



TROUBLESHOOTING PILE DRIVING PROBLEMS WITH A-GAME METHODS STGEC 2023

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LADOTD

OVERVIEW

- Project Details
- Subsurface Explorations
- Damaged Pile
- CPT Soundings and Pipeline Survey
- Field Resistivity
- Recommendations and Outcome

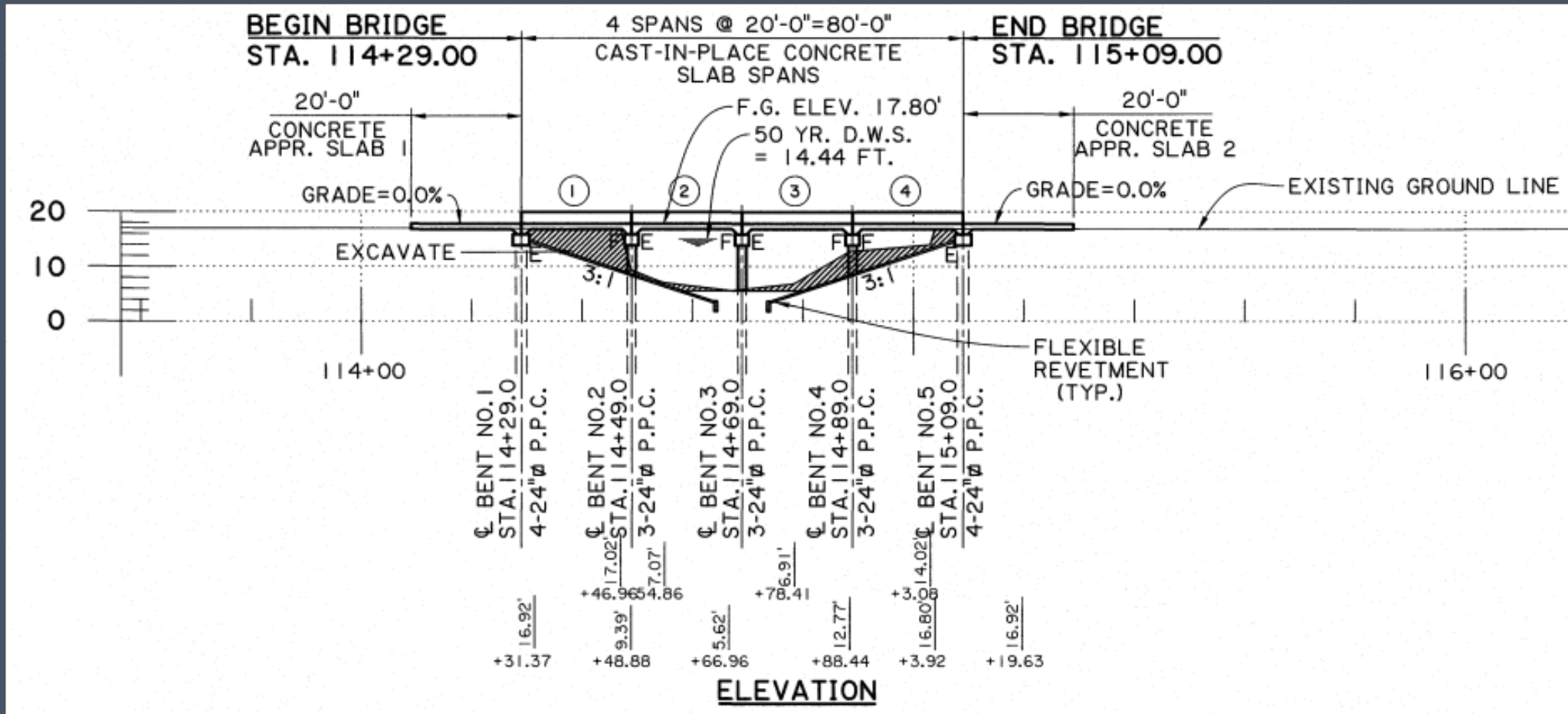
LA 75 - BAYOU BREAUX BRIDGE

- 80' bridge replacement project
- Foundations:
 - 5 bents
 - Piles: 24" PPC piles
 - Loads: 126 - 164 tons
 - Pile lengths: 90'-105'
- Soil profile
 - Mostly normally consolidated clay
 - 25-35' thick sand/silt layer near surface
- Several pipeline crossings nearby

