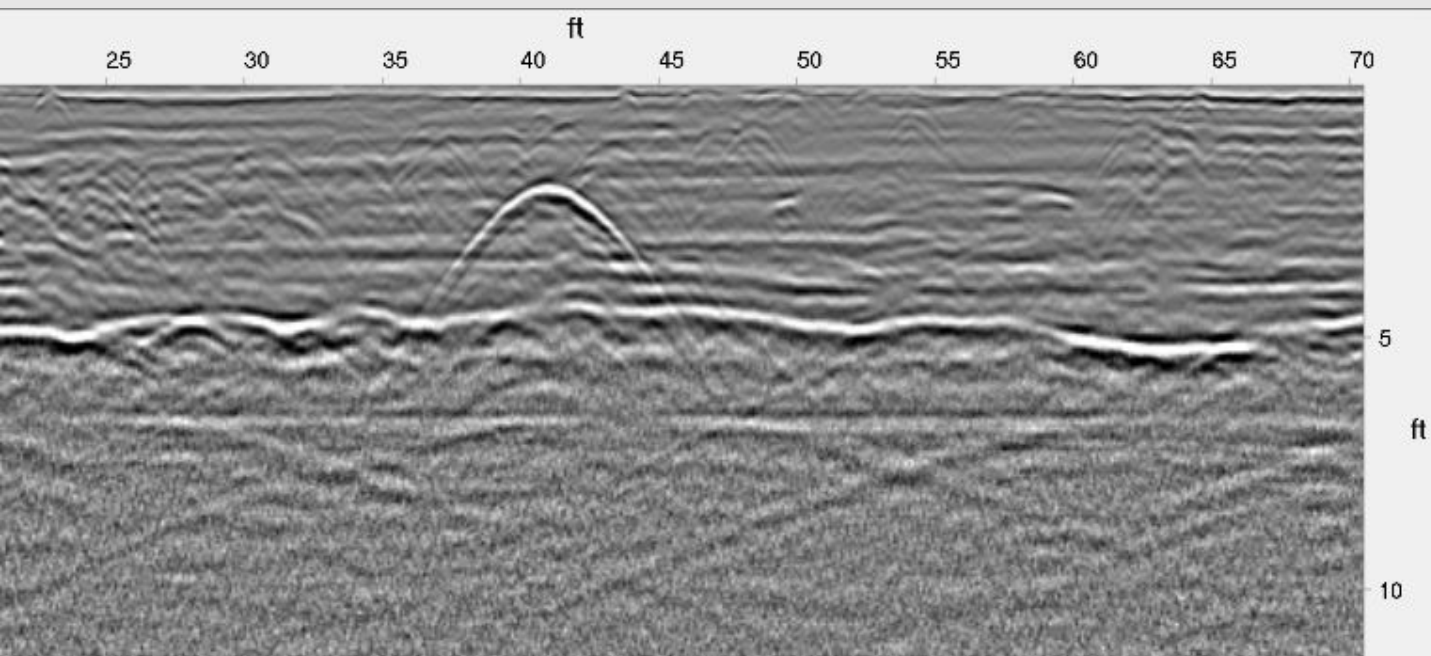


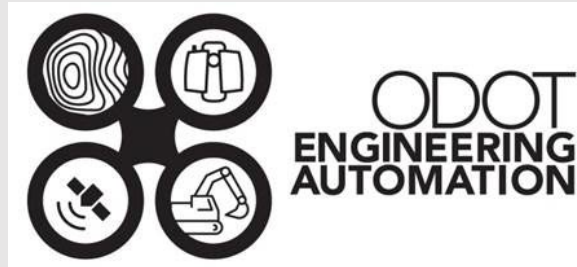
Ground Penetrating Radar at ODOT



Chris Pucci, PLS
ODOT Engineering Automation Section
OGUG Meeting – PLSO Conference
January 21, 2022

Chris Pucci, PLS

- Professional Land Surveyor
- ODOT Statewide Survey/New Technology Group
- Community College Land Surveying Instructor
- Focus on Technology & Training: GNSS Tablets, Ground Penetrating Radar, Machine Control, GNSS Research, anything new...



Why GPR?

- Modern technology!
- Catch up to Industry and Consultants
- Proven track record beyond ODOT
- Reduce design costs
- Reduce construction costs and delays

How did we get here?

