

Monitoring Geohazards Impacting Highway Projects using TDR

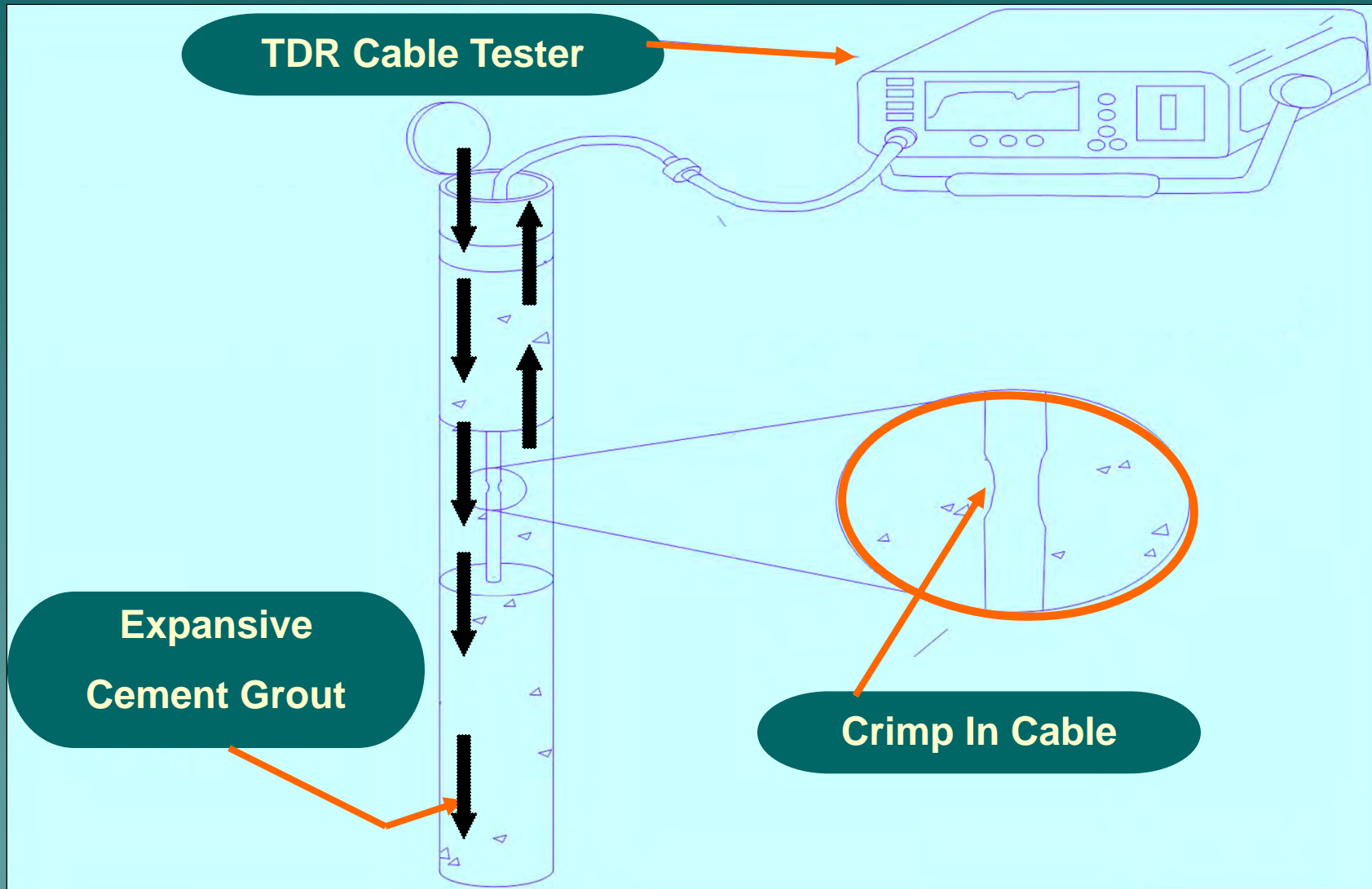
Geohazards Impacting Transportation in the
Appalachian Region
Chattanooga August 2011

Kevin M. O'Connor, Ph.D., P.E.
GeoTDR, Inc.
Westerville, Ohio

8/8/2011



Cables can be grouted into boreholes or trenches to monitor deformation



Battery-operated MTDR unit



8/8/2011



GeoTDR, Inc.

