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PUMPING STATION CONSOLIDATION AND TRENCHLESS INSTALLATION CASE STUDY

New River Street Pump Station - Bridgeport CT

May 1, 2017 NEWEA Sustainability and Collection Systems Conference

Tim McDonald, PE

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NEW RIVER STREET PUMP STATION – BRIDGEPORT, CT

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Today's Agenda

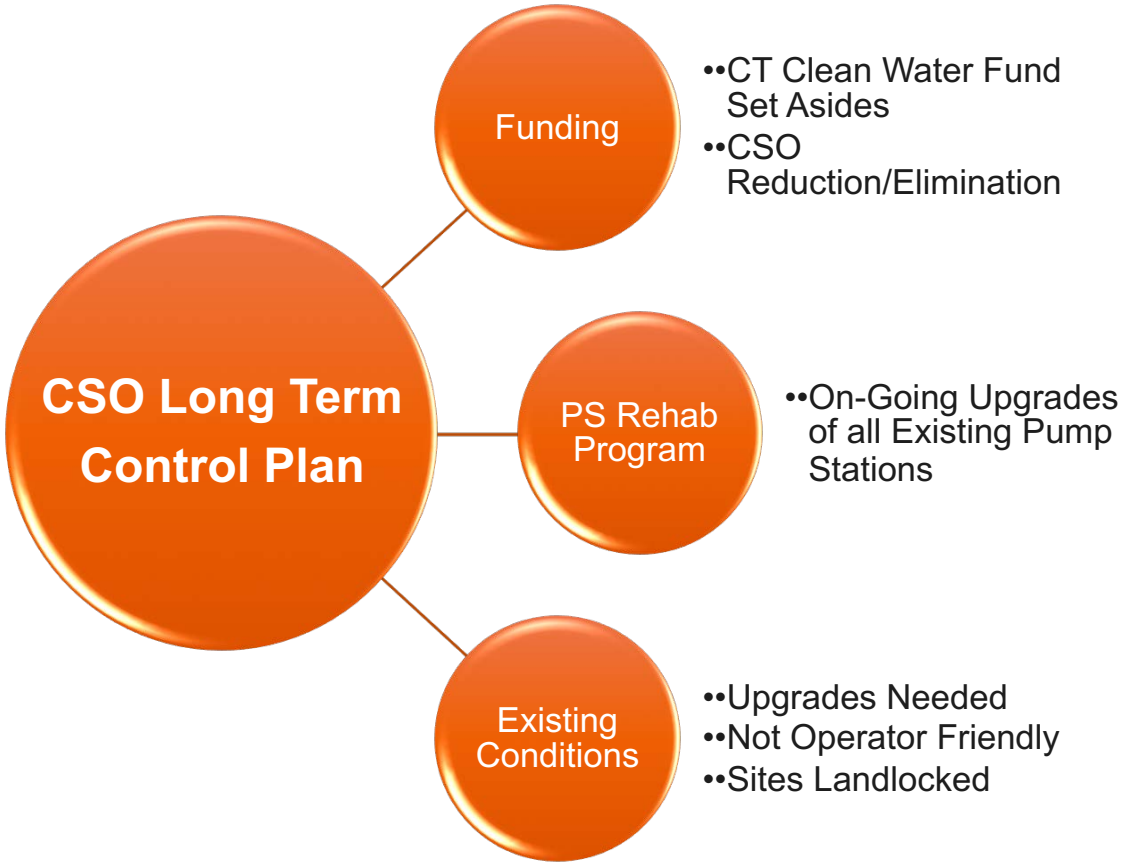
- Overview of Bridgeport CT System
- Project Background and Drivers
- Subsurface Investigation Overview
- Trenchless Sewer Installation Evaluation
- Approach to Risk Mitigation and Control
- Trenchless Installation Experience
- Lessons Learned

Overview of Bridgeport CT System

- East Side WWTP -10 mgd (AA) Activated Sludge Facility
- West Side WWTP - 30 mgd (AA) Activated Sludge Facility
- 20 square mile service area
- 283 miles of sewers:
  - 160 miles of sanitary sewers
  - 123 miles of combined sewers
- 9 Pump Stations
- 66 Regulators
- 8 Inverted Siphons
- 33 CSO Outfalls
- Service Portions of Stratford, Fairfield, and Trumbull, CT

Overview of Bridgeport System

Project Background and Drivers



Project Background and Drivers

Island Brook Pump Station Site Constraints

No Room for Expansion or Construction

Project Background and Drivers

River Street Pump Station Site Constraints

No Room for Expansion or Construction

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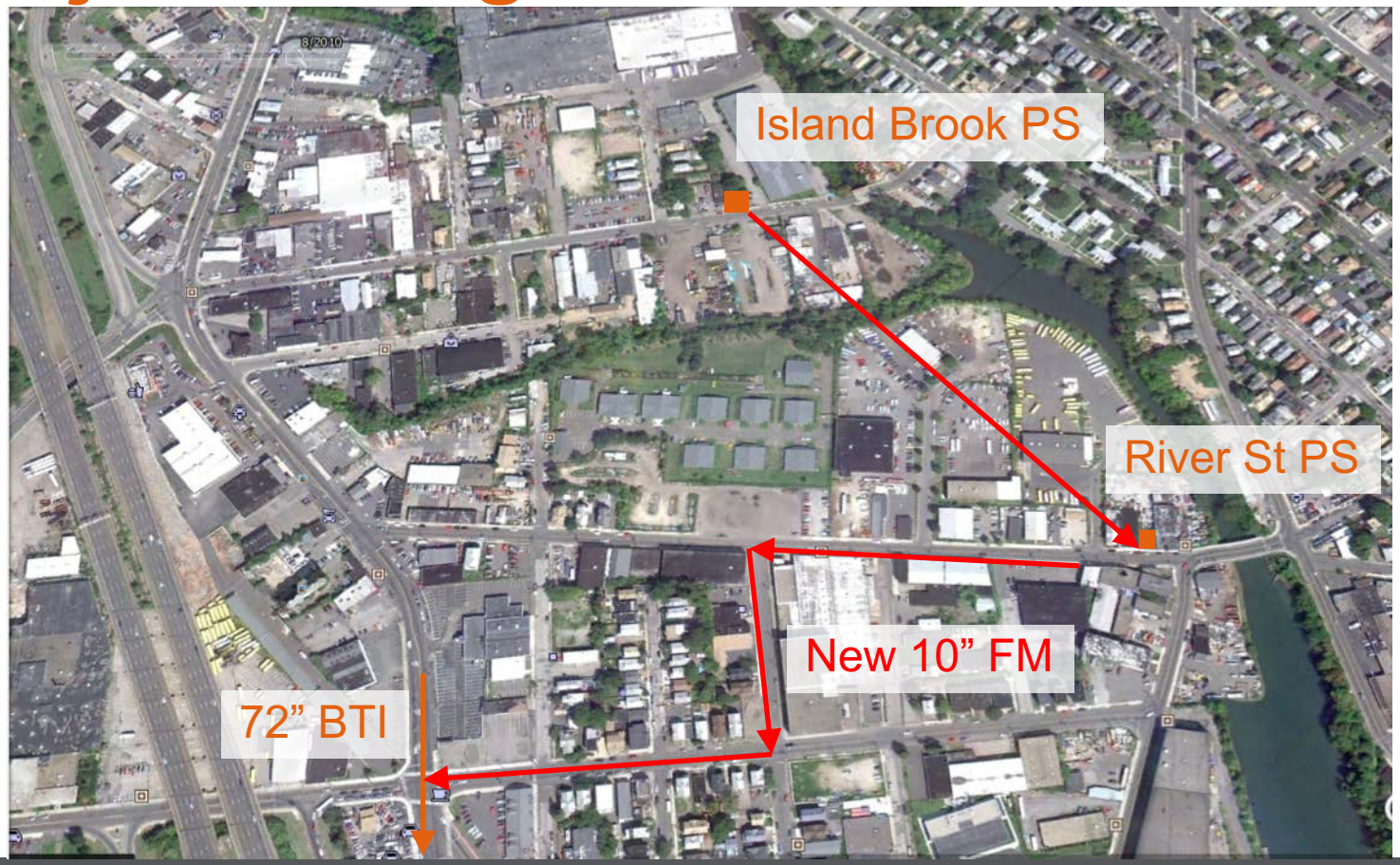
Project Background and Drivers



