



TEXAS & OKLAHOMA



# TRENCHLESS REPORT 2025

OFFICIAL PUBLICATION OF THE NASTT SOUTH CENTRAL CHAPTER (SC-NASTT)

**Trenchless Education  
in TX & OK**

**Houston Surface  
Water Tunnels**

**CFRP Over the Hill  
in Irving**

**Large Diameter,  
No Problem**

**2025**



# HDPE PE4710 PIPE

## *The Best Choice for Water Systems*

|    | TOP 10 Features & Benefits                                                                                                                            | HDPE | D. Iron | Sample References                                                                                                                                                                                                                                              |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <b>Applications:</b> Potable Water (Lead Free), Raw Water, Reclaimed Water, and Wastewater                                                            | ✓    | ✓       | AWWA C901, C906, C151, and NSF 61 + Health Effects of HDPE Pipes and Fittings for Potable Water Applications, NSF 2024                                                                                                                                         |
| 2  | <b>Open Cut Construction:</b> Design and install per AWWA Standards and Manuals                                                                       | ✓    | ✓       | AWWA M55, M41 + MAB-3, MAB-6                                                                                                                                                                                                                                   |
| 3  | <b>Trenchless Construction:</b> Material of choice for HDD, Creek Crossings, Pipe Bursting, Sliplining, and Compression Fit                           | ✓    | ✗       | ASTM F585, F1962, F3508 + MAB-5, MAB-7, MAB-11                                                                                                                                                                                                                 |
| 4  | <b>Fully Restrained Joint-Free System:</b> Minimize need for fittings to facilitate horizontal and vertical deflections                               | ✓    | ✗       | AWWA M55, M41                                                                                                                                                                                                                                                  |
| 5  | <b>Longevity &amp; Corrosion:</b> Pipes, Fittings, and Joints have the least potential for corrosion or tuberculation                                 | ✓    | ✗       | Durability and Reliability of Large Diameter HDPE Pipe for Water Main Applications, EPA/WRF/WERF 2015 + The Critical Need for Corrosion Management in the Water Treatment Sector, NACE 2019 + PPIPPACE.com + Long-Term Aging of Polyethylene Pipes, UKWIR 2020 |
| 6  | <b>Flow Capacity:</b> New pipes have similar flow capacity per AWWA Standards and Manuals                                                             | ✓    | ✓       | AWWA M55, C906, M41 + PPIPPACE.com                                                                                                                                                                                                                             |
| 7  | <b>Water &amp; Energy Conservation:</b> Fused joints have zero allowable water leakage, zero infiltration, and lowest carbon footprint                | ✓    | ✗       | AWWA M55, M41 + ASTM F2620, F3190, F3565 + MAB-1, MAB-2, MAB-8 + TEPFPA Polyethylene Plastic Pipe Systems vs Ductile Iron Environmental Impact Comparison, TEPFPA EPD Calculator                                                                               |
| 8  | <b>Cost Effective:</b> Has the lowest initial cost, lowest life cycle cost, and lowest restoration cost for trenchless installations                  | ✓    | ✗       | Life Cycle Analysis of Water Networks, CSIRO 2008 + Annual Drinking Water Quality Report for 2014, Kittery Water District, 5/31/2015                                                                                                                           |
| 9  | <b>Resilient:</b> Ability to resist ground movements due to droughts, freeze/thaw, earthquakes, hurricanes, with ability for flow control/squeeze off | ✓    | ✗       | Recent Earthquakes: Implications for U.S. Water Utilities, WRF 2012 + Polyethylene Pipeline Performance Against Earthquake, Kubota 2018 + MAB-9                                                                                                                |
| 10 | <b>Permeation/BTEX:</b> Pipes and elastomeric joints need to be properly engineered for contaminated conditions                                       | ✗    | ✗       | AWWA C901/C906 and C111/C151, Sec. 4                                                                                                                                                                                                                           |

Additional information including MAB-3 Model Spec Guide can be found at [www.plasticpipe.org/mabpubs](http://www.plasticpipe.org/mabpubs)





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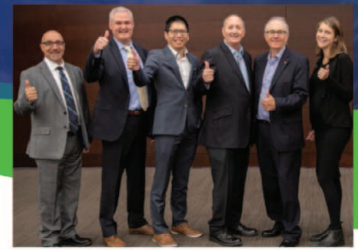
## Be a solution provider.

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## Cover Feature:

### Houston Surface Water Supply Project - Segment B1/B2

The Surface Water Supply Project (SWSP) was developed in response to mandated reductions in groundwater usage in the Houston area, and involves the construction of approximately 42 miles of steel potable water lines. The Segment B section of the SWSP involves the construction of nearly 15 miles of 84-inch and 96-inch steel waterlines, predominantly within densely developed urban areas containing single and multifamily residential buildings, light industrial buildings, petroleum pipeline corridors, commercial buildings, and school buildings. All the Segment B1/B2 tunnels are in soft ground below the groundwater table level. This article provides details on construction of this complex project which entailed the use of 6 different TBMs!



## Features:



### Trenchless Technology Education & Networking in West Texas

A free Trenchless Technology seminar February 25, 2025 led by SC NASTT and co-hosted by El Paso Water was a major success and great showcase of the numerous social and environmental benefits of using trenchless methods in underground construction projects. It was a strong indicator of the great interest and excellent growth potential for trenchless and an inspiration for future events with approximately 200 industry professionals enjoying a half-day of trenchless education and networking.



### Making It Over the Hill - FRP Rehabilitation of Steel Stormwater Pipelines

A recent visual condition assessment and closed-circuit television (CCTV) inspection revealed significant corrosion of four 42-inch and two 30-inch steel discharge pipelines constructed in 1979 to pump stormwater up and over a levee into the Elm Fork Trinity River. After evaluation of available repair options and the development of a rehabilitation plan, internal fiber reinforced polymer (FRP) lining was recommended. Details on the challenges encountered during construction and how these were overcome.



### Large Diameter, No Problem! A Case Study in Tulsa OK

To assess and plan for the future rehabilitation of large diameter gravity sanitary sewer interceptors, the Tulsa Metropolitan Utility Authority (TMUA) initiated a project to evaluate the condition of its sewer interceptor network. The condition assessment program was intended to both quantify the structural integrity of the pipe and identify manholes at high risk of failure, particularly those contributing significant inflow and infiltration (I/I).



### North Richland Hills Adopts HDD for In-House Project Upgrades

By educating NRH council members on the benefits of HDD instead of open cut, the city's Public Works Director was able to persuade a cautious board to approve capital expenditures for HDD equipment and fund its ongoing maintenance. Benefits to this small city were immediately evident, with repair time and costs reduced, and residents in older neighborhoods appreciating the quick construction turnaround times and greatly reduced disruption.





## Also:

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# MESSAGE FROM THE NASTT SOUTH CENTRAL CHAIR

Shawn M. Garcia, P.E., NASTT South Central Chair

**W**elcome to the 8th publication of the *Texas and Oklahoma Trenchless Report*. Established in 2016, the South-Central Chapter of the North American Society for Trenchless Technology (NASTT) is proud to present this journal documenting trenchless projects and technology. This is a result of the growth of the industry in this region, and the impressive level of support from our industry colleagues.

The South-Central regional chapter of NASTT represents Texas and Oklahoma, two states comprising a geographic area experiencing significant growth in population. As the population grows, so does the need to expand, upgrade and replace existing infrastructure. Now more than ever, the benefits of trenchless technologies are critical to addressing our infrastructure challenges. The Texas & Oklahoma Trenchless Report provides an update on the state of trenchless methods and best practices in this region.

The South-Central chapter (SCNASTT) was formed in January of 2016, and has since hosted eight chapter events, including in 2016, 2017, 2019, 2022, and 2024 at The University of Texas at Arlington (UTA) and at Oklahoma State University (OSU) in 2018. After taking a break in 2020 due to Covid-19, we followed up in 2021 with a conference in Sugar Land, Texas for the first time, and then in an effort to diversify our outreach we held our chapter's first ever event in the City of San Antonio, with our annual conference taking place at the University of Texas San Antonio (UTSA) in 2023. In 2024, the conference returned to the DFW metroplex and was hosted at the University of Texas at Arlington (UTA). This year we are continuing the tradition of hosting our 9th annual conference at The University of Texas at Arlington (UTA). These events

## *SCNASTT is proud to present this journal documenting trenchless projects and technology*

average roughly 150 attendees and include utility owners, consulting engineering firms, municipalities, contractors, and vendors. At these events, attendees learn about trenchless projects in their local region, new trenchless technologies in the industry, and enjoy professional networking opportunities.

The South-Central Chapter is committed to supporting education through scholarships for our student members. A total of \$10,000.00 in Student Scholarships will be awarded at the 9th Annual Chapter Conference on November 4th at UTA in Arlington, Texas for the 2025-2026 school year. The South Central Chapter is excited to continue to support eligible students and members through scholarships, education, and future employment within our industry.

I would like to take this opportunity to thank the members of the South Central Chapter Executive Board, which has been expanded to include more members and better diversify our team. The chapter now has a strong core of 12 dedicated members with professional representation from all industry fields. This publica-

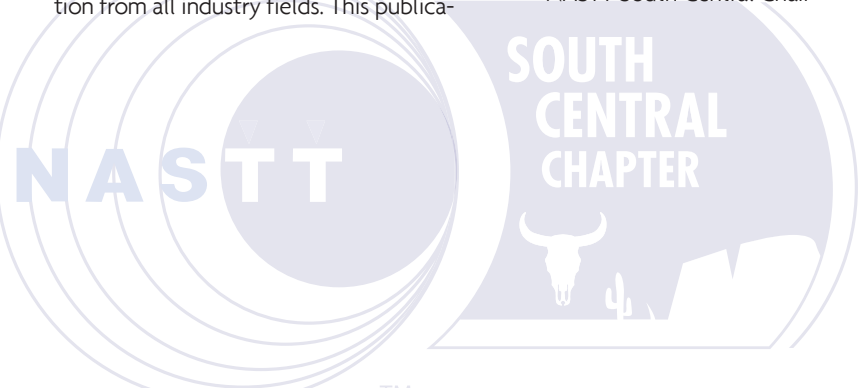
tion, the educational conferences we produce, and the scholarships and support we are able to offer would not be possible without the hard work and support of the executive board members who work to make this chapter what it is. Thank you all for your continued service.

The South Central Chapter has seen exceptional growth over the past several years, and we hope to continue that growth in order to better serve the industry and our communities, and be a resource for the personal and professional growth of our members. I challenge each of you reading this publication to consider joining the South-Central Chapter of NASTT and get involved with our organization. We hope you find this publication to be a valuable resource for all things trenchless and we truly appreciate your continued support.

Sincerely,

*Shawn M. Garcia*

Shawn M. Garcia, P.E.  
NASTT South Central Chair





# MAG X GEO



## PRECISION GPS DATA LOGGING

- » RTK-Enabled GPS with 1–3 cm Accuracy
- » GPS Tracking including Elevation
- » Automatically Record Rod-by-Rod Metrics



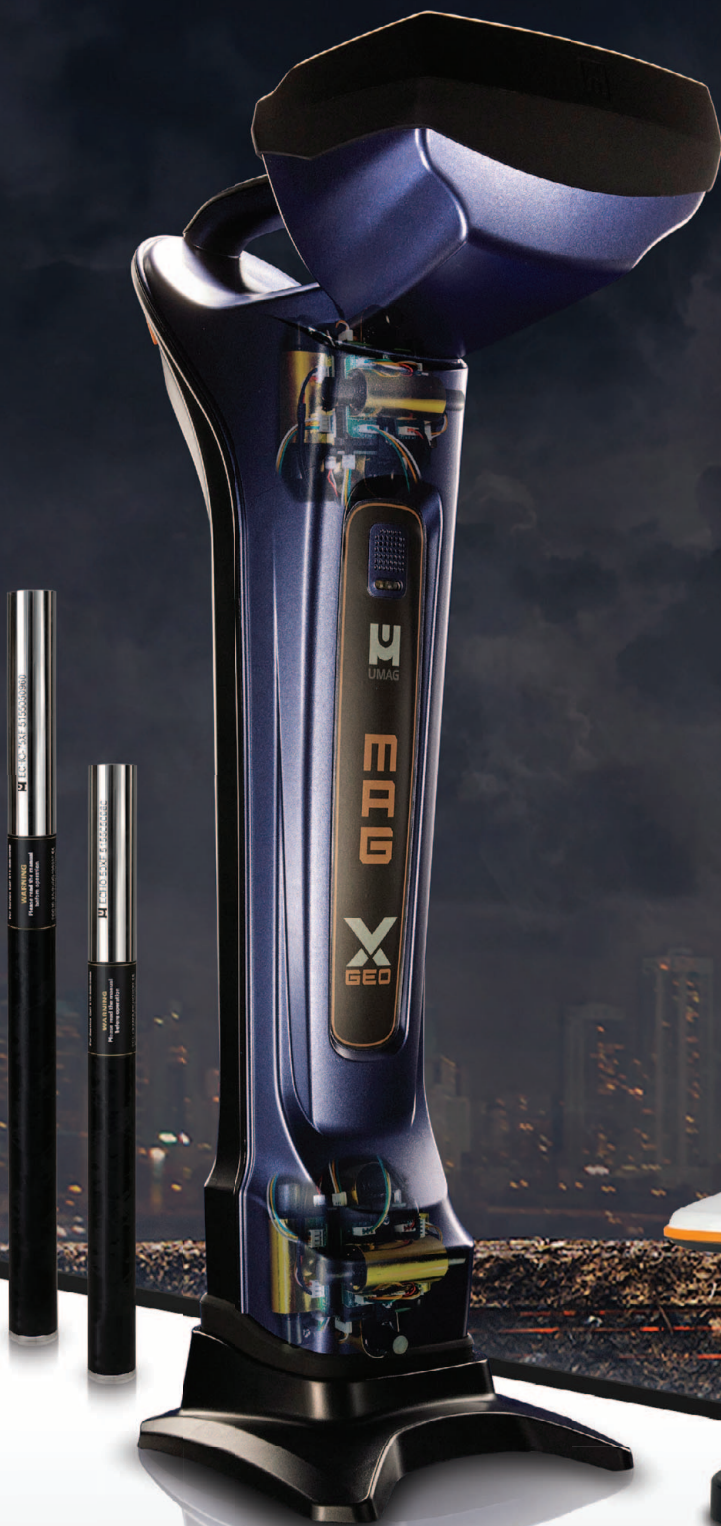
## ON-THE-FLY FUNCTIONALITY

- » Views: Overhead Aerial, Side Profile Chart, Rod Table
- » Tools: Bore-To Steering, GPS Dropline, Pitch Guide
- » Logging: Rod Pitch, Roll, Temp, Depth, and GPS Data



## REPORTING REDEFINED

- » Add Utility Crossings with Type, GPS, and Depth
- » Generate, Share, and Sync Reports from Receiver
- » Real-time Project Monitoring







# MESSAGE FROM THE NASTT CHAIR

Greg Tippet, PEng., NASTT Chair

**D**ear South Central Members & Supporters, as Chair of the NASTT Board of Directors, I want to take a moment to thank you for your continued commitment to the trenchless industry and your active engagement within your regional community. Our success as a society depends on the strength of our Regional Chapters, and the South Central region continues to lead by example.

One of the most inspiring aspects of our organization is the dedication of our volunteers. Whether you're serving on a committee, mentoring a young professional, organizing local events, or simply showing up to lend a hand at chapter activities, your time and energy are what make this society thrive. Your expertise, generosity, and passion for trenchless technology are the heartbeat of our mission, and I want to express my deep appreciation for everything you do.

Looking ahead, we're excited about the upcoming **9th Annual South Central Trenchless Technology Conference**, which will be held in **Arlington, TX on November 3-4**. The conference includes a dynamic program of technical presentations, exhibitors and networking opportunities. Designed for engineers, contractors, suppliers, manufacturers, and other industry stakeholders, this event will explore current challenges, emerging trends, and proven solutions in the trenchless field. I encourage all members, whether you're a long-time veteran or new to the industry, to attend and take full advantage of what this regional gathering has to offer.

***Your time and energy are what make this society thrive!***

While our regional events are essential to strengthening local networks, NASTT also provides you with opportunities to engage with trenchless leaders on a global scale. Next up in 2026, we'll head to **Palm Springs, California for the NASTT 2026 No-Dig Show, March 29–April 2**. Palm Springs promises to be an exciting and memorable destination, and our team is already hard at work planning a world-class event with techni-

cal sessions, networking opportunities, and the unmatched energy that makes the No-Dig Show such a cornerstone of our industry calendar. If you've ever considered presenting, volunteering, or exhibiting at a national level, now is the perfect time to start planning for your involvement.

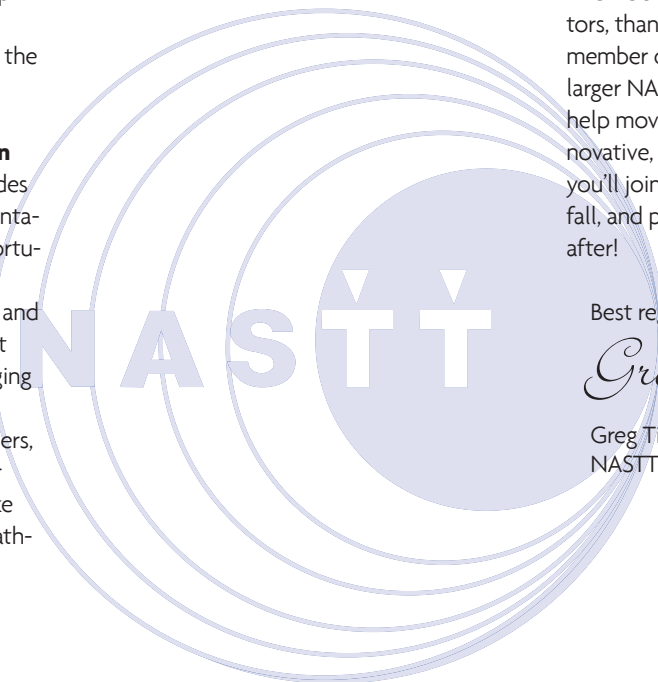
These events, local, national, and international, are only made possible by the engagement and leadership of members like you. As we grow and expand our impact, I encourage you to consider how you might get involved in the months ahead. Whether it's submitting a paper, nominating a deserving peer for an award, supporting student and young professional programming, or participating in one of our many outreach initiatives, your voice matters and your presence makes a difference.

On behalf of the entire Board of Directors, thank you for being a valued member of the SCSTT region and the larger NASTT family. Your contributions help move our industry forward, one innovative, trenchless step at a time. I hope you'll join the Chapter in Arlington this fall, and perhaps in Palm Springs soon after!