Inactive Mine Subsidence
SR 91, Saltville, Virginia



8/8/2011



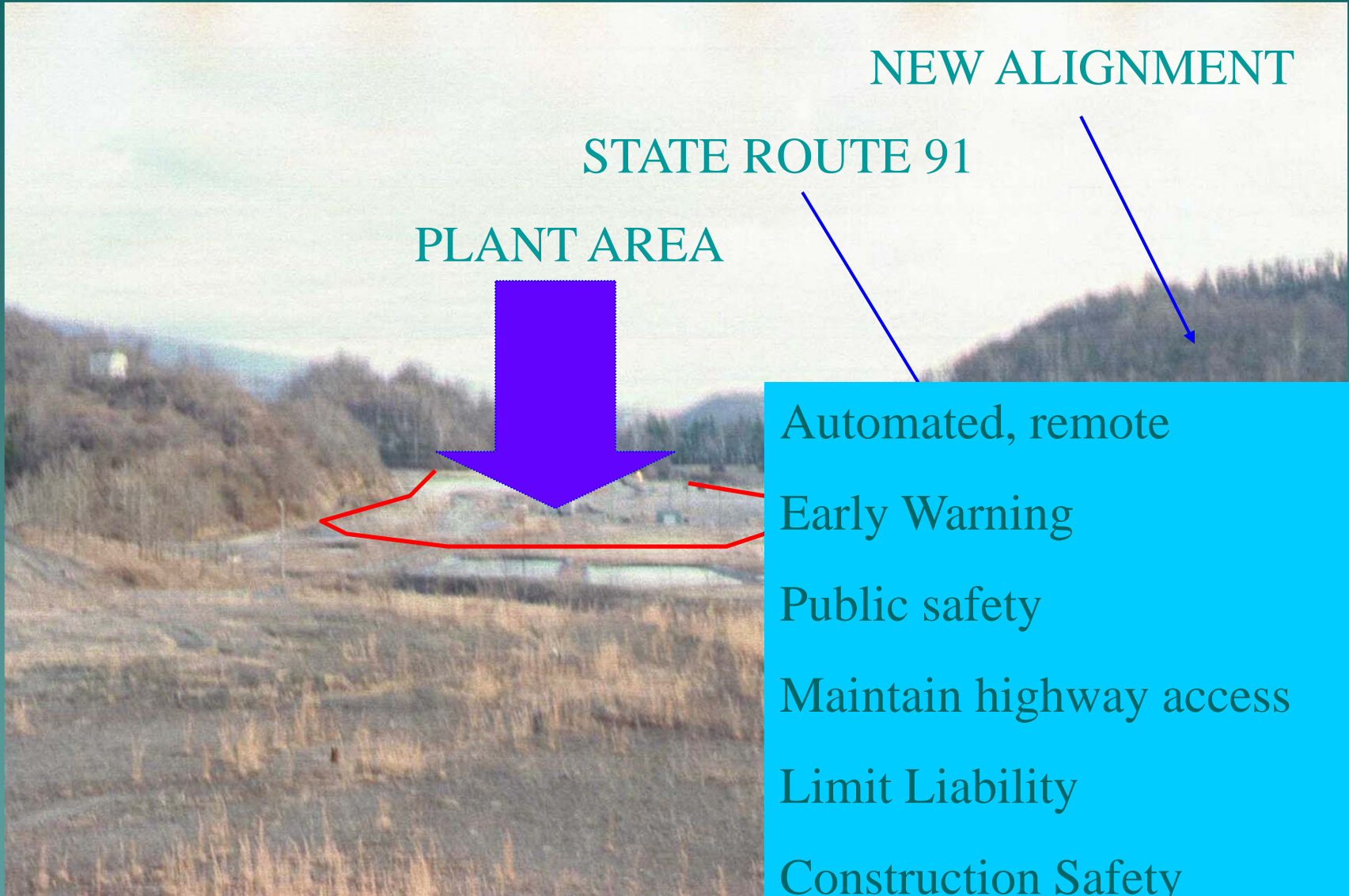
NW

