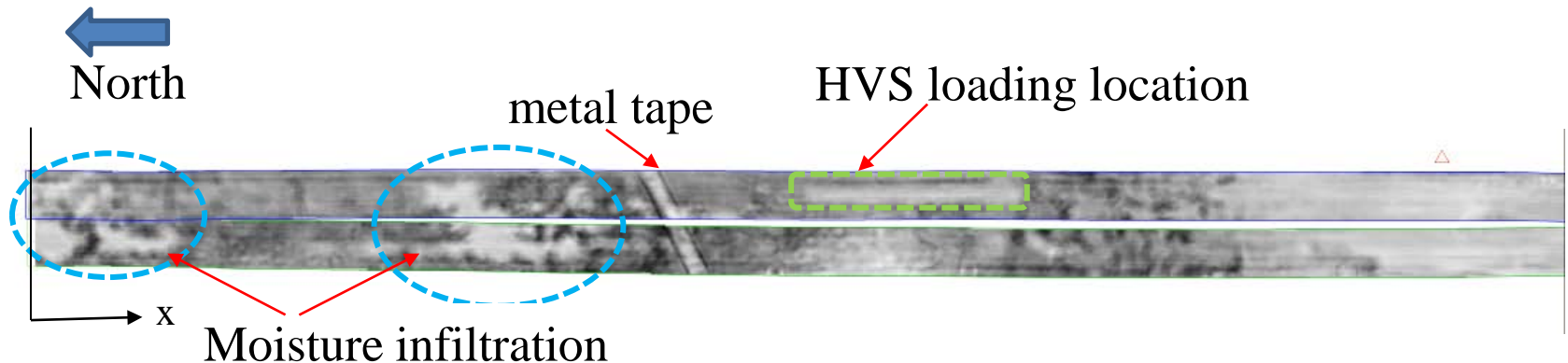
Looking at the technology: Sonic Surface Scanner (SSS), 3D Radar and Impulse Radar



3D RADAR Testing – FDOT SMO

- SMO Test Lane 3 – Debonding - Delamination

Lane 3 -3D Radar depth slice at 2”

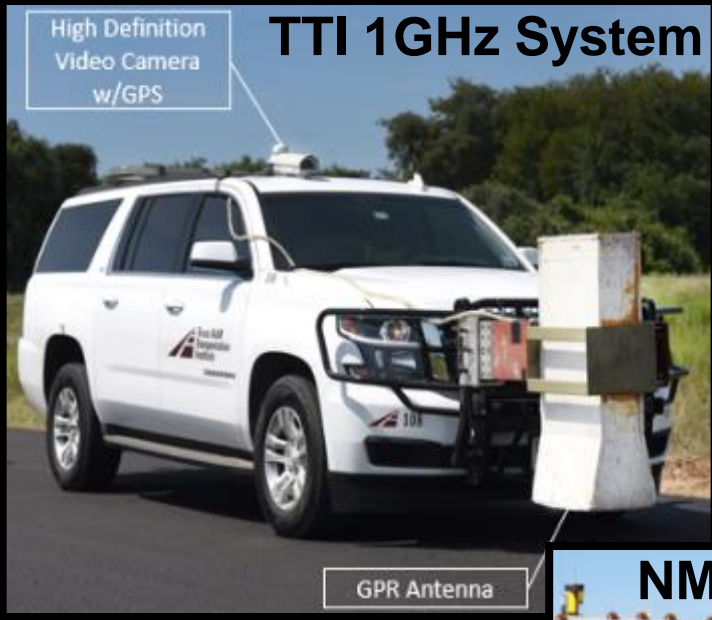


This section - Sand interface area (unbonded) – 1.4”