Best regards,

*Greg Tippet*

Greg Tippet, PEng.,  
NASTT Chair





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# NASTT SOUTH CENTRAL REGIONAL CHAPTER

## ELECTED OFFICERS



**SHAWN GARCIA**  
**CHAIR**  
sgarcia@azuria.com

Shawn Garcia is a licensed Professional Engineer in the State of Texas and currently serves as Regional Manager for Underground Solutions, Inc. (an Azuria Water Solutions Company) for North Texas, Oklahoma, and Arkansas, where he manages and oversees all business development, operations, and activities in these regions. Shawn has gained invaluable experience by working in all sectors of the industry including General Contracting, Public/Municipal, and Private, and has over 23 years of engineering development, engineering design, and construction/management/installation experience specific to Water/Wastewater Utility Infrastructure Rehabilitation and New Construction. He received a Bachelor of Science in Engineering from Texas Tech University. Aside from his role as Chair of SC Chapter of NASTT, he is an active member of AWWA, UCTA North Texas Chapter, and ASCE/UESI.



**ALAN SWARTZ**  
**TREASURER**  
Alan.Swartz@hdrinc.com

Alan Swartz is the Oklahoma Water Program Lead for HDR Engineering Inc. and currently serves as the Treasurer of the Board for the NASTT South Central Chapter. He is responsible for the day-to-day operations of HDR's Oklahoma City Office which serves clients across the states of Oklahoma and Texas. Alan graduated from Texas Tech University with a bachelor's in mechanical engineering and has over 24 years of experience in the design and rehabilitation of water and wastewater pipelines, lift stations and pump stations and is a licensed Professional Engineer in Oklahoma and Texas. Alan has extensive experience in the design and construction of small and large diameter water transmission and distribution mains utilizing both open cut and trenchless methods including auger boring, tunneling and horizontal directional drilling. Pipeline rehabilitation experience includes slip lining of large diameter sanitary sewer interceptors; pipe bursting and cured-in-place pipe lining for small to medium diameter sanitary sewer lines; and pipe bursting and compressed fit HDPE liners for small to medium diameter water transmission and distribution mains.



**ASWATHY SIVARAM**  
**VICE CHAIR**  
sivarama@bv.com

Ash is a licensed Professional Engineer in the state of Texas and currently serves as the Coastal Solutions Leader at Black & Veatch. Her expertise lies in engineering design and construction management, proposal development, preparation of contract documents, and conformance reviews of heavy civil infrastructure projects. Her experience is as broad as it comes – she has worked on all aspects of tunnel projects including pre-positioning with clients, chasing pursuits, technical innovation and value add, and project execution including planning, preliminary and detailed design, and construction contract administration and inspection services. She has successfully delivered dozens of projects adding up to construction contract values of over 1 billion USD. Ash has authored various technical papers and presented in premier industry conferences to a wide variety of audience. Outside of NASTT, Ash is also an active member of Underground Construction Association (UCA).



**PAUL BEARDEN**  
**SECRETARY**  
paul.bearden@hdrinc.com

Paul is HDR's Trenchless Services Program Leader and has nearly 30 years of experience in the design, project management, and construction of oil, gas, water and utility pipelines utilizing trenchless technologies, specifically horizontal directional drilling (HDD), conventional boring methods, and Direct Pipe®. Paul has special expertise in the construction of complex, large-diameter HDD pipeline installations and extensive on-site experience with major projects around the world. Paul has demonstrable management skills and works effectively with multi-skilled, international teams to complete pipeline projects from front-end engineering design through construction. Paul possesses excellent communication, negotiation, and writing skills and the ability to develop positive working relationships.



# BOARD OF DIRECTORS 2025-2026

**JUSTIN TAYLOR**  
**PAST CHAIR**

justin.taylor@cciandassociates.com

Justin Taylor, P.E. is the VP of Engineering and General Manager for CCI & Associates Inc., an engineering, design, and inspection firm specializing in trenchless technology. Justin holds a B.Sc. in Mechanical Engineering from the University of Alberta. After almost 10 years of various engineering and management roles in the Western Canadian CCI offices, Justin moved to Houston, Texas to head the engineering team in CCI's first stateside offices. Jus-



tin is a licensed P.E. in over 25 states including Texas, Oklahoma, and Louisiana. In his time with CCI, Justin has worked on trenchless crossings for various high profile projects such as Keystone/Keystone XL, Enbridge Line 3, Plains Wink to Webster, and Kinder Morgan TMEP Pipelines, and has been involved in the development of tools for real-time measurement of strain and stress on steel pipe during Horizontal Directional Drill installations. Justin is an active member of NASTT, having authored and co-authored several papers for the organization, and being a member of the NASTT Program Committee.

## BOARD MEMBERS



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MARCH 29-APRIL 2 | PALM SPRINGS, CA

**NO-DIG SHOW**

**2026**

*See you next year in* **2026**  
**PALM SPRINGS**

The NASTT No-Dig Show is the largest trenchless technology conference in the world, where professionals attend to learn new techniques that will save money and improve infrastructure. This show offers topic tracks over the course of three days with peer-reviewed, non-commercial presentations, including case studies detailing environmentally friendly trenchless solutions and cost-saving opportunities for municipalities and utilities. With over 2,000 attendees and 200 exhibiting companies and multiple networking events, spend quality time with current colleagues/customers and grow your connections. Whether you're a newcomer or a show veteran, the NASTT No-Dig Show is the must-attend conference for underground infrastructure professionals.

Learn more at [nastt.org/no-dig-show](https://nastt.org/no-dig-show)





THE UNIVERSITY OF TEXAS  
AT ARLINGTON



**TTP-2025**  
9TH ANNUAL

**SC-NASTT TEXAS & OKLAHOMA**

# TRENCHLESS TECHNOLOGY & PIPE CONFERENCE

**Monday - Tuesday, November 3-4**  
**Register at [cuire.uta.edu/ttp2025](http://cuire.uta.edu/ttp2025)**

Scan to register!



**The University of Texas  
at Arlington (UTA)**

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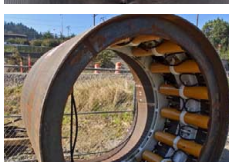
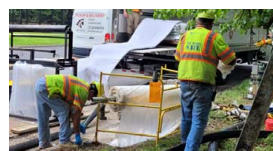
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### MONDAY, NOVEMBER 3, 2025

1:00 – 8:00 PM

**Exhibitor setup**  
(University Centre, UTA)  
(1:00 – 5:00 PM)

**Welcome Reception with Refreshments**  
**FREE!** – (Chicken N Pickle, Grand Prairie,  
Epic Central Park) (4:00 – 8:00 PM)

### TUESDAY, NOVEMBER 4, 2025 • MORNING

7:00 – 8:00 AM

**Registration and Refreshments with Exhibitors**

**Morning Session • 8:00 – 11:00 AM • University Center - Bluebonnet Ballroom**

8:00 – 8:30 AM

**Welcome / SCNASTT Board Introduction / SC and National NASTT Updates**  
**Mr. Shawn Garcia** - Chair of South Central Chapter of NASTT,  
**Mr. Carl Pitzer** - National NASTT Board Member / South Central NASTT Board Member

8:30 – 8:50 AM

**Dr. Jennifer Cowley**  
President, THE UNIVERSITY OF TEXAS AT ARLINGTON, Chair, Coalition of Urban Serving Universities Board

8:50 – 9:00 AM

**Scholarship Awards**  
**Mr. Shawn Garcia** - Chair and **Ms. Aswathy “Ash” Sivaram** – Vice Chair

9:00 – 9:30 AM

**CUIRE / UTA Introduction & Welcome**  
**Dr. Mo Najafi** – Professor/Director of CUIRE, **Dr. Melanie Sattler**, Civil Engineering Department Chair

9:30 – 11:00 AM

**Guest Speakers**  
**Marc Cottingame**, Assistant Director, DALLAS WATER UTILITIES (DWU) – 9:30-10 am  
**Mark Simon**, Director of Engineering, NORTH TEXAS MUNICIPAL WATER DISTRICT (NTMWD) – 10-10:30 am  
**Shelly Hattan**, Resident Engineer, TARRANT REGIONAL WATER DISTRICT (TRWD) – 10:30-11 am

10:15 AM

**Coffee Break with Exhibitors**

**Start of Technical Sessions • 11:15 AM – 12:15 PM (Bluebonnet Ballroom)**

#### Track A – Bluebonnet Room A

Moderator: **Aswathy Sivaram**, SCNASTT Vice Chair

#### Track B – Bluebonnet Room B

Moderator: **Shah Rahman**, SCNASTT Board Member

11:15 – 11:45 AM

**Revolutionizing AC Pipe Remediation:**  
A Cutting-Edge Trenchless Technology Emerges  
**Brian Goad, PE** – Regional Director of PRESSURE  
PIPE AZURIA/INSITUFORM TECHNOLOGIES, LLC

**The Data All Lives in a Yellow Submerged Thing:**  
Corpus Christi Water inspects 101-mile  
Mary Rhodes Pipeline in Single Run  
**Jerry W. Snead II, P.E.**, HDR

11:45 AM  
–  
12:15 PM

**Drilling Toward Demand: Underground Cable Feasibility Under Red Bluff,**  
**B. Kerby Primm, P.E.** - Associate Technical  
Consultant & **Daniel Anadu, P.E.** - Staff  
Electrical Engineer, BURNS & McDONNELL

**Internal Joint Seals – Where, When, & How,**  
**Jeremy Kieninger** - Operations Manager,  
AZURIA/UNDERGROUND SOLUTIONS

12:15 – 1:00 PM

**BBQ Buffet Lunch (Sponsored by Arcadis) with Exhibitors**

# TRENCHLESS TECHNOLOGY & PIPE CONFERENCE

## Technical Sessions Continued • 1:00 PM – 5:00 PM (Bluebonnet Ballroom)

|                | Track A – Bluebonnet Room A<br>Moderator: <b>Mike Ramirez</b> , SCNASTT Board Member                                                                                                                                                            | Track B – Bluebonnet Room B<br>Moderator: <b>Paul Bearden</b> , SCNASTT Secretary                                                                                                                                                                                           |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1:00 – 1:30 PM | <b>Assessing the Durability of CFRP in the Rehabilitation of Pipelines</b><br><b>Dr. Vistasp Karbhari</b> , Professor, Department of Civil Engineering UNIVERSITY OF TEXAS ARLINGTON                                                            | <b>Cost Guide for Trenchless Pipeline Renewal and Replacement Methods</b><br><b>Paria Hamidzadeh</b><br><b>Integrated Data and Machine Learning for Predicting the Remaining Useful Life of Sewer Pipelines</b><br><b>Shima Zare</b> , CUIRE, UNIVERSITY OF TEXAS ARLINGTON |
| 1:30 – 2:00 PM | <b>Park Ten Wastewater Treatment Plant Project: Microtunneling with Fiberglass Reinforced Polymer Jacking Pipe</b><br><b>Carl Pitzer, PE &amp; Sanaz Ghalambor, PhD, MBA</b> , THOMPSON PIPE GROUP                                              | <b>No Trenches, No Trouble: Modern Solutions for Corpus Christi's Asbestos</b><br><b>Maureen Carlin &amp; Diego J. Medrano</b> - GARVER                                                                                                                                     |
| 2:00 – 2:30 PM | <b>Trying to reason with the Hurricane Season</b><br><b>Justin Mouton, Ted Jones</b> - PURIS/PM CONSTRUCTION & GEOTREE SOLUTIONS                                                                                                                | <b>Preserving Mid-Century Water Infrastructure: CFRP Upgrade of a 1949 Cast Iron Pipe Beneath Cedar Springs Road Culvert</b><br><b>Luis Bodington, P.E. &amp; Mike Larsen</b> , DALLAS WATER UTILITIES & STRUCTURAL TECHNOLOGIES                                            |
| 2:30 – 3:00 PM | <b>MTBM Wet Retrieval Case Study – Raw Water Intake Tunnel in Clarksville, TN,</b><br><b>Harsha Reddy, MSCE, MBA</b> - HUXTED TRENCHLESS – MICROTUNNELING, HORIZONTAL & DIRECTIONAL DRILLING                                                    | <b>The Evolution of PVC Pipe Products in Trenchless Technology: The Last Twenty-Five Years of Innovation and Progress</b><br><b>Shah Rahman, MBA, M. ASCE</b> - ARCADIS U.S., INC.                                                                                          |
| 3:00 – 3:30 PM | <b>Break with Exhibitors (Foyer)</b>                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                             |
|                | Moderator: <b>Brad King</b> , SCNASTT Board Member                                                                                                                                                                                              | Moderator: <b>Justin Taylor</b> , SCNASTT Past Chair                                                                                                                                                                                                                        |
| 3:30 – 4:00 PM | <b>Performance-Based Rehabilitation of 78- and 102-Inch PCCP with Hobas FRPM Pipe</b><br><b>Jerry Peck</b> – HOBAS PIPE USA                                                                                                                     | <b>78" Interceptor under Interstate 135 - Navigating through Tunneling Systems for Wichita's Sewer Infrastructure Revamp</b><br><b>Maureen C. Carlin, PhD. &amp; Diego J. Medrano</b> - GARVER                                                                              |
| 4:00 – 4:30 PM | <b>North Richland Hills Has a DIY Attitude with HDD</b><br><b>Craig Fisher, PE</b> - Texas Regional Engineer, WESTLAKE PIPE & FITTINGS                                                                                                          | <b>Curved Microtunneling with Fiberglass Pipe for Water and Wastewater Applications</b><br><b>Gabriel Castelblanco P.E.</b> - HOBAS PIPE USA                                                                                                                                |
| 4:30 – 5:00 PM | <b>Numerical Assessment of Scour and TSS Impacts from HDD Utility Crossings in Environmentally Sensitive Texas Streams</b><br><b>Saman Baharvand &amp; Habib Ahmari</b> , Department of Civil Engineering, THE UNIVERSITY OF TEXAS AT ARLINGTON | <b>AI-Driven Automation for Stormwater and Sewer Pipeline Defect Detection</b><br><b>Dr. Hong Pan and Dr. Zhilin Lin</b> - Department of Civil Engineering, THE UNIVERSITY OF TEXAS AT ARLINGTON                                                                            |
| 5:00 PM        | <b>Distribution of Certificates (8 PDHs – 0.8 CEUs)</b>                                                                                                                                                                                         |                                                                                                                                                                                                                                                                             |



# Trenchless Technology Education & Networking in West Texas!

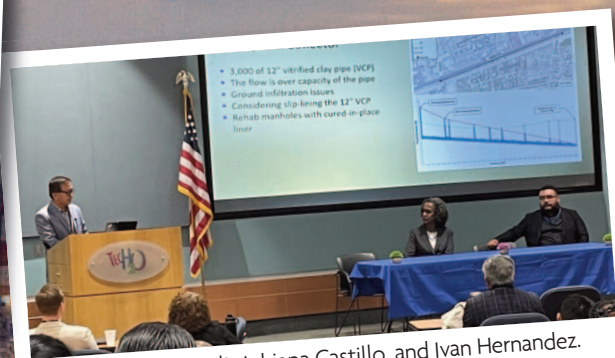
## SCNASTT EL PASO SEMINAR A TRENCHLESS TECHNOLOGY SHOWCASE



SCNASTT seminars are excellent learning opportunities. Professional Development Hours PDH/CEU Certificates were distributed to all participants



Highlight of the seminar was the opening presentation by El Paso Water Utility Engineering Managers (below, left to right) Geoffrey Espineli, Adriana Castillo, and Ivan Hernandez on EPW's use of Trenchless Applications



Geoffrey Espineli, Adriana Castillo, and Ivan Hernandez.

A free Trenchless Technology seminar February 25, 2025 in El Paso presented by the South Central Chapter of NASTT (SCNASTT), and graciously co-hosted by El Paso Water (EPW), was a major success. The well attended half-day seminar was a strong sign of the great interest and excellent potential in trenchless technology across Texas and Oklahoma.

Approximately 200 industry professionals enjoyed a half-day of trenchless education and networking at the *Carlos M. Ramirez Tech<sub>2</sub>O Water Resources Learning Center*, El Paso Water's expansive and impressive community-based educational/training facility. Comprised of public officials, engineers, utility representatives, designers, and contractors involved with the construction, rehabilitation, and management of underground infrastructure assets, attendees learned



about the numerous social and economic benefits of trenchless technology.

Throughout the morning, four peer-reviewed presentations covered various aspects of how trenchless technology methods applied to new installations and rehabilitation construction projects offer environmentally friendly trenchless solutions and cost-saving opportunities for municipalities and utilities. A highlight of the seminar was the opening Welcome and Presentation from El Paso Water (EPW) Utility Engineering Managers, Geoffrey Espineli, Adriana Castillo, and Ivan Hernandez outlining the EPW Current-Future Utility Infrastructure CIP & EPW Trenchless Applications.

Refreshment breaks and lunch organized by SCNASTT provided further opportunities for networking and exchange of ideas amongst attendees. Special

thanks are extended to the SCNASTT Board Members, Mike Ramirez (Parkhill), Alan Swartz (HDR), and Justin Taylor (CCI) for their work as session Moderators and handling the logistics of the event. The SCNASTT Board also greatly appreciates the generosity of El Paso Water in providing such an excellent venue for the seminar.

The very successful seminar in El Paso helped advance the overall SCNASTT effort to raise awareness of the advantages of using trenchless technology methods in infrastructure construction programs. It showcased the bright future ahead for trenchless technology outreach and education in Texas & Oklahoma. Planning is already underway for the next Trenchless Technology Seminar slated for Oklahoma City in February 2026. Stay tuned for details – we hope to see you there!