Consolidate the Pump Stations & Eliminate CSOs

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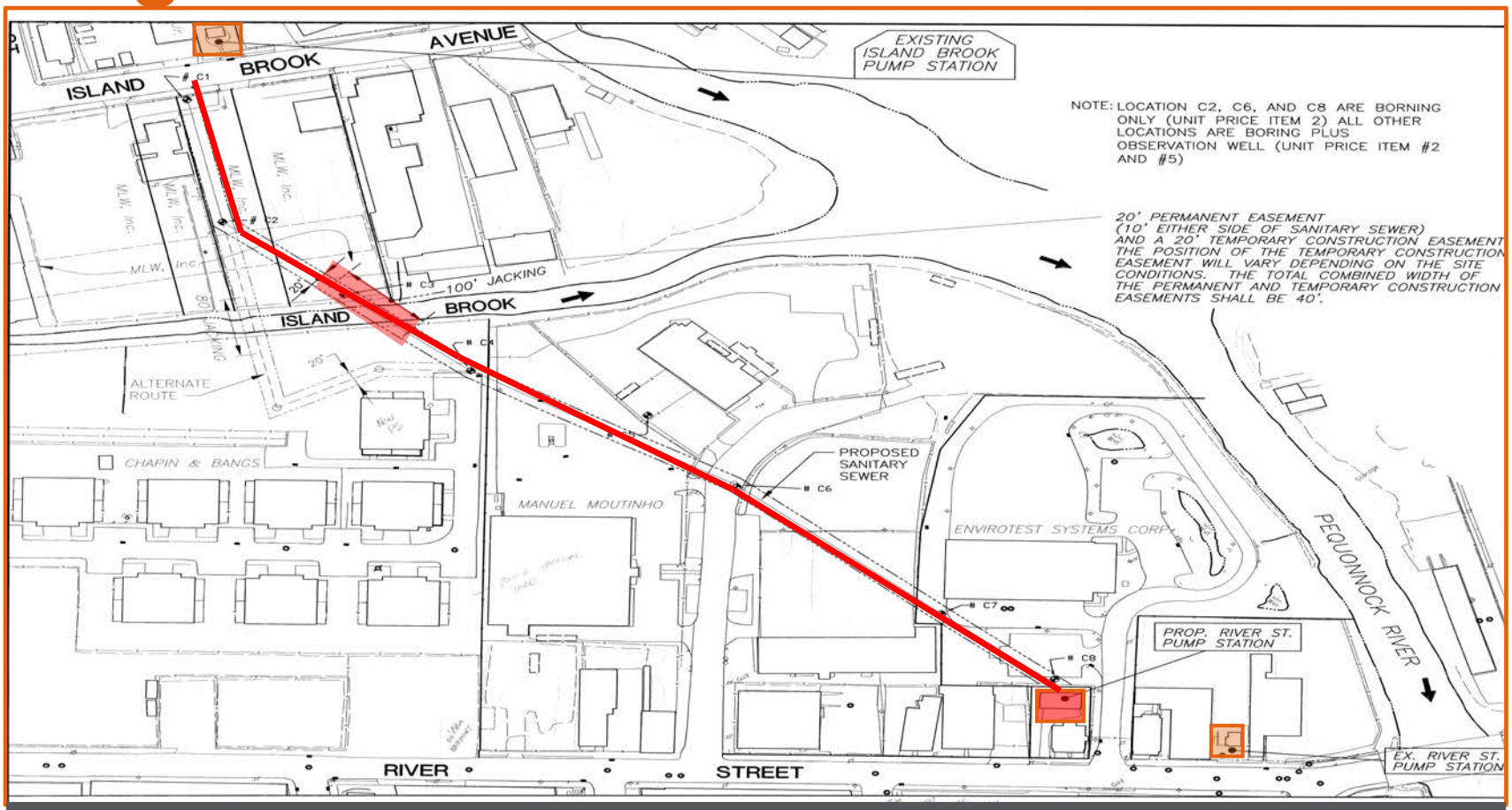
Original Consolidation Plan - 2002



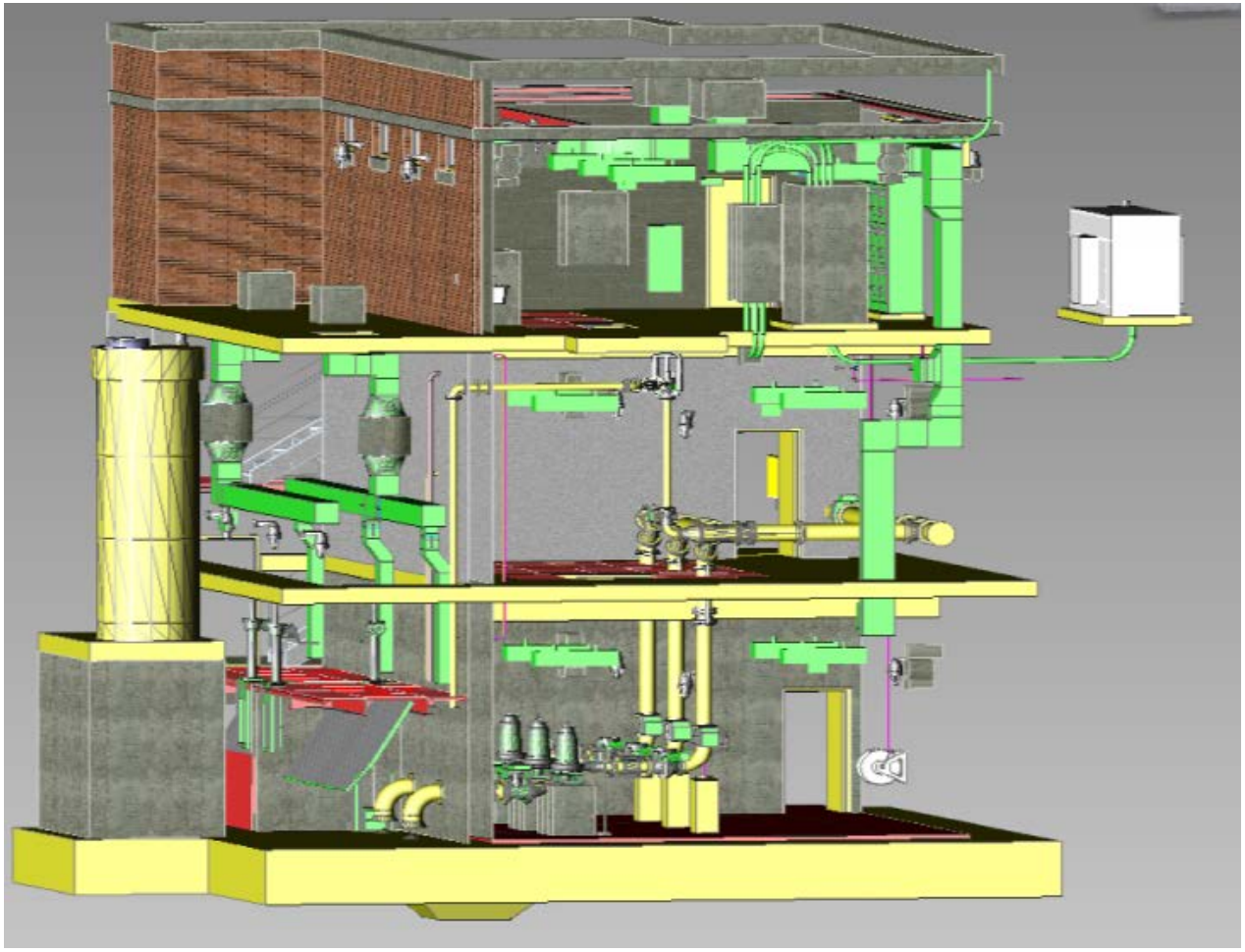
Use Pipe Jacking to Redirect Flow to a New River St PS