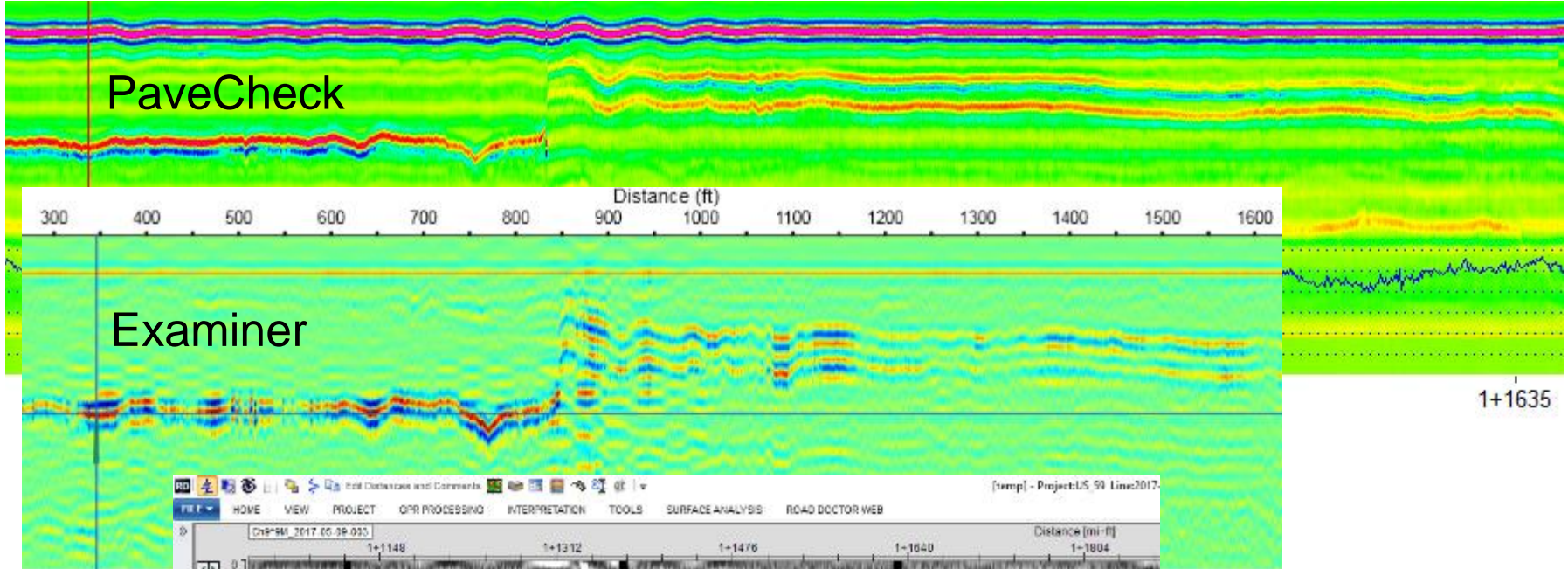
Caltrans, SR 247, Overlay Response



GPR – Comparison to TTI & NM Systems



All Software Elevation Views

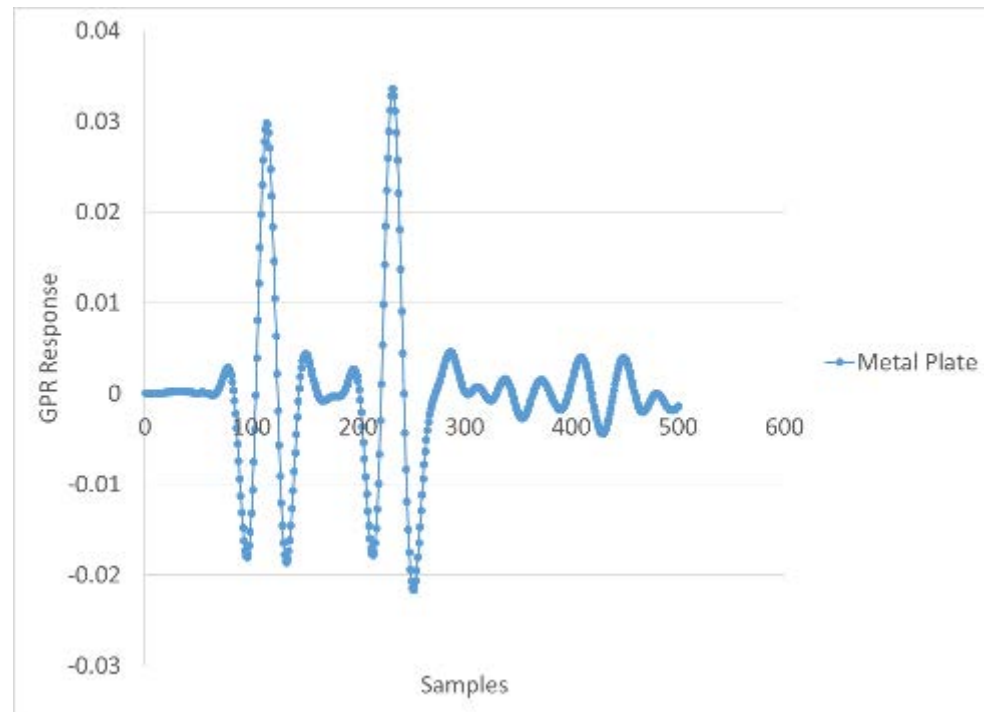


Controlled Laboratory Tests: Metal Calibration