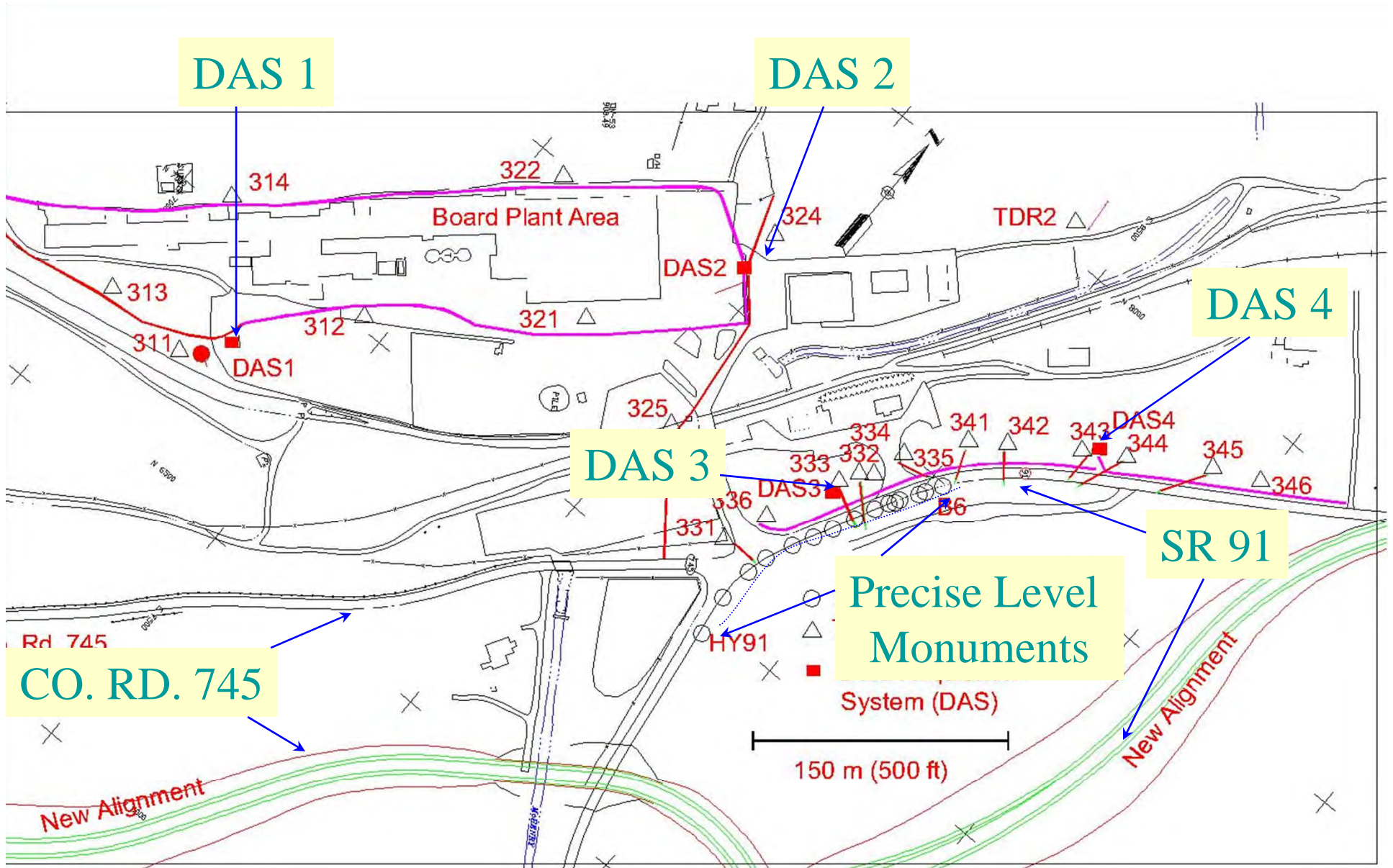
EXISTING
SR91

NEW
ALIGNMENT

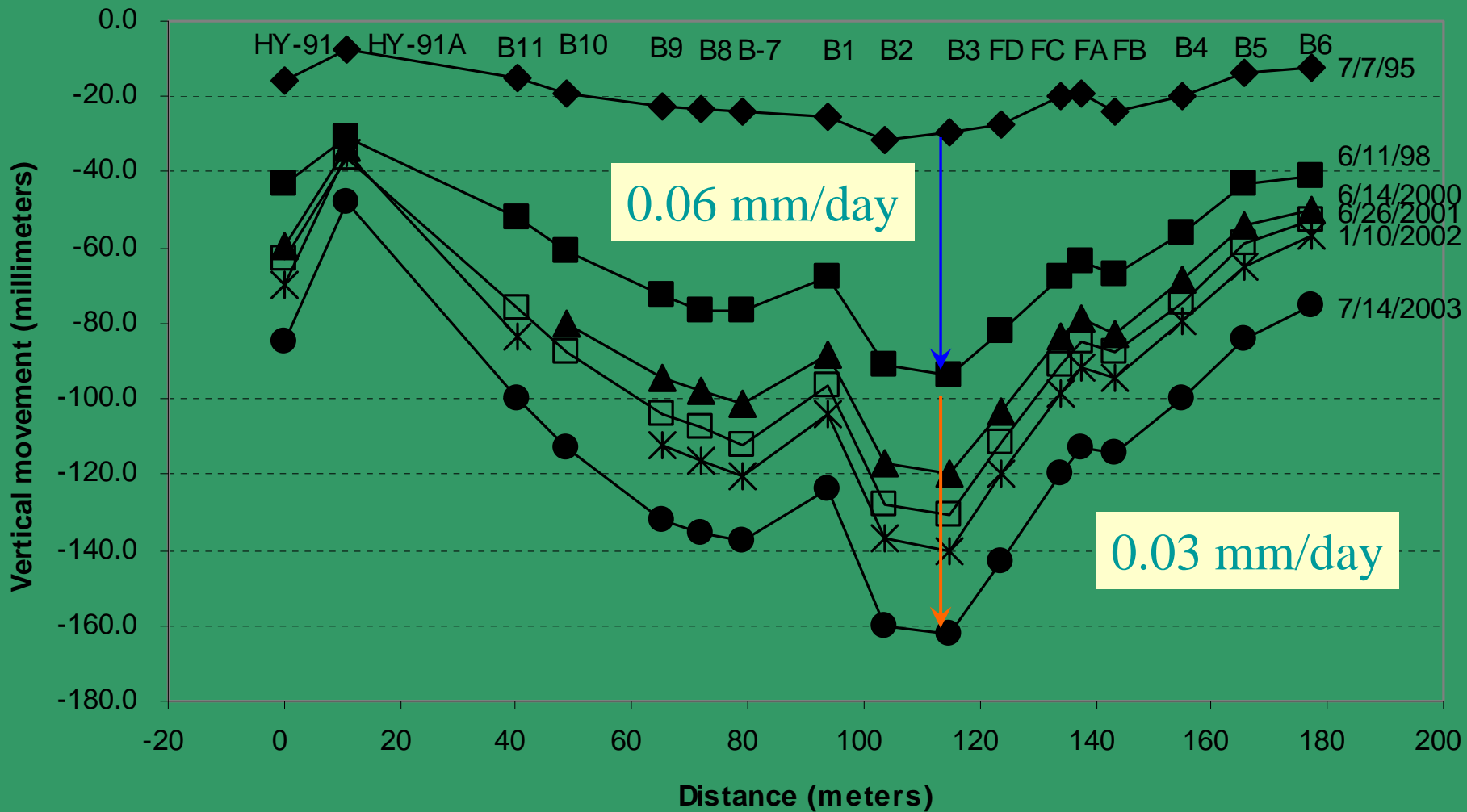
TDR MONITORING
CABLE