The Game Changer in 2008…

A Potential Alternative – Former Dog Kennel Site

New River Street Pump Station

- 2.4 MGD Wastewater PS
- Similar Design to other WPCA Pump Stations
- Wet Well/Dry Well Arrangement
- 3 Dry Pit Submersible Pumps
- Emergency Backup Generator
- Designed Utilizing 3D MEP



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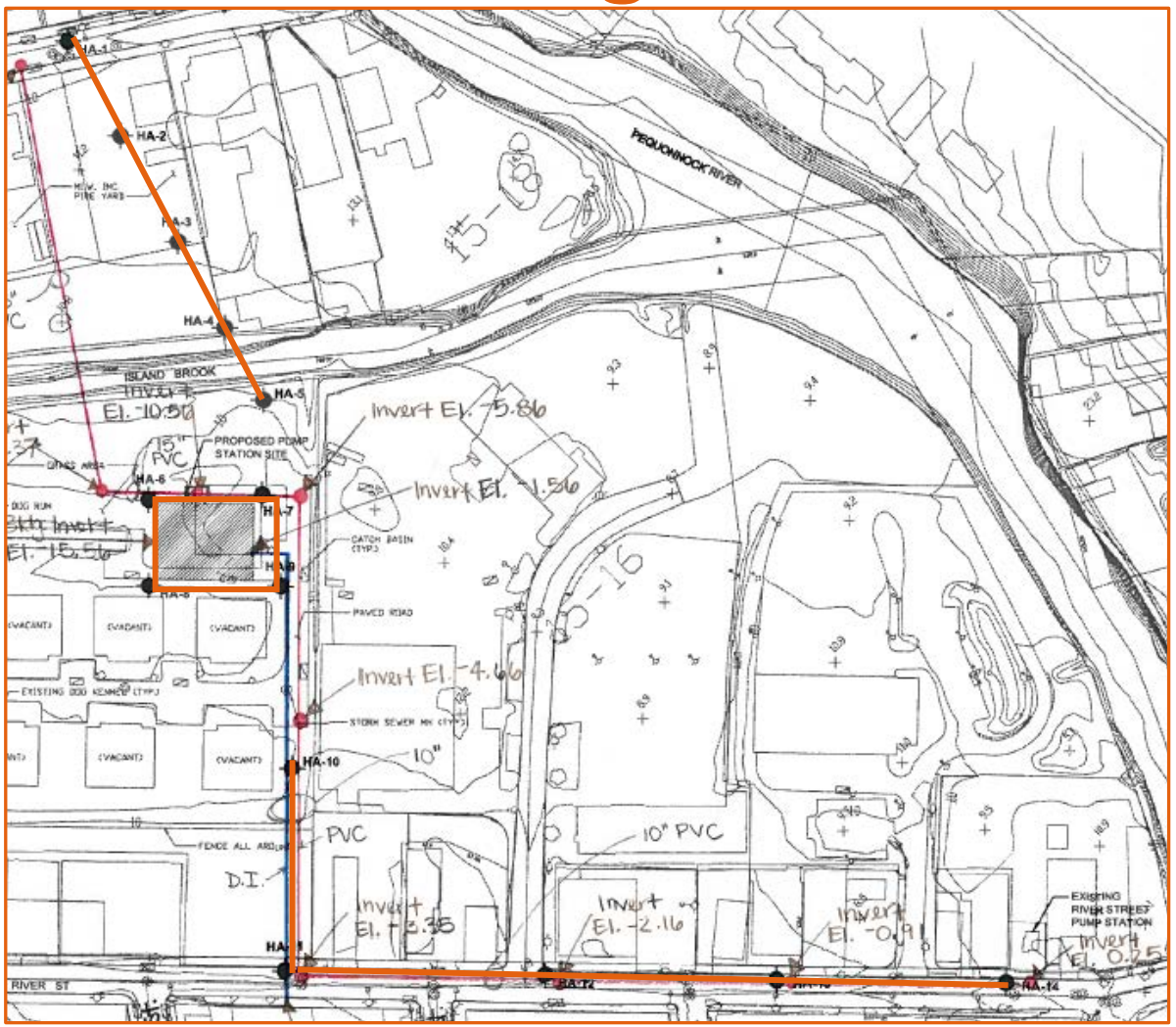
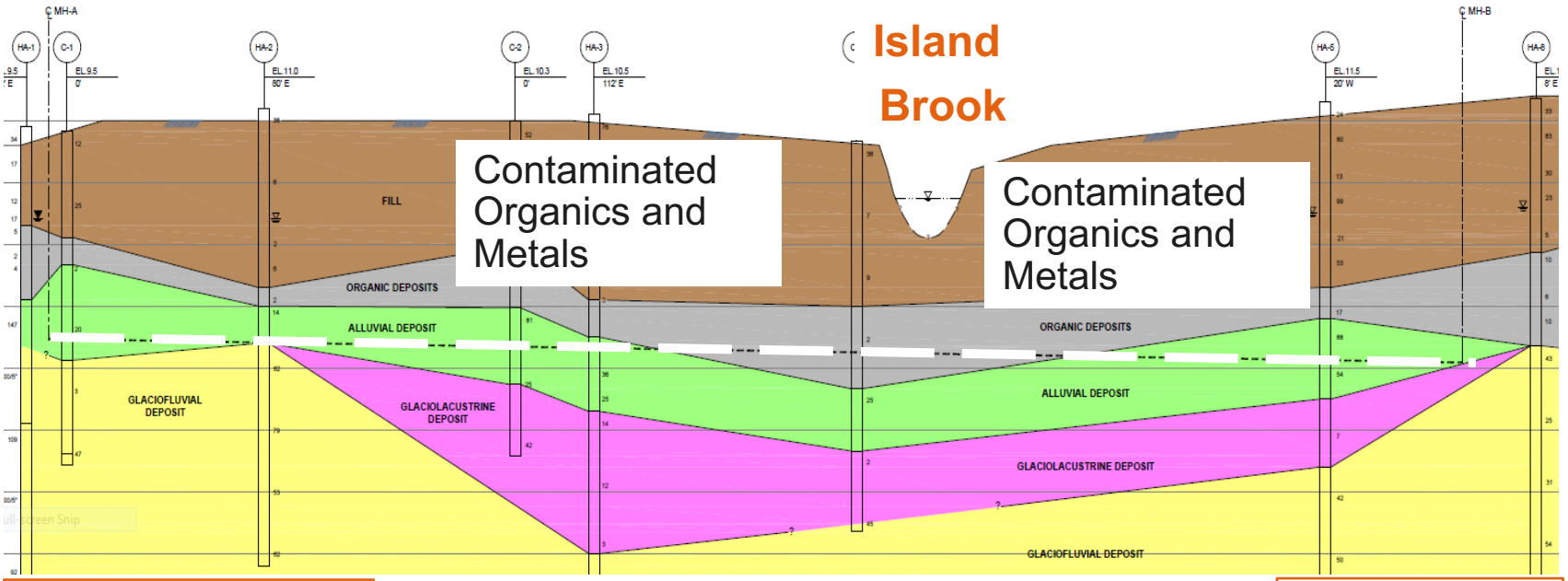
Subsurface Investigation Overview



Credit: Haley and Aldrich, Inc.