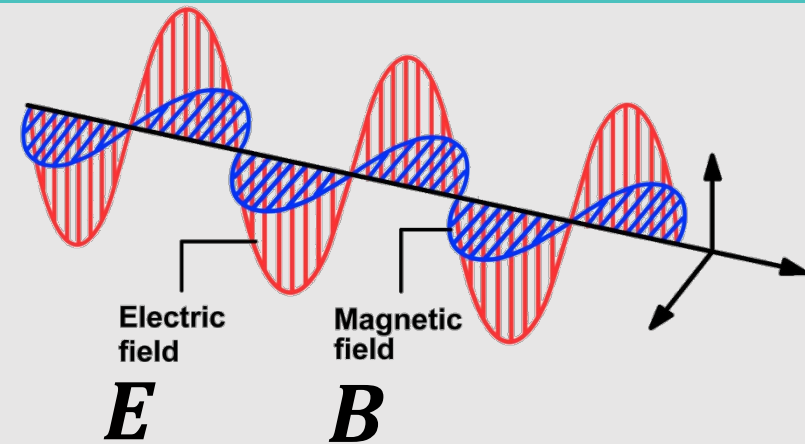
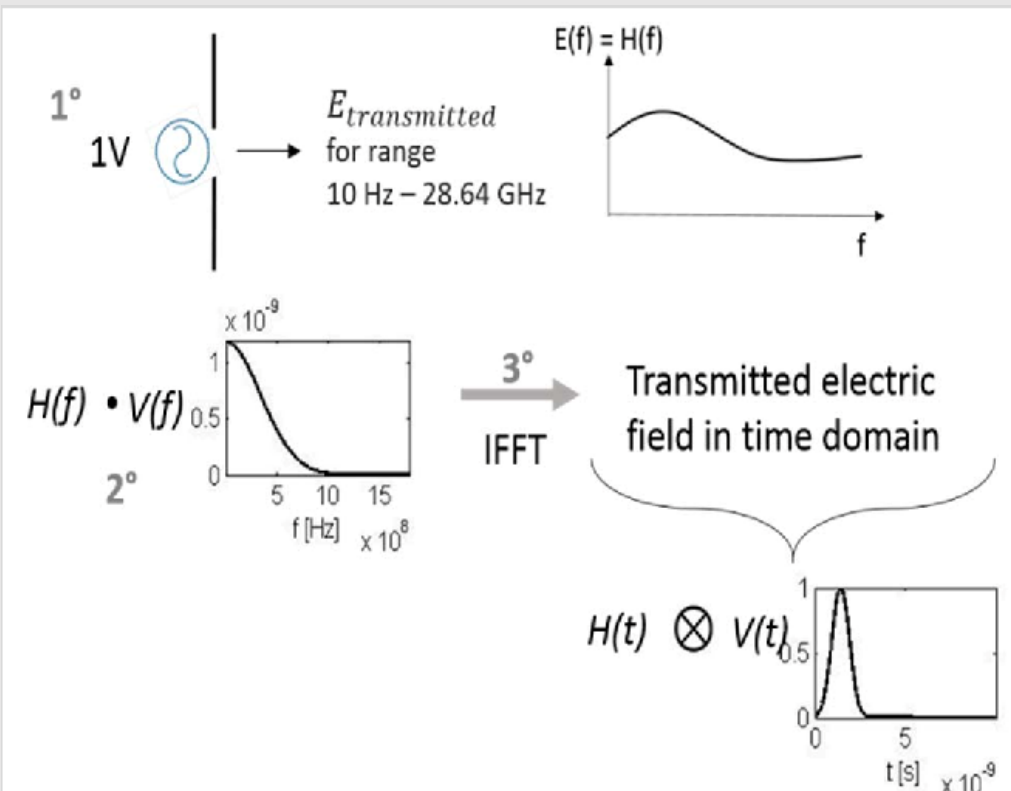
- Research Projects
- Utility mapping contracts
- Federal Innovation Grant
- Statewide new technology group



Current GPR Uses at ODOT

- Better utility locates
- Buried structures/concrete/etc.
- Pavement thickness
- Concrete thickness
- Rebar location
- Historical/Archeology
- Subsurface geology
- And what ever else!

GPR = HARD (Calculus and physics!)



$$\nabla^2 \mathbf{E} = \mu\sigma \frac{\partial \mathbf{E}}{\partial t} + \mu\epsilon \frac{\partial^2 \mathbf{E}}{\partial t^2}$$

$$\nabla^2 \mathbf{B} = \mu\sigma \frac{\partial \mathbf{B}}{\partial t} + \mu\epsilon \frac{\partial^2 \mathbf{B}}{\partial t^2}$$

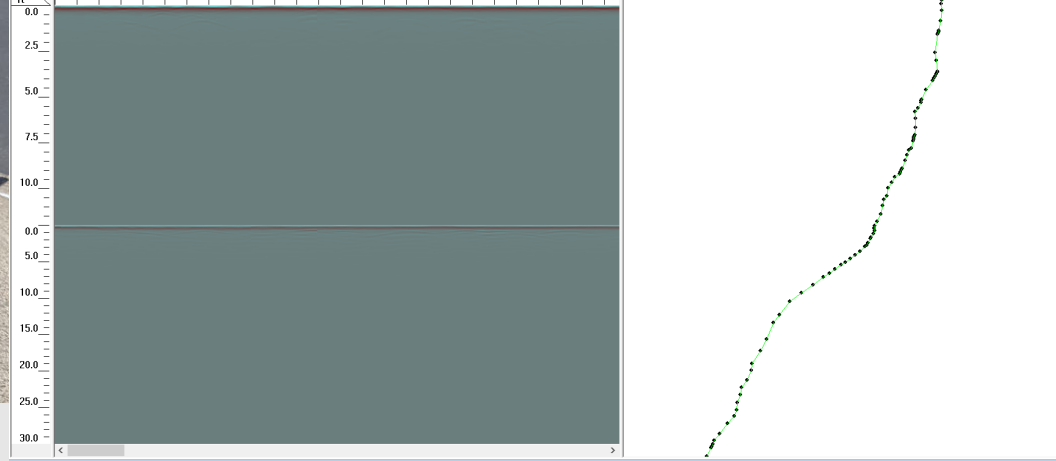
GPR = EASY

(The Equipment has come a
LONG ways!)