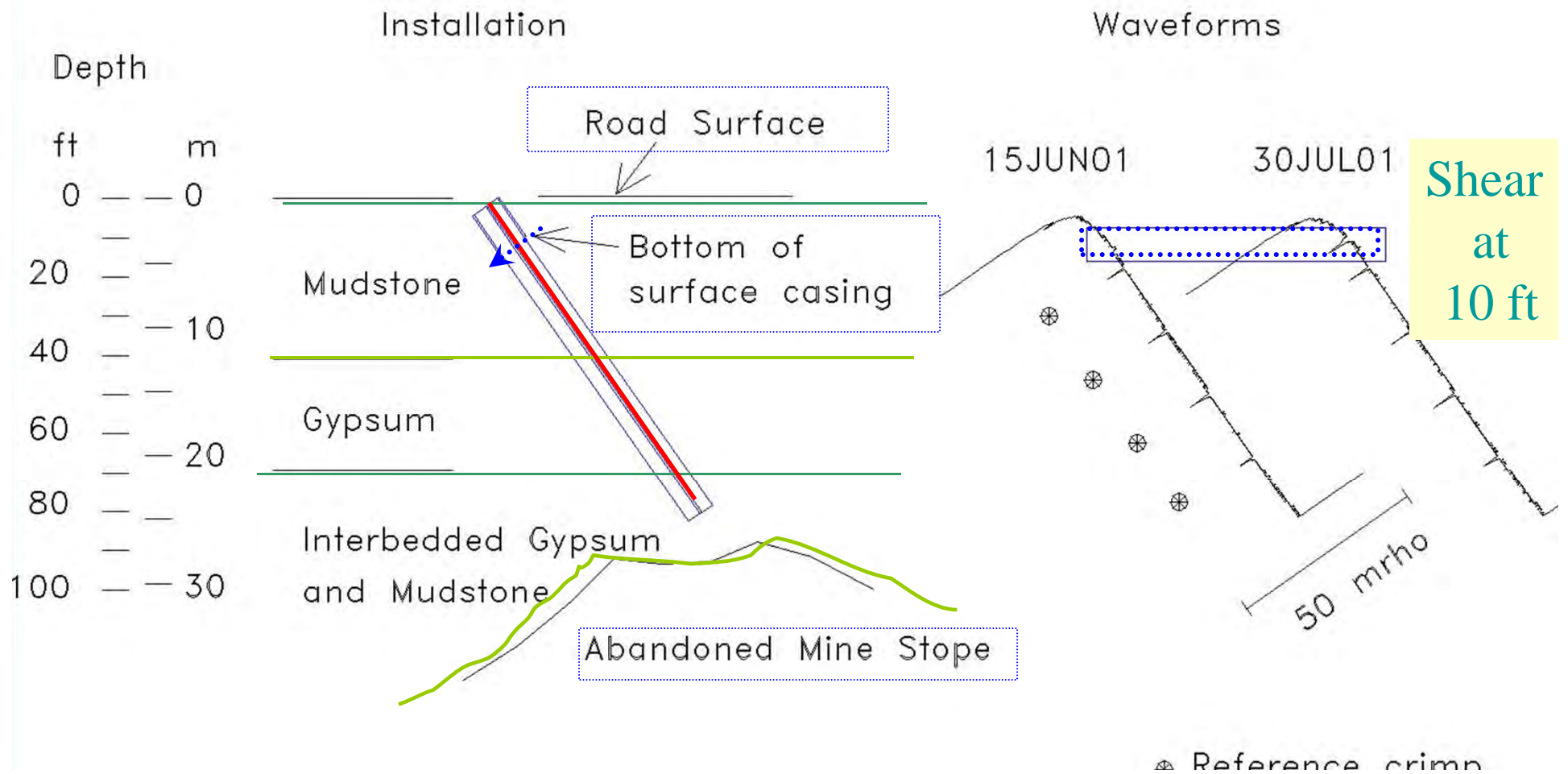




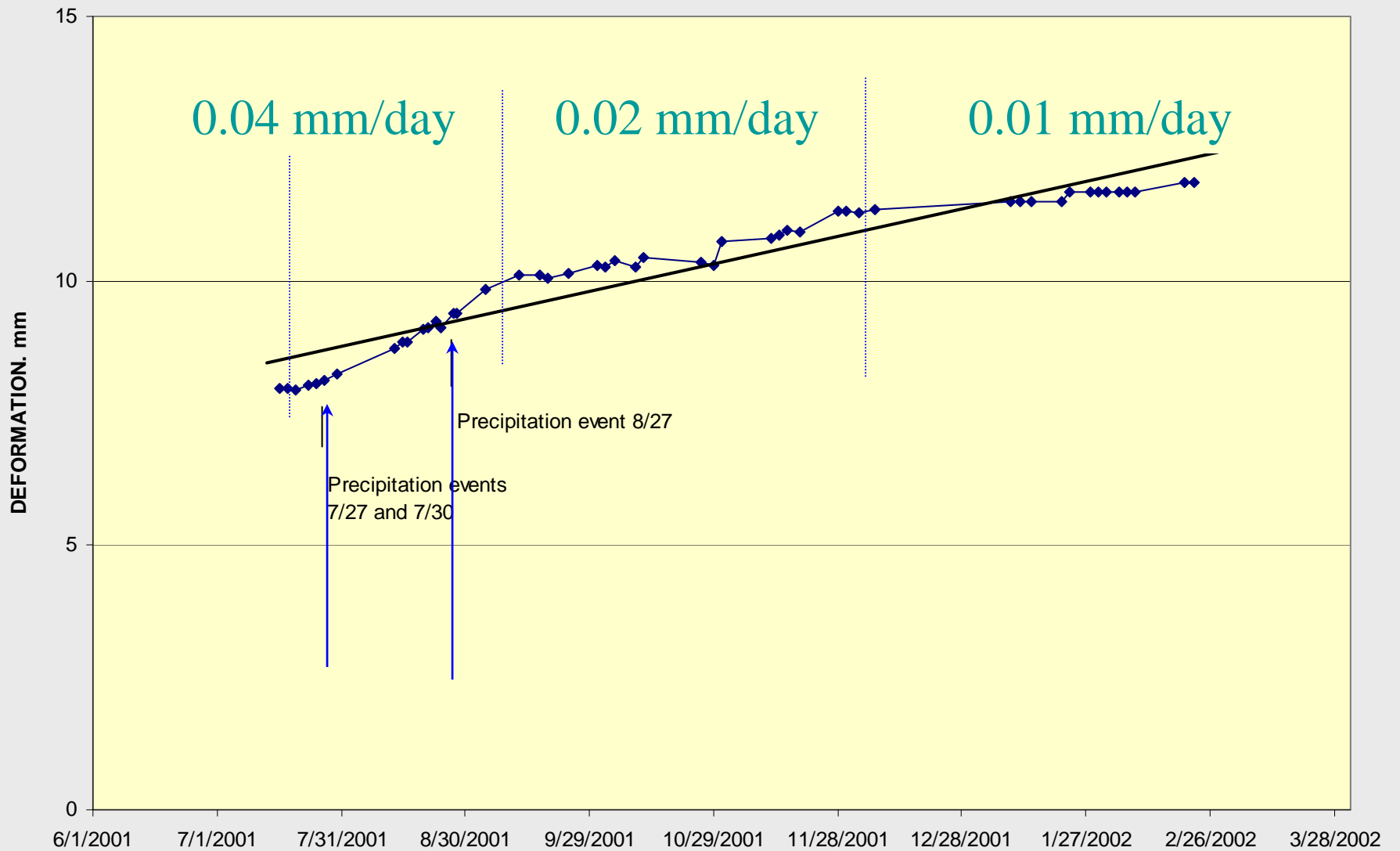
Total Subsidence SR-91 by Precise Level Survey (1995-2003)