Subsurface Profile from Island Brook to New Pump Station Site

Credit: Haley and Aldrich, Inc.

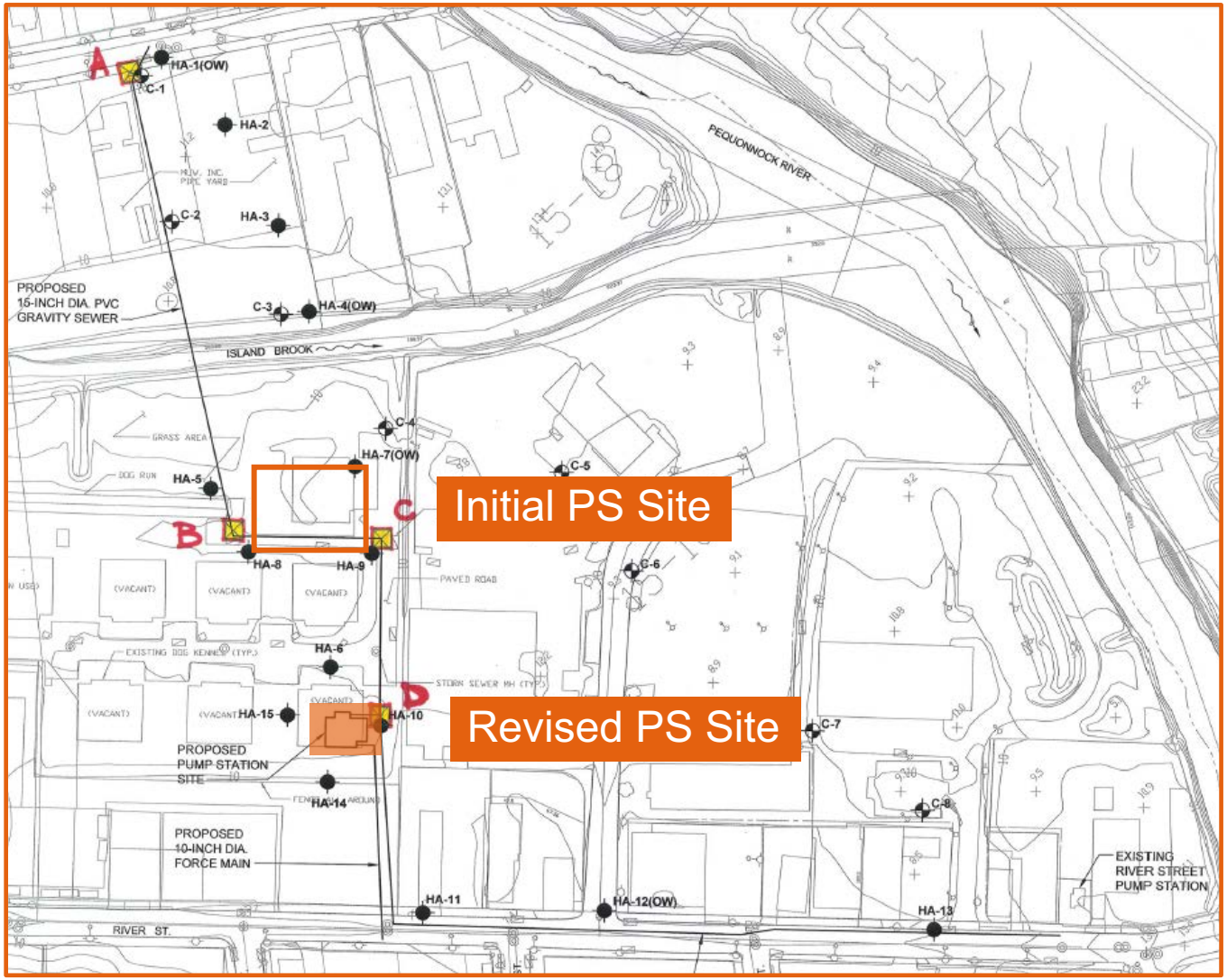


Island Brook Ave

New PS Site

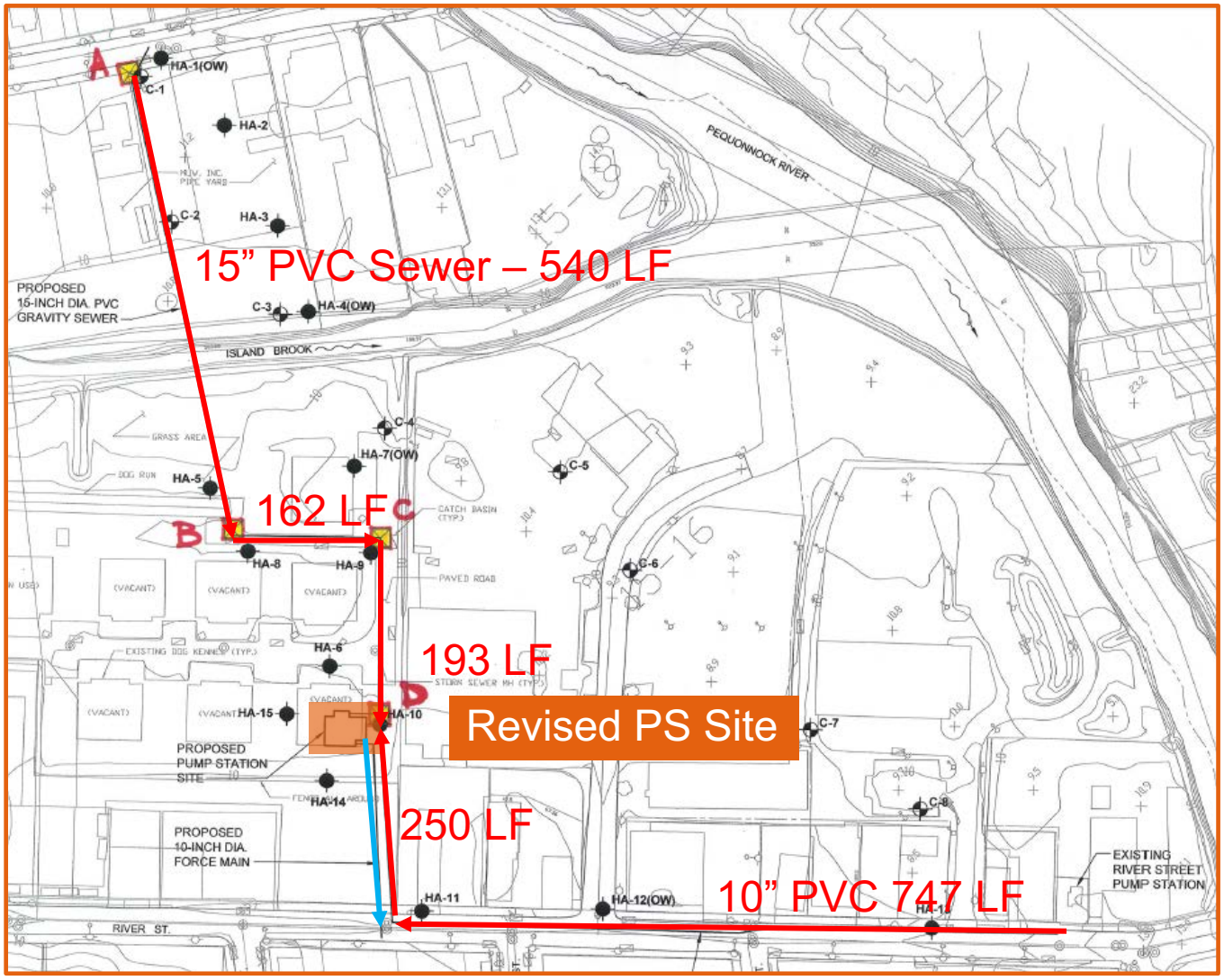
Relocate PS Site and Go Trenchless to Reduce Cost

Relocate PS to Avoid Contamination



Credit: Haley and Aldrich, Inc.