- PhD not required to operate!
- No ticker tape paper output
- Real time interpretation
- Unlimited post processing options
- CAD/GIS outputs



And yes, you can put GNSS on your GPR machine...



Training #1 -Big Picture

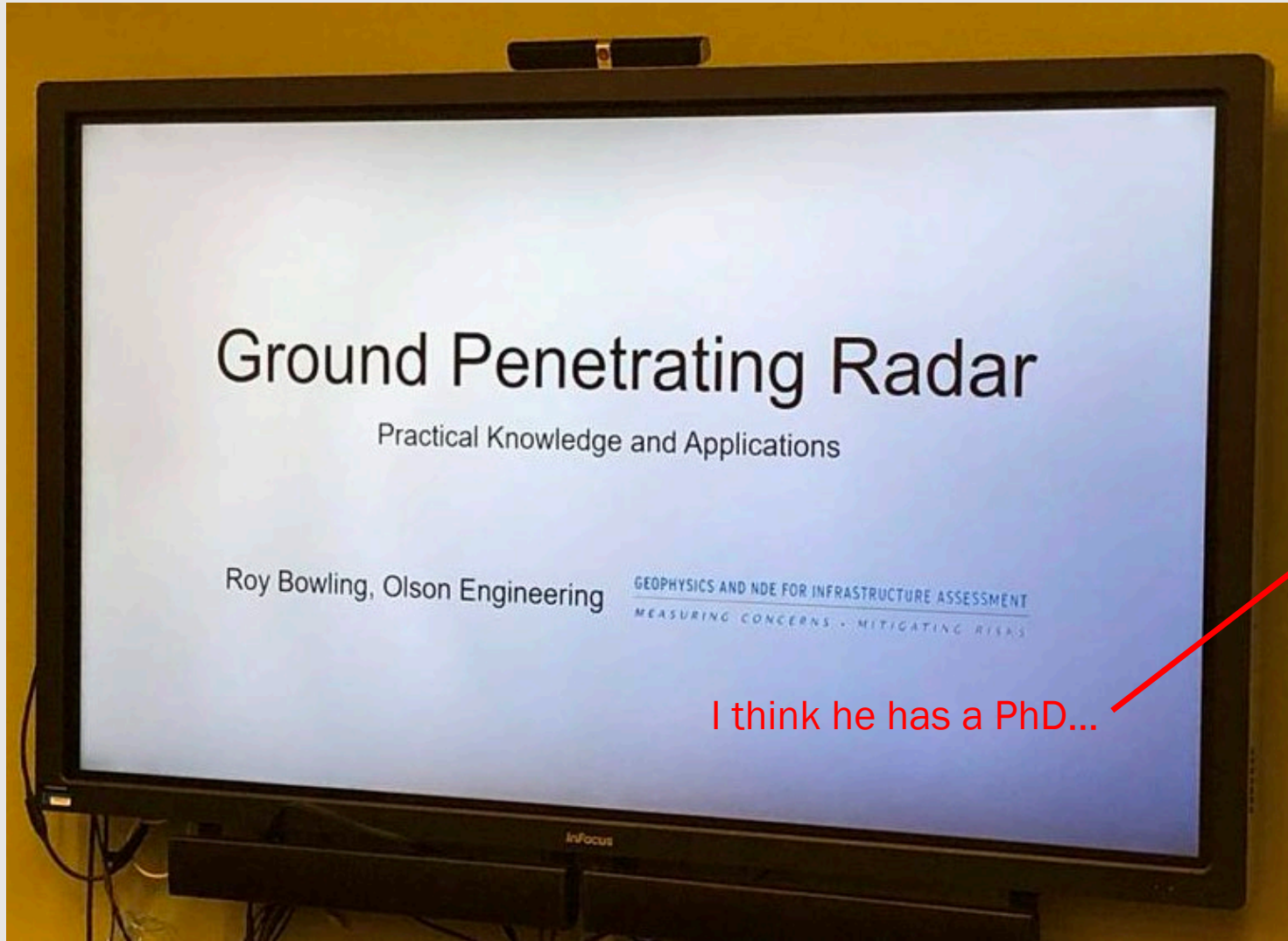
FHWA, AASHTO, Olson Engineering, IDS GeoRadar

Guys with PhD's sitting just out of the picture...