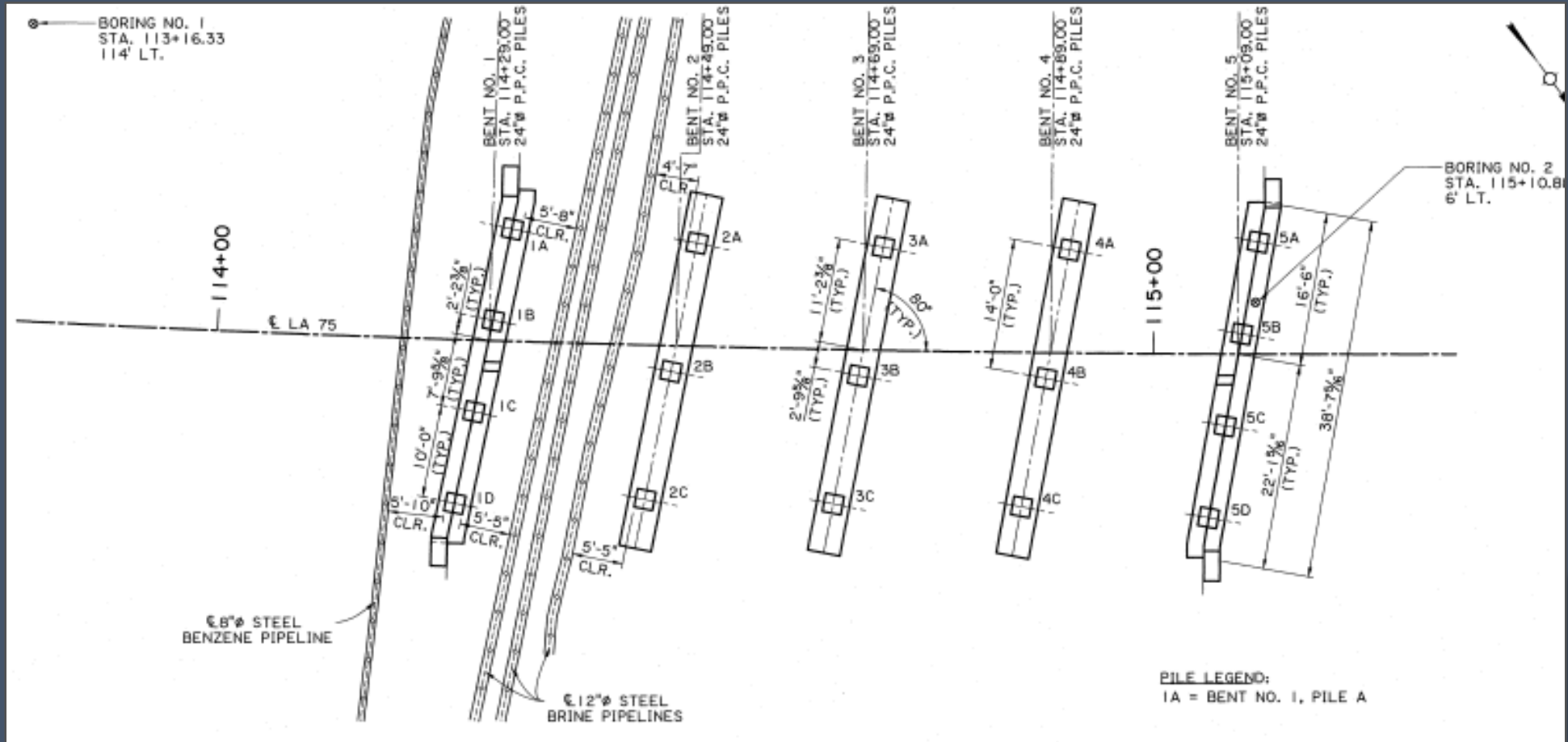


Project Location: Iberville Parish, LA

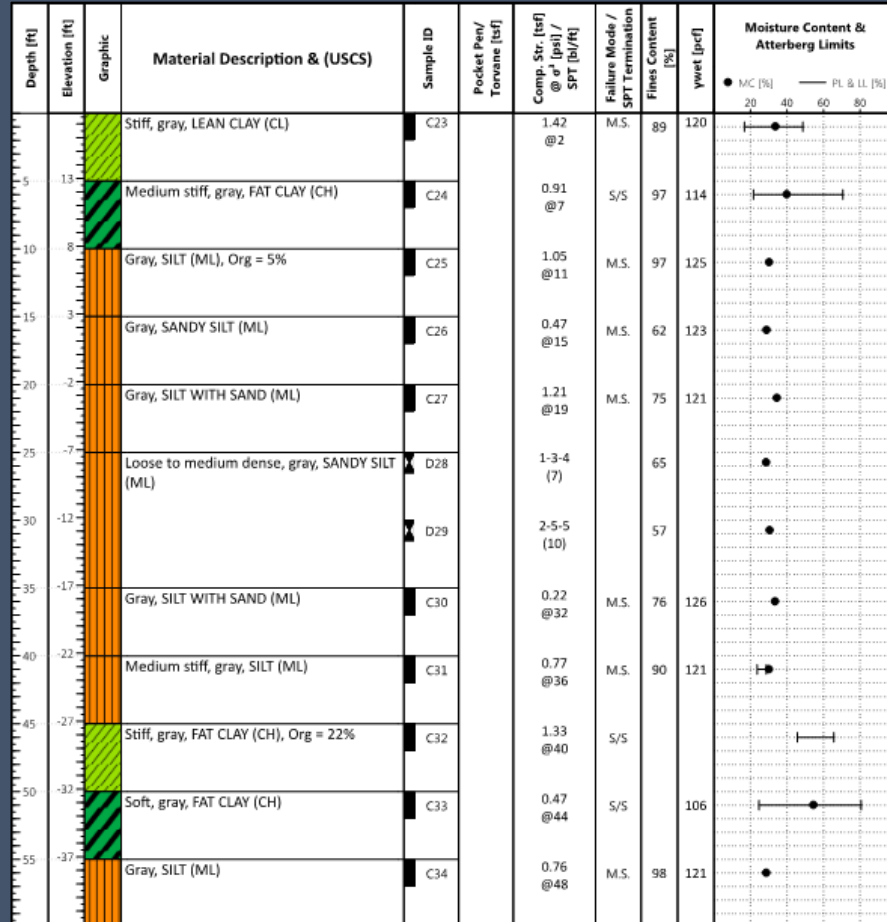
BRIDGE PROFILE



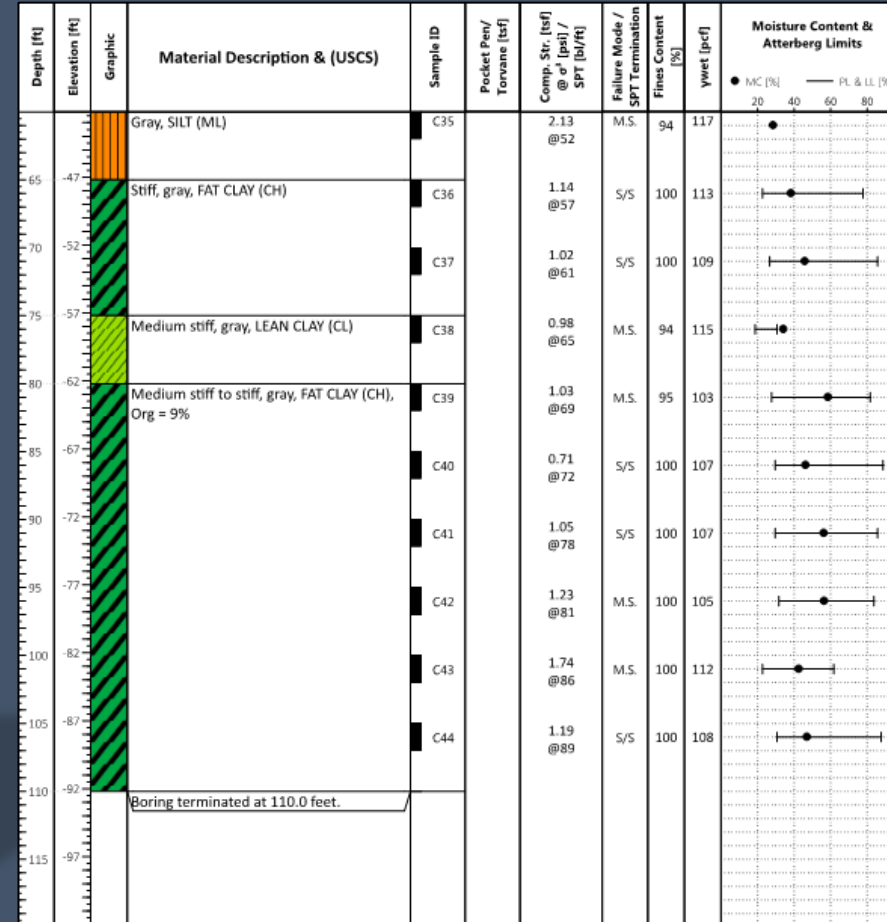
FOUNDATION LAYOUT



SOIL BORING LOG



0 to 60'



60 to 110'

DAMAGED PILE

- Pile in Bent 2 cracked during driving
 - 40' above plan tip elevation
 - Longitudinal crack > 10' long
 - Multiple transverse cracks