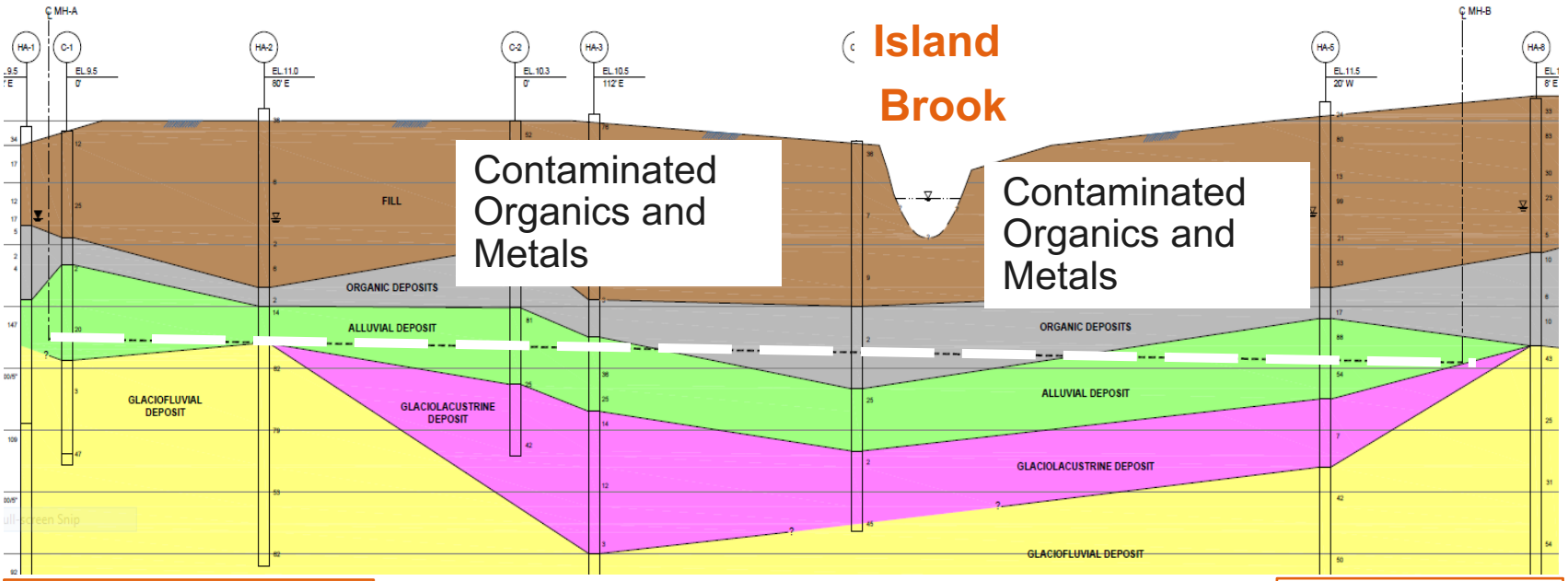
Trenchless Considerations



Credit: Haley and Aldrich, Inc.

Trenchless Evaluation

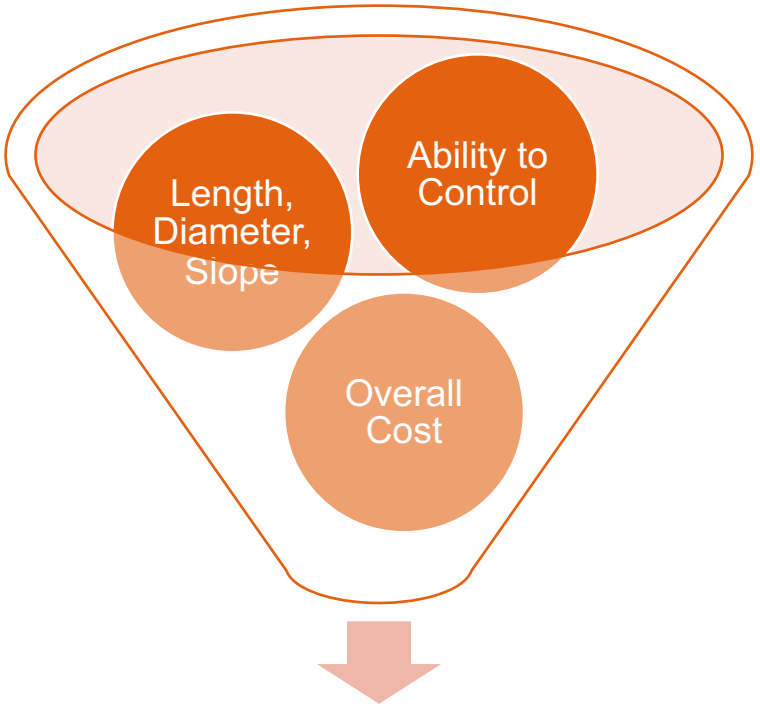
Credit: Haley and Aldrich, Inc.



