

SHRP2 R06(E): Real-Time Smoothness Measurements during Construction



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SHRP2



STRATEGIC HIGHWAY
RESEARCH PROGRAM



What have we delivered from this project?

- Validation of innovative tools for evaluating concrete pavement smoothness in real time.
- Tools that can possibly be used for quality control and process improvements.
- Process improvements as a result of timely feedback.
- Improved understanding about what construction artifacts can affect smoothness.

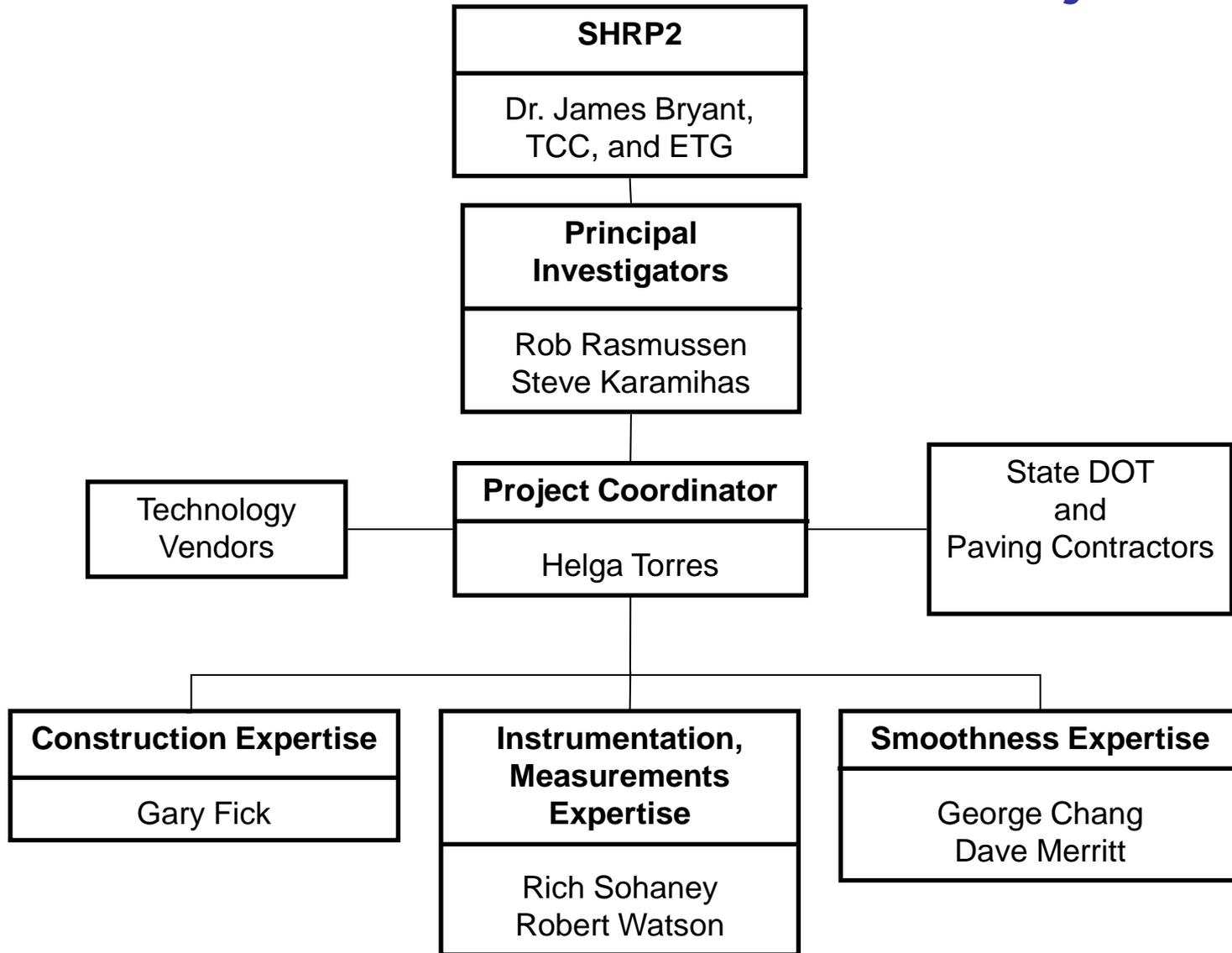
What can't we deliver from this project?

- A replacement for conventional profiling for acceptance.
- A replacement for better practices to construct smoother pavements.

Project Objectives

- Demonstrate and evaluate real-time smoothness measuring technologies for concrete paving.
- Develop draft specifications and construction guidance for use with these technologies.

