

Crossing Paths: A Minor Problem for a Large Tunnel

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Surface Water Supply Project - Introduction

The West Harris County Regional Water Authority (WHCRWA) and North Fort Bend Water Authority (NFBWA) are constructing the Surface Water Supply Project (SWSP) to provide additional surface water from Lake Houston to reduce land subsidence.



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Segment B- Introduction

- 3 miles of 84-in and 8 miles 96-in waterline
- 19 tunnels
- 2.3 miles of tunnels



SWSP Contract Segment B1-B2 - Overview

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Segment B1/B2 : The White Oak Bayou Crossing

- Tunnel crossing under White Oak Bayou and BNSF Railroad, within previous Exxon easement
- Lovat “Dual Mode” TBM
- 132” Tunnel
- 1,267 Linear Feet
- 52 ft. deep



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Segment B1/B2 : The White Oak Bayou Crossing

- Ribs and Wood Lagging with filter fabric



- Ribs and Steel Lagging under Railroad with filter fabric



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Segment B1- Introduction

History of Exxon/WHCRWA Easement

- 1940s - 6-in line installed by Humble Oil & Refining Company
- 1973 – Exxon Mobil acquires easement
- 2006 – WHCRWA purchases easement for 40-mile corridor
- 05/2023 – Begin excavating launch shaft
- 08/2023 – Contractor instructed to lower shaft 10 VF
- 10/2023 to 12/2023 – Tunnel construction

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Crossing Paths: Working the Problem

- Construction Management Team discovered the 6-inch gas line was re-installed later than the record drawings provided
- Installed via HDD with unknown accuracy in the 1990s
- New record drawing showed "**HDD profile was not in conflict with tunnel profile**"



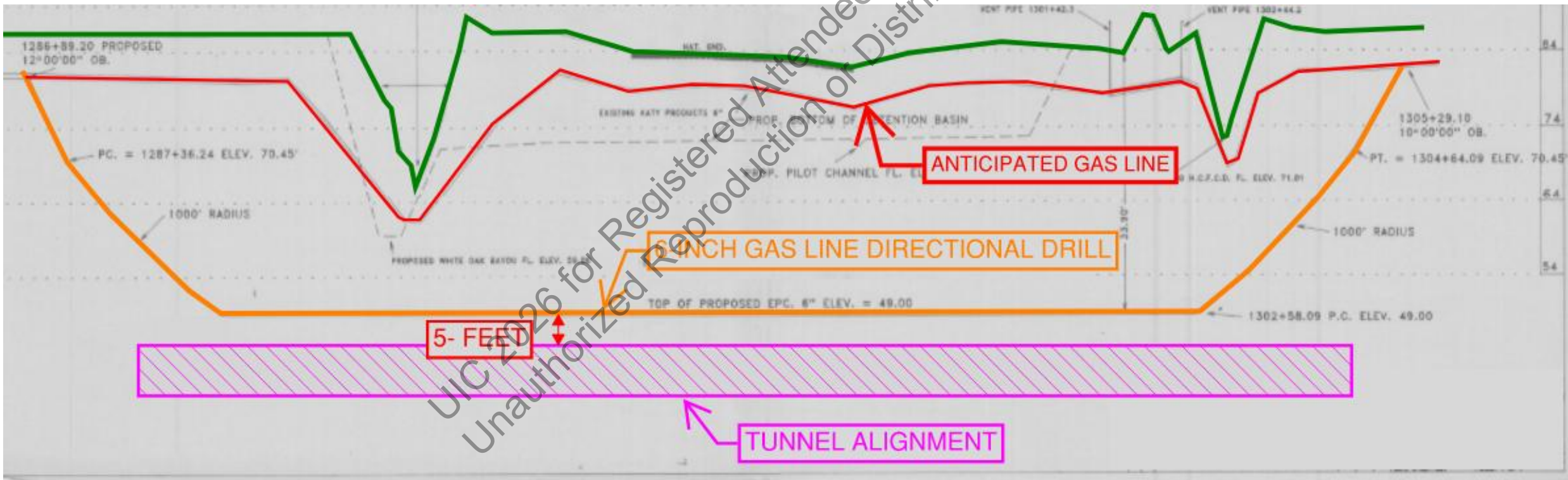
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Crossing Paths: Working the Problem

- **HDD profile was "not" in conflict with tunnel profile**
- *What the record drawing showed:*



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Crossing Paths: Working the Problem

Directed:

- Gyroscopic mapping of the 6-inch gas line
- Contractor to stop work once excavation to original depth was completed