Cable TDR1



TDR1 Shear at 10 ft

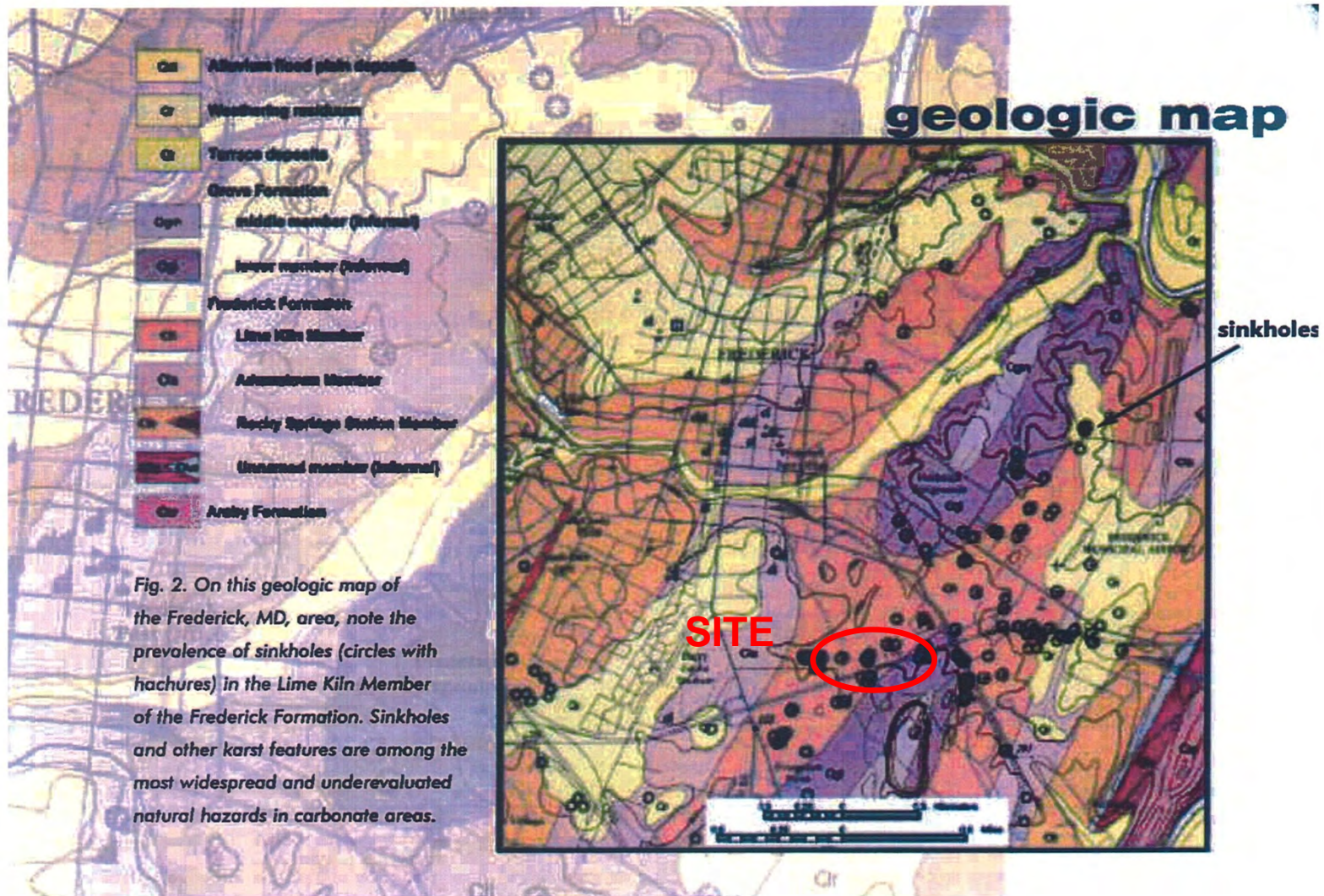


Karst Sinkhole Subsidence I-70 Interchange Frederick, Maryland



8/8/2011





Karst Sinkhole Subsidence

I-70 Interchange

Frederick, Maryland

Automated remote

Extensive area

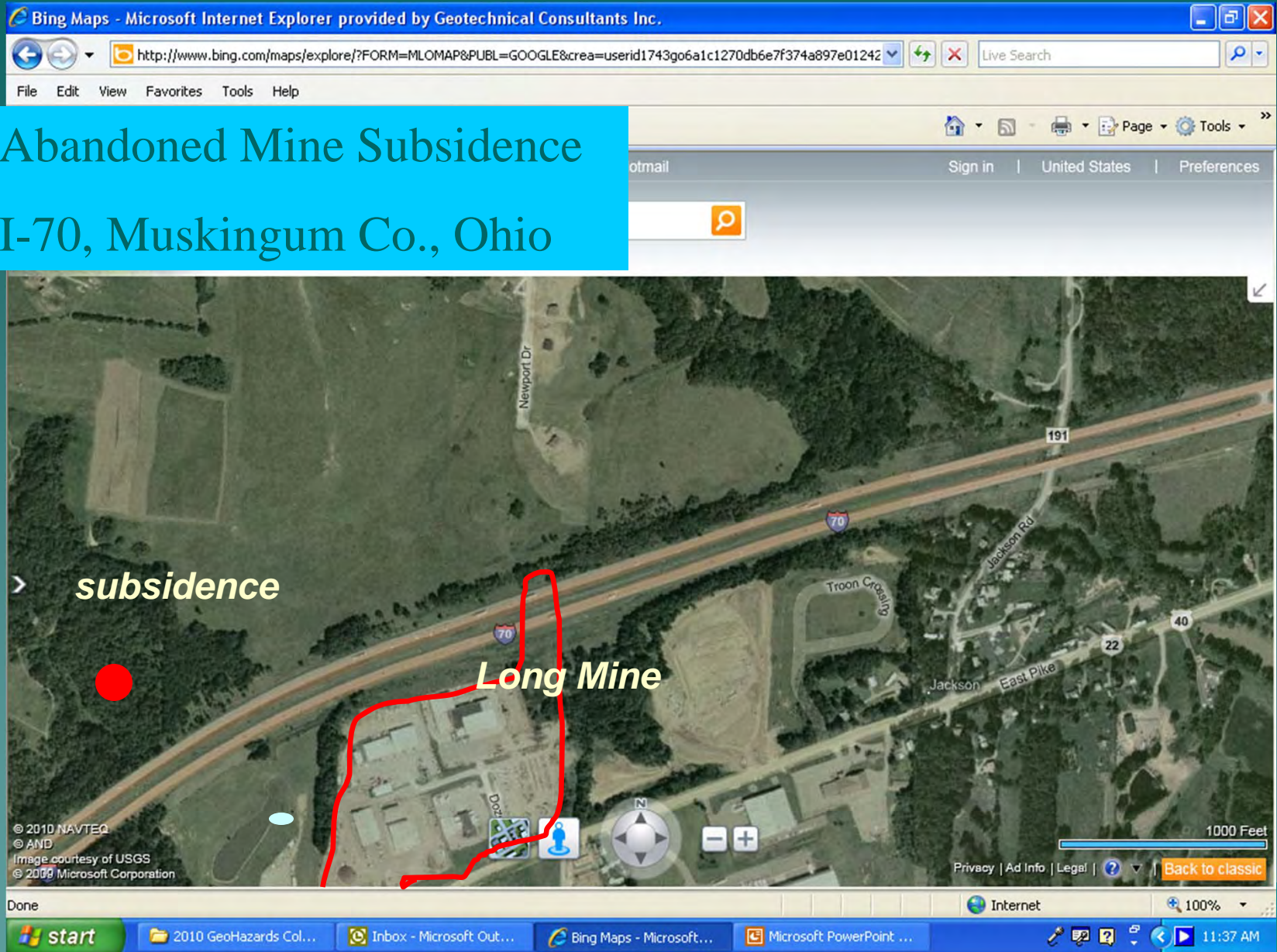
DoT O&M monitor
effectiveness of stabilization