Project Team

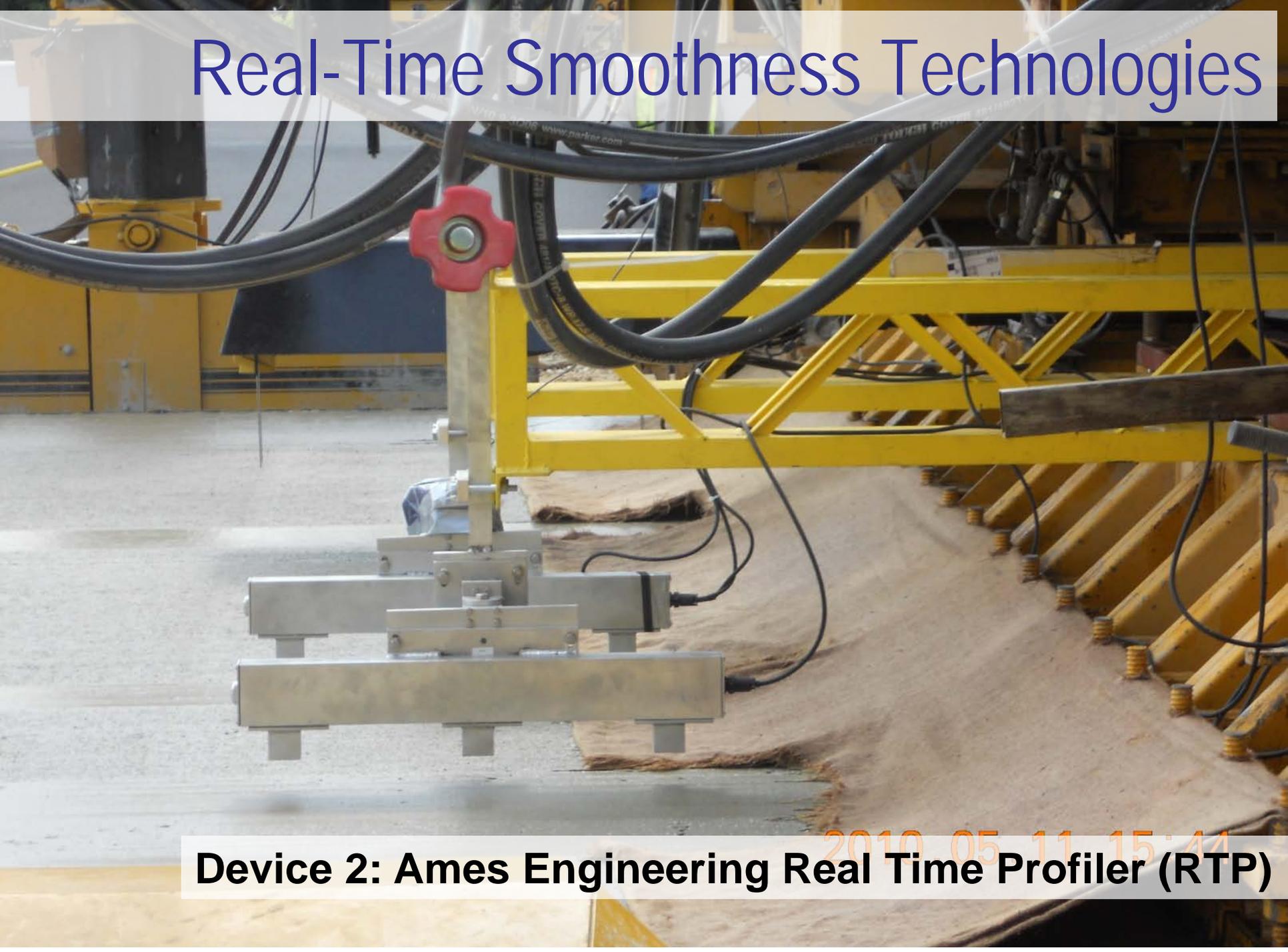


Real-Time Smoothness Technologies



Device 1: GOMACO Smoothness Indicator (GSI)

Real-Time Smoothness Technologies



Device 2: Ames Engineering Real Time Profiler (RTP)

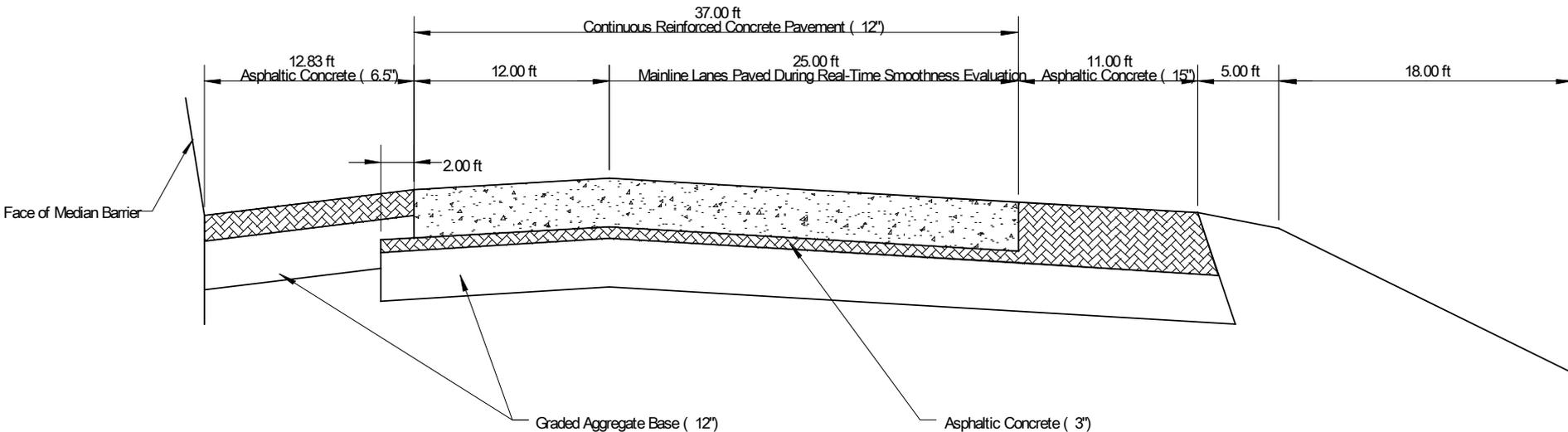
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Technology Evaluation

I-75 Widening and Reconstruction

- Adel, Georgia
- May 6-12, 2010
- CRCP

Thanks to GDOT and
The Scruggs Company
for all of your help!!



Technology Evaluation: Diary

■ What happened in front of the spreader?



Technology Evaluation: Diary

■ What happened in front of the paver?



Technology Evaluation: Diary

■ What happened behind the paver?