Select Sustainable, Cost Efficient Method to Mitigate Risk

Trenchless Evaluation

- Microtunneling
- Horizontal Directional Drilling
- Pipe Jacking



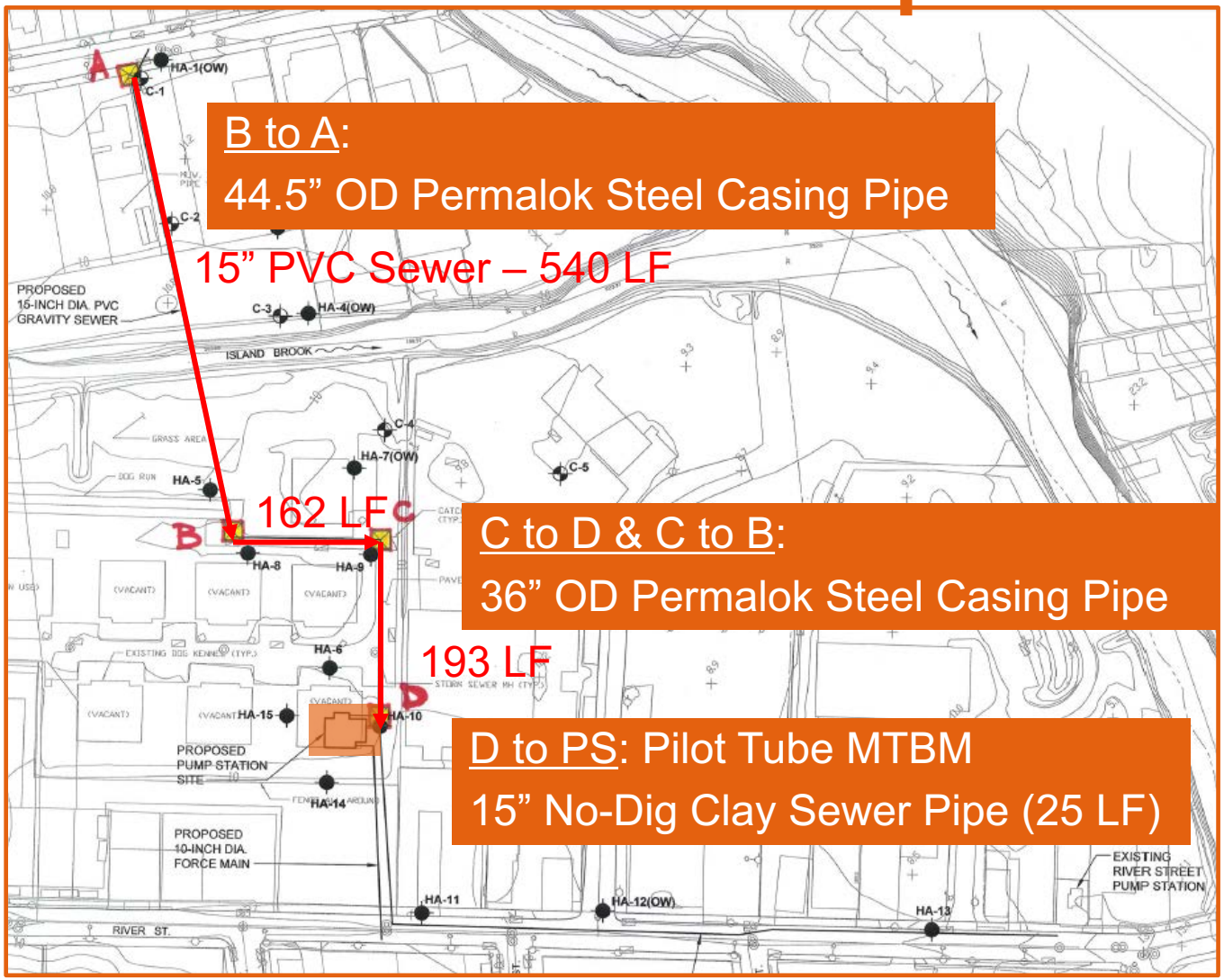
Microtunneling

Microtunneling Offered Best Chance of Success

Design Approach to Risk Mitigation and Control

Data Availability	••Supplemental Information to Bidders ••Define Limits of Reliance on Data
Specify Parameters	••Prequalify Tunneling Contractors ••Define Minimum MTBM Diameter ••Define “Boulders” and “Obstructions”
Plan for the Unexpected	••Discuss Risk and Develop a Mitigation Plan ••Unit Price for Tunneling Crew Delay Time ••Allowance Item for “Rescue Shafts”
Monitor and Control	••Document Existing Conditions ••Install and Monitor Crack Gauges ••Monitor Site for Movement/Settlement

Trenchless Installation Experience



Credit: Haley and Aldrich, Inc.

MTBM Equipment

Herrenknecht AG, Germany

AVN600 for 36” OD (495 Tons Jacking Force)

AVN800A for 44.5” OD (765 Tons Jacking Force)

Estimated Jacking Force Required – 115 Tons

Typical Cutter Head Arrangement

Credit: Northeast Remsco, Inc.

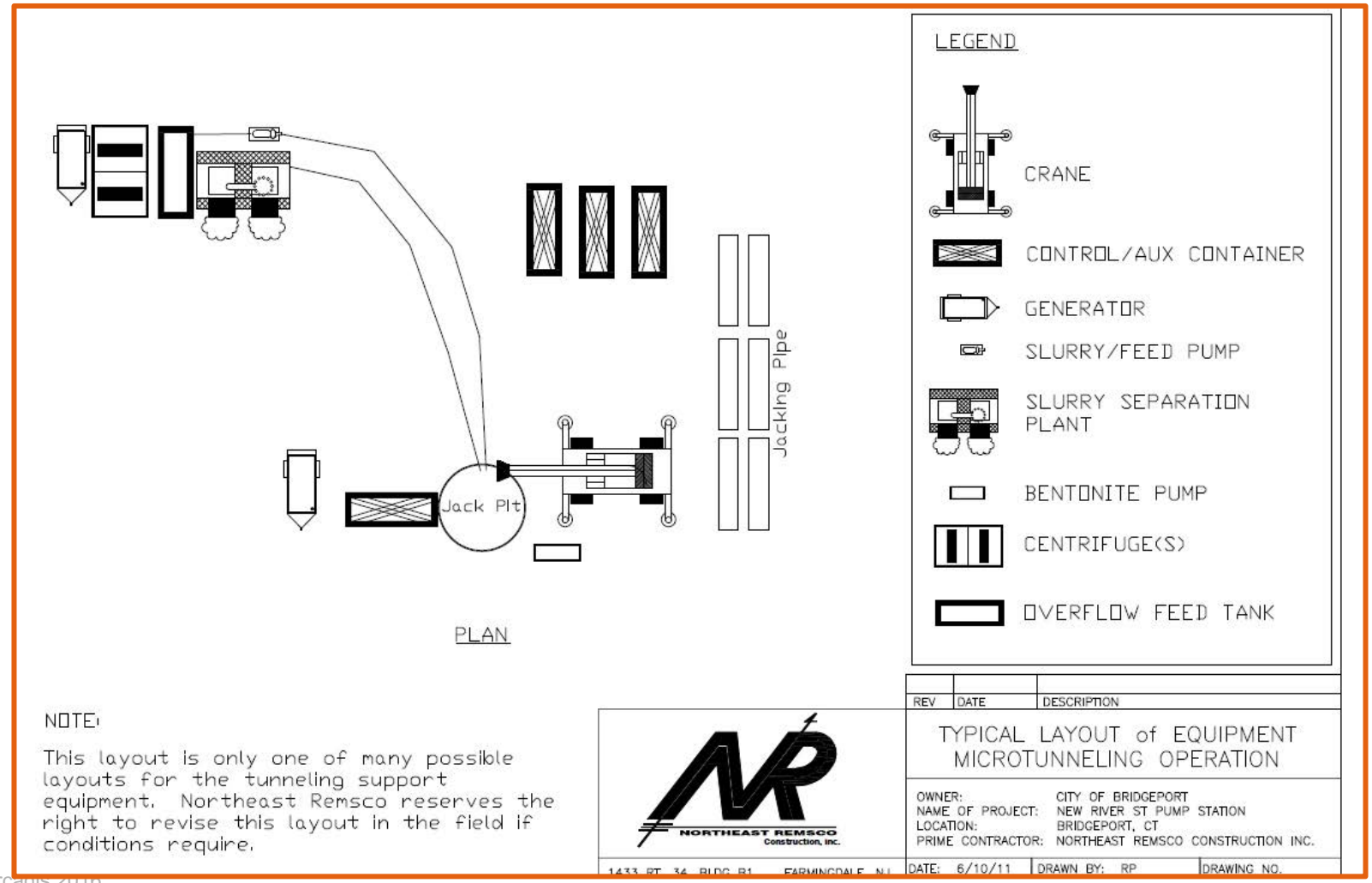
Guided Bore/Pilot Tube MBTM Equipment

Akkerman PCH 22.5 with 308A/309A Jacking Frame

Pilot Tube MBTM Section

Cutter Head Arrangement – 15” OD

Typical MTBM Site Layout



Credit: Northeast Remsco, Inc.