Public safety

Early warning



Abandoned Mine Subsidence I-70, Muskingum Co., Ohio



8/8/2011





04/21/2009

8/8/2011



15

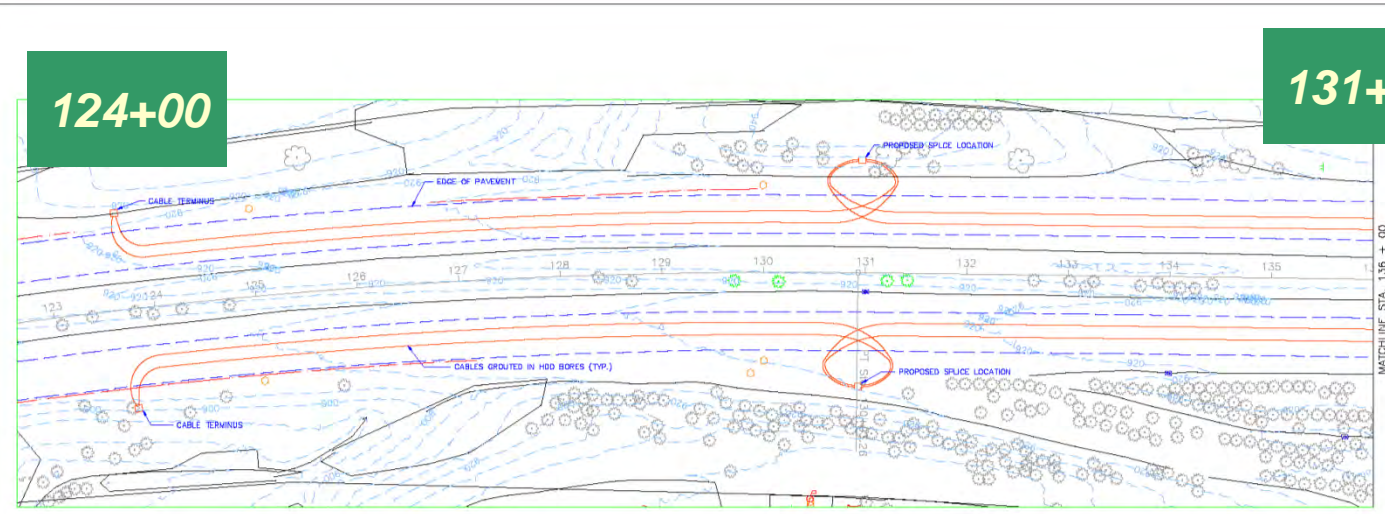


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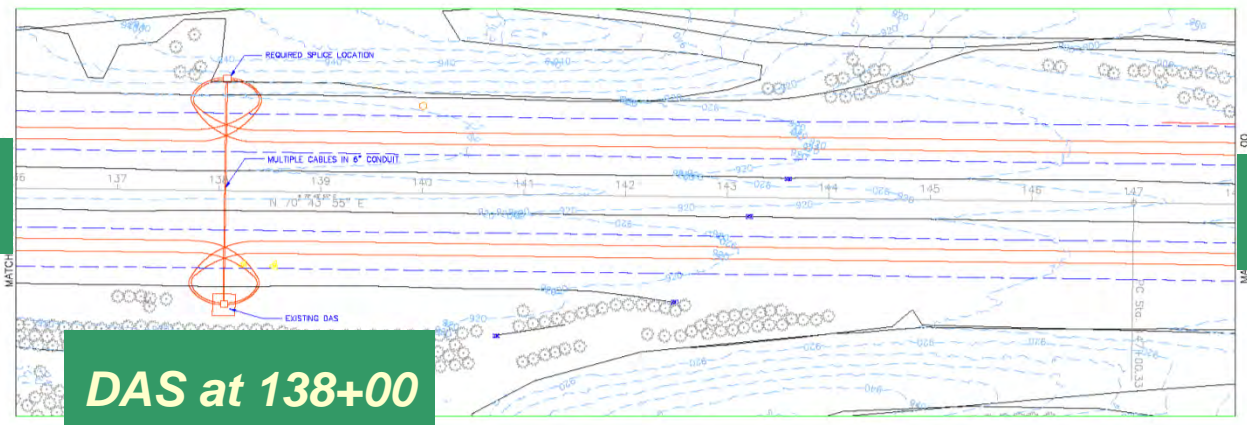
124+00

131+00



131+00

148+00



DAS at 138+00



TDR CABLE LAYOUT SHEET

MUS-I R 70-15.