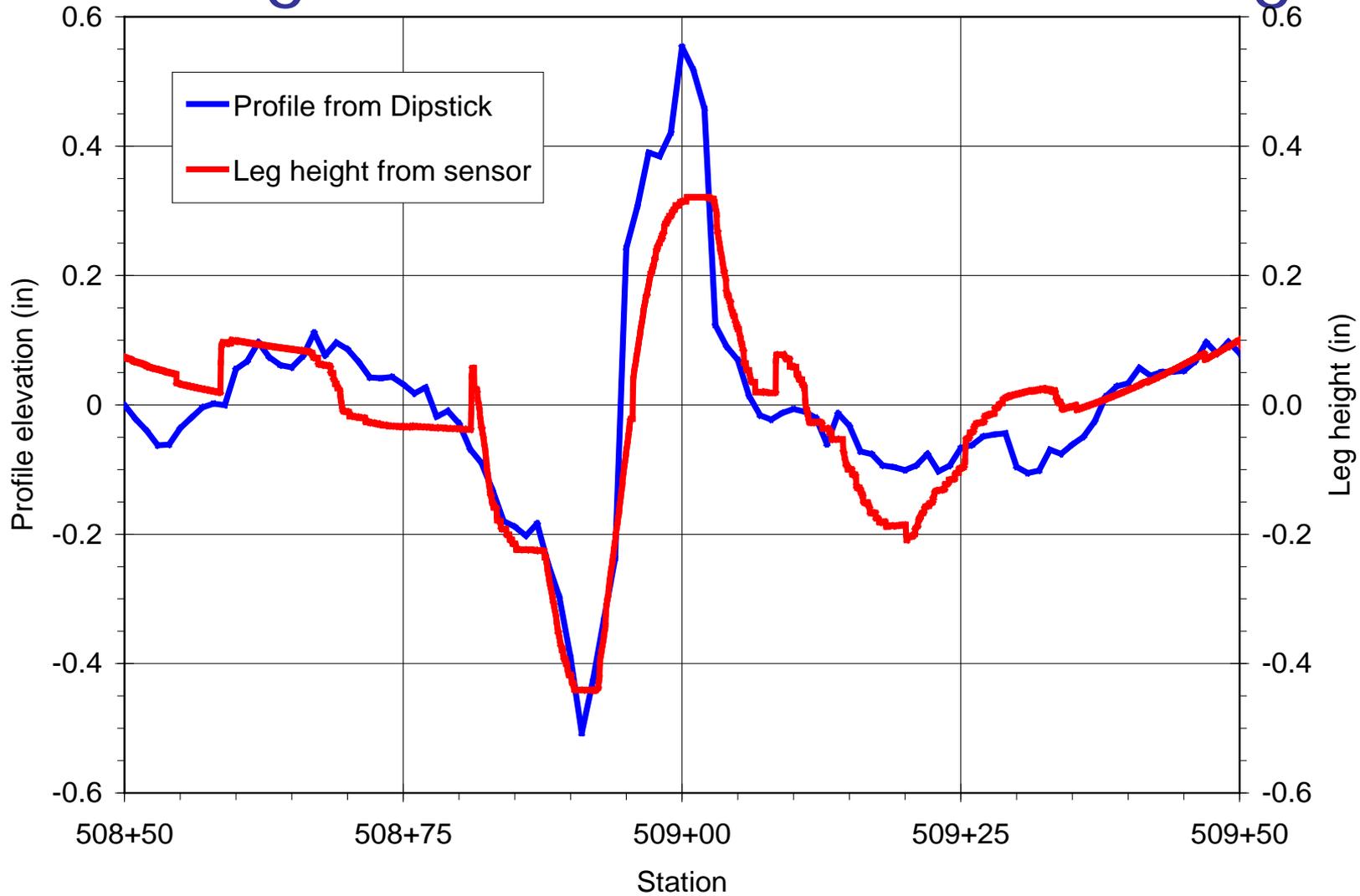
Technology Evaluation

**Evaluate Profiler Operation
and
Identify Construction Artifacts**

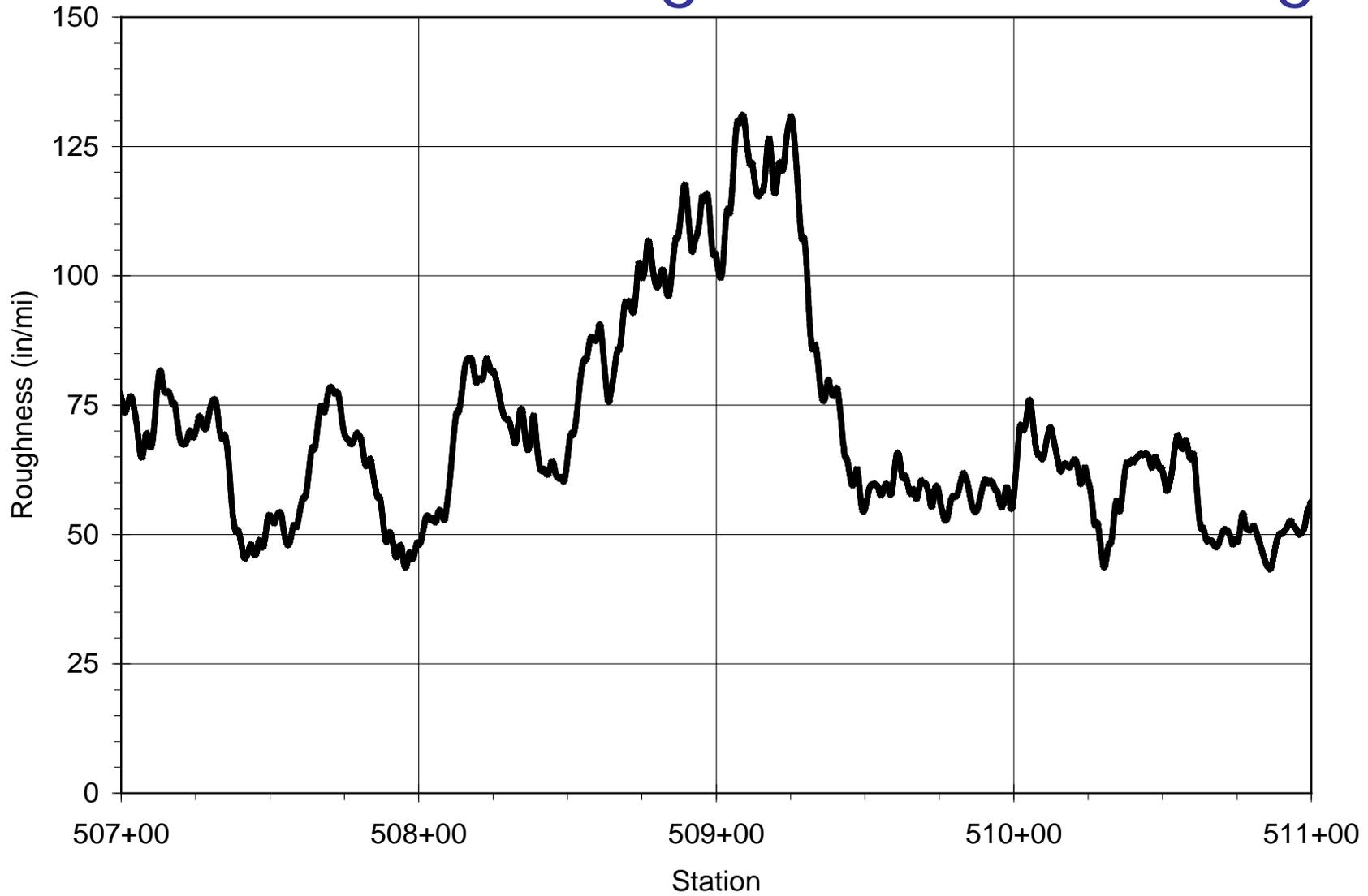
Rough Trackline



Rough Trackline: Profile and Leg Motion

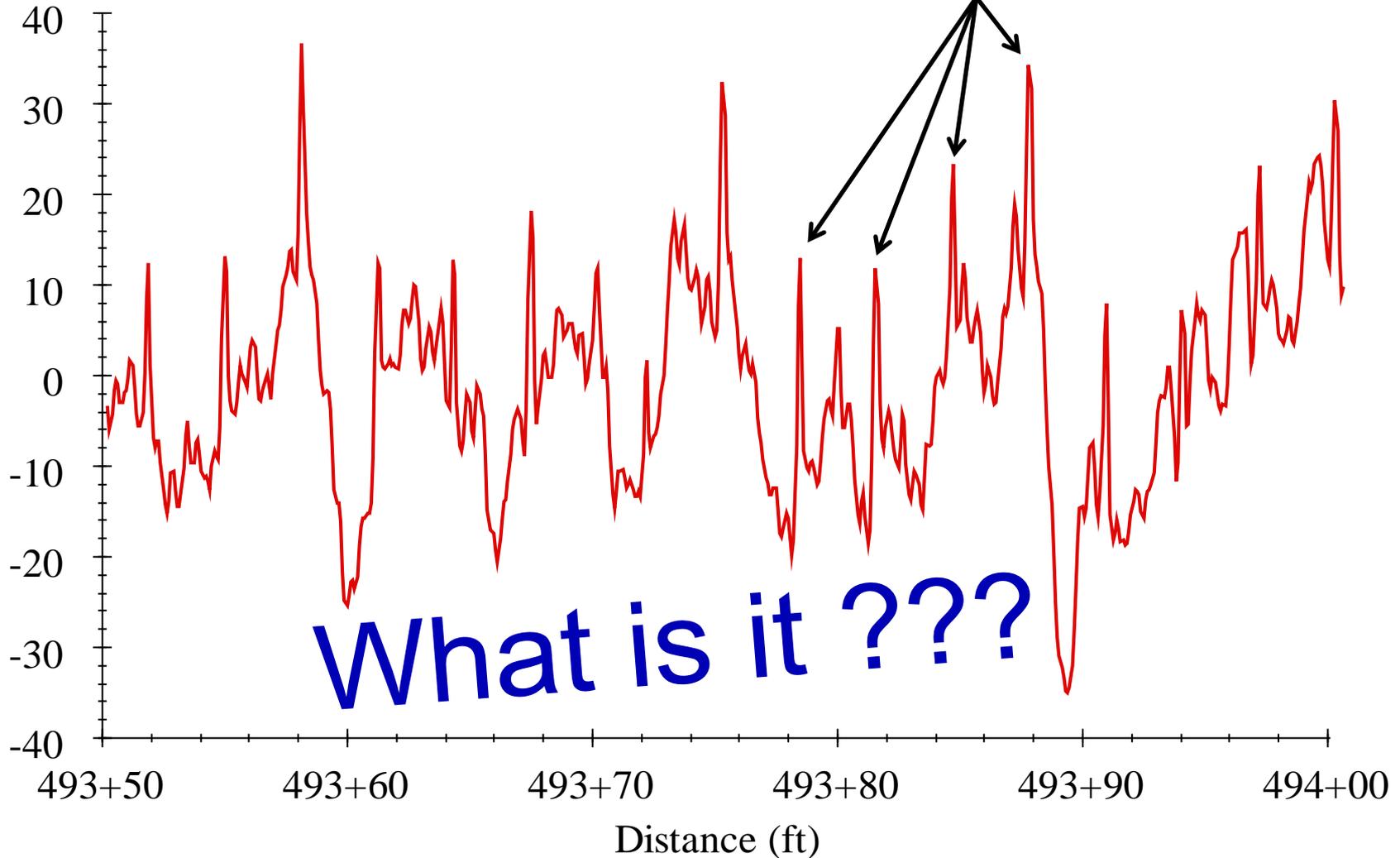


Rough Trackline: Roughness



Quiz: Profile (Hardened)

Elevation (mils)



Quiz: Profile (Hardened)



**Transverse Bars
spaced 3 ft c-c**

Reinforcement Ripple!!

Technology Demonstration #1

- Project: Vilonia Bypass (New Alignment)
- Owner: Arkansas State Highway and Transportation Department
- Contractor: Interstate Highway Construction
- Real-Time Smoothness Vendor: GOMACO