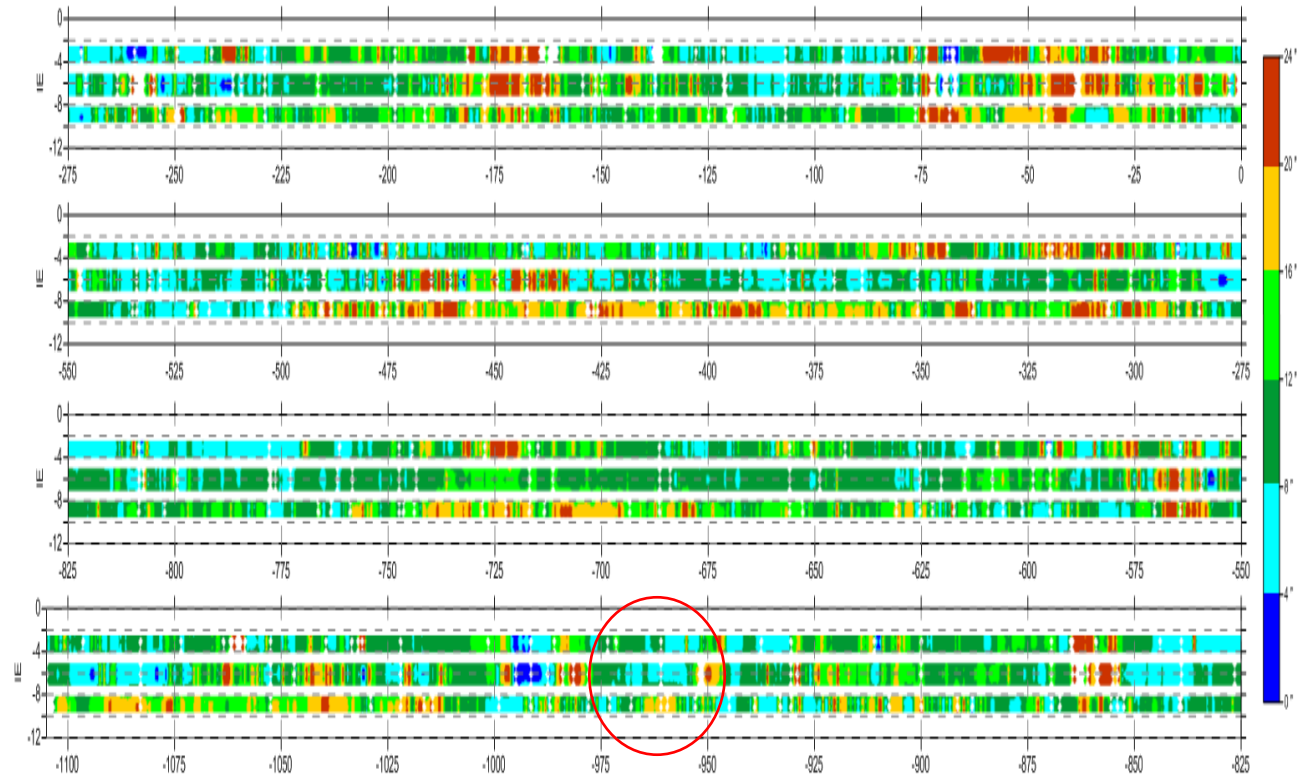


4'x8' Metal Surface Reflection Amplitude

- Placed in the center of the antenna array
- Use the amplitude of the surface reflection to characterize the signal magnitude