- Contractor claimed that they hit a pipeline and demobilized from site
 - Happens to be behind on multiple projects...
 - Other theories: oyster bed or cypress stumps
- Driving resistance 2-3 b/ft when pile broke
- No dynamic monitoring on this pile

General Info:
Project: Bay
Project No: H-1
Parish:
Contractor: TL
Hammer:
Auger Diam.:
Pile Information
Type: Concr
Cent: 2
Length: 10.5
Drive Time: Start
 Cushion Type/Thi

Elevation Inform
Reference E
G.S./Mudline E
Predrill E
Bottom Casing E
Design Tip E
Final Tip E

DA Restrike Inf
Date:
Time:
Blows:
Set (in):

Notes: Pile 65-70 or they to is also

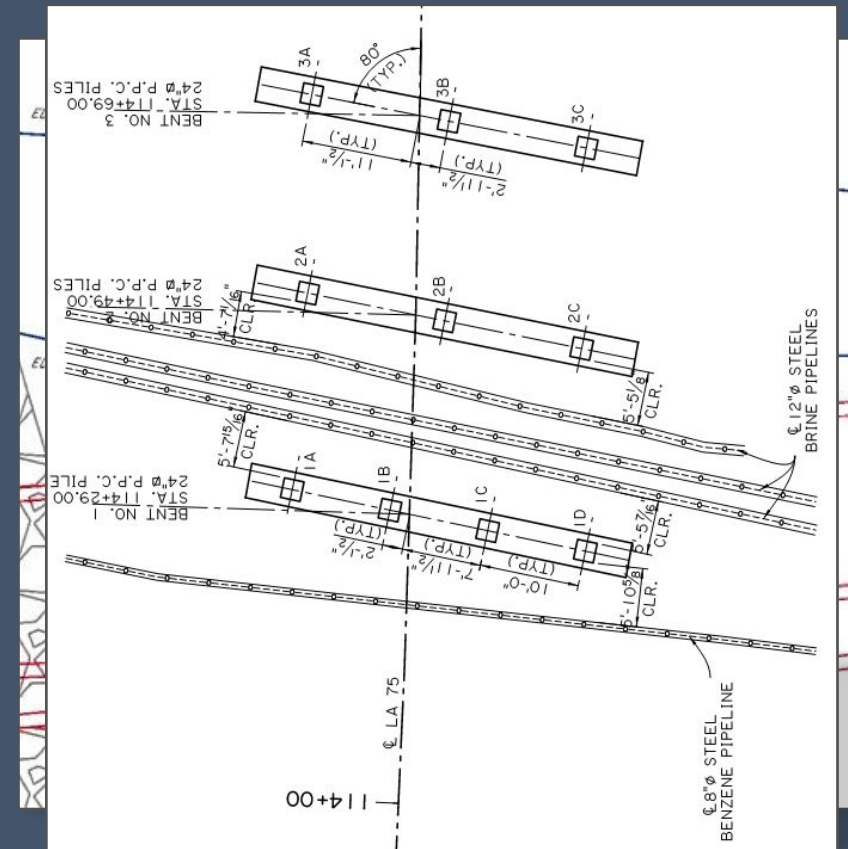
b/ft	Stk ft

Notes: 2-3 around start with pile

Transverse & Longitudinal Cracks
40' Above Driving Stop Elev.