- April-May 2011

GOMACO GSI Behind the Paver



DBI / OCB



GOMACO GSI Tractor Mounted



Finishing



Checking



Checking



Not Finishing



Line Sensor Adjustments



Localized Base Failures



Soft Trackline



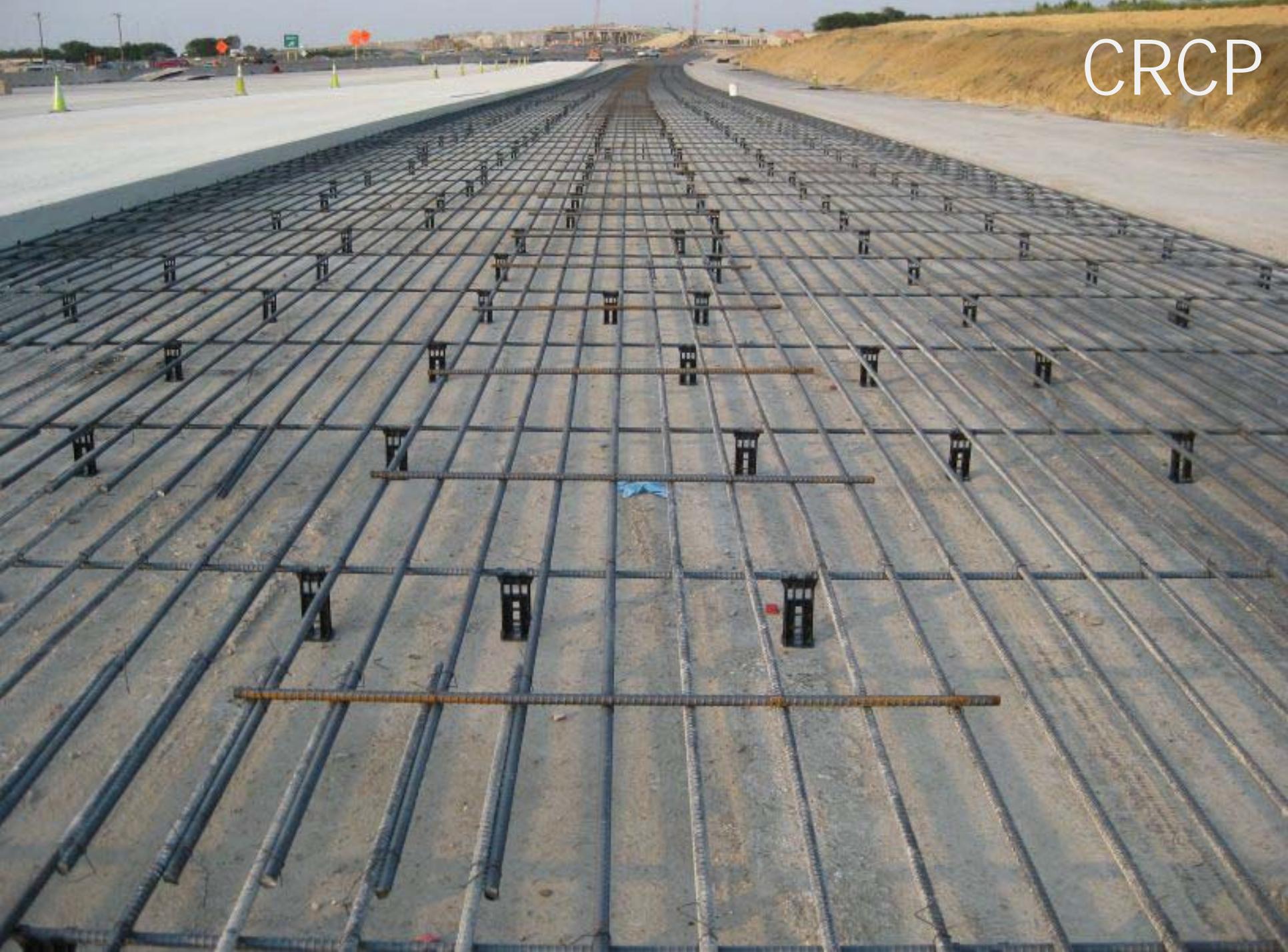
Stringline Swap



Technology Demonstration #2

- Project: DFW Connector
 - Owner: Texas Department of Transportation
 - Contractor: Northgate Constructors
 - Real-Time Smoothness Vendor: Ames
-
- June 2011

CRCP



Batch Plant



Paving Train



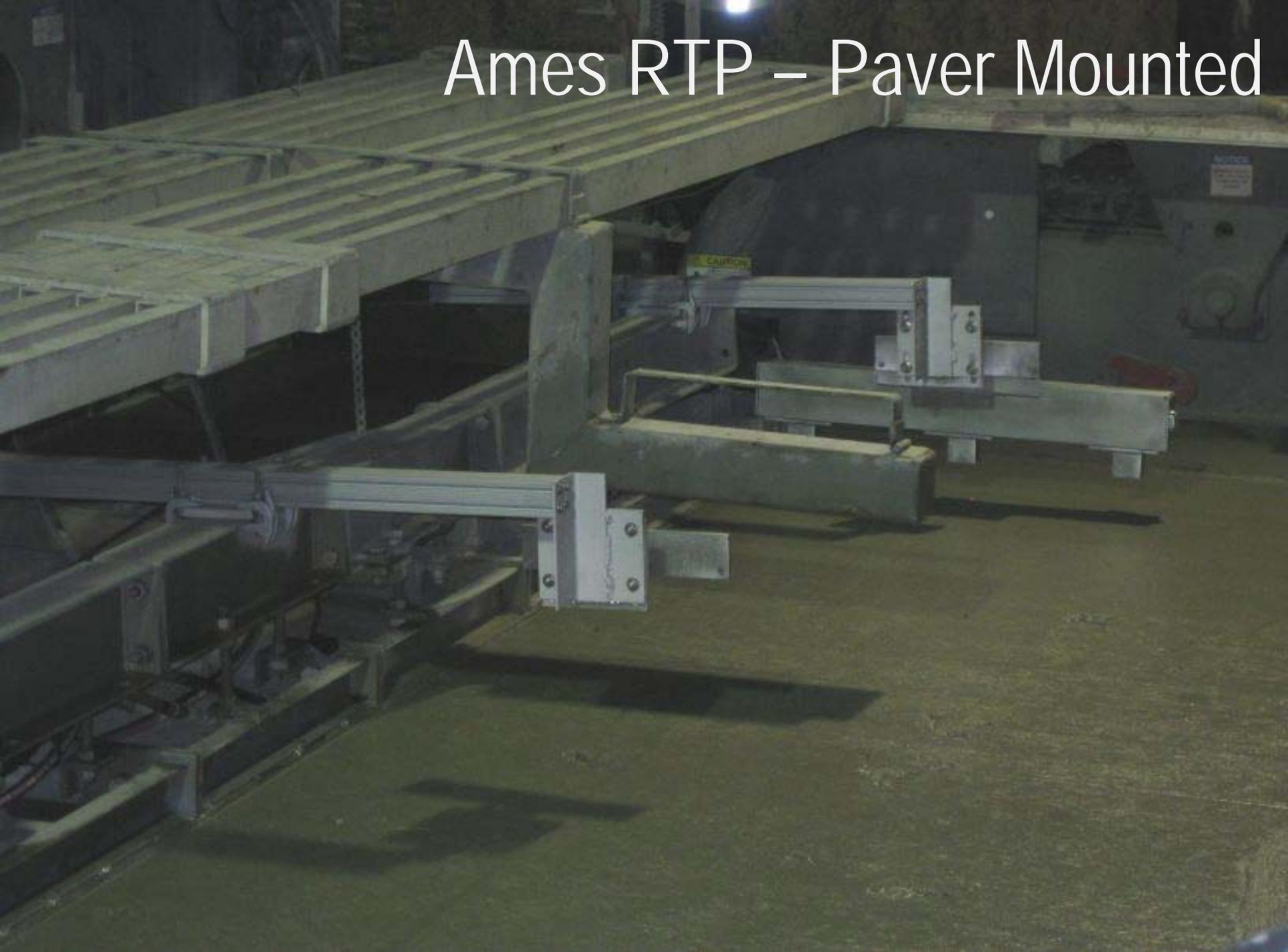
Stringless Paving Guidance



Paver's Paradise



Ames RTP – Paver Mounted



Ames RTP Power Supply





Phase III, Demo #2B & #3

- Project: I-94 Reconstruction
- Owner: Michigan Department of Transportation
- Contractor: Interstate Highway Construction
- Real-Time Smoothness Vendor: GOMACO and Ames