Training #2 – Deep Dive

Roy Bowling, Olson Engineering



Training #3 – Hands on

Dan Bigman, LearnGPR.com



Keys to GPR

- Know how GPR works!
- Know your site conditions
- Know how your GPR equipment operates
- Make a plan & document, document, document!



Our Equipment at ODOT

- GSSI UtilityScan Pro GPR Unit
 - SIR4000 Controller
 - 300/800 MHz Dual Frequency Antenna
 - 1600 MHz Antenna
 - 4 Wheel Cart
 - Emlid RS2+ GNSS Unit



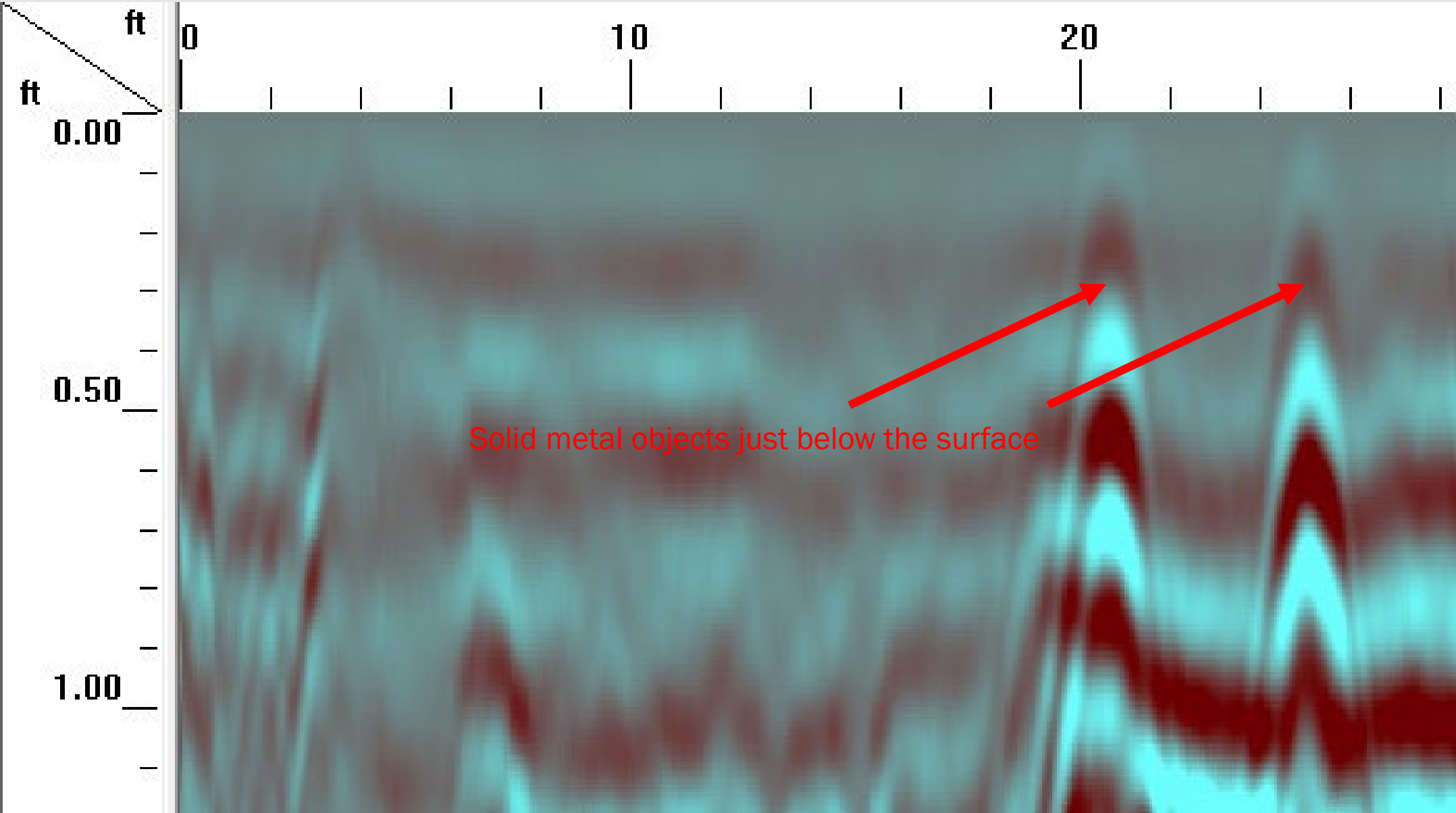


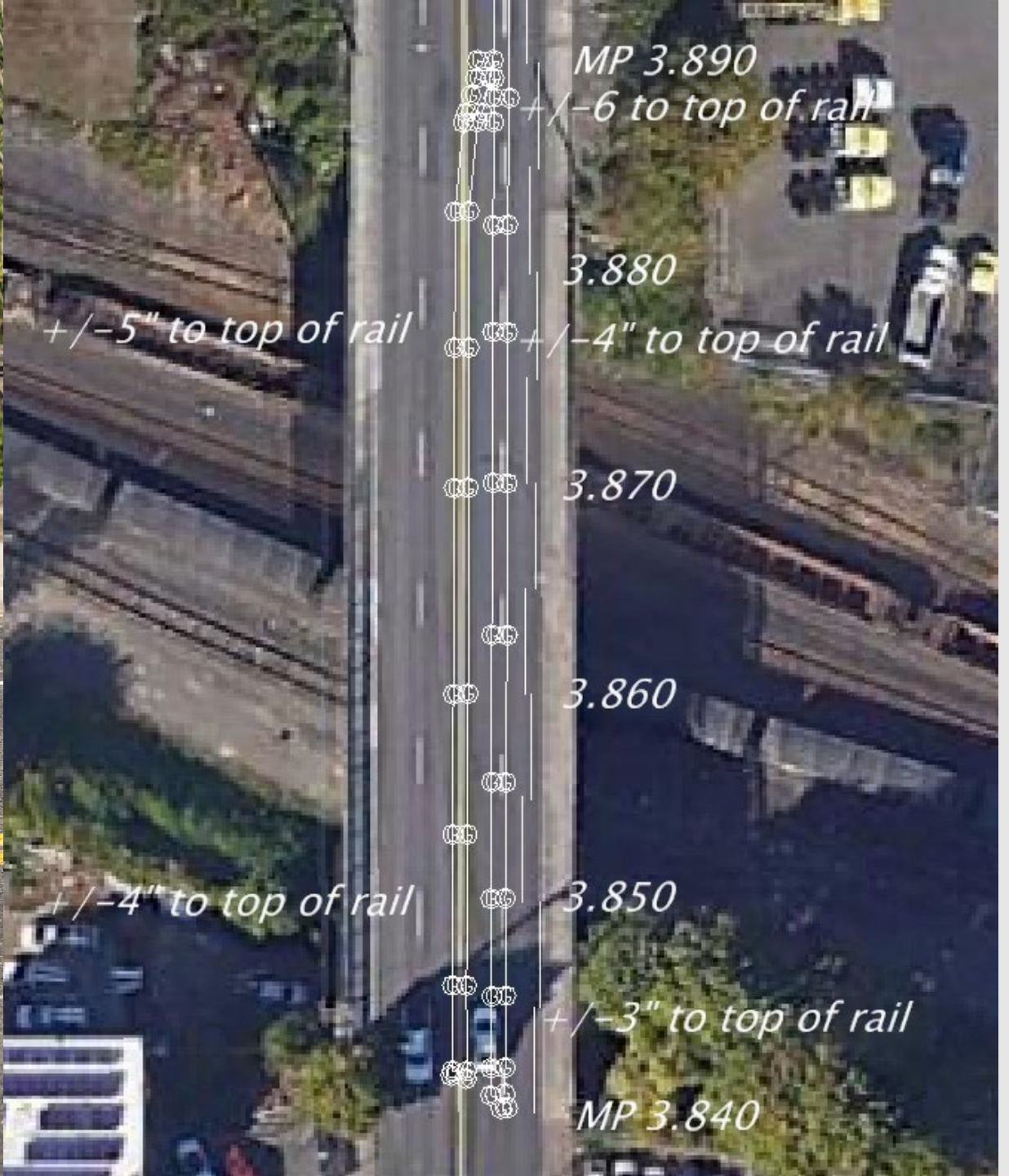


Buried Railroad track search



FOUND THEM!