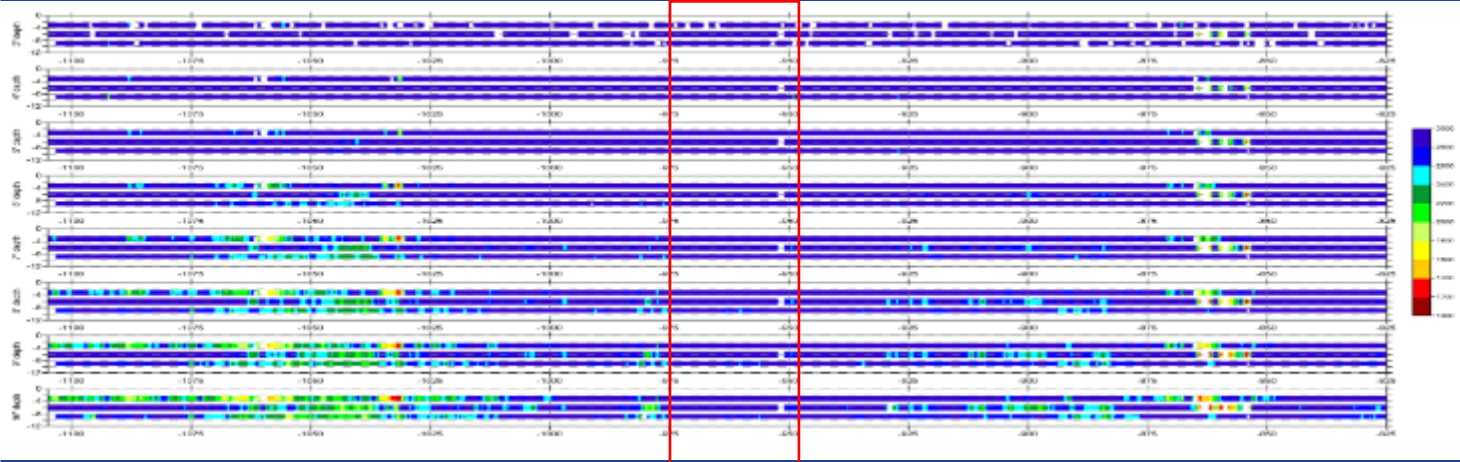
Impact Echo: core IE4, section three, CWP--960.7 feet