MTBM Site Layout

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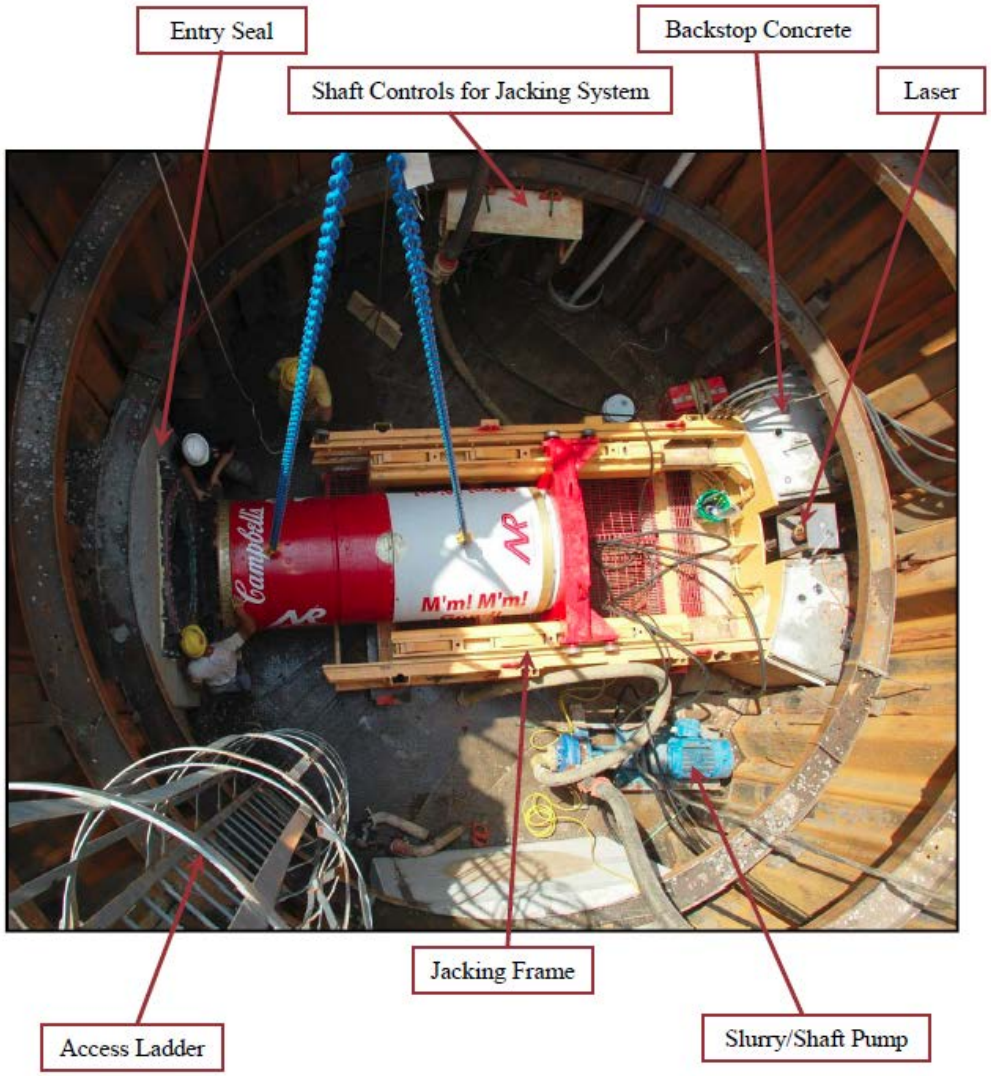
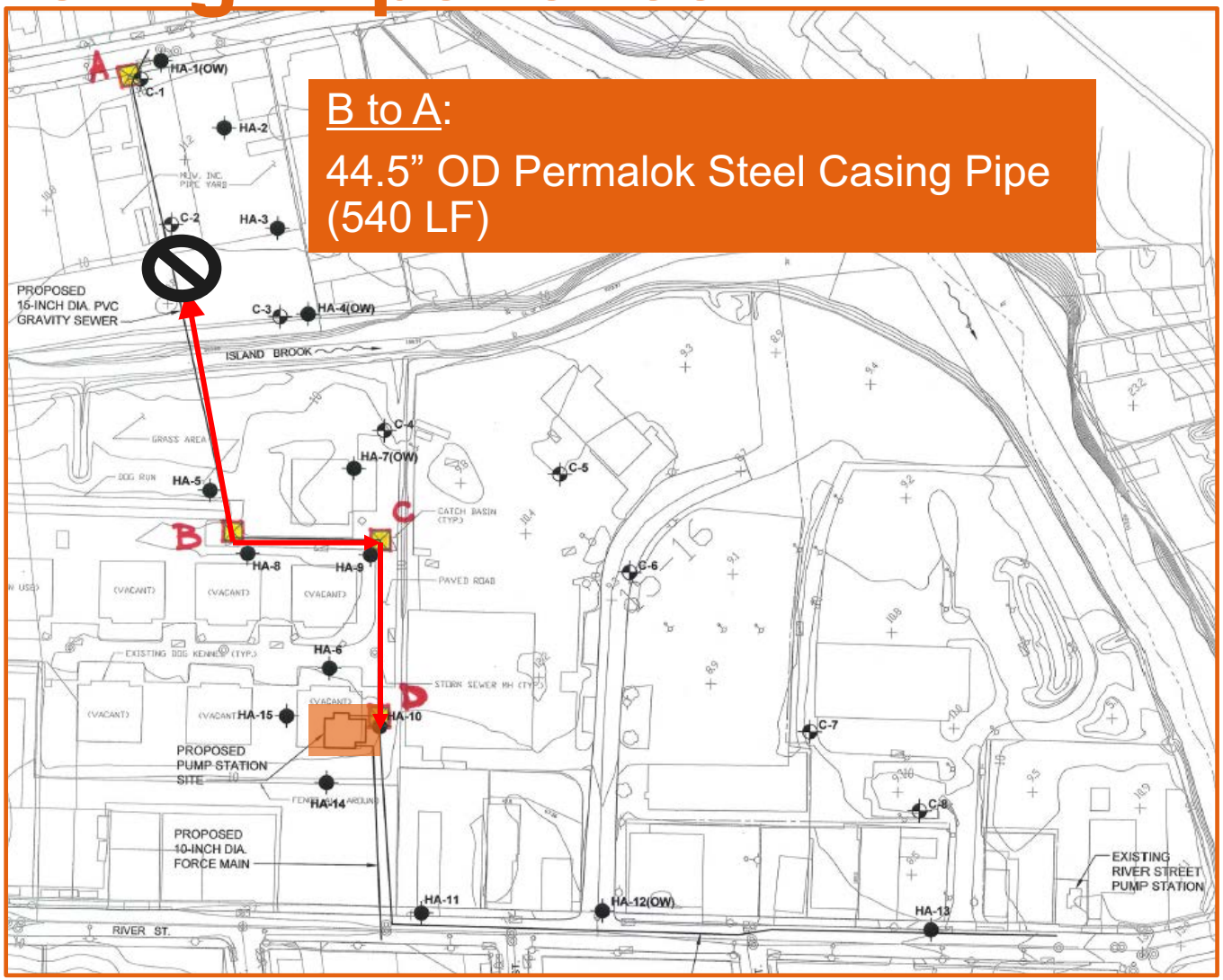
MTBM Site Layout – Slurry Plant

Typical MTBM Launch Shaft Setup



Credit: Northeast Remsco, Inc.