PIPELINE SURVEY

- DOTD Geotech was asked to evaluate:
 - Relocating Bent 2 approx. 5' towards Bent 1
 - Feasibility of driving piles at Bent 1
- A second pipeline survey was ordered
 - Plan set survey shows:
 - 3 brine lines between Bents 1 & 2
 - 1 benzene line downstation of Bent 1
 - New survey shows:
 - 1 line between Bents 2 & 3
 - 2 lines between Bents 1 & 2
- Results do not match plans
 - More uncertainty!



Pipeline Survey: Plan Set

CPT SOUNDINGS

- Pushed 2 CPTs at Bent 1 (20' away)
- One with dummy tip for obstructions
 - No obstruction found with dummy tip
- One CPTu sounding to confirm stratigraphy
 - No obstruction found with the CPT probe
- CPT rig could not get close to Bent 2
 - Still uncertainty regarding offset option



LADOTD CPT Rig
CPT Sounding Data
Cone with Dummy Tip

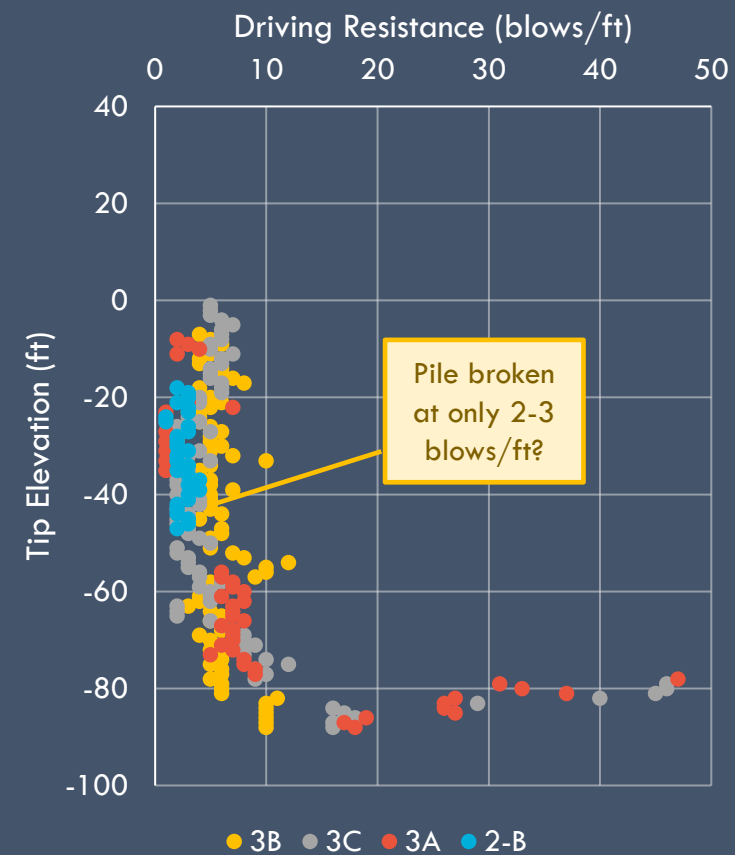
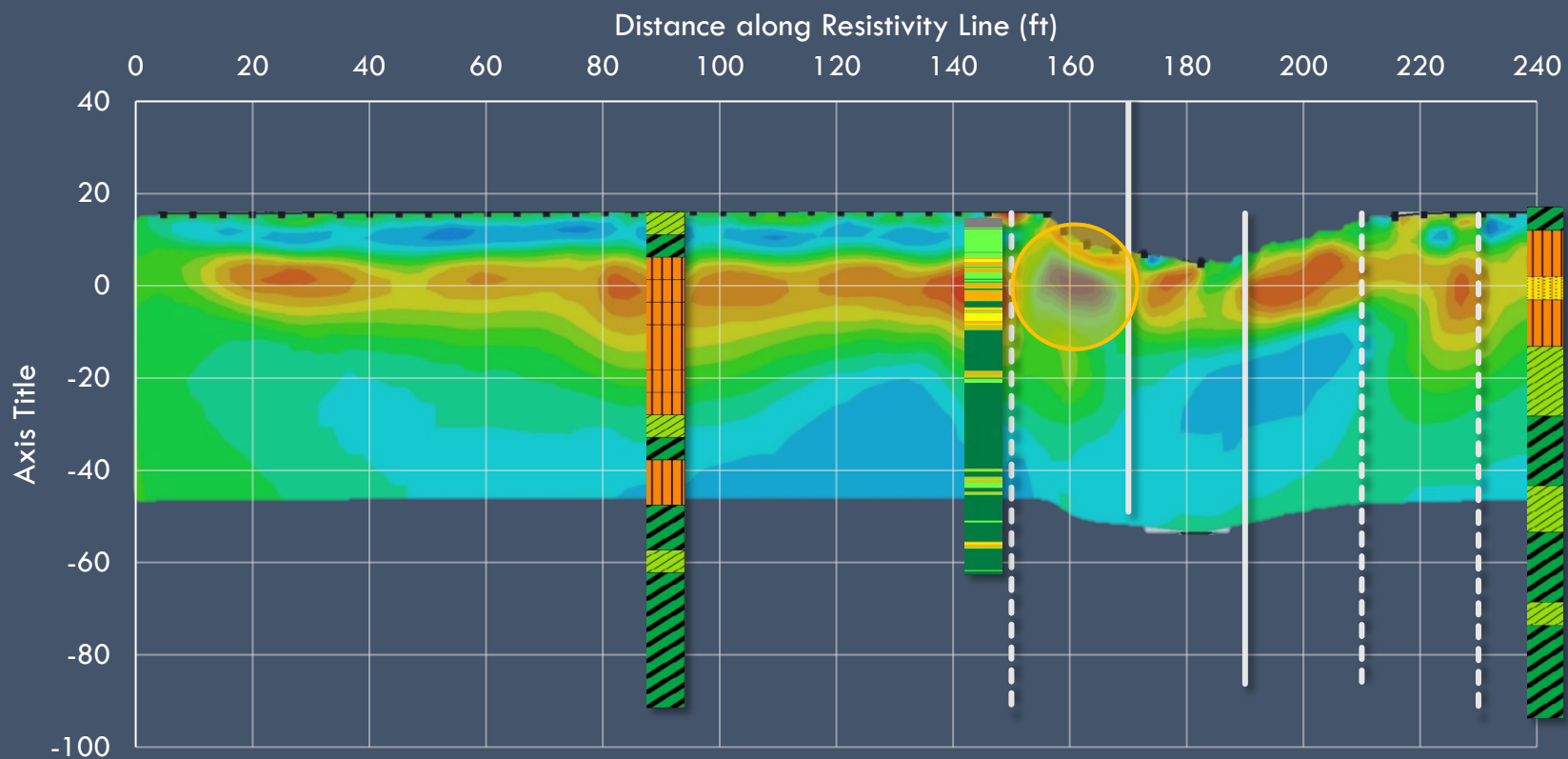
ELECTRICAL RESISTIVITY SURVEY