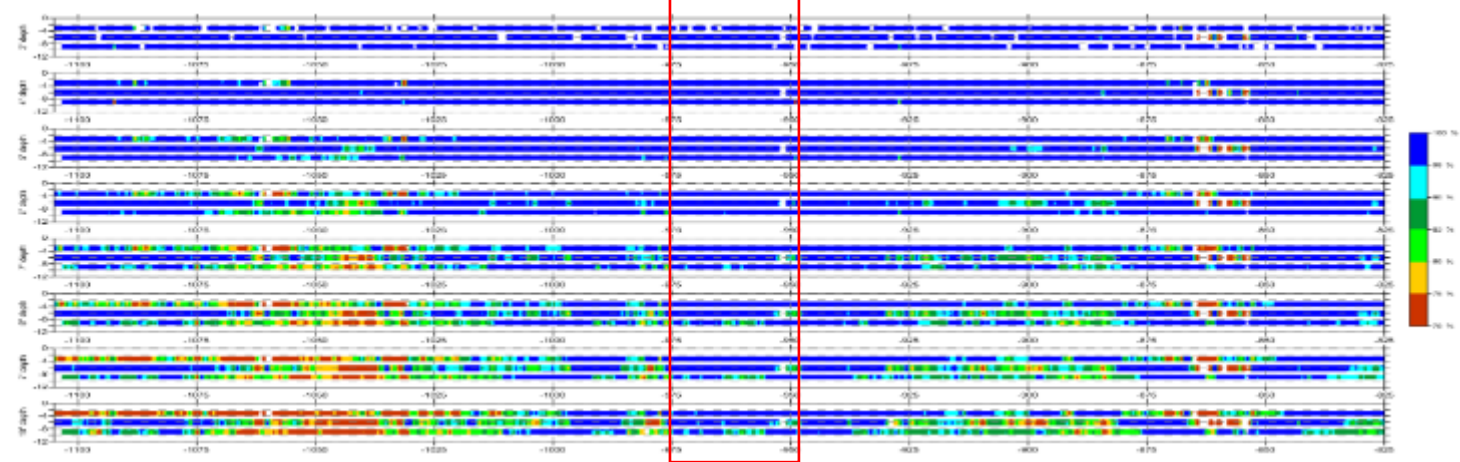


SASW: core IE4, section three, CWP--960.7 feet

absolute velocity

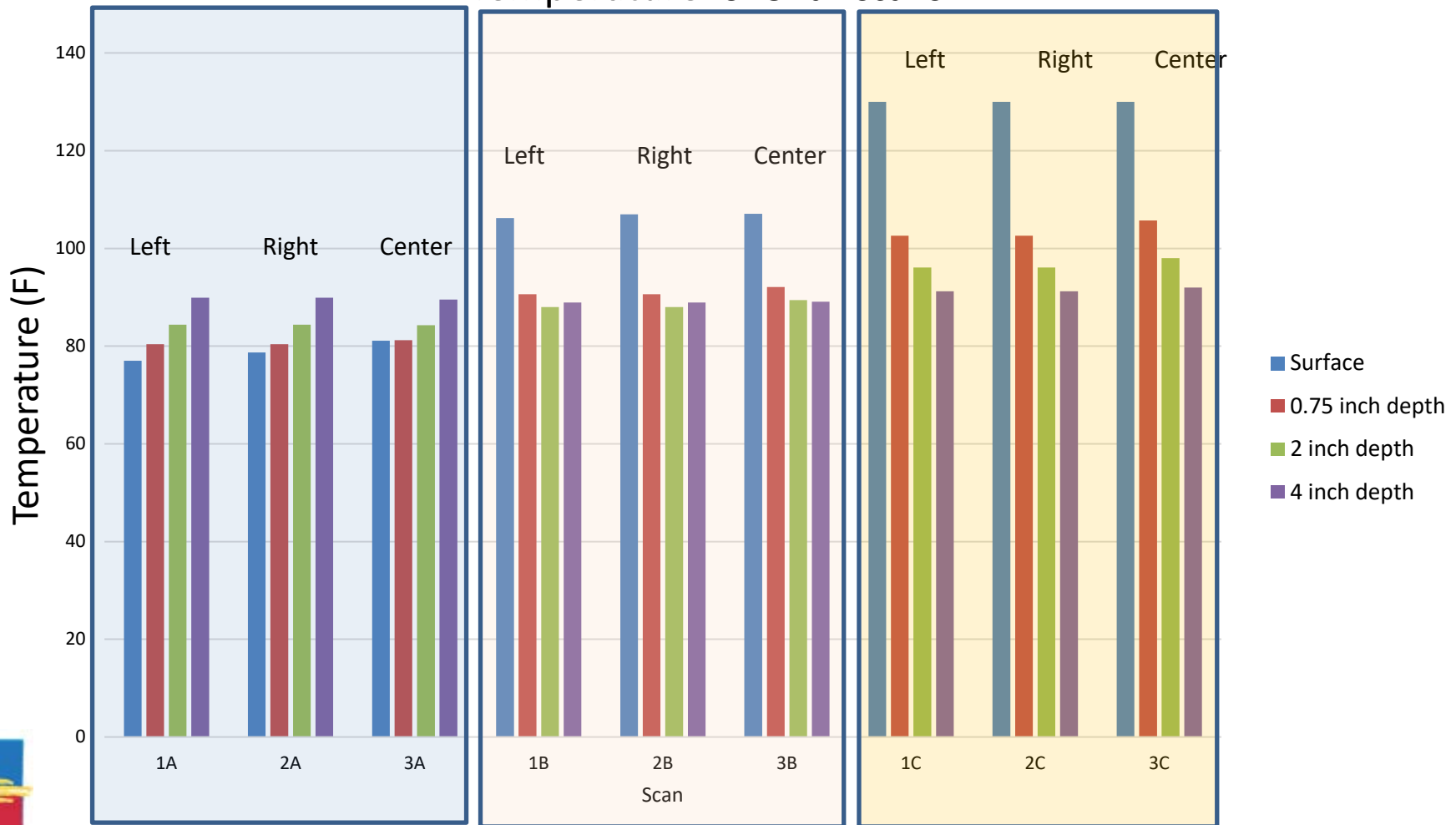


normalized velocity



District 3 Full Scans Temperature

Temperature for 3 full scans



IE Test Results – 525'