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Crossing Paths: Working the Problem

Required a second point along the line to retrieve the device



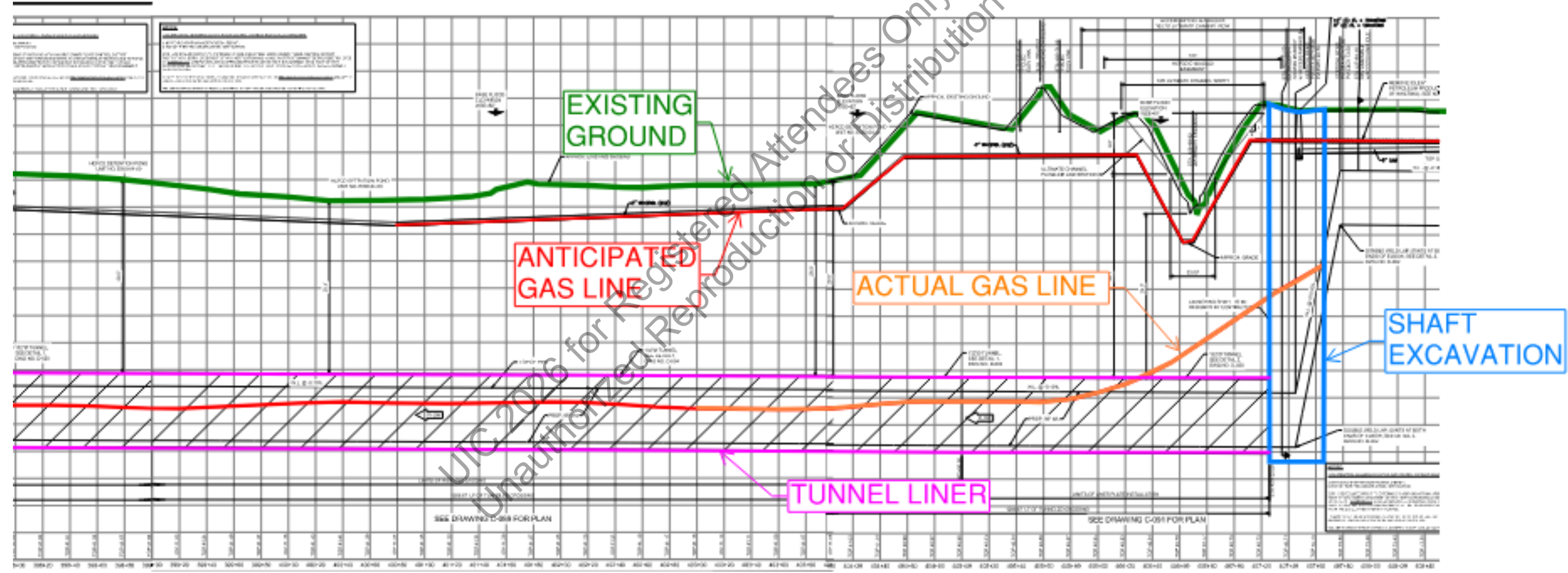
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Crossing Paths: Working the Problem

Wireline survey results



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Crossing Paths: Solving the Problem

Met with the Contractor and presented two options:

- Option 1: Lower the shafts and tunnel by approximately 10 vertical feet
- Option 2: Offset the tunnel horizontally by revising tunnel and adding curves