- July 2011

Work Bridge Mounted



Work Bridge Mounted



Paver Mounted

AMES ENGINEERING



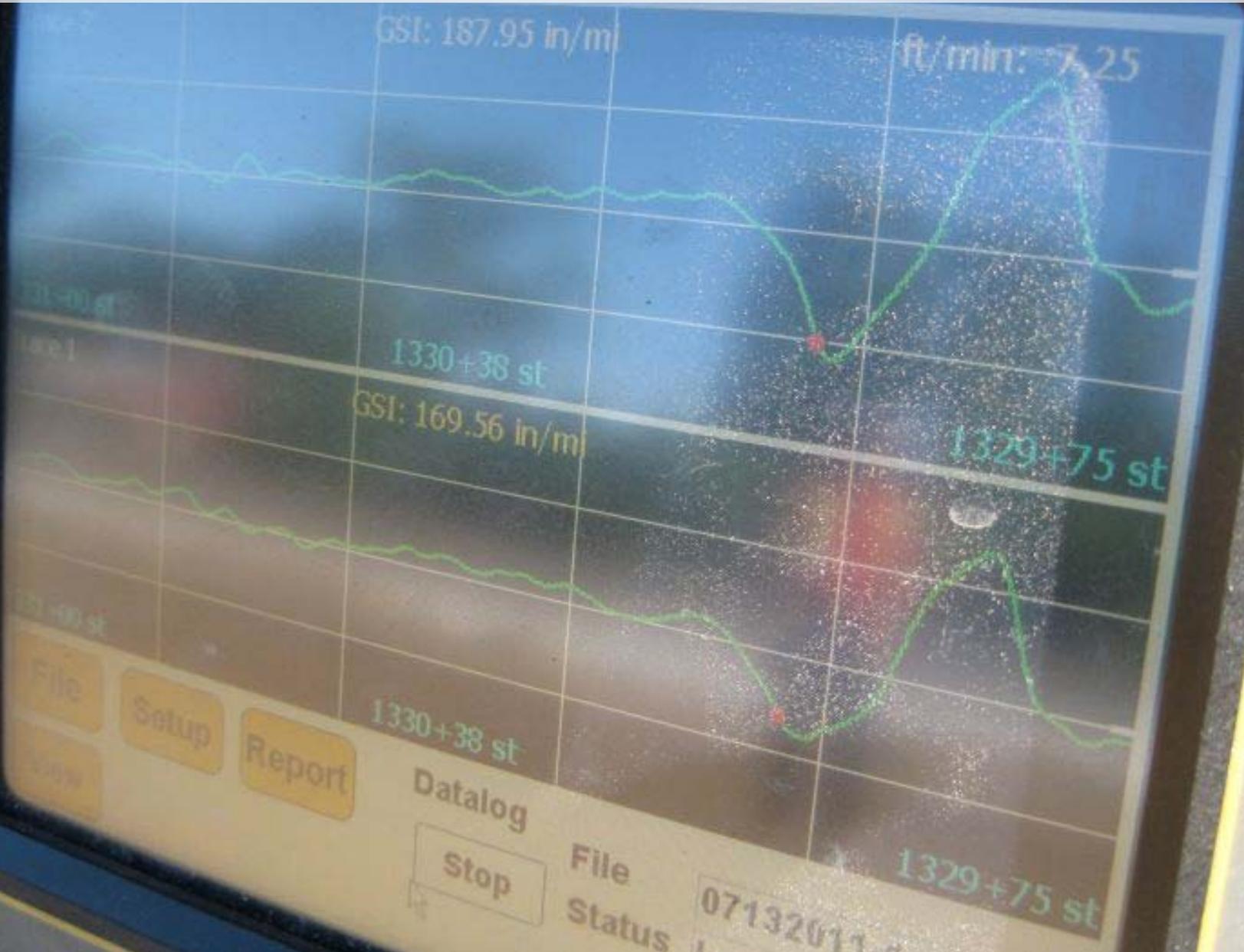
Stringline Sensor Moved off Line



Stringline Sensor Moved off Line



Stringline Sensor Moved off Line

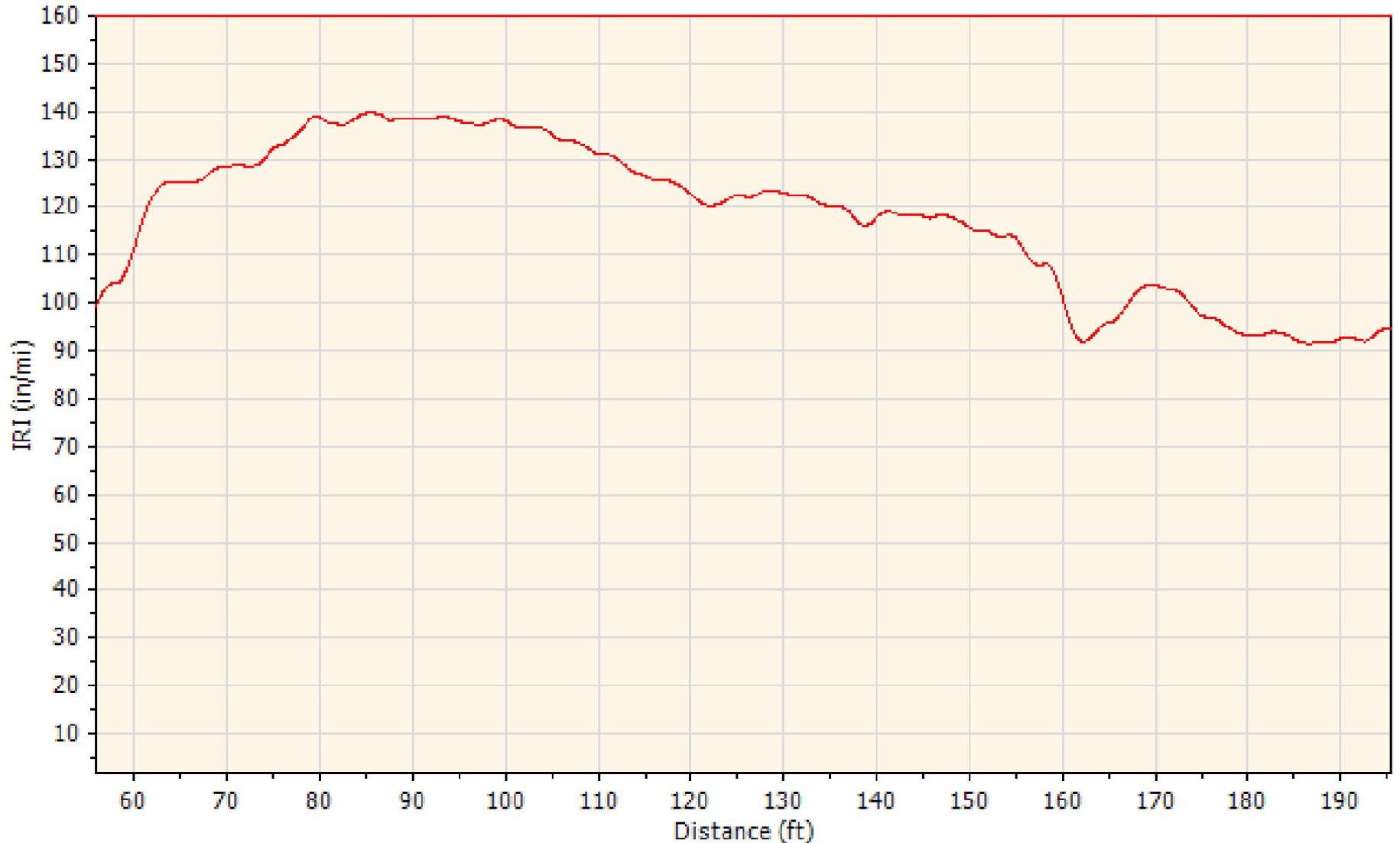


File Setup Report

Datalog Stop

File Status 07132011

Stringline Sensor Moved off Line



Paver Adjustments



Phase III, Demo #4

- Project: I-90 Reconstruction
 - Owner: New York State Thruway Authority
 - Contractor: Cold Spring Construction
 - Real-Time Smoothness Vendor: Ames
-
- August 2011