**EL PASO TRENCHLESS  
TECHNOLOGY SEMINAR  
FEBRUARY 25, 2025  
TecH2O Center - El Paso, TX:**

**NASTT SOUTH CENTRAL  
CHAPTER (SCNASTT) &  
EL PASO WATER (EPW)**

*Welcome/SCNASTT Board  
Introduction/SC and National  
NASTT Update*

- **Shawn Garcia**  
SCNASTT Chair
- **Carl Pitzer**  
SCNASTT Board &  
National NASTT Board Member

*El Paso Water (EPW)  
Welcome Presentation:*

*EPW Current-Future Utility  
Infrastructure CIP & EPW Trenchless  
Applications*

- **Geoffrey Espineli**  
Utility Engineering Manager
- **Adriana Castillo**  
Utility Engineering Manager
- **Ivan Hernandez**  
Utility Engineering Manager



Shawn Garcia, P.E., Azuria Water Solutions and SCNASTT Board Chair welcomed attendees to the seminar and provided an overview of Horizontal Directional Drilling (HDD)



SCNASTT Vice-Chair Aswathy "Ash" Sivaram, Black & Veatch, delivered an informative presentation on Large Diameter Tunnelling





Approximately 200 industry professionals enjoyed a half-day of trenchless education and networking



Carl Pitzer, P.E., Thompson Pipe Group, and SCNASTT Board Member, outlines various trenchless tunnelling methods

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## PRESENTATIONS

- **Tunnelling – Micro-Tunnelling/Hand-Mining/Pipe Jacking**  
Carl Pitzer – Thompson Pipe Group
- **Large Diameter Tunnelling**  
Aswathy “Ash” Sivaram – Black & Veatch
- **Horizontal Directional Drilling**  
Shawn Garcia – Underground Solutions/Azuria Water Solutions
- **In-Place Rehab – Pipebursting/Sliplining/CIPP**  
Brad King – Horseshoe Construction
- Q & A with Presenters/Thank You

SPECIAL  
THANKS TO  
**SC-NASTT**  
FOR LUNCH &  
REFRESHMENTS

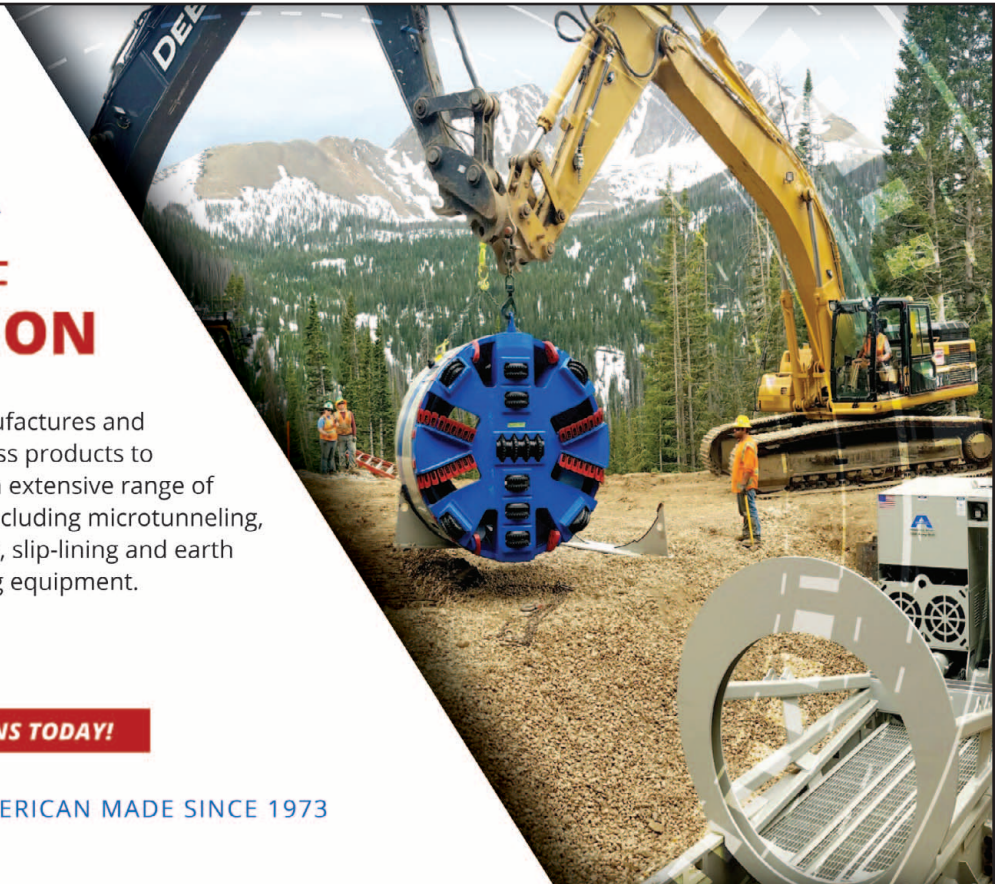


## DEPTHS OF INNOVATION

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# Surface Water Supply Project – Segment B1/B2

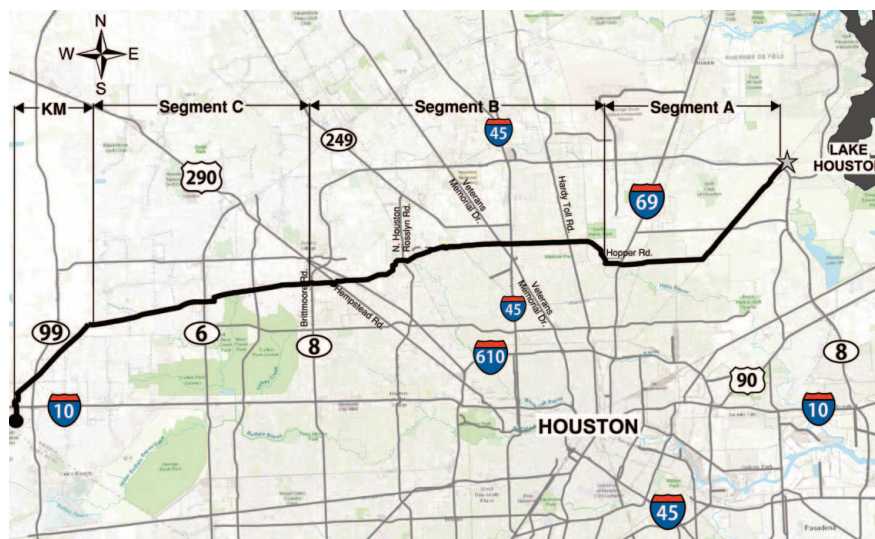
## Construction of 10 mile section of 84-inch and 96-inch steel waterline

By: Sergio Flores, P.E., Black & Veatch

In response to mandated reductions in groundwater extraction in the Houston area, the West Harris County Regional Water Authority (WHCRWA) and the North Fort Bend Water Authority (NFBWA) have collaborated in the construction of the Surface Water Supply Project (SWSP). The objective of the project is to reduce ground subsidence, which has increased the risk of flooding in certain areas. The SWSP involves the construction of approximately 42 miles of welded steel potable water pipelines, with diameters ranging from 96-inch to 66-inch, and the construction of two large booster pump stations.

The Segment B section of the SWSP involves the construction of nearly 15 miles of 84-inch and 96-inch steel waterlines, predominantly within densely developed urban areas containing single and multi-family residential buildings, light industrial buildings, petroleum pipeline corridors, commercial buildings, and school buildings. In addition to the surface infrastructure and waterways, the alignment crosses extensive underground utility systems, including sewers, natural gas pipelines, petroleum product pipelines, and electric, telecommunication, and fiber optic conduits.

Due to the size of the project and for bidding purposes, Segment B was divided into three different projects: Segment B1, B2 and B3. Segments B1 and B2 were awarded in 2022 to Harper Brothers Construction (HBC) and HB Trenchless was subcontracted by HBC to construct the 19 tunnel crossings including most of the shafts. Segment B3 was awarded in 2022 to Jay-Dee Contractors Inc. Jay-Dee Contractors joined forces with HB Trenchless to create the JDHB JV to construct Segment B3.



**Figure 1: Surface Water Supply Project Alignment Map – approximately 42 miles of welded steel potable water pipelines**

All the Segment B1/B2 tunnels are in soft ground below the groundwater table level. The groundwater is generally shallow in the Houston area, with the groundwater level averaging 10 to 15 feet below ground surface. Tunneling was expected to be under the groundwater for all the tunnel crossings, with shallow ground cover. Since most of the tunnel crossings were very shallow, surface settlements posed a very significant risk and had to be mitigated during design and construction. The tunnel sizes, length, average cover, ground conditions and tunnel methods are described in Table 1.

Schedule and logistic challenges had to be addressed to construct 19 tunnel crossings and 38 shafts. The complexity of the Segment B1/B2 project is not only derived from many different ground conditions and tunnel methods, but also the quantity of tunnels and shafts that needed to be constructed in the highly urban environment within budget and schedule. This is why HB Trenchless used six different TBMs:

- HB Trenchless Hand Mining Shield, 132-inch outside diameter (OD)
- Akkerman EX960B Digger Shield, 114-inch OD
- Herrenknecht Digger Shield, 132-inch OD
- Herrenknecht AVN 2000AB, 106-inch OD
- Lovat M-130 Series 1000, 130-inch OD
- Herrenknecht EPB M2445, 136-inch OD

Project construction began in the summer of 2022 with the U.S. Highway 290 tunnel being one of the first tunnels constructed using the refurbished Lovat M-130 Series 1000 named Sheryl. Each tunnel drive was unique and some of the tunnels had challenges that were successfully resolved by the collaboration of the Contractor, the Engineer, and the WHCRWA Construction Management team.

The U.S. Highway 290 tunnel crossing was the longest tunnel drive of the Segment B1/B2 project. The specifications

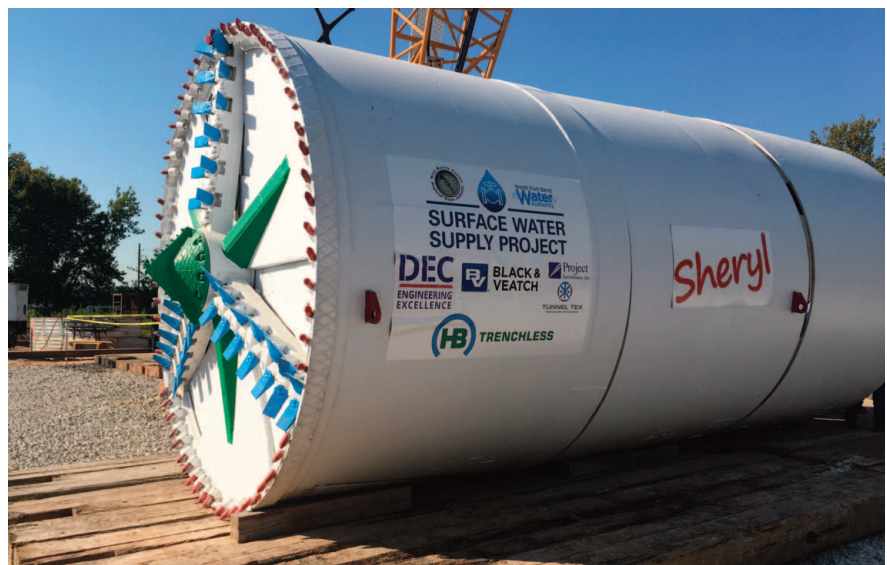


| No. | Tunnel                      | Size (in.) | Length (ft.) | Average Ground Cover (ft.) | Construction Ground Conditions              | Excavation Methods and Tunnel Lining                                            |
|-----|-----------------------------|------------|--------------|----------------------------|---------------------------------------------|---------------------------------------------------------------------------------|
| 1   | Brittmoore Rd.              | 116        | 292          | 24                         | Mostly clay, some silt                      | Digger shield – Galvanized ribs and channel                                     |
| 2   | CenterPoint Gas Lines       | 120        | 50           | 7                          | Clay with Sands at the invert               | Hand mining with shield – Steel casing                                          |
| 3   | Sam Houston Tollway         | 106        | 744          | 25                         | Sand and cemented sands                     | Microtunneling TBM – Steel casing                                               |
| 4   | Fisher Rd. / Cole Creek     | 106        | 468          | 20                         | Sand                                        | Microtunneling TBM – Steel casing                                               |
| 5   | Clara St.                   | 116        | 111          | 22                         | Clay, silt and sand                         | Digger shield – Galvanized ribs and channel                                     |
| 6   | Hempstead Highway           | 120        | 293          | 22                         | Clay and sand                               | Microtunneling TBM – Steel casing                                               |
| 7   | Gessner Rd.                 | 120        | 265          | 18                         | Sand and Clay                               | Microtunneling TBM – Steel casing                                               |
| 8   | U.S. Highway 290            | 132        | 2,383        | 25                         | Mostly clay, sand lenses and sand at invert | Dual mode TBM – Open mode – Ribs and wood lagging / Galvanized ribs and channel |
| 9   | Fairbanks N. Houston Rd.    | 132        | 148          | 14                         | Clay                                        | Digger Shield – Steel casing                                                    |
| 10  | W. Little York Rd.          | 130        | 172          | 16                         | Clay                                        | Digger Shield – Steel casing                                                    |
| 11  | Fairbanks White Oak Rd.     | 132        | 72           | 18                         | Mostly clay and some sand                   | Hand Mining with Shield – Grouted liner plates                                  |
| 12  | Hollister Detention Pond    | 132        | 717          | 25                         | Mostly Clay and some silt                   | Earth Pressure Balance TBM – Ribs and wood lagging                              |
| 13  | N. Houston Rosslyn          | 132        | 440          | 26                         | Clay and silt                               | Dual mode TBM – Open mode – Ribs and wood lagging                               |
| 14  | White Oak Bayou / BNSF R.R. | 144        | 1,267        | 44                         | Clay                                        | Dual mode TBM – Open mode – Ribs and wood lagging/Galvanized ribs and channel   |
| 15  | Antoine Dr.                 | 132        | 457          | 20                         | Clay and silt                               | Digger Shield - Ribs and wood lagging                                           |
| 16  | W. Gulf Bank / Vogel Creek  | 144        | 2,285        | 28                         | Clay and silt                               | Dual mode TBM – Open mode - Ribs and wood lagging                               |
| 17  | W. Montgomery Rd.           | 132        | 201          | 18                         | Clay                                        | Digger Shield – Ribs and wood lagging                                           |
| 18  | Ella Blvd.                  | 144        | 1,793        | 28                         | Clay                                        | Dual mode TBM – Open mode – Ribs and wood lagging                               |
| 19  | Veterans Memorial Dr.       | 130        | 200          | 27                         | Clay and silt                               | Dual mode TBM – Open mode – Galvanized ribs and channel                         |

**Table 1. Segment B1 and B2 Tunnels**

required a Dual Mode TBM because the anticipated ground conditions indicated that tunneling could encounter silty and sandy material. The tunnel excavation had some challenging ground just before the TxDOT right of way. The TBM encountered a sand lense right under a flood control ditch. The sand material was flowing into the tunnel and a sink-hole appeared at the flood control ditch. The Contractor mitigated the ground conditions by quickly deploying dewatering methods. After this challenge was resolved, the rest of the tunnel excavation proceeded without any issues.

The Sam Houston Tollway tunnel also had its unique challenges. The shafts' ground conditions were mostly sands and dewatering of the shafts was extremely challenging. The tunnel profile



**Figure 2. Refurbished Lovat M-130 Series 1000 named “Sheryl” was used for one of the first tunnels constructed under US Highway 290. Six different MTBMs were used in this phase**





**Figure 3. Herrenknecht AVN 2000AB microtunneling boring machine in use along with interlocking steel casing**

was revised two times to shallow the profile of the tunnel crossing. The Contractor utilized the Herrenknecht AVN 2000AB microtunneling boring machine along with interlocking steel casing. Most of the tunnel profile was in sands under the water table. The Contract specifications required three intermediate jacking stations (IJS) for this drive. This requirement proved to be of great benefit to the project because the Contractor had to use the IJS in order to complete the drive.

At the Hempstead Highway, the Contractor encountered cemented material within tunnel profile. The Herrenknecht AVN 2000AB was also used for this crossing and the TBM had some issues excavating through the cemented material as

the overcut cutters began to wear away during the drive.

Most of the Segment B1/B2 alignment was located following the easements of a 6-inch idle pipeline that was previously used to convey petroleum products. The WHCRWA acquired this 6-inch idle pipeline to obtain most of the easements for Segment B. This 6-inch idle pipeline presents no risks for open-cut construction since this line is removed and disposed during the excavation of the trench. This idle pipeline presented the most risk for tunneling. Most of the as-built records for the 6-inch idle pipeline were provided during design and the Contractor also field verified the location of this line at the tunnel crossings where the line was near the tunnel alignments.

The Fairbanks N. Houston tunnel crossing encountered the 6-inch idle pipeline in the tunnel profile, but the Contractor was using the Akkerman EX960B Digger Shield, so the Contractor was able to remove the 6-in idle pipeline while they were excavating the tunnel.



**Figure 4: Newer idle 6-inch HDD pipeline found at the White Oak Bayou launching shaft**

The North Houston Rosslyn was one of the most complex crossings in regard to utility conflict risks. One unique challenge is that this particular tunnel is located under a bridge; therefore, the tunnel alignment was between the bridge piers. No issues during construction were found while tunneling between the piers. During the construction of the west shaft, the shaft drilling equipment hit a live high pressure CenterPoint natural gas line. The shaft location had to be relocated and the transition of the pipeline from the tunnel to the open-cut had to be re-designed in order to weave between the previously unknown encountered gas lines. This challenge was quickly resolved with the collaboration of the team. Finally, during tunnel excavation, the TBM hit an unknown fiber optic cable managed by CenterPoint Energy. CenterPoint relocated the fiber optic through power poles and the contractor was able to resume excavation.

The White Oak Bayou tunnel encountered a newer 6-inch horizontally directionally drilled (HDD) idle pipeline nearly 15 feet lower than the original 6-



inch idle pipeline at the shafts. The existence of this HDD pipeline was not known to the team at the time of design but was discovered during construction through extensive coordination efforts with various utilities. The first step in resolving the problem was to determine the exact location of the 6-inch HDD pipeline. XYZ (3D) Pipeline Mapping “Wireline” survey of existing newer HDD 6-inch was used to map the exact location of the pipeline. The Engineer collaborated with the Contractor in analyzing and redesigning the tunnel in order to avoid the unexpected, but now known conflict. With the “Wireline” survey, the exact location of the 6-inch HDD idle pipeline was known. The White Oak Bayou tunnel was lowered by approximately 10 vertical feet to avoid the conflict and this change prevented the TBM from hitting the 6-inch HDD pipeline during tunnel excavation.

The tunnel and shaft specifications were very specific in describing the types of allowed TBMs and tunnel primary support for each individual crossing and section of crossings for the longer tunnels. The Contractor provided feedback during construction and presented a few different alternatives for some crossings. All the longer tunnels had ground conditions that mostly matched an open mode TBM operation, but all of these tunnels also had ground conditions that

could have required the use of a pressurized mode of excavation.

A robust geotechnical instrumentation program to monitor the tunnel excavation performance was required per Contract specifications and was successfully implemented. The project drawings included a very detailed surface settlement monitoring program. The Contractors selected experienced geotechnical instrumentation and monitoring subcontractors. The monitoring program included two different real-time online systems that provided data as it was col-



**Figure 5: Wireline survey used to map exact location of 6-inch steel pipeline discovered during construction**



**Figure 6: Full penetration casings and double lap welds were required for tunnels in fault crossings**

lected by automated instruments in the field. This allowed for the Contractors, Engineer, and the WHCROWA Construction Management team to monitor and see the real-time performance of the excavation. The result was tunneling under all critical highway infrastructure within the allowed settlement limits required in the project specification.

Currently, the Contractor has completed installing all the 84-inch and 96-inch waterline carrier pipe using 25-foot long sections of pipe. The most of pipeline sections are single-lap welded, completed from inside the pipe. After the completion of the single-lap joint welding, it is required that the Contractor inspects each pipe joint weld using Magnetic Particle method by a Certified Welding Inspector. The project also had full penetration casings and double lap welds that were required for tunnels in fault crossings. Full penetration welding

required Radiographic or Ultrasonic nondestructive examination.

The annular space between the pipeline and the tunnel is backfilled with cellular grout. The project specifications required the use of 75 PCF cellular grout. This cellular grout density is needed to move water in the tunnel and to provide corrosion protection since most of the pipeline section joints do not have a heat-shrink sleeve. The pipeline has a corrosion/cathodic protection system that is

an impressed current system. The Contractor has completed the annular grouting of all the 19 tunnel crossings.

All the 19 tunnels and 38 shafts were successfully completed in June of 2025. The Contractor is anticipated to complete the installation of the 84-inch and 96-inch pipeline both in tunnels and open-cut by August 2025.