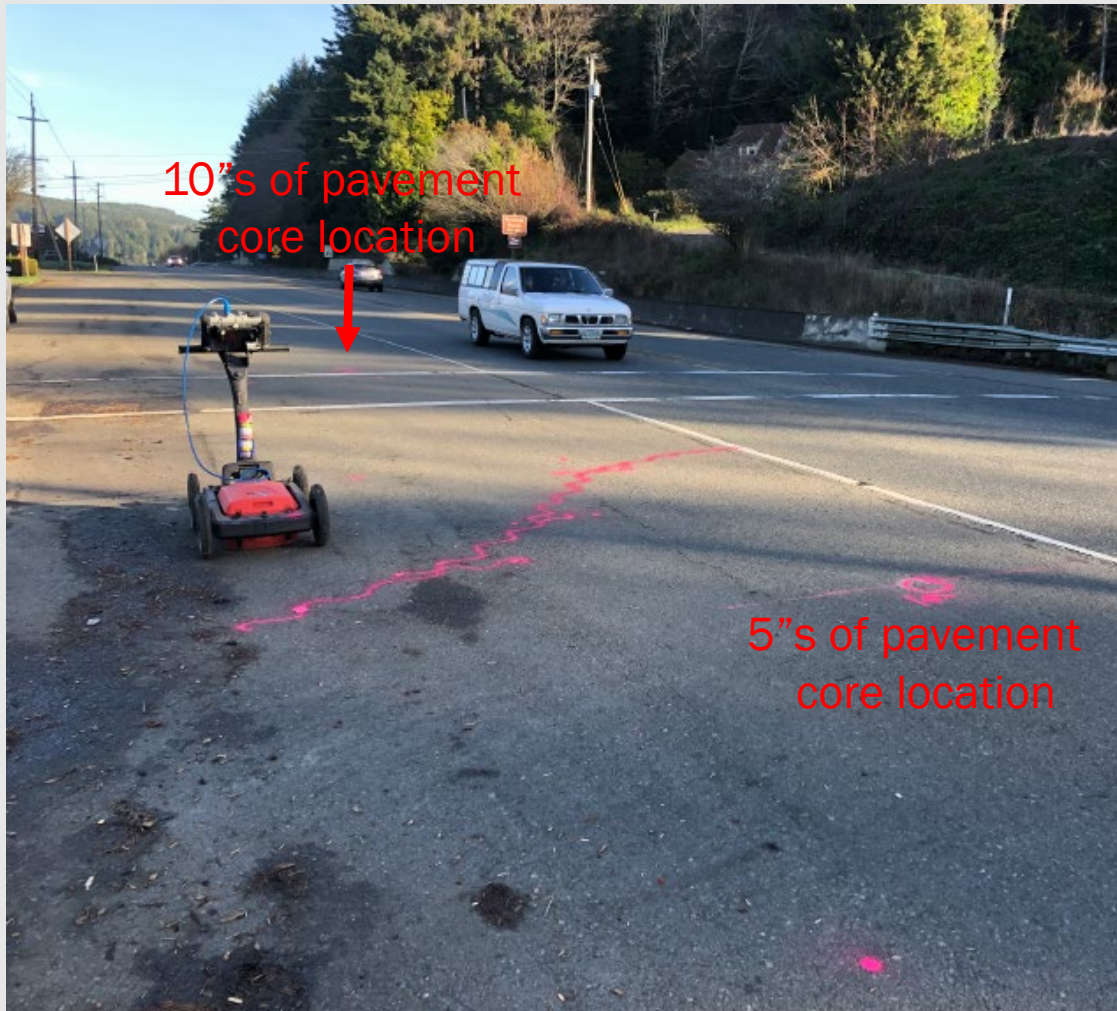
Railroad track search - Results

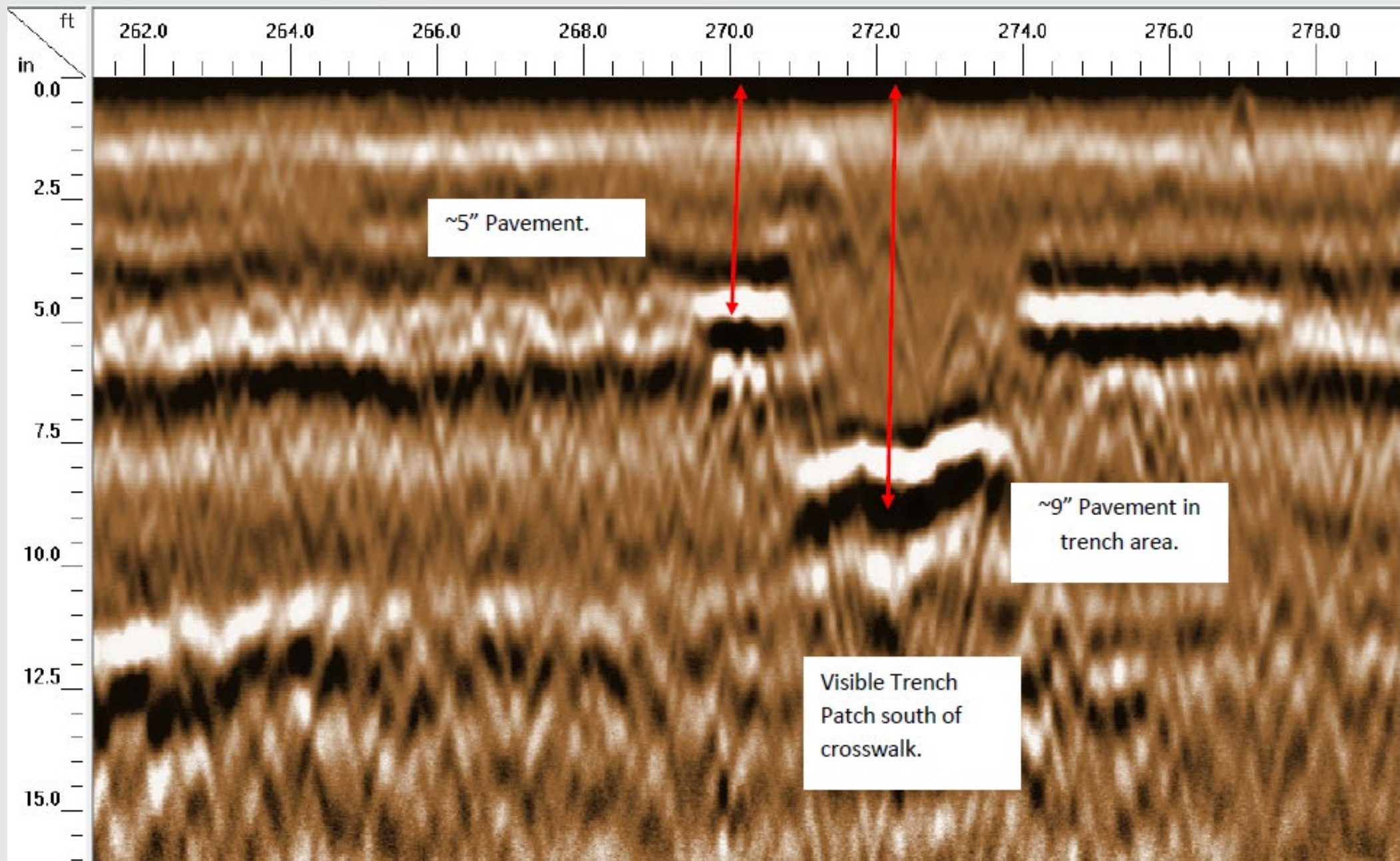
- Located approximately 1100 linear feet of paved over tracks
- Approximate depths determined
- Map created and delivered
- Total time in the road ~35 minutes!