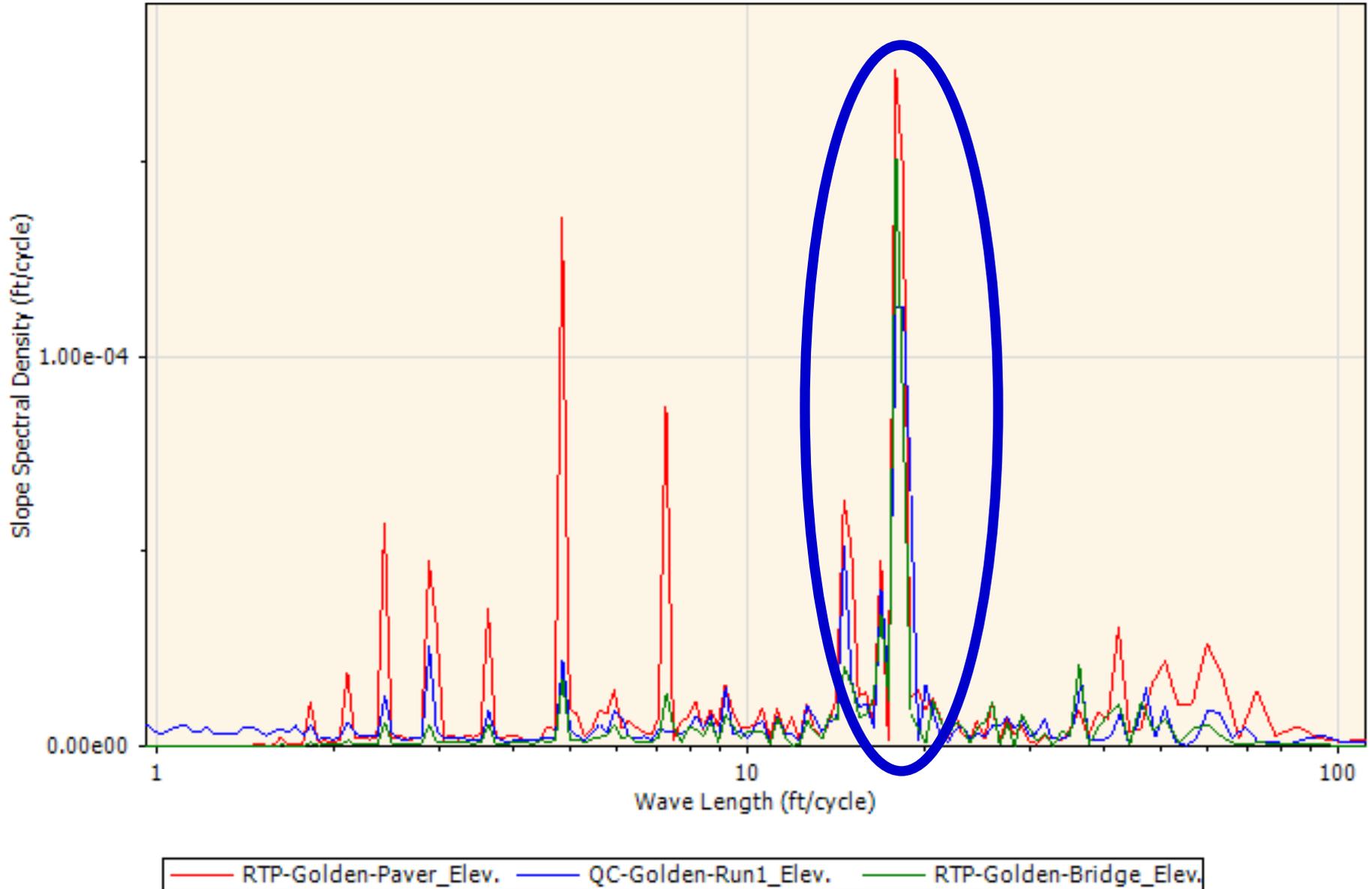
Paver Mounted



Self Propelled Work Bridge Mounted



The Mystery at 18 ft.



The Mystery at 18 ft.