## ABOUT THE AUTHOR

**Sergio Flores** is an Engineering Manager with Black & Veatch in the Houston, TX office. He is a licensed professional engineer in the states of Texas and Oklahoma. He has over 20 years of experience in the design and construction of tunnel and large diameter waterline projects.



# Challenges Faced During the FRP Rehabilitation of Steel Stormwater Pump Station Discharge Pipelines

By: Ben Stephens, PE, ENV SP, Halff & Timothy Peterie, Azuria-Insituform Technologies

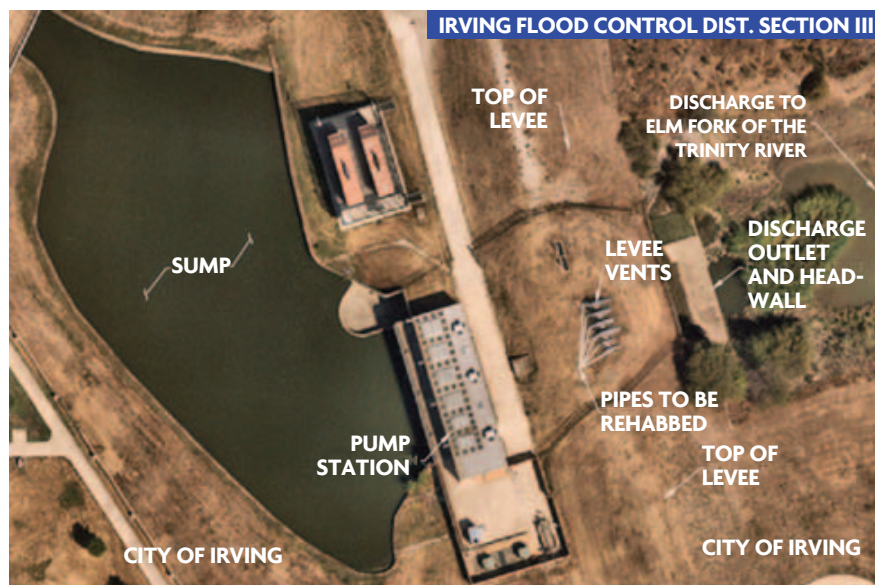
## ABSTRACT

The Irving Flood Control District Section III (IFCD-3) provides flood control facilities and operations for the Valley Ranch community in Irving, Texas. The IFCD-3's pump station, constructed in 1979, discharges stormwater up and over a levee to the Elm Fork Trinity River via four 42-inch and two 30-inch steel pipelines. After a recent condition assessment indicated significant corrosion of the discharge pipelines, IFCD-3 contracted for the engineering evaluation of pipeline repair options and development of a rehabilitation plan, followed by the internal rehabilitation of the pipelines by fiber reinforced polymer (FRP) application. This paper discusses the challenges faced during the internal FRP rehabilitation of the stormwater pump station steel discharge pipelines, and how those challenges were overcome.

## INTRODUCTION

The Irving Flood Control District Section III (IFCD-3) was formed in 1983 to provide flood control and protection for a population of nearly 30,000 residents and businesses of the Valley Ranch community in Irving, Texas. IFCD-3 operates a stormwater pump station, constructed in 1979, that pumps excess stormwater from a sump on the west side of the Elm Fork Trinity River levee through six parallel welded steel discharge pipelines. The discharge pipelines convey the water up and over the levee to an outlet channel that then conveys the stormwater to the river. The discharge pipelines, four 42-inch diameter and two 30-inch diameter, each span 150 linear feet and have a vent at the levee crest. Figure 1 shows an aerial view of the sump, pump station, levee, discharge pipe vents, and outfall channel.

A recent visual condition assessment and closed-circuit television (CCTV) in-



**Figure 1. Aerial View of IFCD-3 Pump Station (Source: Stephens and Peterie 2025)**

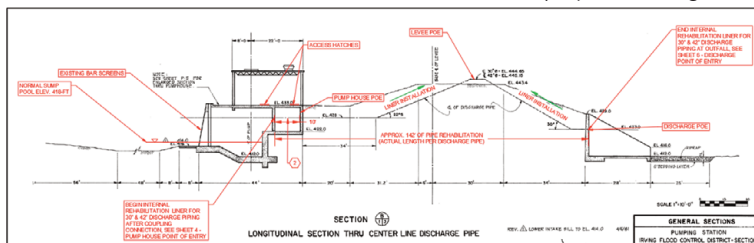
spection revealed significant corrosion of the discharge pipelines. IFCD-3 subsequently contracted for the engineering evaluation of pipeline repair options and the development of a rehabilitation plan. The Engineer recommended rehabilitation by internal fiber reinforced polymer (FRP) lining. The FRP process involves the fabrication of strips infused with glass and/or carbon fibers, which are saturated at the surface with a resin. The saturated strips are manually applied to the pipe, typically in multiple layers, creating a composite structure that enhances the strength and durability of the pipe. ANSI/AWWA Standard C305-18, CFRP Renewal and Strengthening of Prestressed

Concrete Cylinder Pipe (PCCP) (AWWA 2018) governs the planning, design, production, installation, and testing of the FRP system.

IFCD-3 proceeded with procurement of a contractor through the competitive sealed bidding process. The engineering evaluation, design, and contractor procurement are discussed in detail in a paper by Burke, Benefiel, Fereidoonfar, Moore, and Stephens (2024).

## FRP SYSTEM INSTALLATION

Upon completion of the submittal and review process, construction started in March 2024. Figure 2 shows a section view of the project. Existing access to the



**Figure 2. Project Section View (Source: Stephens and Peterie 2025)**



**Figures 3 (left) and 4 (right). Access at Vents at Levee Crest (left) and Inside Pump House on Pump Intakes (right) (Source: Stephens and Peterie 2025)**

pipeline was limited to the vents at the levee crest which included 8-inch outlets on the 30-inch pipes and 12-inch outlets on the 42-inch pipes (see Figure 3), flanged openings on the pump intakes inside the pump house which were not adequate for FRP installation access (see Figure 4), and the discharge outfall. Initial construction therefore focused on the installation of new 24-inch manways on each discharge pipe at the levee crest (see Figure 5). These manways provided the primary access to each pipe segment for the remainder of the project.

The next phase was installation of the FRP system, which began in June 2024 and was to include the following procedure:

1. Lock-out/tag-out of the respective pump on the segment to be rehabilitated to ensure flow isolation and personnel safety.
2. Properly size and set-up ventilation, dehumidification, and exhaust/dust collection systems to provide a safe working environment in confined space and adequate temperature and humidity controls for proper curing of the FRP system.
3. Clean the steel pipe surfaces by dry media sandblasting or near white metal finish per SSPC SP-10 standards (AMPP 2024).
4. Apply primer, thickened epoxy, three glass fiber reinforced polymer (GFRP) layers (two hoop layers and one longitudinal layer per the manufacturer's guidelines and the final design drawings), and a final thickened epoxy topcoat.
5. Apply topcoat of approved paint coating on all exposed pipe at the levee crest.
6. Replace discharge pipe vent stacks and remove lock-out/tag-out for pipe to be put back in service by IFCD-3 after at least 72 hours of curing.
7. Begin the same procedure on the next pipe segment until all pipe segments are complete.

As is usually the case for any construction project, challenges, both foreseen and unforeseen, were encountered. Some of the primary challenges included:

An abnormally wet spring during which the river level rose above the discharge

pipeline outlets, requiring adjustments to the originally planned pipeline rehabilitation phasing.

Steel pipe surface preparation, necessary to ensure adhesion of the FRP lining to the steel substrate, that was significantly more difficult than anticipated due to the presence of an internal coating of unknown material.

Restricted and difficult access due to the small pipe diameters, steep grades, and elevation changes of the pipelines as they traverse the levee.

High ambient temperatures during the summer that increased the safety risks for personnel working within the pipelines.

## CHALLENGE 1 - 2024 FLOOD WATERS

The project specifications required that only one discharge pipe could be out of service at any time to allow IFCD-3 to maintain operational capabilities in the event of heavy rain or flood conditions. Although initial bid plans anticipated construction to take place during dry wintertime conditions, lengthy contracting, submittals, and reviews pushed the pipeline rehabilitations to a late spring and early summer start. In 2024, Dallas County received non-typical wet weather throughout this timeframe that resulted in the highest rainfall totals since 2005. The flood conditions resulted in prolonged water levels above the discharge outfalls that surcharged into the pipes on the river side of the levee (see Figure 6). In turn, the project phasing had to be drastically changed due to the flood conditions preventing access to the discharge outfall end of the project.



**Figure 5. Vents with New Access Manways (Source: Stephens and Peterie 2025)**



**Figure 6. Discharge Outfall Access Surcharged During Flood (Source: Stephens and Peterie 2025)**



Since the flood conditions prevented the ability to access the entire length of each pipeline, the Contractor decided very early in the FRP application phase to initially complete surface preparation and FRP installation only on the upstream portion of each pipeline from the pump house to the levee crest. Once the flood waters subsided, rehabilitation of the downstream portion of each pipeline from the levee crest to the outfall could be completed. As each pipeline had to still be operational, this change resulted in multiple additional setups for each pipeline, moving and replacement of equipment, recleaning/surface preparation for those areas already prepared for FRP installation, and additional removal/replacement of manway and access flanges. This change contributed to an estimated 14 construction days added to the duration of the project.

## CHALLENGE 2 - SURPRISE COATING

Once access to the first pipe segment was provided, surface preparation crews immediately determined that a coating of unknown material was present on the interior of the steel pipe surface (see Figure 7). The pipe coating appeared to be metallic in nature and was not noted on the record drawings. IFCD-3 had no record of the coating material and was unaware whether the coating had been applied at the time of pipe manufacture or had been applied later as a measure to extend the useful life of the pipes. Due to the need to remove this coating via man



entry in very tight spaces and with challenging slopes, the task was very laborious (see Figure 8).

Ultimately, IFCD-3 agreed to compensate the Contractor for the additional time required to remove this coating on all pipe segment interior surfaces to the required near white metal finish (see Figure 9). This change contributed to an estimated 19 construction days added to the duration of the project.



**Figure 9. Surface Preparation to Near White Metal Finish (Source: Stephens and Peterie 2025)**

## CHALLENGE 3 - RESTRICTED AND DIFFICULT ACCESS

FRP applications come with inherent challenges due to very labor-intensive installation and the requirement for man entry access. The challenges are further



**Figures 7 (left) and 8 (right). Coating Prior to Surface Preparation (left) and Coating Being Removed (right) (Source: Stephens and Peterie 2025)**

complicated in small diameter pipes such as those smaller than 54 inches. The small diameters of the pipelines on this project, coupled with the steep grades and elevation changes of the pipelines as they traverse the levee, created significant access constraints for both personnel and equipment. These physical limitations made it difficult to position necessary tools and machinery, requiring the development of customized entry protocols and modifications to standard equipment (see Figures 10 and 11). Overcoming these challenges was critical to maintaining progress and ensuring safe working conditions throughout the rehabilitation process.

## CHALLENGE 4 - TEXAS SUMMER EXTREME TEMPERATURES

As the work progressed into the summer months and the Texas heat took over with ambient temperatures exceeding 104 F for multiple consecutive days, it became apparent that adjustments would have to be made to the daily work schedule. The high ambient temperatures not only made the surfaces of the pipelines extremely hot, in excess of 115 F (see Figure 12), but also increased the safety risks for personnel working inside the confined space of the pipelines. To mitigate the impact of the heat, the Contractor proposed adjusting the work schedule to nighttime hours, from 7 p.m. to 7 a.m. This change allowed workers to operate in much cooler conditions, reducing heat-related risks, and ensuring that the project continued without interruption due to the extreme temperatures during the day. IFCD-3 agreed to this schedule change, which also required Inspector work hour changes and nighttime site visits by all involved for progress updates.

## CONCLUSION

The successful rehabilitation of the IFCD-3 stormwater pump station discharge pipelines underscores the importance of thorough planning, flexibility, and innovation in addressing unforeseen challenges. The collaboration between IFCD-3, the Engineer, and the Contractor was essen-



**Figures 10 (left) and 11 (right). Sloped Pipeline Access Challenges**  
(Source: Stephens and Peterie 2025)

tial to navigating obstacles and maintaining project momentum. Key takeaways include noting the potential benefits of:

- Conducting exhaustive preliminary assessments to identify potential challenges. For example, additional assessment and/or testing of the pipe coating of unknown material prior to initiating construction may have allowed for more efficient pipe surface preparation.
- Incorporating flexibility into project schedules to accommodate environmental and operational variables, such as the flooding and heat encountered in this project.
- Ensuring robust safety measures for personnel working in confined spaces and extreme conditions, such as the small pipes on steep slopes encountered in this project.
- Providing an Owner's Allowance or Contingency pay item for budget

considerations concerning changed and/or unforeseen conditions, whether due to encountering unknown materials, extreme weather, or other situations.

The FRP rehabilitation of IFCD-3's pipelines demonstrates the effectiveness of this method in addressing aging infrastructure. Despite significant challenges,

the project's success offers valuable insights for future applications in similar contexts. By sharing these experiences, this paper aims to contribute to the knowledge base of pipeline rehabilitation and enhance practices in the field.

## REFERENCES

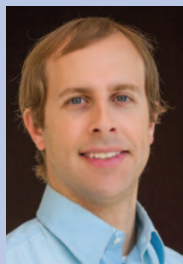
- AWWA (American Water Works Association). (2018). ANSI/AWWA Standard C305-18, *CFRP Renewal and Strengthening of Prestressed Concrete Cylinder Pipe (PCCP)*. AWWA, Denver, CO.
- Burke, D., Benefiel, T., Fereidoonfar, R., Moore, P., and Stephens, B. (2024). "Rust to Wealth: Rehabilitation of Steel Pipes Using Carbon Fiber Reinforced Polymer Method." *Proc., Pipelines 2024 Conference, Construction and Rehabilitation*, ASCE, Reston, VA, 563–568.
- AMPP (Association for Materials Protection and Performance). (2024). Joint Surface Preparation Standard SSPC-SP 10/NACE No. 2, *Near-White metal Blast Cleaning*. AMPP, Houston, TX.



**Figure 12. Temperature Reading Inside Pipe** (Source: Stephens and Peterie 2025)

## ABOUT THE AUTHORS:

**Ben Stephens**, PE, ENV SP is a Water/Wastewater Technical Leader for Halff, where he has been involved in the study, design, and management of water and wastewater pipeline improvement projects within the DFW Metroplex and throughout Texas for over 22 years. He earned his Bachelor's degree from Texas Tech University and a Master's degree from the University of Texas at Arlington with a specialization in Infrastructure Engineering and Management.



**Timothy Peterie** is a Manager of Business Development with Insituform Technologies, LLC. With Insituform for more than 23 years, he has over 30 years of experience working in various capacities related to engineering and specializes in helping municipalities find solutions for their pipeline problems. He has a degree in Aerospace Engineering from the University of Tennessee.





# Large Diameter, No Problem!

## A Case Study in Large Diameter Condition Assessment and Rehabilitation

By: Jacob Brumbaugh, PE, RJN Group, Inc.

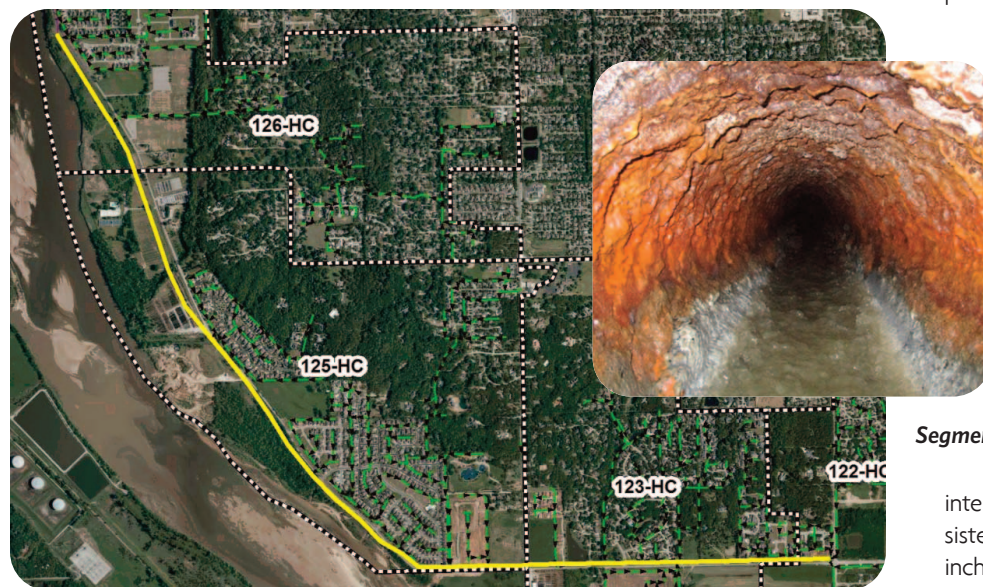
The Tulsa Metropolitan Utility Authority (TMUA), a municipality in northeastern Oklahoma, provides water and sanitary sewer service to more than 400,000 people. Like many utilities, TMUA must manage aging assets while continuing to prioritize its Capital Improvement Plan (CIP) against a wide variety of competing projects. To assess and plan for the future rehabilitation of large-diameter gravity sanitary sewer interceptors, a project was initiated to evaluate the condition of TMUA's interceptors. In June 2016, TMUA retained RJN Group, Inc. (RJN) to perform a comprehensive multi-

risk of failure, particularly those contributing significant inflow and infiltration (I/I).

The pipeline assessment relied on a combination of high-definition closed-circuit television (HDCCTV), sonar scanning, and laser/LiDAR profiling. Each technology addressed a different challenge: the HDCCTV provided a detailed visual record of cracks, joint separations, and other structural issues; sonar measured sediment accumulation in submerged sections; and LiDAR quantified ovality and wall loss caused by corrosion. Together, these tools delivered both

etration. The amount of corrosion was measured by using a screwdriver to determine how far it penetrated the wall. In some instances, these inspections revealed not only widespread deterioration but also serious safety concerns for workers due to aggressive corrosion within the concrete structures.

The five project locations were treated as separate assessments and reports within this project. Through analysis and prioritization, RJN identified the Southeast Basin West Leg Interceptor as the highest-priority project area due to significant corrosion and concerns about a potential failure in the near future. This



**Project Location Map. The Southeast Basin West Leg Interceptor was identified as the highest-priority project area**

sensor inspection (MSI) of approximately 59,550 linear feet (LF) of pipe, ranging from 18 inches to 54 inches, and the associated manholes for interceptors across the City of Tulsa in five separate locations. The program was intended not only to quantify the structural integrity of the pipe but also to identify manholes at high

qualitative and quantitative data that could be directly compared with original pipe specifications.