Railroad track search - HUGE Cost Savings

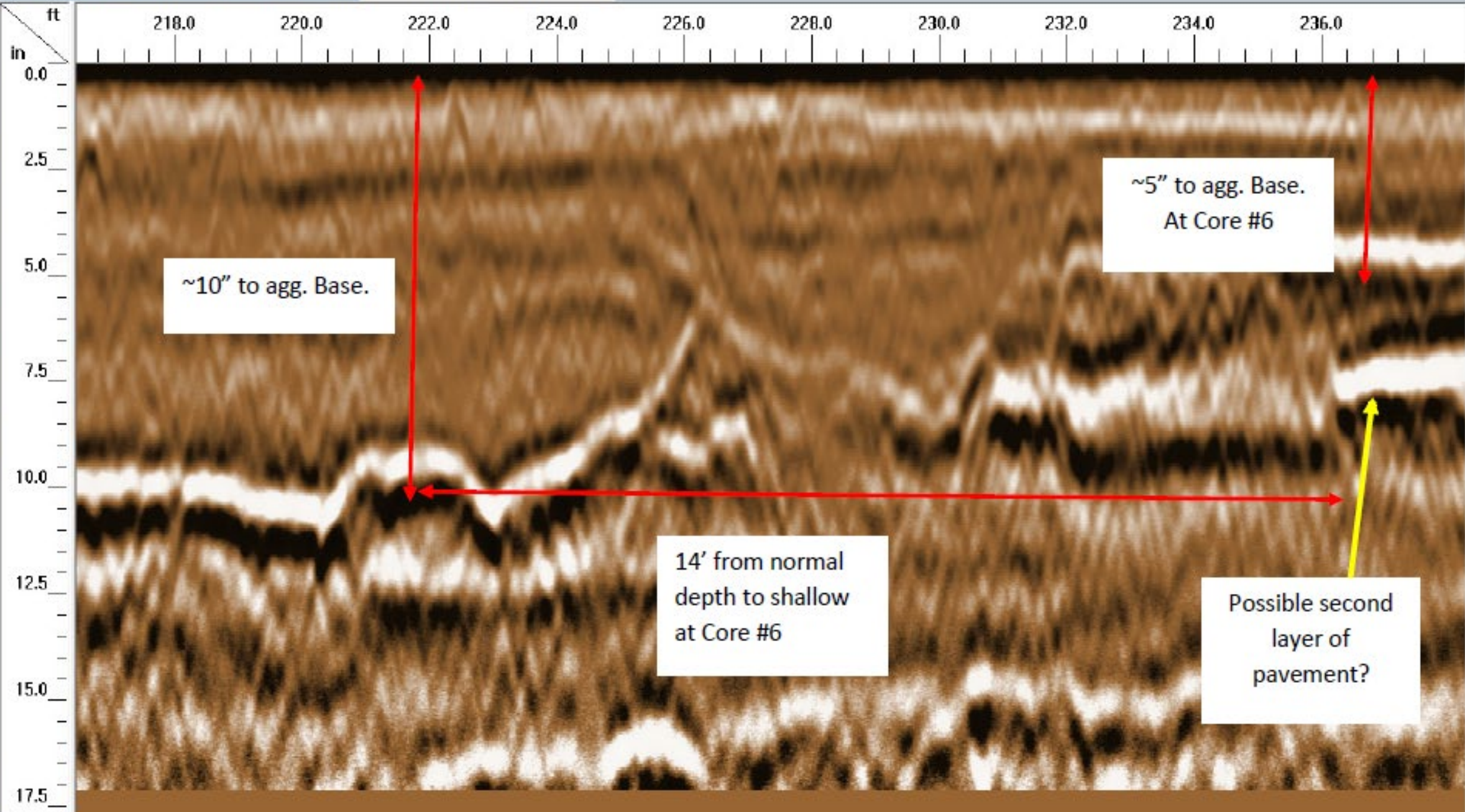
- ~\$1200 for GPR
- ~\$4200 for coring AND you still wouldn't have all the data and locations
- Time/Danger in the road also greatly reduced. GPR = 2 people @ 1 hour vs. Coring = 6+ people @ 8 hours