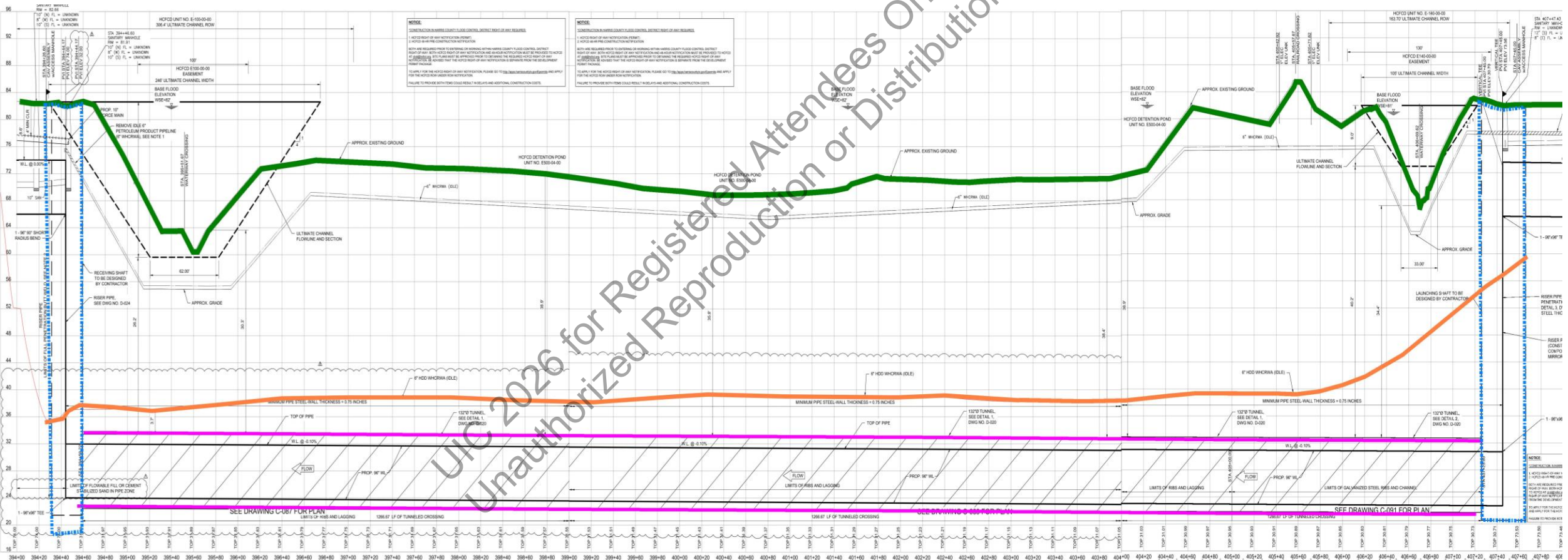
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Crossing Paths: Solving the Problem

- The Chosen Solution (Option 1):
 - Lower the shafts and tunnel by approximately 10 vertical feet



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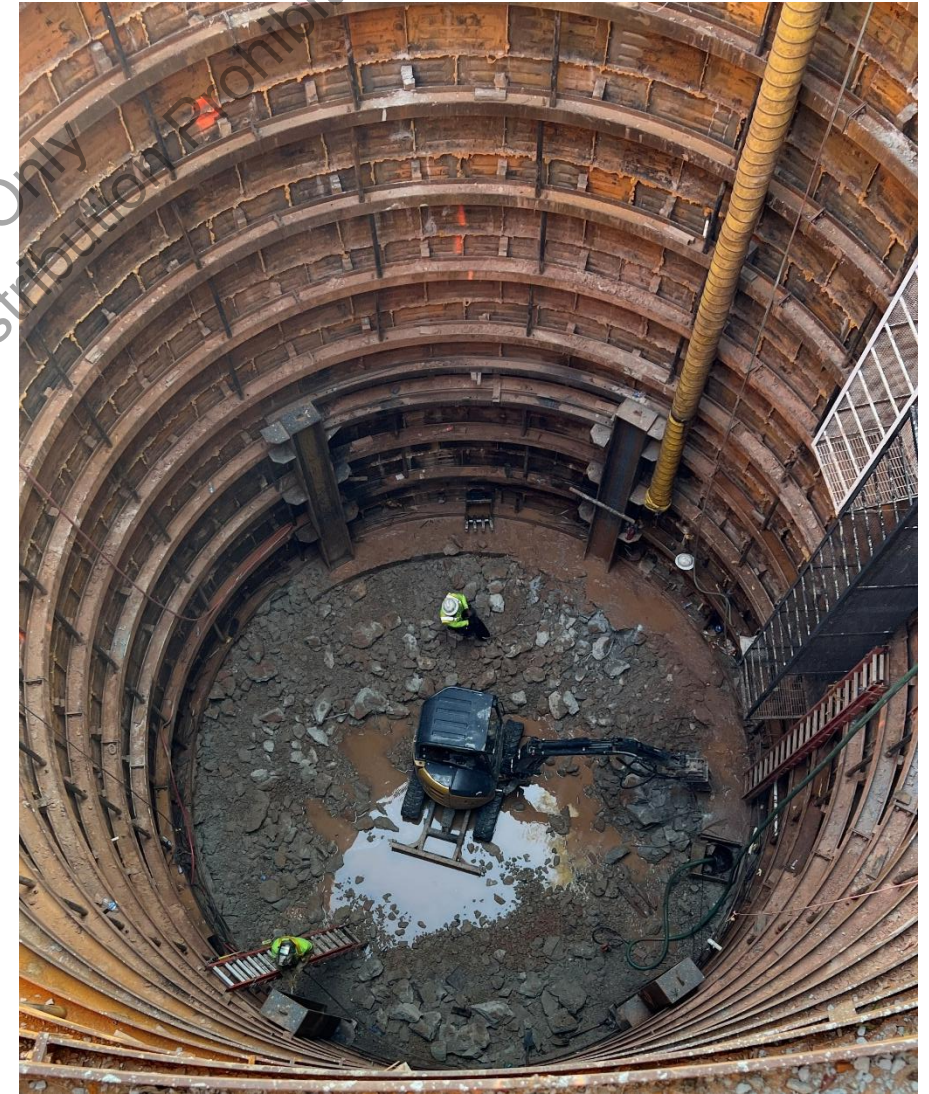
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Crossing Paths: Solving the Problem