Manhole assessment followed the Level 2 MACP standard. Crews performed confined-space entries where necessary to record wall pH values, evaluate liner conditions, and measure corrosion pen-

interceptor was installed in 1998 and consisted of approximately 4,493 LF of 36-inch and approximately 13,636 LF of 48-inch Prestressed Concrete Cylinder Pipe (PCCP) with a coal tar epoxy liner and 8-foot diameter precast concrete manholes. The interceptor accepts flow from a nearby lift station on the upstream end of the line and was installed at extremely flat slopes. Due to the pipe material, incoming force main, and flat slopes, the segments had experienced severe corrosion, with reinforcement exposed in several areas and wall loss far beyond acceptable limits. Additionally, an

### Segments had experienced severe corrosion

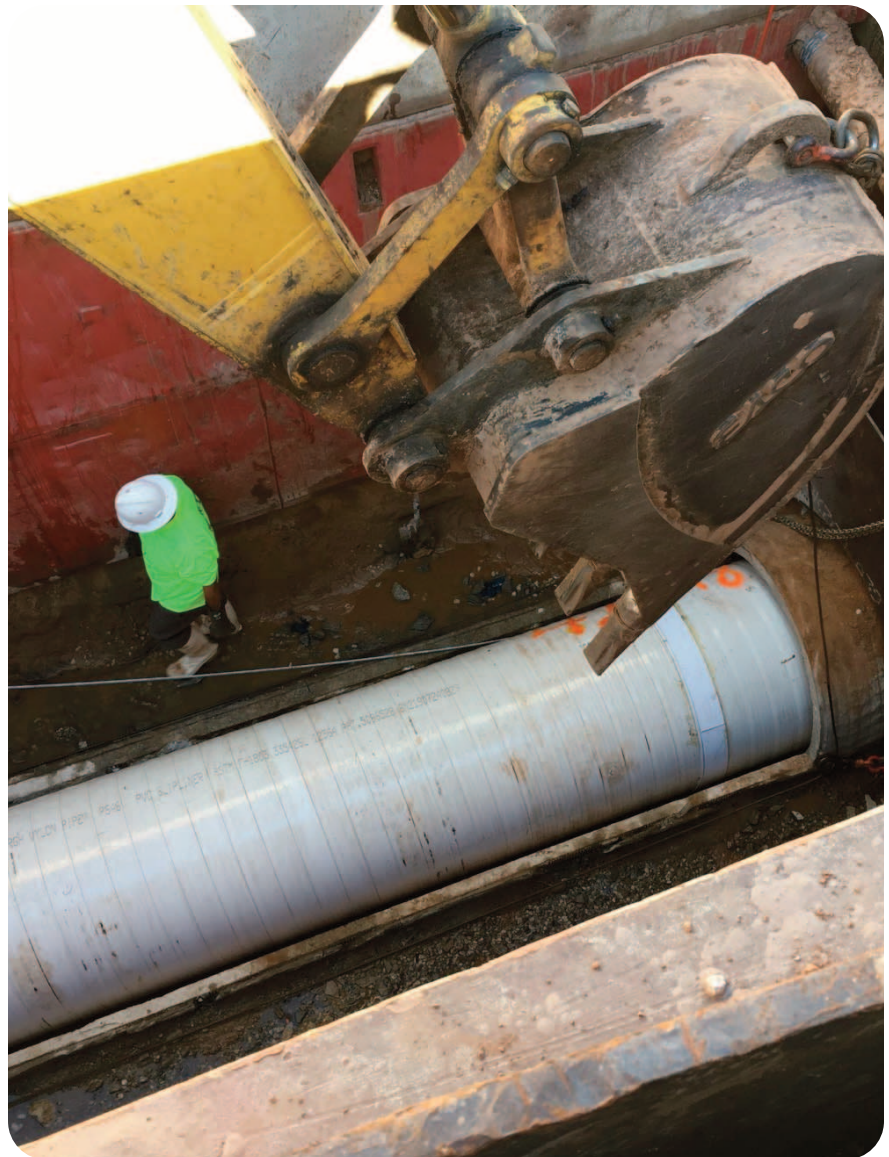
## Open-cut replacement was quickly deemed not to be cost-effective.

offset joint along the interceptor was discovered, which added another level of concern. This interceptor is located in south Tulsa, following along the Arkansas River and nearby neighborhoods, which resulted in a high consequence of failure.

Due to the existing conditions and consequences of failure, RJN developed rehabilitation recommendations in the assessment report. There were two primary options available to rehabilitate the interceptor: complete replacement through open-cut excavation or rehabilitation using trenchless techniques. Open-cut replacement was quickly deemed not to be cost-effective. The interceptor was located deep in sandy soils that could behave like quicksand, and it passed near ponds and neighborhoods, which limited the working space. Excavation would have been disruptive, costly, and time-consuming, and it would have required extensive bypass pumping to maintain flow. A new route for the interceptor was not feasible due to other existing utilities and neighborhoods.

Rehabilitation offered a more attractive alternative. Segmental sliplining of the pipe with polyvinyl chloride (PVC) liner sections could provide a structural renewal, reduce the diameter slightly while preserving most of the existing capacity, and be installed with relatively little surface disruption. Segmental sliplining involves inserting a new, smaller-diameter pipe into an existing, deteriorated pipe to restore structural integrity and extend the service life. Another option considered was Cured-in-Place-Pipe (CIPP), which provides a structural repair with minimal diameter reduction. A point repair was needed at an offset joint regardless of which trenchless method was ultimately selected.

For the manholes, 7-foot diameter fiberglass-reinforced plastic (FRP) liners



***Segmental sliplining of the pipe provided a structural renewal, while preserving most of the existing capacity***

could be inserted into the existing 8-foot diameter structures, restoring structural integrity, eliminating I/I, and providing long-term corrosion resistance. Utilizing FRP liners would limit the amount of bypass pumping required for a full-depth manhole replacement and also poses as a more cost-effective solution than epoxy coating the existing structures.

To determine whether segmental sliplining would still provide adequate capacity to serve the basin, RJN developed a hydraulic model of the Southeast Basin. The analysis confirmed that the required capacity could be maintained even if the existing 36-inch and 48-inch pipes were reduced to 30 inches and 42 inches, respectively, through the use of sliplining. The

proposed pipe diameters were selected to ensure they fit within the existing host pipe. This led RJN to determine that the existing interceptor was oversized for the drainage basin it was serving. This basin was nearly fully developed at the time this model was developed, and limited future additional flow was anticipated.

Considering the existing conditions of the interceptor and the high consequences of failure, RJN ultimately recommended proceeding with rehabilitating this line as soon as possible. To get the Southeast Basin West Leg Interceptor rehabilitation into TMUA's CIP budget as quickly as possible, the rehabilitation was split into three phases, with each phase being approximately 6,000 LF.



## *Segmental sliplining was chosen not only for its cost-effectiveness but also because bypass pumping was not needed.*

The first phase began at the downstream end of the interceptor, and subsequent phases progressed further upstream, being completed in consecutive years.

RJN developed plan sets for each phase, allowing for segmental sliplining and CIPP as the two options. Ultimately, the contractor selected segmental sliplining of the interceptor using 42-inch and 32-inch pipe. The contractor selected Vylon PVC as its pipe material for this project rather than FRP. Segmental sliplining was chosen not only for its cost-effectiveness but also because bypass pumping was not needed. The annular space was then filled with cellular concrete to prevent the pipe from shifting.

For the manholes, open-bottom FRP liners were specified at 7 feet in diameter to fit inside the existing 8-foot concrete structures. The liners had composite

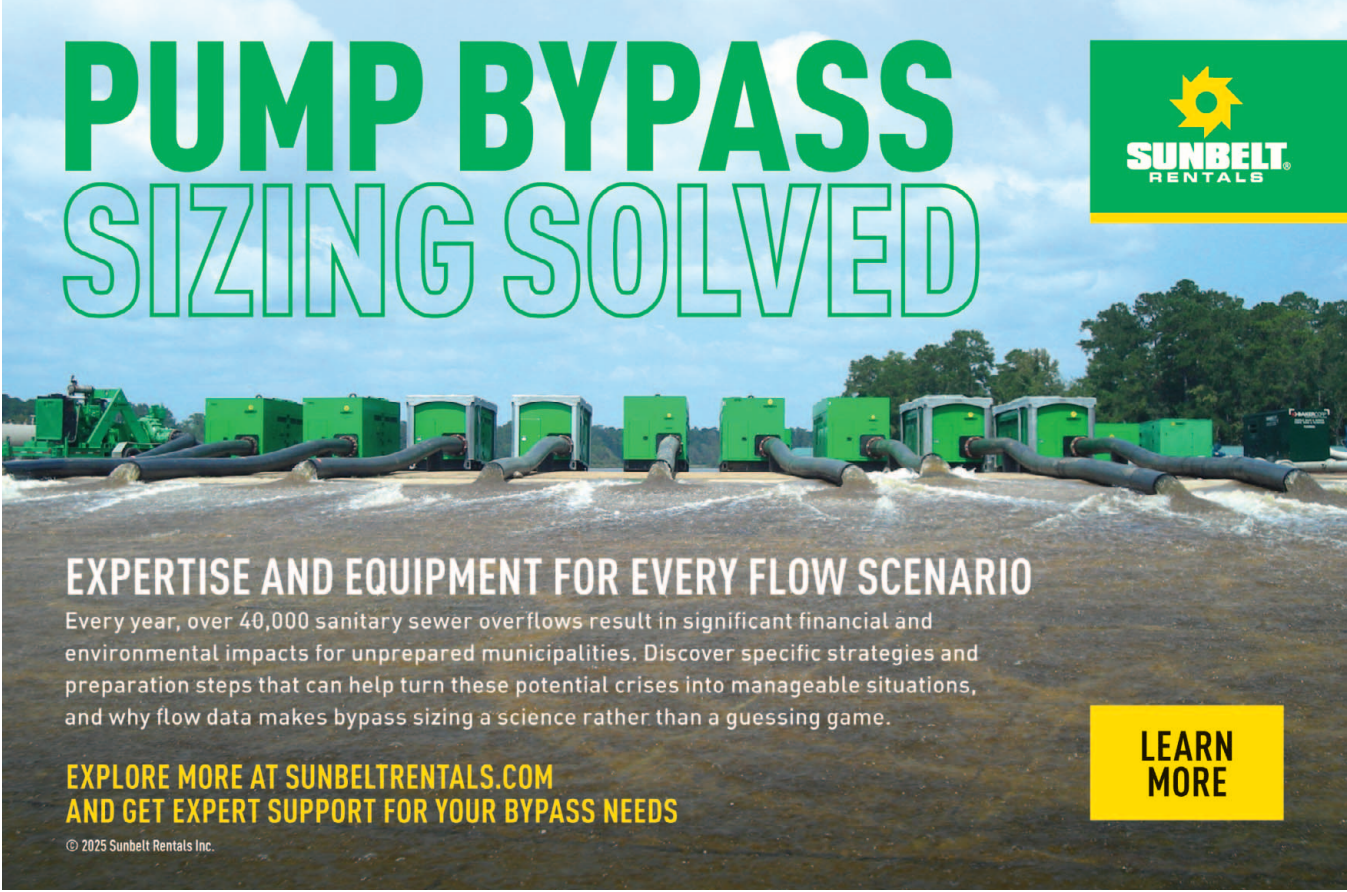
frames and covers installed on them to ensure a corrosion-resistant structure. These liners were expected to eliminate infiltration, restore structural stability, and extend the service life of the manholes for decades. The annular space was then filled with grout to ensure the FRP liner did not shift.

All three phases have now been successfully completed. The use of segmental sliplining enabled construction to proceed with minimal disruption, making bypass pumping unnecessary. This not only reduced costs but also eliminated one of the most significant risks associated with large-diameter sewer rehabilitation.

Several important lessons emerged from the program. Perhaps the most critical was the value of preparation. Sliplining large-diameter sewers is not a straightforward process; joints, offsets,

and bends all present challenges that must be addressed through careful pre-planning and field confirmation. The contractor must properly clean the existing interceptor before pulling a mandrel through the pipe. The mandrel ensures minimal debris is present and identifies potential areas where the slipliner pipe could get caught on an offset joint. This should be done prior to attempting to install the slipliner pipe.

The project also demonstrated the importance of contractor experience. Installing segmental slipliners one piece at a time requires a skilled and knowledgeable crew, and the success of the rehabilitation relies heavily on their expertise. Having these types of projects completed by a contractor well-versed in segmental sliplining helps the projects run very smoothly.



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Similarly, the installation of manhole liners required a high level of precision. Accurate field measurements were critical to ensure the fabricated FRP liners fit correctly and sealed as intended. One key lesson learned was the importance of specifying liner depth from the top of the bench of the existing manhole to the proposed rim elevation. In Phase 1, the liners were fabricated using the invert-to-rim dimension, which resulted in structures that were taller than needed. As a result, each FRP liner had to be field-

modified by cutting down the excess wall height to achieve the proper elevation.

The rehabilitation program delivered substantial benefits to TMUA and its customers. Structurally, the interceptor and manholes have been renewed and are expected to provide reliable service for decades. Hydraulically, the required capacity has been preserved through model confirmation and selection of liner diameters. Operationally, the threat of potential failures has been eliminated with the new PVC liner.

Perhaps most importantly, the work was accomplished without the large-scale disruptions that would have accompanied open-cut replacement. Streets and neighborhoods were spared from extensive excavation, and wastewater service continued uninterrupted. Financially, the trenchless approach provided a long-term solution at a fraction of the cost of replacement, a result that demonstrates the benefits of segmental sliplining.



#### ABOUT THE AUTHOR:

**Jacob Brumbaugh, PE**, is a licensed professional engineer in the state of Oklahoma. He earned his MBA from Oklahoma State University and a bachelor's degree in civil engineering from the University of Oklahoma. During his time at RJN, Jacob has provided pragmatic engineering solutions to Oklahoma utility owners to improve system performance and achieve regulatory compliance. He has worked on numerous assessment and design projects, including hydraulic modeling and master planning, large- and small-diameter pipelines, force mains and lift stations, gravity lines, and manholes. He is also well-versed in using trenchless and traditional construction methods to deliver cost-effective and impactful solutions.

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| TYPICAL CRITERIA             | HDD                                                              | Direct Steerable Pipe Thrusting                                                          | Microtunneling                                                                           | Pilot Tunneling Auger                                   |
|------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Pipe Diameter                | 2 - 48 inches                                                    | 30 - 60 inches                                                                           | 30 - 120 inches                                                                          | 4 - 48 inches                                           |
| Depth Range                  | 15 - 200 feet                                                    | 25 - 130 feet                                                                            | 15 - 100 feet                                                                            | 8 - 30 feet                                             |
| Length Range                 | 200 - >10,000 feet                                               | 500 - 4,000 feet                                                                         | 200 - 3,000 feet                                                                         | 50 - 300 feet                                           |
| Maximum Length               | >10,000 feet                                                     | >5,000 feet (7,500 feet maximum)                                                         | 2,000 feet with intermediate jacking stations                                            | +/- 400 feet                                            |
| Minimum Depth of Cover       | >25 feet                                                         | As low as 2X pipe diameter                                                               | As low as 2X pipe diameter                                                               | As low as 1X pipe diameter                              |
| Design Angles                | Entry: 8 to 14 degrees / Exit: 8 to 16 degrees                   | Launch: 0 to 8 degrees / Reception: 2 to 10 degrees                                      | Typically < 2.5%                                                                         | Typically < 2.5%                                        |
| Entry/Launch Approach        | Surface entry                                                    | Near surface launch                                                                      | Shaft launch                                                                             | Shaft launch                                            |
| Min. Install Radii           | Governed by installation & operating stresses                    | Governed by installation & operating stresses                                            | Generally flat or sloped                                                                 | Generally flat or sloped                                |
| Pit/Shaft Design             | Shallow pit, non-engineered                                      | Engineered shoring for shallow launch pit; shallow, non-engineered reception pit         | Engineered shoring for launch & reception shaft                                          | Engineered shoring for launch & reception shaft         |
| Foundation                   | Traditional deadman                                              | Engineered for site conditions & anticipated loads                                       | Engineered for site conditions & anticipated loads                                       | Engineered for site conditions & anticipated loads      |
| Pipe Stringing               | Typically exit side                                              | Launch side                                                                              | Pipe segment storage on launch side                                                      | Pipe segment storage on launch side                     |
| Installation Stresses        | Tension, bending, hydrostatic buckling & combined                | Compression, bending, & combined; column buckling                                        | Compression & buckling                                                                   | Compression & buckling                                  |
| Annular Pressures            | Hydrostatic drilling fluid pressure & cutting transport pressure | Hydrostatic lubricating pressure & slurry over pressure                                  | Hydrostatic lubricating pressure & slurry over pressure                                  | Hydrostatic lubricating pressure & slurry over pressure |
| Gravel, Cobbles and Boulders | High risk of failure for > ~30-40% gravel                        | Can negotiate limited rocks up to 1/3 size of the cutterhead, and up to ~30 - 40% gravel | Can negotiate limited rocks up to 1/3 size of the cutterhead, and up to ~30 - 40% gravel | High risk of failure for > ~30-40% gravel               |
| Clay Soils                   | Risk of hydraulic fracture                                       | Low risk of hydraulic fracture                                                           | Low risk of hydraulic fracture                                                           | Low risk of hydraulic fracture                          |
| Relative Cost                | \$\$                                                             | \$\$\$\$                                                                                 | \$\$\$\$                                                                                 | \$\$                                                    |

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## TECHNOLOGY OVERVIEW GUIDE: NEW INSTALLATIONS

| Shielded or Guided Boring           | Auger Boring                                       | Pipe Ramming                                         | Pipe Jacking                                                                  | Hand Mining/Tunneling                                                         |
|-------------------------------------|----------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Shaft diameters                     | 12-72 inches                                       | 12 - 120 inches                                      | 42 - 144 inches                                                               | 42 - 144 inches                                                               |
| Depth                               | 8 - 30 feet                                        | 5 - 25 feet                                          | 10 - 40 feet                                                                  | 10 - 40 feet                                                                  |
| Length                              | 50 - 300 feet                                      | 50 - 300 feet                                        | 200 - 1,000 feet                                                              | 100 - 600 feet                                                                |
| Depth                               | +/- 500 feet w/ guidance                           | +/- 400 feet w/ guidance                             | 1,500 feet with intermediate jacking stations                                 | 1,000+ feet                                                                   |
| Minimum diameter                    | As low as 2X pipe diameter                         | As low as 1X pipe diameter                           | As low as 2X pipe diameter                                                    | As low as 2X pipe diameter                                                    |
| Groundwater                         | Typically < 2.5%                                   | Typically < 2.5%                                     | Typically < 2.5%                                                              | Typically < 2.5%                                                              |
| Access                              | Shaft launch                                       | Shaft launch                                         | Shaft launch                                                                  | Shaft launch                                                                  |
| Ground conditions                   | Generally flat or sloped                           | Generally flat or sloped                             | Generally flat or sloped                                                      | Generally flat or sloped                                                      |
| Shoring for launch & reception      | Engineered shoring for launch & reception shaft    | Engineered shoring for launch & reception shaft      | Engineered shoring for launch & reception shaft                               | Engineered shoring for launch & reception shaft                               |
| Site conditions & anticipated loads | Engineered for site conditions & anticipated loads | Engineered for site conditions & anticipated loads   | Engineered for site conditions & anticipated loads                            | Engineered for site conditions & anticipated loads                            |
| Segment storage                     | Pipe segment storage on launch side                | Pipe segment storage on launch side                  | Pipe segment storage on launch side                                           | Tunnel liner segment storage on launch side                                   |
| Failure modes                       | Compression & buckling                             | Compression & buckling                               | Compression & buckling                                                        | Compression & buckling                                                        |
| Lubrication                         | Hydrostatic lubricating pressure                   | Hydrostatic lubricating pressure                     | Hydrostatic lubricating pressure                                              | Hydrostatic lubricating pressure                                              |
| Risk of failure                     | Can negotiate up to 1/3 size of the cutterhead     | Casing can be sized to swallow up cobbles & boulders | Medium risk of failure. Can access tunnel heading for removal of obstructions | Medium risk of failure. Can access tunnel heading for removal of obstructions |
| Risk of hydraulic fracture          | Low risk of hydraulic fracture                     | Low risk of hydraulic fracture                       | Low risk of hydraulic fracture                                                | Low risk of hydraulic fracture                                                |
| Cost                                | \$                                                 | \$\$                                                 | \$\$\$                                                                        | \$\$\$                                                                        |



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# North Richland Hills Selects Certa-Lok® Pipe for In-House HDD Project Upgrades

## Beneficial for the City

By: Craig Fisher, P.E., Westlake Pipe & Fittings



**Susan Court Project Map**

*Over twenty-five years ago, North Richland Hills, Texas (NRH) was faced with an aging water infrastructure and a limited budget for pipe replacement. To expedite the work and lower costs, the Public Works Director recommended using Horizontal Directional Drilling (HDD), a relatively new technology for water line replacement, but contractors at the time only operated large rigs where long runs were needed to offer competitive bids.*

NRH is one of the smaller cities in the Dallas/Fort Worth metroplex as measured by population and by land area. In the late 1990s, NRH's population was around 55,000 with a geographical footprint of 18.2 square miles. In the late 1990s, the Public Works Director at the time, Larry Jones, wanted to use Horizontal Directional Drilling (HDD) for installing

replacement pipe for some of the city's water lines that had reached the end-of-useful life. In review, the amount of HDD work NRH had annually was not sufficient to gain enough contractor interest to obtain an affordable installation cost. In those days, HDD was still considered a new technology, and the city council was hesitant about adoption.