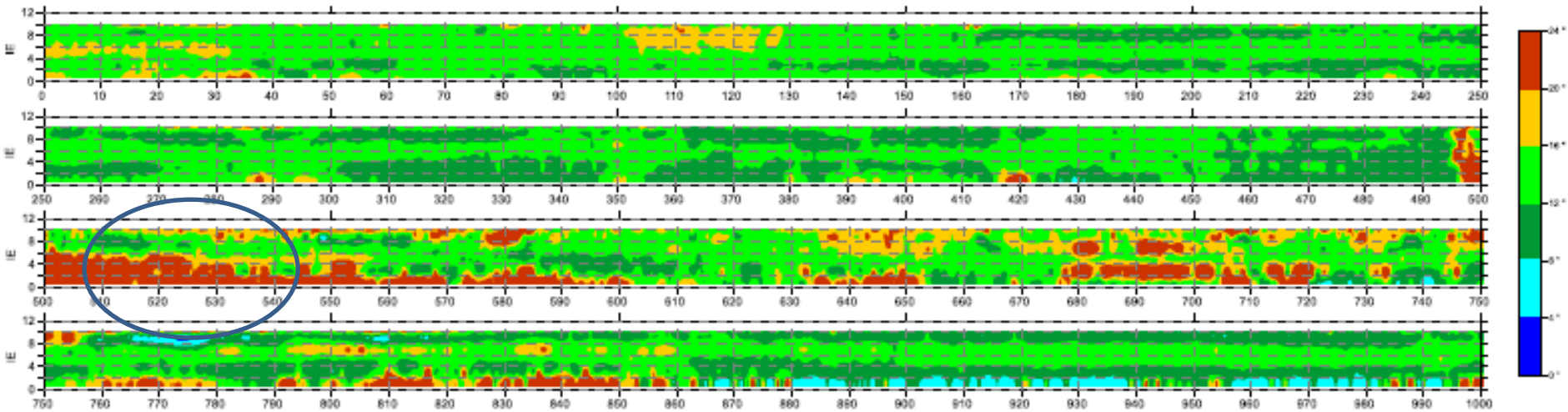


Figure A1: IE Results, Highway 59 SB Right Lane. X =



Between Wheel Paths

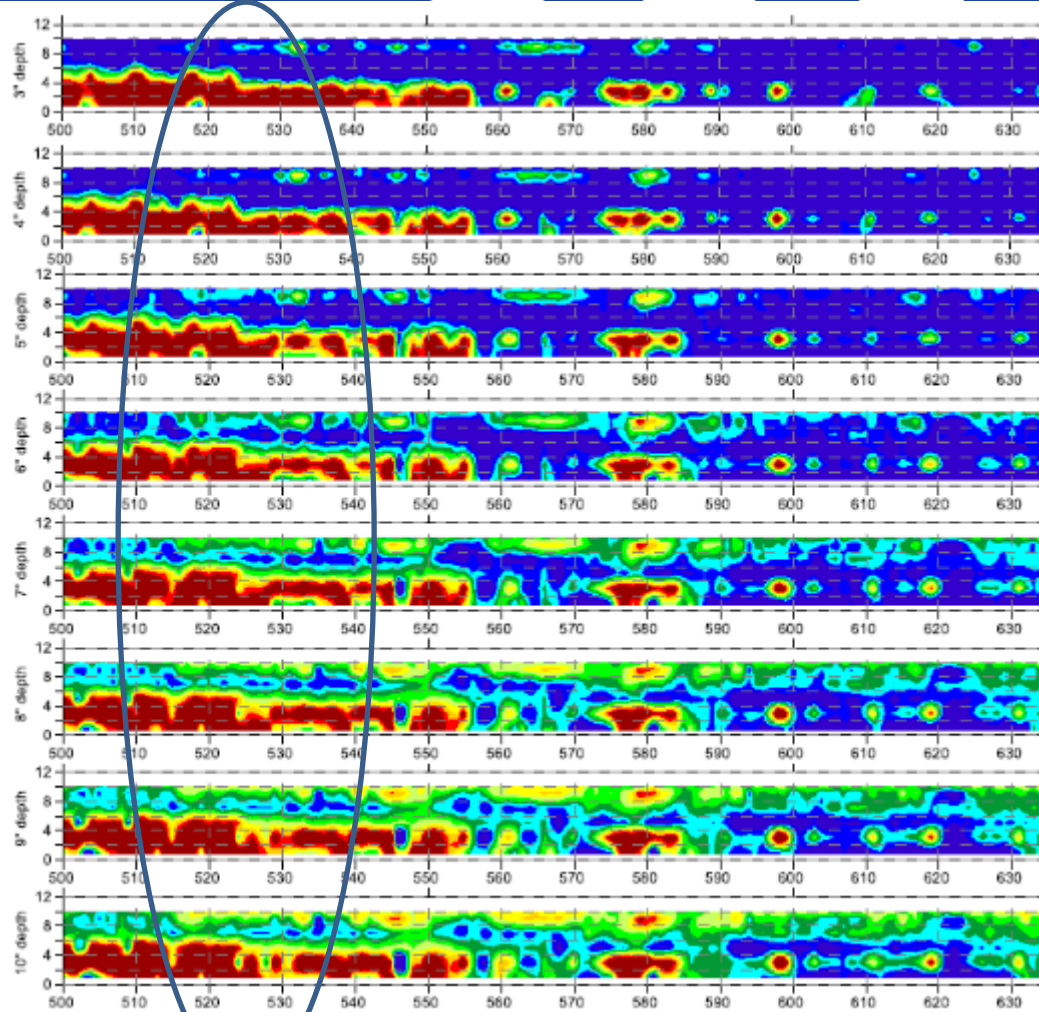


Right Wheel Path

SASW Test Results – Absolute Velocity

US 59

Cores RWP
&
Between WP
at 525'



Peer Exchange Summary

NDT system should have these features.

- Equipment calibration assures precision and accuracy.
- Equipment verification assures proper field operation.
- Testing protocols guide measurement quality for different roadway features.
- Recording test location is key to identifying distress location.
- Software to automate data analysis improves efficiency of analysis time.
- Validate the NDT results with another technology.

Move towards a broader User Group for all GPR users.

The GPR 3D-Radar system is ready for use.

The Olson IE/SASW may compliment or supplement coring to confirm boundaries for damaged area. Pavement temperature and data analysis are concerns.

SME final thoughts

- Chicken and Egg: Vendors need agency interest before investing in system development. Agencies need implementable systems before investing in equipment.
- Both technologies have strengths and weaknesses.
- Both systems can be used for multiple agency evaluations.
- Mostly for project development, not ready for system-wide asset management.
- Both technologies needed better automated analysis software.
- ROI is making better pavement rehab project decision to avoid construction change orders.