11





8/8/2011



18

TDR Cable Tester

Modem

Programmable Data Logger

Coaxial Multiplexer

8/8/2011



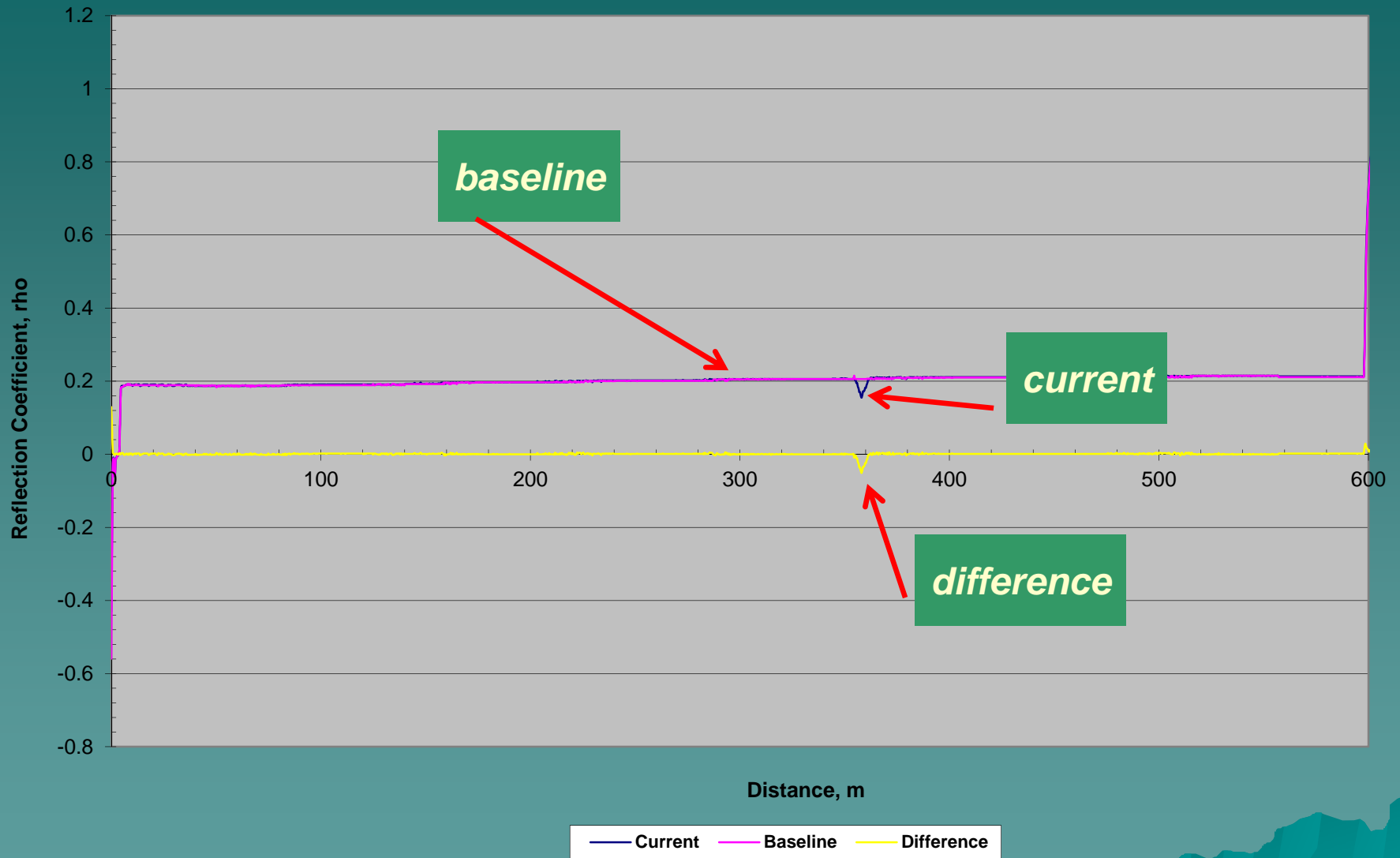
Geo TDR & Inc.