Convinced that the new HDD technology would be beneficial for the city, Jones championed the idea of developing in-house expertise by leading the initiative for NRH to purchase a modestly sized HDD rig and train an existing crew on the operation. By educating the council members on the benefits of HDD instead of open cut, Jones was able to persuade a cautious board to approve the capital expenditure for the HDD equipment. NRH's fleet division, unfamiliar with HDD equipment, was reluctant to add the new equipment to their maintenance responsibilities. This was solved with the

Operations Department of the Public Works Department accepting the role of equipment maintenance for the new HDD equipment.

With everything in place, NRH's in-house HDD program was launched. In 2025, NRH prioritized a project on Susan Court. The pipe selected for the project was 630 feet of AquaSpring AWWA C900 Certa-Lok® restrained joint integral bell (RJIB) DR18 PVC pipe from Westlake Pipe & Fittings (WPF). The rig manufacturer provided training for running the HDD rig and demonstrated the use of the other tools and equipment required for this type of installation. Additional training and support was provided by Mark Montgomery, territory manager for WPF. Montgomery provided information about the Certa-Lok RJIB pipe and pulling heads specifically designed for the Certa-Lok restraint system.

NRH had some specific reasons for selecting Certa-Lok RJIB PVC pipe over

***"We wanted to stick with a familiar, reliable product."***

***- Justin Dean, Construction Superintendent, North Richland Hills***

other HDD pipe options. "First, we wanted to stick with a familiar, reliable product, which was DR18 AWWA C900 PVC pressure pipe," said Justin Dean, construction superintendent for NRH. "We didn't want to add to the training burden for the team, and that would be required if we went with a fused product." Other drawbacks with the fused option included the amount of equipment needed for the process. The public works team was not interested in storing the additional equipment required or adding even more equipment to the maintenance program. This narrowed their pipe selection process to segmental AWWA C900 restrained-joint pipe. Another segmental pipe option was initially selected, but the team quickly found they needed a joining system that offered a consistent, quick and easy assembly process as well as a product that could be disassembled if needed. Another often-overlooked project requirement is product availability to support the project schedule. NRH found on-time delivery of the HDD pipe was much more likely with Certa-Lok than with the product previously selected.

The replacement of the water line under the Susan Court neighborhood was in the older part of town and was being served by a 6-inch cast iron water line that quickly reduced down to a 4-inch water line. NRH prioritized this project due to the age of the pipe and the resulting higher maintenance costs. With the pipe replacement, there was an added benefit. It would improve the water circulation for the 18 lots served by the line. Further review showed another reason to



***The reamer and pulling head are attached to a short length of Certa-Lok***

prioritize Susan Court was because the Streets & Traffic Division was scheduled to mill and replace the asphalt road in the near future. By replacing the pipe ahead of the road replacement, NRH would avoid cutting into newly laid pavement.

The Susan Court Project Map shows the 18 lots and the approximate location of the newly installed 6-inch water line. Looking at the neighborhood street and driveway access, installation of Fusible PVC would have required pre-fusing 630 feet of pipe into a single pipe string creating a logistical problem for the family homes near the construction, blocking driveways and other access. Staging fusible pipe through the neighborhood in preparation for pullback would be highly disruptive. These factors provided justification for NRH's preference for segmental pipe over fused products for the HDD project.

The project started on Scott Drive with the installation continuing to Susan Court. Using a Ditch Witch AT32 with 32,000 lb of pullback capability, the con-

struction superintendent scheduled the HDD pullback to occur May 2, 2025, in the window of time between storms that occur frequently in late April and early May. Having the pipe near the pit facilitates the cartridge style assembly method, where each 20-foot pipe segment is added to the pipe string during the pullback operation. Joint assembly occurs while a drill rod is unthreaded and re-racked; the time needed to do that is more than the time it takes to assemble a Certa-Lok joint. For this project, the restrained joint was assembled in under two minutes. The crew did this manually with the aid of an assembly tool called the Eagle Claw.

For this pipe size and DR, the weight of a stick of pipe is about 106 pounds. The crew used a short stub of pipe for installing the pulling head, which allowed them to do this on the bed of their utility truck. The stub of pipe, a swivel, and a reamer were attached to the drill rods. Then the first length of Certa-Lok was connected to the short Certa-Lok bell section. The crew was able to drill the



bore path and do the pullback of 630 feet of pipe in a single day.

Now that the in-house HDD program has been in place for over two decades, Josh Oler and Justin Dean look back on the program they created and the challenges that were faced over the years. "One of the first challenges is keeping a fully staffed crew of trained workers," said Josh Oler, utility superintendent NRH Public Works Department. "As crew members are promoted or relocated, new crew members need education and training on the HDD operation." NRH has a strong team with the institutional knowl-

edge of Oler and Dean as they continue to manage and develop the program. These key individuals are on hand to help problem-solve any unexpected issues that sometimes arise in the field.

Ongoing challenges include:

- Prioritize the city's water lines that are most in need of replacement for the current fiscal year. These will likely be in the older parts of town, where ongoing water line repair costs can exceed the replacement cost.
- Identify the optimal replacement age of equipment. With experience, they have found it more cost effective

to replace equipment sooner rather than incurring higher repair costs for older equipment.

- Respect the limitations of the crew and the equipment. Cost and schedule overruns are more likely when either is operated at the edge of its capabilities. In these cases, the risks outweigh the rewards.
- Remember to consider both installation options. They have learned through experience that HDD or open cut may be the best approach. It all depends upon project specific constraints.

Both Oler and Dean agree about the savings NRH enjoys in time and repair costs when HDD is used. The residents of the established neighborhoods with the older lines appreciate the quicker installation that HDD offers along with the reduced amount of disruption.

This is one of several successful HDD projects NRH plans to complete in the calendar year of 2025.



### ABOUT THE AUTHOR:

**Craig Fisher, P.E.**, is a Regional Engineer with Westlake Pipe & Fittings, and has over 30 years of experience in the waterworks industry. He eagerly shares the insights that he has learned over three decades in the business. Craig offers practical advice and suggests real-world solutions to the problems encountered when designing and installing buried pipe systems. He works with owners, engineers, and contractors during all phases of the project.

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# Beyond ARO: A Case Study in HDD Coating Failure and the Shift to SAIG Protection

By: Ron Raphoon, Raphoon LLC

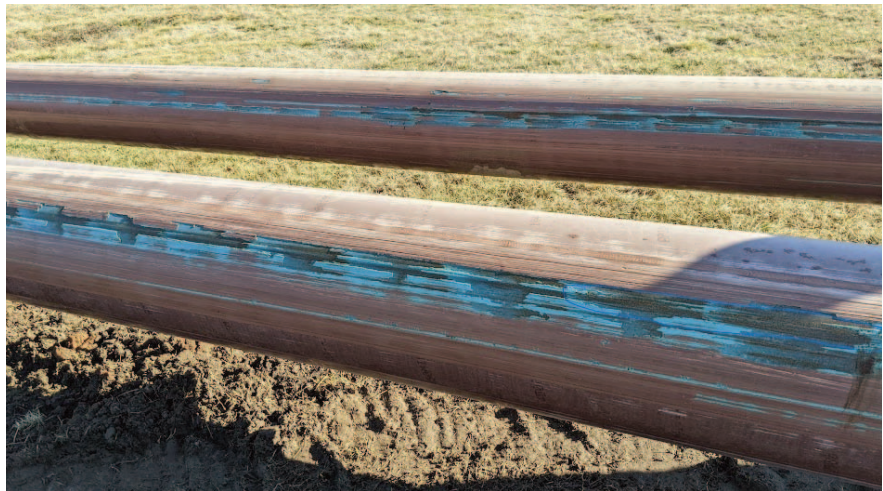
**H**orizontal Directional Drilling (HDD) continues to evolve with improved equipment, better design practices, and highly engineered guidance systems. Yet, even with these advancements, one of the most unpredictable factors remains: the ground itself. When pipeline coating systems fail during HDD installations, the consequences can be both immediate and expensive. This case study, set in Fayetteville, Arkansas, demonstrates how traditional coatings like FBE and ARO fell short in protecting a 24-inch steel pipeline during a challenging HDD river crossing—and how a shift to shear, abrasion, impact, and gouge (SAIG) resistant coating protection proved to be the missing piece.

## THE PROJECT

### A Steep River Crossing in Mixed Soils

In early 2023, a leading U.S. pipeline operator undertook an HDD installation beneath a riverbed in Arkansas. The project involved 24-inch API 5L steel pipe, pre-coated with fusion bonded epoxy (FBE) and an abrasion-resistant overcoat (ARO)—a long-standing industry standard. The bore path required a steep entry angle and passed through a mix of sandy and cobble-filled soils.

Upon completing the pilot bore and reaming to the proper diameter, the team began pullback. However, when the pipe emerged on the other side, it was immediately clear that something had gone wrong. The ARO coating showed extensive damage, and in many places, the FBE was stripped down to bare steel. More concerning were the visible indentations running longitudinally along the pipe and worn-down weld caps—evidence of high-contact abrasion and impact, particularly near the turning point just before the river crossing.



*Damage to traditional FBE and ARO coating after initial HDD pullback, showing stripped epoxy and worn steel weld caps*



*Visual comparison of three coating sections post-HDD: 4-layer Bore-Wrap (front), epoxy ARO (middle), and 2-layer Bore-Wrap (rear)*





**4-layer Bore-Wrap section showing only superficial scratches, with anti-corrosion layer fully preserved**

Faced with this unexpected failure, the operator made the call to pull the pipe back out and reassess.

## THE TEST PULL

### A Three-Zone Experiment

To evaluate alternative protective measures, the operator partnered with Denso, Inc. and Raphoon, LLC to perform a controlled test pull using the same bore path. The pipe was divided into three coating zones:

Zone 1: 4 layers of Denso Bore-Wrap

Zone 2: Traditional epoxy ARO system (“the way we always do it”)

Zone 3: 2 layers of Bore-Wrap

This approach allowed a direct comparison under identical conditions. After pullback, a thorough visual inspection was conducted to assess coating integrity and damage.

## THE RESULTS WERE UNAMBIGUOUS:

Zone 1 (4-layer Bore-Wrap): Minimal to no visible damage. Only a superficial scratch

appeared on one side, confirming high performance under HDD stress.

Zone 2 (epoxy ARO): Severe failure. The epoxy was almost entirely removed, exposing the original plant-applied ARO, which itself showed multiple gouges.

Zone 3 (2-layer Bore-Wrap): Some wear at the leading edge, but once past initial contact points, the Bore-Wrap absorbed the impact and protected the underlying layers effectively.

## ADOPTING A NEW STANDARD

The visual evidence made a compelling case. Where traditional coatings failed, Bore-Wrap succeeded. Following the test pull, the operator implemented Bore-Wrap on future challenging bores, particularly those involving steep inclines or abrasive soil types. The wrap offered:

- Resistance to gouging and impact at inflection points
- Flexibility during bending
- Rapid application and no VOCs
- Reliable protection for weld caps and anti-corrosion layers

The decision also aligned with recent regulatory changes coming from PHMSA’s “Mega Rule” which has expanded integrity management standards, particularly for gas transmission pipelines, the use of out-dated ARO systems may soon carry greater compliance risks. Additionally, many modern HDD installations are located in High Consequence Areas (HCAs), such as river crossings, wetlands, and densely populated urban corridors. These locations not only present higher environmental and public safety risks, but also render the pipeline completely inaccessible once installed. As a result, the coatings applied during construction must be capable of surviving the entire service life of the pipeline without failure. There is no second chance for repair once the pipe is buried deep beneath critical terrain.

## LESSONS LEARNED

This case underscores a key truth: coating selection for HDD is not just a design checkbox. It’s a critical factor in the success or failure of the entire operation. While FBE + ARO has been the standard for decades, more demanding installations require more robust protection. SAIG-resistant solutions like Bore-Wrap add a layer of insurance that can save hundreds of thousands of dollars in re-work, repair, and downtime.

## CONCLUSION

In HDD, even well-planned projects can go sideways when the ground throws a surprise. But with the right protective system in place, those risks can be mitigated. This Arkansas river crossing proved that SAIG protection isn’t just marketing—it’s a real solution for real problems. As the industry prepares for stricter safety standards and more complex bores, it’s time to rethink what “standard” coating protection really means.



## ABOUT THE AUTHOR:

**Ron Raphoon** is Principal Consultant at Raphoon LLC with 19 years of experience in pipeline integrity and coatings. He is a CIP Senior Inspector and serves as Chairman of AMPP SC-03 (Buried Coatings). Ron specializes in trenchless coating applications and HDD coating performance evaluations.

# Emerging Technology:

## Close Tolerance Pipe Slurrification (CTPS) for Asbestos Cement Pipelines

By: Andrew Costa, Azuria Water Solutions

**T**here are over 600,000 miles of Asbestos Cement pipe buried across the United States that have reached or will reach the end of their estimated design and useful lives. Like most of our buried infrastructure, the time has come to renovate or replace these systems. Naturally, the focus is on how to accomplish the work most efficiently and economically with the least disruption to the public, as necessary. Removing and replacing Asbestos Cement pipe has the additional burdens of complying with NESHAP and OSHA requirements which govern the handling, removal, and disposal of any material containing more than 1 percent asbestos.

On June 10, 2019, the EPA approved an alternative work practice (AWP) for Close Tolerance Pipe Slurrification (CTPS) to replace, rehabilitate, and repair existing buried Asbestos Cement (AC) pipe systems. Subsequently, the EPA has determined that CTPS is an equivalent work practice to open cut pipe replacement for replacing, rehabilitating, and repairing Asbestos Cement (AC) pipe. The CTPS process is the only trenchless technology approved by the EPA for the replacement of AC pipelines, and compliant with the Asbestos NESHAP requirements.

Close Tolerance Pipe Slurrification (CTPS) is a proven “trenchless technology” method used to remove and replace an existing pipeline with minimum amounts of excavation. The CTPS method removes the existing pipe by pulling a rotating cutting head through the existing pipe while simultaneously injecting a bentonite-based lubricating fluid with Cementitious additives. The cutting head rotates at sufficient speed to grind the existing pipe, surrounding soil, and bentonite-based lubricating fluid into a slurry. This slurry is pigged out of the ground by



**Figure 1. The CTPS process grinds the existing host pipe while simultaneously pulling in new pipe**

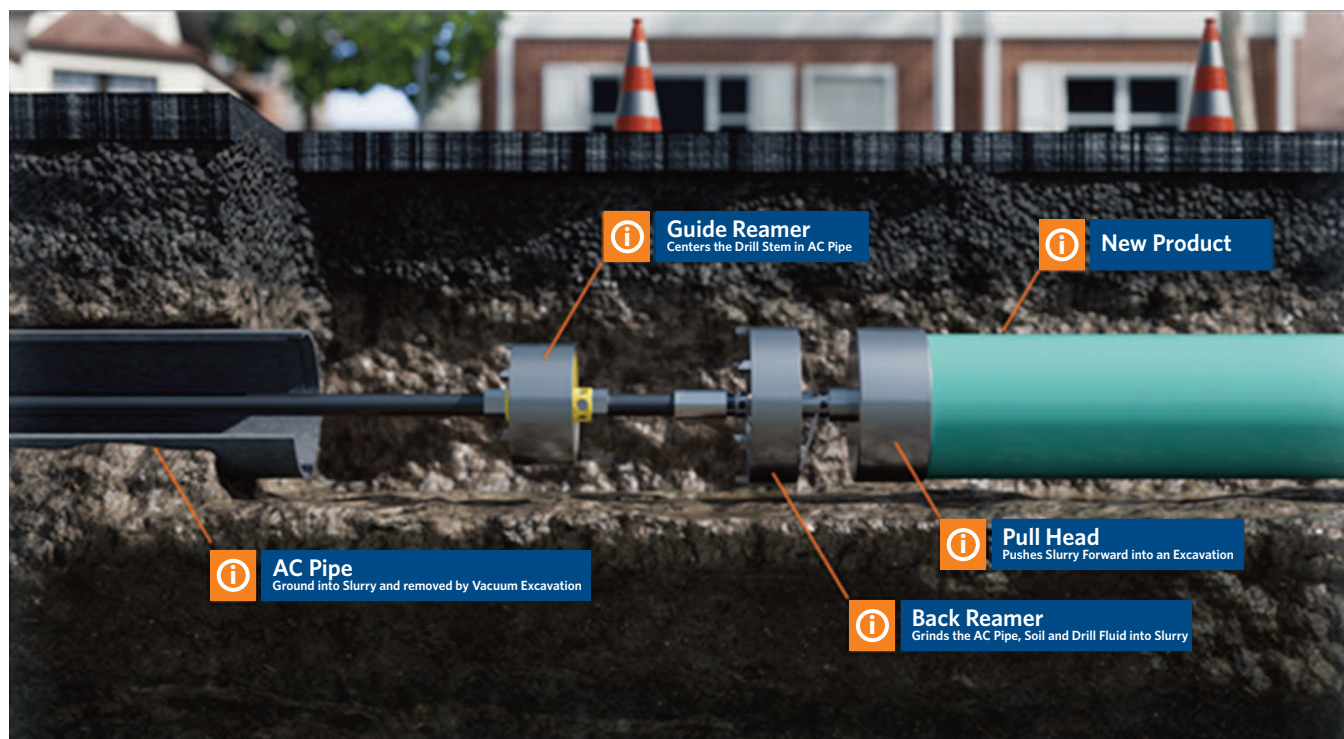
a pulling head or forced out of the ground into a receiving pit by the new pipe that is being pulled in behind the cutting head as the entire process is running concurrently. As a result of the CTPS

***Municipalities have long sought an EPA approved trenchless method to address the billions of feet of AC pipe***

process completion, the existing pipe is removed, the new pipe is installed through the subsequent tight-fitting void, and the slurry containing the existing pipe fragments, soil, and bentonite-fluid is removed from the ground. Figure 1 represents an overview of the process.