Benefits:

- Less perceived risks - easier to construct
- Less estimated costs
- Ground below previous tunnel profile showed to be mostly clay based on borings



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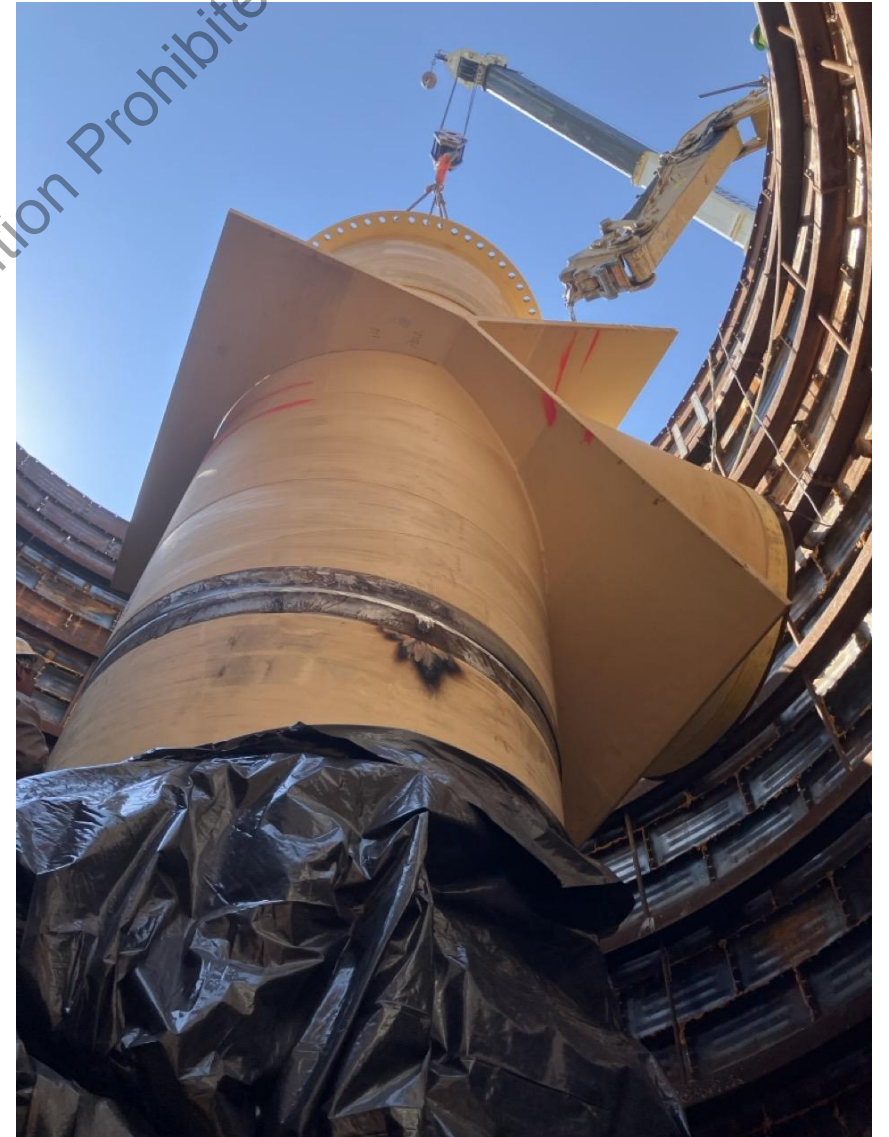
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Crossing Paths: Solving the Problem

Revised and reissued drawings

- Higher wall thickness of tunnel pipe
- Changed from elbows/bends to tee fitting (riser pipe)
 - Full penetration butt welds
 - Radiographic Examination or Ultrasonic Examination
- Deleted one access manway