- Hired a consultant to perform ER survey
- Laid out two lines at ~270' each
 - Try to pass on 2 sides of cracked pile
- Max. depth approx. 70'
- LADOTD drill crew cored roadway & backfilled holes with sand
- Sand was wetted prior to ER testing



Survey of South Ave (for on bridge)

ER SURVEY RESULTS



RECOMMENDATIONS

- Piles in Bent 1 can be driven
- Do not relocate Bent 2
 - ER survey shows discontinuity in the sand stratum
 - Could be leaking pipe or clay backfill?
- Attempt to redrive damaged pile another ~10 feet, then cut off
 - Surveys confirm no lines at this location
 - No evidence of dense layer or obstruction in the pile driving logs
 - Should be soft clays – can we remobilize it before completely breaking it?
- Redesign Bent 2 to accommodate additional piles
 - No evidence of dense layer or pipeline in ER survey
 - Inspector later told us pile driving crew argued about breaking the pile before it happened!
 - Did the Contractor use pipeline concerns as an excuse to buy time?

OUTCOME

- Pile Driving Analyzer (PDA) was added to monitor the stresses on the piles
- Bent 2 was redesigned from a three-pile bent to a four-pile bent
 - The piles were all driven to grade at Bent 2 without hitting any “obstructions” or damaging the piles
- The damaged pile was cut-off at the ground surface, re-driving the pile was deemed unsafe



Underneath of Concrete Bridge

Abandoned Broken Pile