When the CTPS process is used to remove and replace Asbestos Cement pipe systems, there are several important components of the process that match extremely well with regulations surrounding AC pipe work. First, the patented process requires the injection of bentonite-based fluid at critical points. This fluid maintains a wet-cutting environment, which is an important requirement for cutting Asbestos Containing Material (ACM). Second, the “close tolerance” sizing of the cutting head, in relation to the new pipe being pulled into place, facilitates the removal of the Asbestos Containing Material (ACM) from the ground. This “close tolerance” sizing creates a scenario where the new product pipe, along with the injection of additional drill fluid, will pressurize the slurry, which is expelled at excavations. The slurry containing the ACM is then removed from the site. Third, any remaining trace amounts of asbestos fiber are encapsulated in the skim coat of





**Figure 2. Guide Reamer, Back Reamer (cutting head), and Pull Head components of CTPS installation process**

slurry remaining around the pipe. This skim coat has the consistency of a light-weight concrete material commonly known as “excavatable flowable fill,” until it rehardens to a non-friable state.

Applying the CTPS technology to the removal and replacement of Asbestos Cement pipe systems has the potential for several advantages over the alternatives currently available to the municipalities and utility owners charged with replacing AC pipe systems at the end of their design and useful life cycles. The primary methods currently being implemented for replacing AC pipe systems are “open cut” replacement in through the existing pipe from this excavation to another where the cutting head and pipe are attached and pulled into place. The back reamer, or cutting head, is held centered in the existing pipe by a guide reamer so that the back reamer cuts uniformly over the existing pipe as shown in Figure 2.

Thus, the CTPS process will keep the alignment and grade of the existing pipeline. CTPS does not displace the existing pipe fragments into the surrounding soil, but rather cuts the soil ½ inch more than the outside diameter of the new pipe being installed and then blends the soil and existing pipe fragments into a slurry that is forced out by the new pipe being

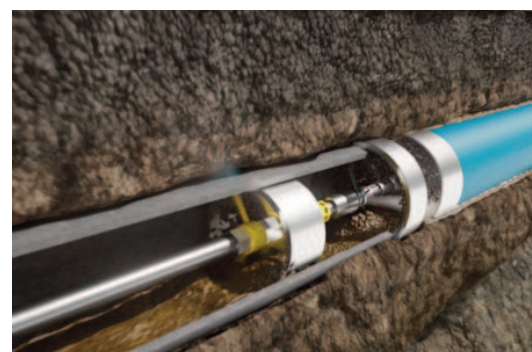
pulled into place. The slurry (consisting of the soil and pipe fragments) is pushed or squeegeed to access points in front of the pipe being installed where it is removed by a vacuum excavator and hauled to a landfill.

## KEY COMPONENTS OF CTPS

### Bentonite-Based Drill Fluid for “Pipe Slurrification”

The patented process requires the continuous injection of a bentonite-based fluid at critical points throughout the duration of the process. This drill fluid serves several principal functions in the CTPS process. Bentonite-based drill fluid is one of the key components of achieving slurrification of the AC pipe and enabling the ability to move the unwanted material to the pits for removal.

First, the drill fluid’s lubricating properties are key to mixing the existing pipe and soil into a slurry when the cutting head is rotated at sufficient speed; much like a blender would mix cake batter and water to create a semi-liquid slurry. The blending of the existing pipe material, soil and drill fluid is the essence of the “pipe slurrification” process. Figure 3 shows the slurry created from the mixture of ground AC pipe and drilling fluid.



**Figure 3. Grinding of AC pipe and mixture with drill mud creates the slurrification during the process**

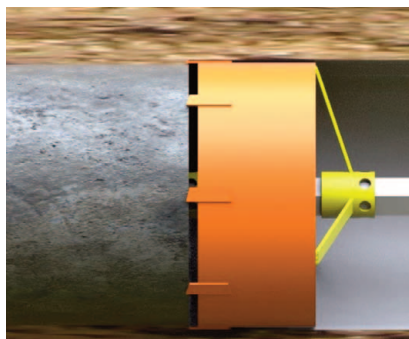
Fourth, the drill fluid (turned slurry) lubricates the tight-fitting void or opening so that the new pipe can be pulled through the void from one excavation to the other. This lubrication keeps the new pipe from becoming stuck in the tight-fitting void due to surface friction.

Finally, the pipe slurrification process grinds and reactivates the cementitious properties of the AC pipe, whereas these cementitious particles combine with the slurry to harden into a material with the consistency of a light-weight concrete material similar to excavatable flowable fill. This material fills the ½-inch annular space between the new pipe and virgin soil, forming what the EPA describes as a

very thin skim coat around the new pipe. Consequently, any remaining trace amounts of asbestos fiber not removed are encapsulated in this skim coat of slurry remaining around the pipe.

### **The Importance of “Close Tolerance”**

The term “close tolerance” refers to the fact that the cutting head is sized only  $\frac{1}{4}$  inch larger than the outside diameter of the new pipe that will be installed behind the cutting head. Consequently, the cutting head creates a tight-fitting cavity or void only slightly larger than the new pipe being pulled into place.



**Figure 4. Close Tolerance of  $\frac{1}{2}$ -inch is one of the important keys to the slurrification removal**

This “close tolerance” of  $\frac{1}{2}$  inch is critical so that the pulling head that attaches the new pipe to the cutting head will pig or force the slurry that contains the soil, pipe fragments, drill fluid out of the tight-fitting void while it is pulled through. See Figure 4.

The slurry produced during the CTPS process collects in the excavation, and from there it is vacuumed up (see Figure 5) and sent to an approved landfill or disposal site in accordance with all federal, state, and local regulations. The materials handling and regulatory processes have many similarities as the handling of intact segments of AC pipe and are outlined in the asbestos NESHAP.

### **Excavations**

As described, the injection of bentonite-based drill fluid, “pipe slurrification, and “close tolerance” sizing of the cutting head creates a scenario where the slurry becomes pressurized when the new pipe is pulled into place. This pressure facilitates the eventual removal of the slurry at strategically located excavations.



## ***CTPS is a proven “Trenchless Technology” method used to remove and replace an existing pipeline with minimum amounts of excavation***

Often, these are excavations that would have occurred naturally at bends, tees, wyes, valves, etc.

“Close Tolerance” differentiates from traditional HDD practices where the cutting head is sized to 1.5 times larger than the outside diameter of the new pipe to be installed; for example, a 12-inch void would be created to pull in an 8-inch pipe. Consequently, the larger void of traditional HDD allows the new pipe being pulled in place to float through the slurry rather than squeeze the material into an excavation where it can be removed from the site. Thus, with the traditional HDD method the bulk of the slurry is not removed from the underground cavity.

Variance from the combination of “close tolerance” and “pipe slurrification” process in any way will significantly diminish the ability of meeting the intent of the approved Alternative Work Practice (AWP) for Using CTPS for Removing Asbestos Cement Pipe, so it is critical that the CTPS process as a whole incorporates both of these key components.

### **Safety**

To date, two federal agencies have been principally responsible for generating regulations for asbestos control; the U.S. Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA). The EPA regulates asbestos through the National Emissions Standards for Hazardous Air Pollutants (NESHAP). To comply with the Alternative Work Practice (AWP) for Using Close Tolerance Pipe Slurrification

(CTPS) to Replace AC Pipe, the pertinent NESHAP and OSHA regulations that affect and govern the removal and replacement of AC pipe must be recognized, understood, and followed. While the EPA regulations are generally concerned with notification, air quality, and disposal requirements that affect the long-term impact of asbestos fibers on the public and the environment, OSHA regulations are generally related to the immediate and long-term safety of the employees working with and around asbestos containing material.

For these reasons, the CTPS method would be most favorably applied to shallower pipes where long segments of pipe can be replaced in one pull such as in the rehabilitation of potable water mains and force mains. The majority of pressure pipes are generally shallow in Texas/Oklahoma, ensuring a cost-effective means of replacement via CTPS. The technical envelope for the CTPS process is from 4- to 24- inch asbestos cement pipe, with the ability to upsize the new product pipe. Particular use cases within the technical envelope revolve around projects whereby the removal/replacement of AC pipes is not cost effective, carries higher social and restoration costs, and instances where a faster project is preferred.

Additionally, open cut projects that are using a new pipe route or alignment involving land or easement acquisition, additionally permitting, etc. are excellent fits for the CTPS method, since it utilizes the existing pipe alignment.



## Applications

While it would be possible to use the CTPS method on deeper applications, the excavation where the drill stem enters the pipe would be elongated in relation to the depth of the pipe. This is due to the limited bend radius of the drill stem. Consequently, the economy of the method diminishes with significant depths. For this reason, the CTPS method would be most favorably applied to shallower pipes where long segments of pipe can be replaced in one pull such as in the rehabilitation of portable water main and force mains. The technical envelope for the CTPS process is from 4 to 24-inch asbestos cement pipe, with the ability to upsize the new product pipe. Particular use cases within the technical envelope revolve around projects whereby the removal/replacement of AC pipe is not cost effective, carries higher social and restoration costs and instances where a faster project is preferred. Additionally,

## *CTPS process is the only EPA approved trenchless method for the replacement of AC pipelines*

open cut projects that are using a new pipe route or alignment involving land or easement acquisition, additionally permitting, etc. are excellent fits for the CTPS Method, since it utilizes the existing pipe alignment.

## Industry Implications

Currently, the only EPA approved solutions for the replacement of existing AC pipes are dig-and-replace by open trench, or by CTPS. Alternatively, both bursting/breaking AC pipes render the existing pipe friable and do not comply with the requirements of Asbestos NE-SHAP. Therefore, Municipalities have long sought an EPA approved trenchless method to address the billions of feet of asbestos cement water main and force mains that have systematically begun to fail. With an EPA alternative Work Practice (AWP) and a cost advantage over open-cut replacement, CTPS instantly becomes the most viable option in these AC Replacement projects.



## ABOUT THE AUTHOR:

**Andrew Costa** has worked in the trenchless water/wastewater industry since 2006. His experience includes positions in the contracting, manufacturing, and distribution sectors. His expertise in the water/wastewater markets includes cementitious/polymer manhole rehabilitation, specialty coatings, cured-in-place pipe (CIPP) rehabilitation, carbon fiber remediation, geopolymer solutions, and concrete corrosion. He is currently a Vice President of Sales & Strategy (CTPS/Pressure Pipe) for Azuria Water Solutions – the leading worldwide provider of CIPP and other technologies/services for the rehabilitation of pipeline systems. He is currently on the National NASTT Board of Directors and remains heavily involved with the Southeast NASTT chapter.

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*HDPE is the way of the future*

## Big Easy Upgrades Water System

One Phase Completed, Saving Five Million Gallons Daily; Others Fast Tracked Due to Timesaving HDPE Pipe Installation Method

By: Steve Cooper, SCA Communications

**B**eing more than 300 years old, the Crescent City has had water transmission lines ranging from hollowed-out cypress logs to more traditional materials such as cast iron, asbestos concrete, and now leak-free high-density polyethylene (HDPE) PE4710 pipe that allows for greater pressures, while providing a greater hydraulic capacity, resiliency, cost effectiveness, water conservation, and installation efficiencies.

New Orleans' aging infrastructure has led to numerous boil orders, unstable water pressure, plus damage to roads and pavement from water main breaks. To rectify those issues, the Sewerage & Water Board of New Orleans (SWBNO) launched an 11-project effort in 2023 to replace its cast iron potable water transmission mains with a modern piping sys-

tem, stating that it was "using the HDPE pipe because it is more durable than traditional pipes." The utility serves more than 138,400 customers with nearly 152 million gallons of water daily using 1,600 miles of water main.

The South Claiborne Transmission Main Project, one of the 11 now on the books, aimed to stabilize water pressure in many areas of the city and improve water quality with HDPE pipe that has a design life of 100 years. Completed in the fall of 2023, it has been reported that the new pipeline is saving New Orleans five million gallons of water a day.

Using CompressionFit™ trenchless installation technology and the HDPE pipe, it has been estimated by the contracting installer that there was an overall 25 percent savings in materials, labor and time

compared to other methods.

"The South Claiborne Transmission Main project illustrates the value of PE4710 HDPE pipe for cost-effective piping rehabilitation through Compression-Fit," explained Camille George Rubeiz, P.E., F. ASCE, co-chair, HDPE Municipal Advisory Board (MAB), and senior director of engineering for the Plastics Pipe Institute's (PPI) Municipal & Industrial Division. PPI is the major North American trade association representing the plastic pipe industry.

The Transmission Main Program is FEMA-funded and managed by SWBNO in cooperation with the City of New Orleans as part of the Joint Infrastructure Recovery Roads (JIRR) Program. Total cost for the South Claiborne Avenue Transmission Main was budgeted at \$25.5 million.



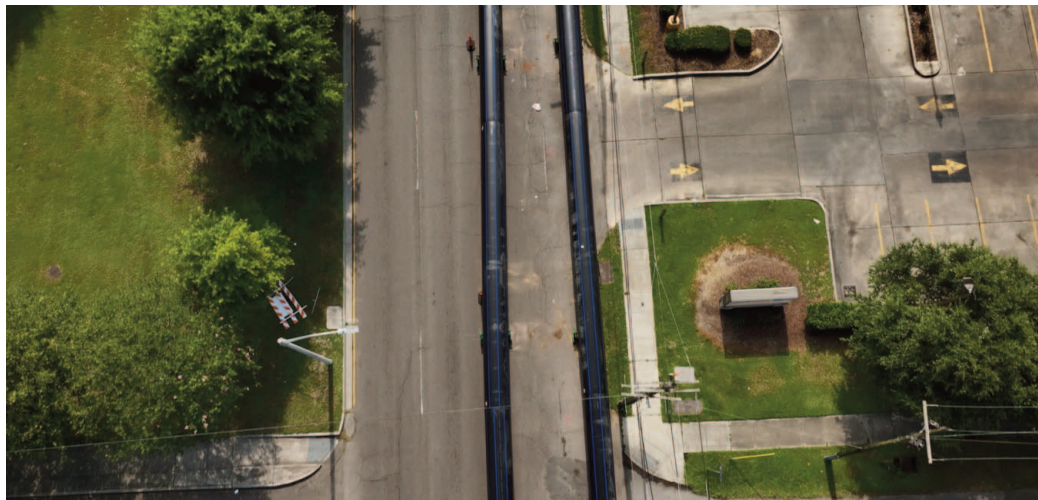
The Murphy Pipeline Contractor's (Jacksonville, FL) CompressionFit method uses the old pipeline as a path for pulling through the new pipe. Governed by ASTM F3508, CompressionFit uses HDPE pipe with an outside diameter larger in size than the inside of the existing pipe. After the HDPE pipe sections are heat fused to the desired length, the monolithic pipeline is pulled through a reduction die before entering the old host pipe. This reduces the HDPE pipe temporarily below the inside diameter of the host pipe allowing it to be inserted.

Once the pipe has finished being pulled through the length of the section, the tension reduction allows it to expand, pushing flush against the interior of the existing pipe. This technique, especially for the South Claiborne Transmission Main Project, helped reduce overall project costs, minimize traffic disruption, and simplify the installation. It was also a key component for securing project funding. Murphy is a member company of PPI's Municipal Advisory Board (MAB).

According to HDPE pipe industry expert and consultant Harvey Svetlik, P.E. "One of the principal things that this technology does is that it preserves the flow rate of the existing host pipeline and seals over holes and leaks, so you have a dual-wall composite pipeline. And the thicker HDPE pipe provides structural integrity." The wall thickness of the DR 17 HDPE pipe is 2.9 inches and is pressure rated to handle 125 psi. The city's water transmission lines run 70 to 80 psi.

HDPE pipe, according to PPI's Rubeiz, offers corrosion protection, flexibility, durability, ground movements, and best seismic resistance than any other piping materials. "Moreover, it virtually eliminates leakage plus prevents any infiltration of sediment or rainwater into the system. The pipe also has a low biofilm formation potential, highlighting its capability to preserve water and water quality while conveying it," he stated "Even the 48-inch diameter HDPE pipe with a wall thickness of nearly three inches is ideal as its properties align with the compressed fit installation method outlined in ASTM F3508."

Two sizes of PE4710 DIP SDR 17 pipes were used: 4,400 feet of 48-inch and 1,150 feet of 30-inch diameter. The pipe was



**Longest pull was about 1,400 feet**

manufactured by AGRU America at its Charleston, S.C. plant. AGRU pipe is available in sizes up to 11.5 feet (OD) and seamless lengths up to 2,000 feet long. It is a member company of PPI.

The South Claiborne job was voted Project of the Year by the Municipal & Industrial Division of PPI for the year 2023. Each year the PPI membership reviews and votes on the Project of the Year for

***"HDPE pipe virtually eliminates leakage plus prevents any infiltration of sediment or rainwater."***

each of the five PPI divisions. The award was presented to AGRU during the association's annual membership meeting held in May 2024.

CMG Pipelines, Inc. (Kenner, LA) installed the pipe. "There's not a lot of certainty about what's in the ground in New Orleans. With directional drilling or digging trenches, who knows what you'll hit," explained CMG President Carmelo Gutierrez, P.E. "A lot of New Orleans is built on reclaimed land, using whatever they found that was cheap to throw in the hole is what they filled it up with. And when you start digging through that, it's going to be a pain. The typical trench for 48-inch pipe required here in New Orleans would be eight feet wide and five

feet deep to the top of the pipe. So, you're eight feet wide, 14 feet deep for a thousand feet. Digging that is not fun. It's horrible, horrible ground to dig in and tough. Plus, protecting our crew is most important. That's also why we suggest HDPE, because of the soil here, and the settling that we have and the water table, and all the little issues that we have in New Orleans. HDPE solves those issues."

During the 14-month long project, it took the CMG crew of 16 – two teams of eight – four months to actually install the pipe from South Claiborne and State Street to South Claiborne and Upperline Street. One team was at the entrance pit took care of fusion and moving pipe. The other one took care of prepping the holes and did the pull.