19

EBPA



EB Passing Lane Trench B



Abutment Slope Movement

I-64, Sulphur, Indiana

Forensic

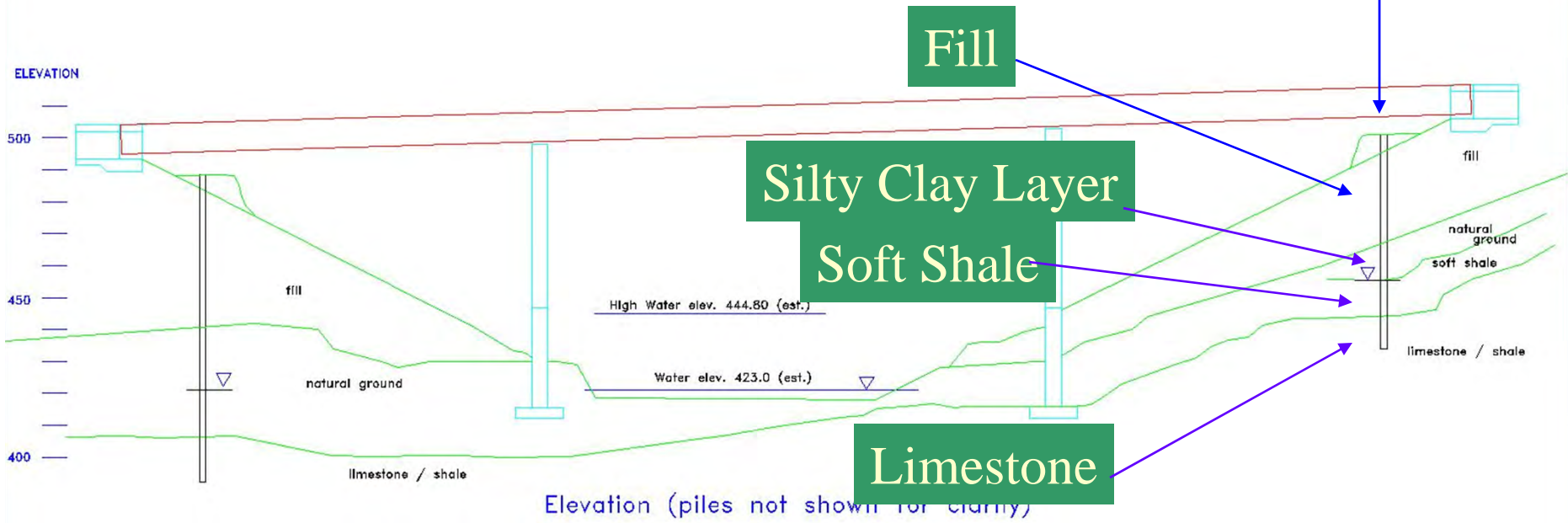


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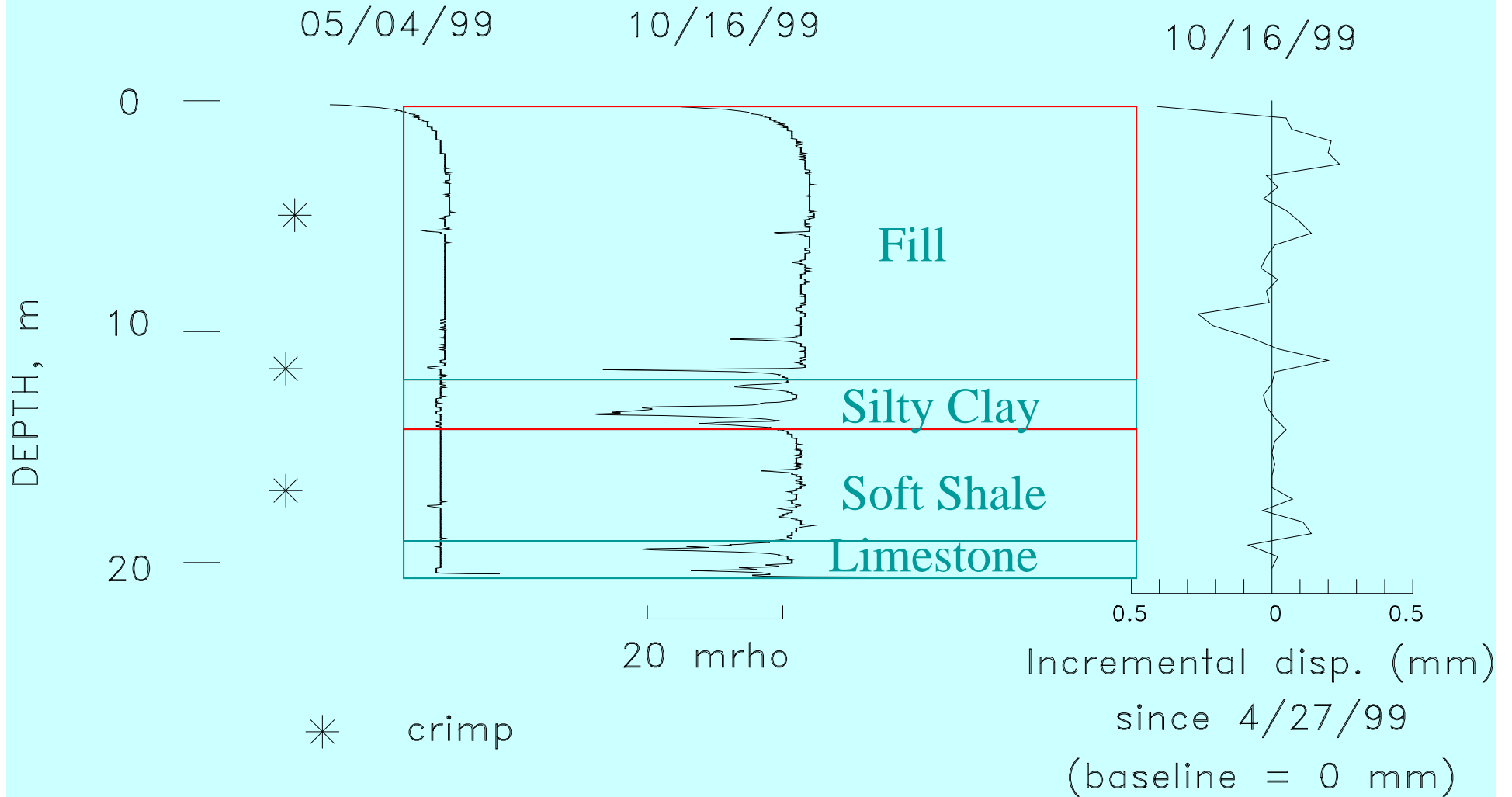
22

TDR Cable



TDR WAVEFORMS

INCLINOMETER



Typical Costs

- ◆ MTDR unit \$3,600
- ◆ Cable on Spool \$1/ft
- ◆ Remote DAS \$10,000

- ◆ INSTALLED CABLE COST
- ◆ Trench \$7/ft
- ◆ Vertical hole \$15-\$25 /ft
- ◆ Angled hole \$30-\$45 / ft
- ◆ Inside inclinometer casing \$3-\$5 /ft



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