Pavement thickness determination





Scan at trench patch area – showing trench at normal thickness and surrounding area at 'shallow' thickness

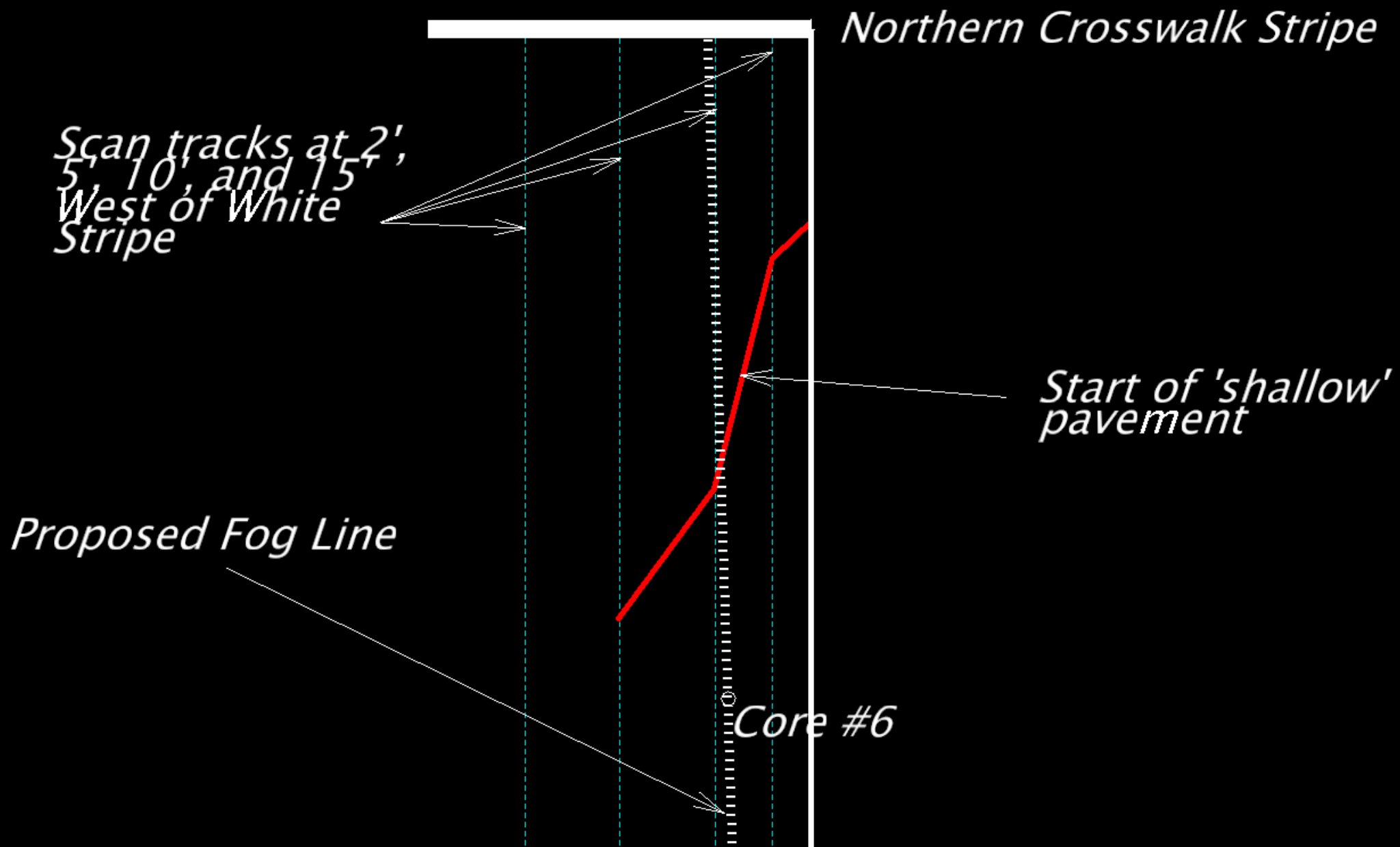


~10" to agg. Base.

~5" to agg. Base.
At Core #6

14' from normal
depth to shallow
at Core #6

Possible second
layer of
pavement?



*Scan tracks at 2',
5', 10', and 15'
West of White
Stripe*

Northern Crosswalk Stripe

*Start of 'shallow'
pavement*

Proposed Fog Line

Core #6

Pavement Thickness - Results

- Full work area scanned
- Accurate location of pavement thickness change
- Other pavement thickness anomalies found
- Cost savings ~\$900 for GPR vs ~\$4200 for more coring AND you still wouldn't have all the data and locations

Overall GPR Program Results

- Over 30 Projects completed to date
- “Success” rate at +70%
- Data for design and construction
- Huge cost savings on multiple projects
- Vastly increased exposure to GPR across the agency

Questions?

Chris Pucci, PLS

Project Surveyor

Engineering Automation Section

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