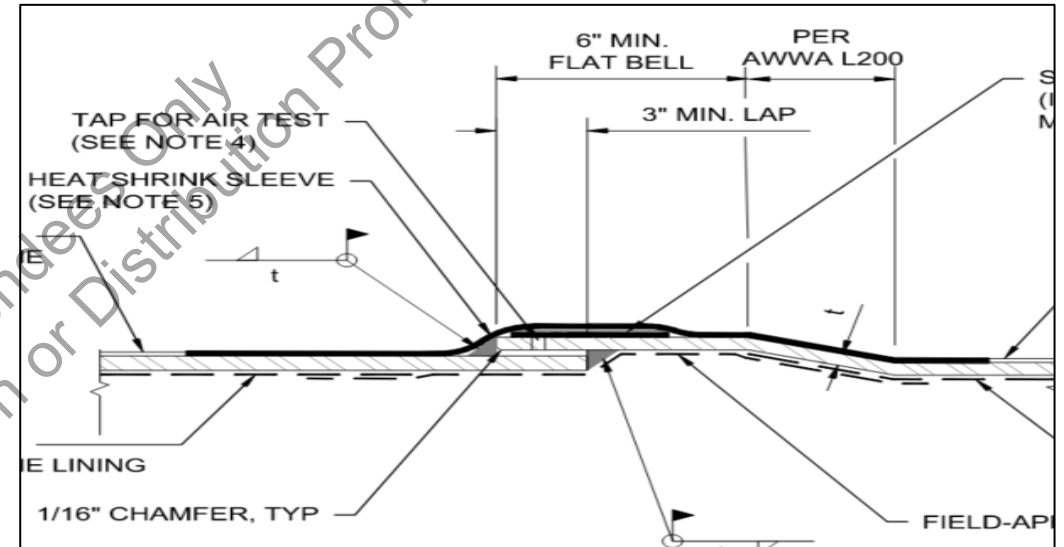
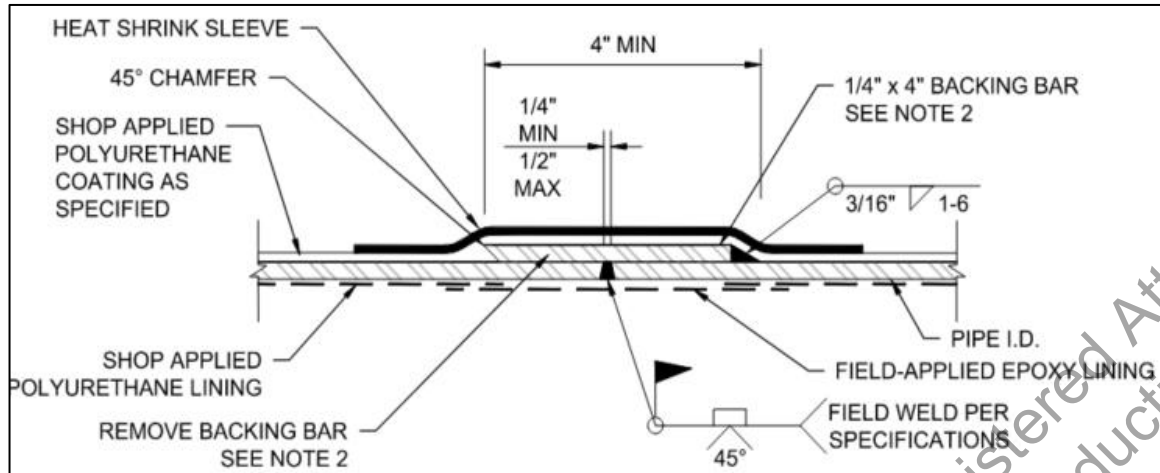


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Crossing Paths: Solving the Problem



Full Penetration Butt Weld

0.75" Steel Pipe Thickness
Pipe Material per Specifications

Double Weld Lap Joints

0.625" Steel Pipe Thickness
Pipe Material per Specifications

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Crossing Paths: The Costs

- Change Order Issued for **\$1.8 Million** and **27 Contract days**
 - Included Contractor downtime, increased shaft depth, increased waterline depth, etc.,
 - \$730k in costs for vertical risers and increased waterline wall thickness
 - \$30k to locate 6-inch idle gas line



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Crossing Paths: Lessons Learned

- Swift decisions save money and time
 - Stopping the Contractor saved the Owner money in the long run
- Important decision criteria: safety, constructability, schedule, cost, risk
- Extend geotechnical bores to at least two tunnel diameters below initial profile depth
- Contractor input throughout the change process

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Questions?

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Underground Infrastructure Conference

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