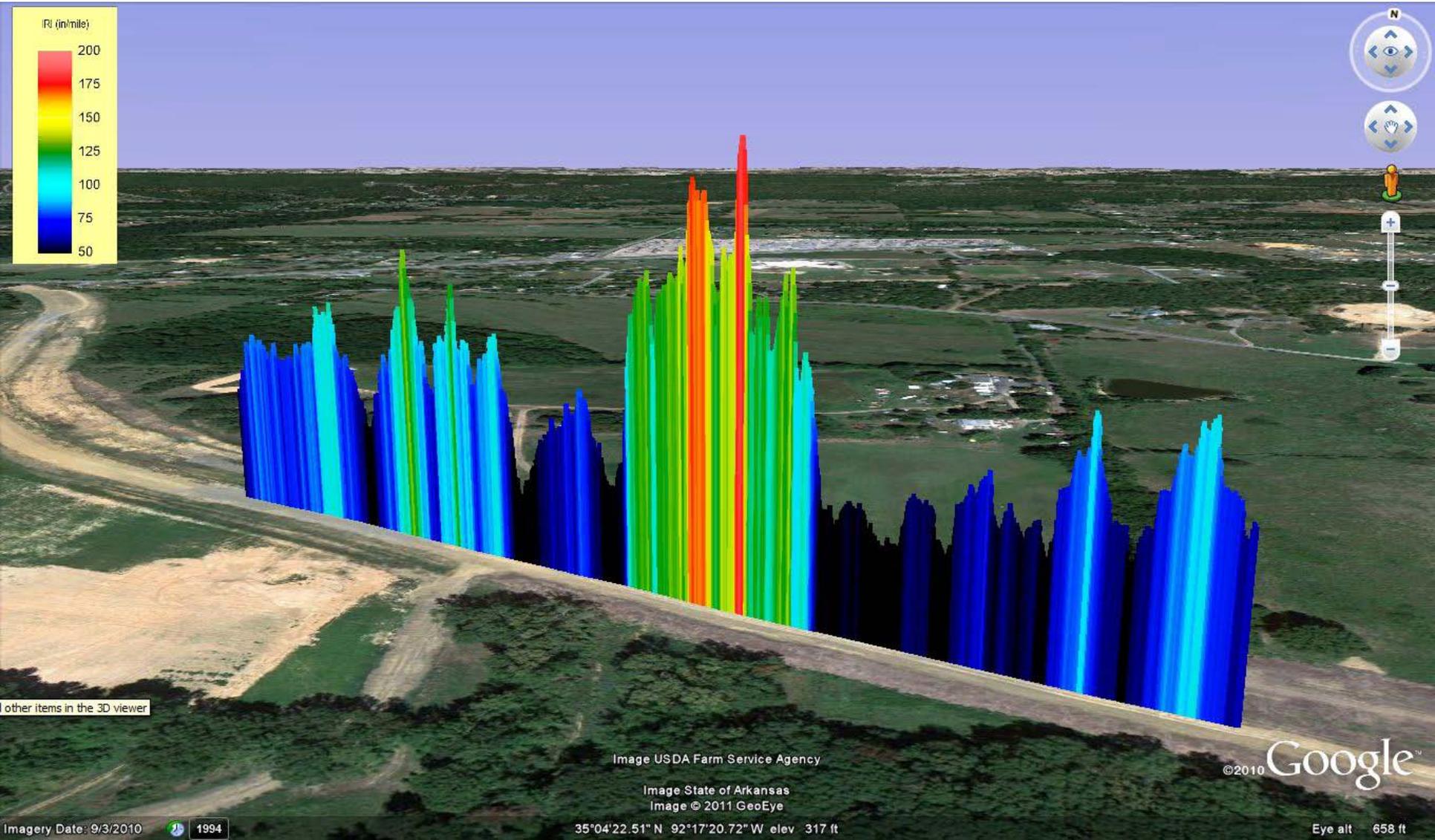
The Mystery at 18 ft.



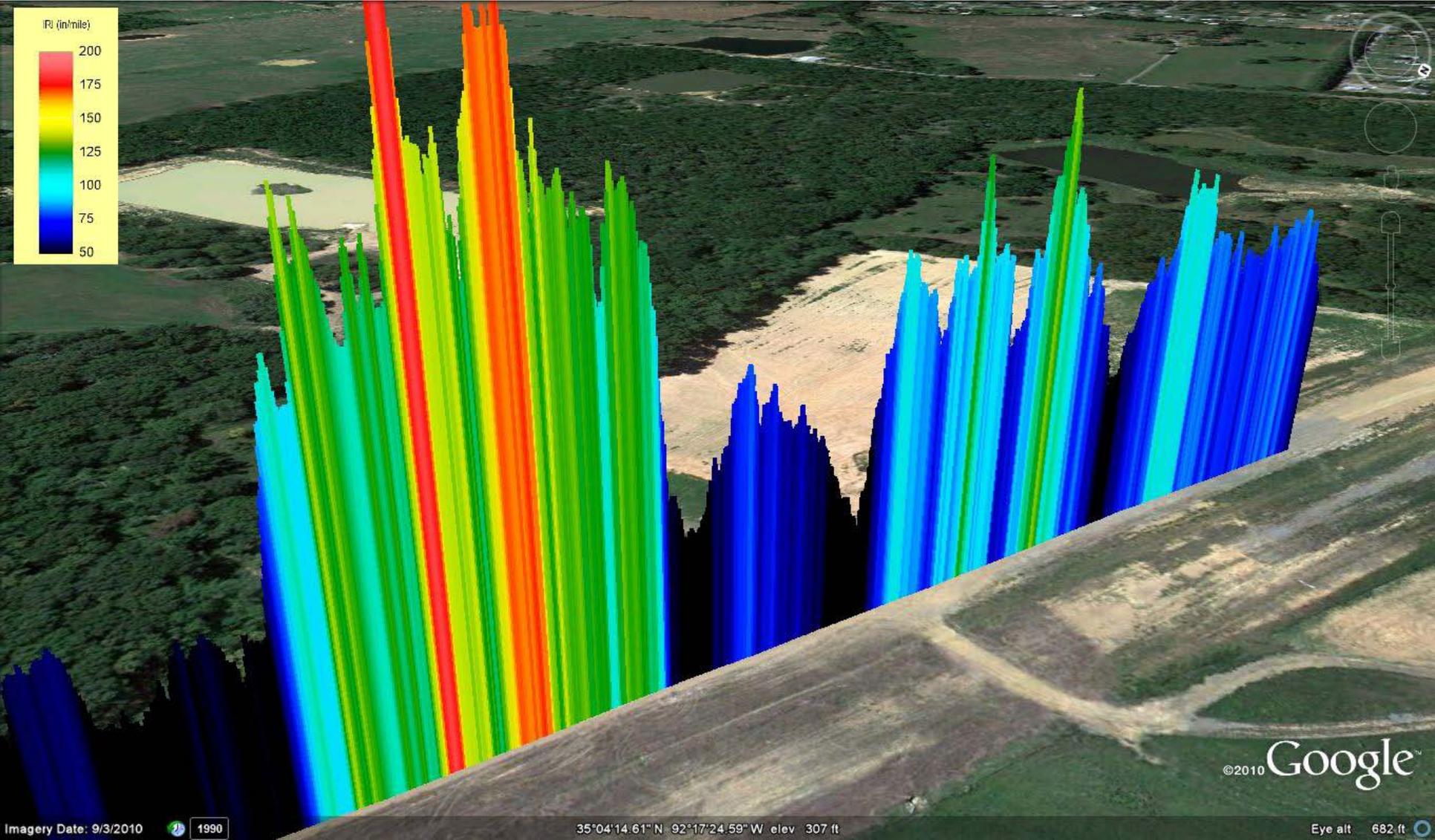
The Mystery at 18 ft.



Findings – Visualization



Findings – Visualization



Findings

- Both vendors made some changes, but others are recommended
- Mounting to the paver is not always the best
- Paving crews embraced the technology
- RTS technology is well suited for:
 - Identifying impacts on smoothness
 - Tuning the paver
 - Quality control

Project Deliverables

- Model Specifications
- Guidelines
- Documentation of profiler performance and recommendations

Thank You!



Project Principals:

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