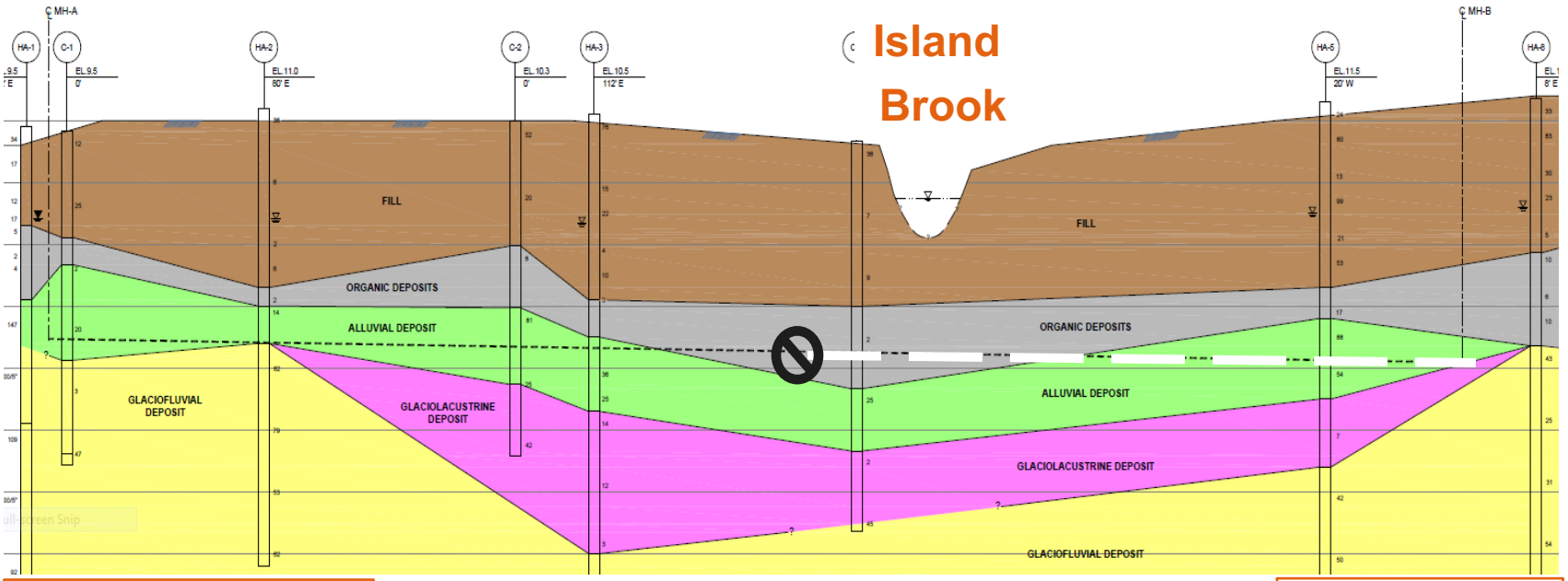
Tunneling Experience



Credit: Haley and Aldrich, Inc.

Murphy was an Optimist…

Credit: Haley and Aldrich, Inc.



Island Brook Ave

New PS Site

MBTM Lost Alignment (26mm right/78 mm down)

Investigating the Issue

- MTBM would need to be "Rescued" via Excavation of Rescue Shaft
- Obtain Inland Wetlands Permit
- Tunneling Logs Reviewed
- Material in front of MTBM observed and reviewed
- Discuss Potential Causes and Best Way to Proceed
- Utilized Unit Price and Allowance Items for Rescue Shaft

Photo of exposed MTBM showing face clogged with soil

Work Collaboratively to Develop a Recovery Plan

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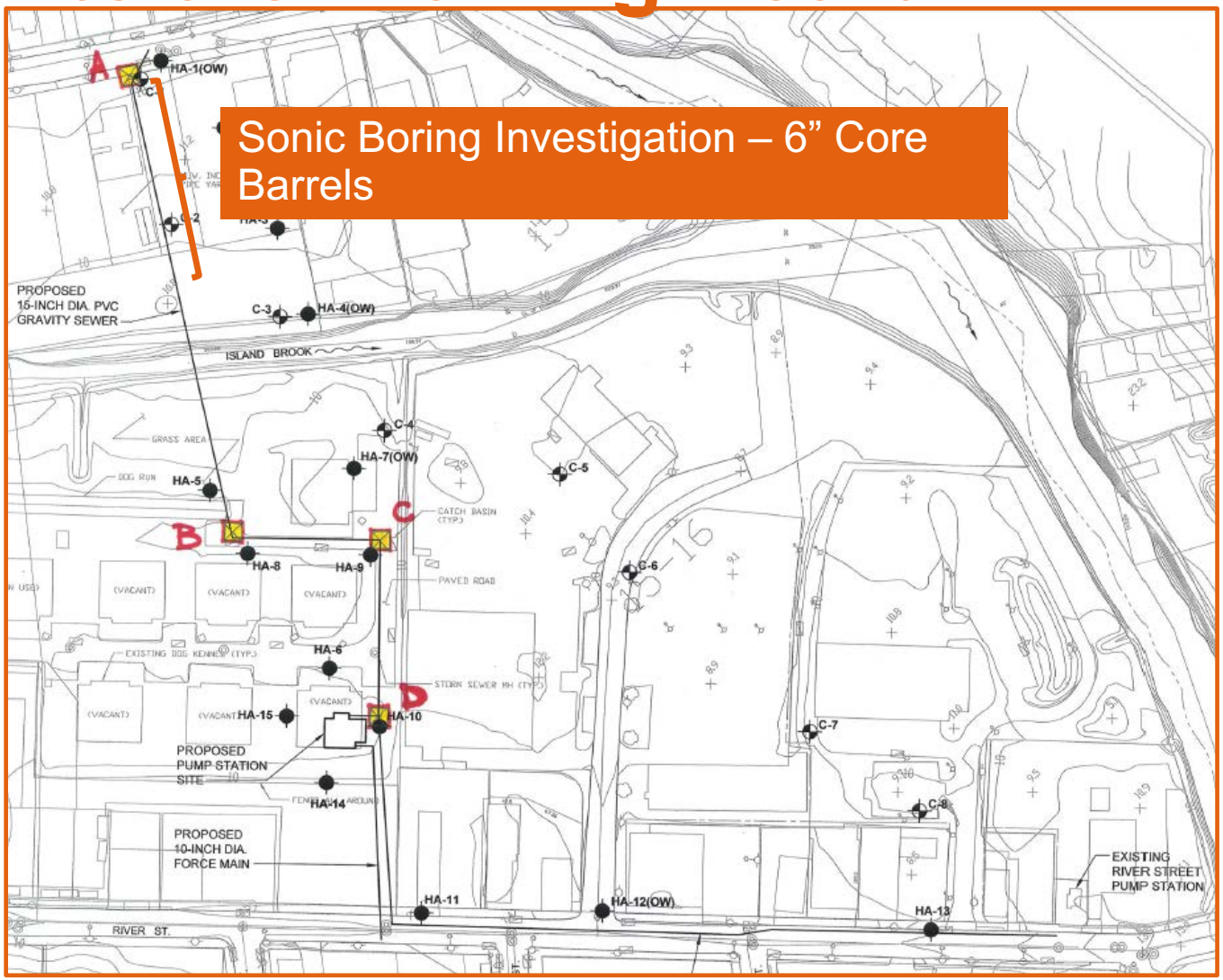
Back to the Drawing Board…



Credit: Haley and Aldrich, Inc.

Planning for Completion

- Convert Rescue Shaft to Launch Shaft
- Upsize MTBM to 48” OD – AVN1200 with different Cutter Head Arrangement
  - Use 48” OD RC Casing Pipe
  - Sell off 44.5” OD Permalok Pipe

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Meanwhile, Back at the Pump Station…

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Murphy Didn't Stick Around…

Lessons Learned

- Drill, Drill, Drill…Determine Subsurface Conditions
- Prequalify Tunneling Contractors
- Clearly Specify Tunneling Parameters
- Plan for Unexpected Delays and Conditions
- Collaborate and Work Together for Success
- Trenchless is a sustainable, cost effective solution to buried infrastructure challenges

Acknowledgements

- Bill Robinson and Ravi Keerthy, Bridgeport WPCA
- Haley and Aldrich, Inc.
- Pereira Engineering, LLC
- CT DEEP
- Northeast Remsco Construction

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