"We did 4,400 feet of 48-inch, nearly 1,200 feet of 30-inch, and some 8-inch open cut. Because we're close to Tulane University, we had to watch their football schedules, and had to pay attention to traffic," Gutierrez explained. "Our longest pull was about 1,400 feet through the old cast iron pipe. We had a couple of large control valves. We dropped one 48-inch valve and three 30-inch valves in the system to help control the flow.

"There were also sidewall fusions where we were able to use HDPE all across to do our tie-ins, plus, standard fittings, adapters and MJ adapters. That's because of HDPE's flexibility at normal ductile line pipe size, and we didn't miss a beat. We had all the fittings we needed. Basically, one day the pipe was above ground and the next day it was gone.





#### **Protecting the crews is most important**

job fun. And the utility agreed that this was the most cost-effective and time-effective method to quickly replace their mains without creating so much mess in the city.

“We believe HDPE is the way of the future. It solves a lot of check marks for the concerns of utility companies, utility owners. That’s how Murphy Pipelines and CMG

brought this technology to New Orleans, and SWBNO has added a new tool to its pipe replacement toolbox. Now, they’re rehabilitating large diameter lines, and a few years ago that was never a thought.”

“One of the things about the ASTM F3508,” Svetlik explained, “is that it can be utilized not only for municipalities for gravity flow, but even more ideally for pressure pipes for water pipeline replacement, or force main replacement.”

**Additional information** can be found at [www.plasticpipe.org/mabpubs](http://www.plasticpipe.org/mabpubs) or [www.plasticpipe.org/municipalindustrial](http://www.plasticpipe.org/municipalindustrial)



#### **The CompressionFit method helped reduce overall project costs and minimize traffic disruption**

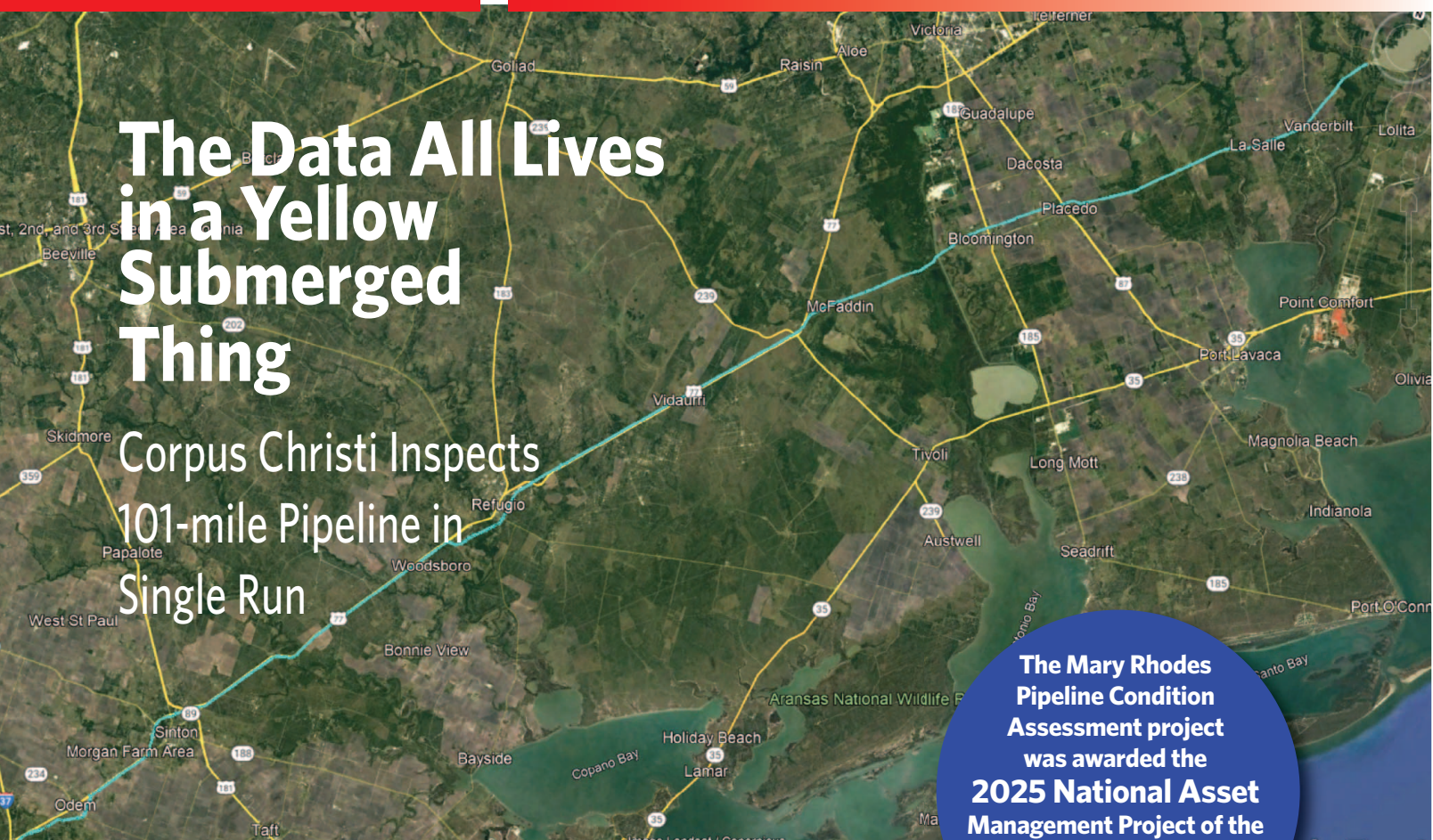
“Compression allowed the city to fix their lines quicker,” he continued. “We didn’t have to worry now about the path of the pipe, because we followed the same path. It made an otherwise tough

#### **ABOUT PPI:**



**The Plastics Pipe Institute, Inc. (PPI)** is the major North American trade association representing the plastic pipe industry and is dedicated to promoting plastic as the materials of choice for pipe and conduit applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in the development and design of plastic pipe and conduit systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.





# The Data All Lives in a Yellow Submerged Thing

## Corpus Christi Inspects 101-mile Pipeline in Single Run

The Mary Rhodes Pipeline Condition Assessment project was awarded the 2025 National Asset Management Project of the Year at the Underground Infrastructure Conference.

Figure 1. Mary Rhodes Pipeline Ph1 and Key Components

By: Jerry W. Snead II, P.E., HDR Engineering

### PROJECT OVERVIEW AND SUMMARY

The Mary Rhodes Pipeline (MRP) Condition Assessment Project overcame an industry challenge with a record-breaking distance inspection utilizing the next generation of inline inspection tools previously not available. For over 130 years, Corpus Christi Water (CCW) has been the vital water supplier for the seven-county Coastal Bend Region providing water to over 500,000 area residents. CCW has one water treatment plant (O.N. Stevens WTP) that receives and treats water from several sources. The 25-year-old MRP currently conveys roughly half of CCW's raw water from Lake Texana to the WTP over 101 miles and is critical to providing the raw water supply to the treatment plant for transmission and distribution to CCW customers. Since its inception, the MRP has experienced 33 leaks/failures and because of its capacity, length, and lack of redundancy, the MRP has a high con-

sequence of failure. As a result, CCW contacted HDR Engineering (HDR) to perform a desktop assessment of the MRP to better understand potential causes of historical failures and provide recommendations for a pipeline condition assessment to help CCW understand what would be required to maintain the level of service of the MRP. This article covers the activities that were included in the MRP Condition Assessment and the collaboration between CCW, HDR, a tool provider, and others.

HDR in collaboration with CCW investigated and interviewed several tool providers and selected a tool provider based on their advanced tool capabilities.

The assessment revealed that:

1. the structural integrity of the pipeline was in good condition;
2. multiple pipeline threats were identified and corrected, and;
3. Three leaks were detected with the inline

This aspect of the project has resulted

in a new tool being available to the industry to perform high resolution leak detection on large and long-distance pipelines. A hydraulic analysis also identified areas of excessive pipe roughness and where operating pressures were exceeding pipe design pressure ratings.

This project has ultimately given CCW confidence in the pipeline and provided data on what steps are needed to maintain pipeline reliability. These measures allowed CCW to increase the flowrate through the MRP and access additional water for the Corpus Christi community.

### MARY RHODES PIPELINE DESCRIPTION, OPERATION, AND CURRENT CONDITIONS

#### System Description

The Mary Rhodes Pipeline Phase 1 is a raw water pipeline that transmits raw water approximately 101 miles from the Lavaca Navidad River Authority (LNRA) intake pump station on the west edge of Lake

Texana to the O.N. Stevens WTP. The majority of the MRP is 64-inch diameter bar-wrapped pipe with approximately 2,040 feet on the north end and 4,000 feet on the south end constructed with 72-inch diameter prestressed concrete cylinder pipe (PCCP). In addition, there are two locations where the pipe was directionally drilled under river crossings for 1,628 feet and 2,250 feet at the Victoria Barge Canal and Guadalupe River Crossings respectively.

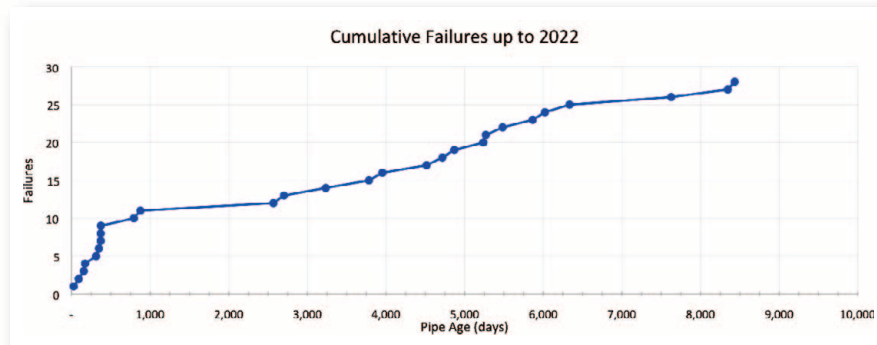
The MRP includes two interim booster pump stations to assist with high flow pumping conditions. The first, Bloomington, is located approximately 27.5 miles southeast of the LNRA pump station. The second, Woodsboro, is located approximately 63 miles southeast of the LNRA pump station.

The MRP has two customer connections; the first is a 24-inch diameter pipe that serves the SDI manufacturing facility on the east side of Sinton, TX and the other is a 36-inch diameter pipe that serves the San Patricio Municipal Water District on the west side of Sinton.

**Figure 1** shows the MRP Phase 1 and key components.

### Operation

Based on discussions with CCW staff, HDR understands that water is conveyed through the MRP in a collaborative process in which the LNRA uses its intake pump station on the west side of Lake Texana to deliver water into a 72-PCCP that extends approximately 2,040 feet



**Figure 2. Cumulative MRP Failures Up to 2022**

west of its pump station property where it connects to a 64-inch BWP owned and maintained by CCW. LNRA and CCW coordinate pumping operations and LNRA monitors conditions via instrumentation located at the Bloomington Pump Station.

The amount of water conveyed through the MRP during this evaluation was on the order of 42 MGD but flow can be adjusted based on 6 pumping schedules (scenarios) to deliver more water when needed.

### CURRENT CONDITION

The MRP Phase 1 was placed into service in 1999 and is an essential component of CCW's water supply system for the City of Corpus Christi and its customers. Over the last 25 years the MRP has experienced at least 33 failures of varying severity, including two during the duration of this condition assessment project. A plot showing cumulative failures versus pipe age is shown in **Figure 2**. The figure shows a relatively high rate of failures shortly

after installation which are likely a result of poor bedding/installation. However, after 1 to 2½ years the rate of failures decreases to an average rate of roughly 1 failure per year which are largely attributed to air valve connection leaks and joint failures.

An initial review of failure documentation provided by CCW staff indicate that the failures are primarily located at pipe joints and air valve connections and are believed to be a result of improper pipe embedment and incomplete threading of the air valve connections to the MRP. Specifically, the failures do not appear to be the result of pipeline degradation due to corrosion. Such failures are more difficult and costly to fix and indicate that a pipeline may be approaching its end of remaining life. Fortunately, this is not the case for the MRP.

While failure of any type on a critical asset like the MRP is a concern, the number of failures to date for a pipeline

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of this length and diameter is considered to be low. As a result, the MRP is believed to be in acceptable condition.

The sections that follow provide detailed findings from HDR's internal (direct) assessment of the condition of the MRP and recommendations to improve its reliability.

## INTERNAL CONDITION ASSESSMENT AND FINDINGS

### Internal Condition Assessment

The internal condition assessment included identification of a viable method and technology provider who could execute a leak and air pocket detection inspection. Through a rigorous evaluation process, an acoustic free-swimming leak and air pocket detection tool was determined to be best suited to complete the inspection in a single insertion and extraction. The selected tool recorded acoustic leaks as its sensors passed along the pipe and minimized the number of pipeline shutdowns and other logistics required to perform the inspection.

The selected inspection device was specifically developed to meet the challenges of the MRP. This inspection also served as a test for a future targeted free-swimming electromagnetic assessment.

The internal assessments also included an opportunistic emergency evaluation of a failure of a 72 inch diameter PCCP section and its neighboring pipes. The failure took place at STA 5326+84, approximately 103 feet downstream of a 12-inch ARV at STA 5325+82, or approximately 1,425 linear feet upstream of the O.N. Stevens Water Treatment Plant. The internal assessments included a visual and sounding inspection and an electromagnetic inspection which evaluated the condition of the prestressing wire wraps.

The sections that follow present the evaluations and findings of these activities.

### Acoustic Leak Detection Tool Evaluation

The length, diameter, limited number of access manways, and inability to take the system out of service for extended periods of time present challenges for internal condition assessment of the MRP. Several tools are available to perform in-



**Figure 3. Insertion of Ball Through Modified Flange at LNRA Pump Station**

ternal condition assessment, and each has various access requirements, trackability, data collection, and cost. In order to identify the preferred tool for the MRP, HDR performed the following activities:

1. Review of available tool providers and technologies,
2. Interview of the four most promising technology providers,
3. Solicitation and evaluation of proposals from three technology providers, and
4. Selection and subcontract agreement with preferred technology provider.

**Table 1** summarizes this activity:

After the initial phone screening HDR requested proposals from 3 of the 4 tool providers.

Proposals were received from all 3 tool providers and the tool providers were evaluated and ranked based on the following criteria:

1. Project Team
2. References/Experience
3. Technical Approach
4. Price/Assumptions
5. Pipeline Prep Required and
6. Schedule

The length of this pipeline and limited number of tool insertion/extraction points along the MRP made it a challenge to assess and HDR was pleased to have identified 3 providers interested in taking on the challenge. Despite the complexity, the cost in each proposal was well within the project budget for internal condition

| Parameter                                                            | Leak Detection Tool Provider                                                                 |                                                                                              |                                                                                     |                                                                                     |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                      | 1                                                                                            | 2                                                                                            | 3                                                                                   | 4                                                                                   |
| Battery Life (hours)                                                 | 20                                                                                           | As Designed                                                                                  | 20                                                                                  | 27                                                                                  |
| Anticipated number of insertions                                     | 1                                                                                            | 1                                                                                            | 6-8                                                                                 | 4                                                                                   |
| Ability to track tool in pipe                                        | Yes                                                                                          | Yes                                                                                          | Yes with development                                                                | No                                                                                  |
| Remote or Manned Tracking                                            | Remote                                                                                       | Remote                                                                                       | Manned                                                                              | None                                                                                |
| Tracking to be relocated during inspection                           | No                                                                                           | No                                                                                           | Yes                                                                                 | N/A                                                                                 |
| Estimates Leakage volume                                             | Yes                                                                                          | Yes                                                                                          | Yes                                                                                 | No                                                                                  |
| Bouyancy                                                             | Negative                                                                                     | Neutral                                                                                      | Neutral                                                                             | Neutral                                                                             |
| Mapping capability                                                   | Yes                                                                                          | Yes                                                                                          | No                                                                                  | No                                                                                  |
| Other sensor types                                                   | Magnetic                                                                                     | Magnetic                                                                                     | Pressure                                                                            | Magnetic                                                                            |
|                                                                      | IMU                                                                                          | IMU                                                                                          |                                                                                     | IMU                                                                                 |
|                                                                      | Pressure                                                                                     | Pressure                                                                                     |                                                                                     | Pressure                                                                            |
|                                                                      | Temperature                                                                                  | Sonar                                                                                        |                                                                                     |                                                                                     |
| Ability to meet schedule                                             | Yes                                                                                          | Yes                                                                                          | Yes                                                                                 | Yes                                                                                 |
| Pros and Cons of each provider for internal leak detection of MRP Ph |                                                                                              |                                                                                              |                                                                                     |                                                                                     |
| Pros                                                                 | Extensive Firm Experience                                                                    | Neutrally buoyant ball reduces chances of stuck device                                       | Neutrally buoyant ball reduces chances of stuck device                              | Neutrally buoyant ball reduces chances of stuck device                              |
|                                                                      |                                                                                              | Single Run- Minimum amount of logistics                                                      |                                                                                     |                                                                                     |
| Cons                                                                 | Negatively buoyant ball increases likelihood of stuck device                                 | Firm is new (limited project experience)                                                     | Limited experience with tracking                                                    | Not trackable                                                                       |
|                                                                      | Additional mapping and setup work to establish good tracking points                          | Confirmed ability to meet schedule but acknowledges it will be a challenge to accomplish it. | Most amount of logistical support                                                   | No long-distance experience                                                         |
|                                                                      | Confirmed ability to meet schedule but acknowledges it will be a challenge to accomplish it. | New approach, some tool components still in development                                      | Tracking requires following the device. Two leapfrogging teams                      | Limited potable/raw water experience                                                |
|                                                                      | Foam shell increases likelihood of stuck device                                              |                                                                                              | Long workdays. Six-20-hour days to complete                                         | Would require shutdown to swap out 12" air valves. (potentially multiple shutdowns) |
|                                                                      | New approach, some tool components still in development                                      |                                                                                              | Would require shutdown to swap out 12" air valves. (potentially multiple shutdowns) |                                                                                     |
| Proposal requested/submitted                                         | Yes/Yes                                                                                      | Yes/Yes                                                                                      | Yes/Yes                                                                             | No/No                                                                               |

**Table 1. Leak detection tool provider comparison**





**Figure 4. Tracking Unit Along Alignment**



**Figure 5. Leak that Occurred During the Condition Assessment**



**Figure 6. Two Balls Retrieved from the Custom Extraction Net at O.N. Stevens Treatment Plant**

assessment and reflects the competitive bid environment and interest in this atypical project.

In summary, tool provider 1 are industry leaders in internal condition assessment, but their tool was negatively buoyant (i.e. rolls along the bottom of the pipe) and covered with a foam shell, which significantly increases the risk of becoming stuck on debris at unknown locations in the MRP.

Tool provider 3 proposed a less experienced team than tool provider 1 or tool provider 2 and required a high number of insertions/extractions which complicates the project and increases effort for all team members. This would result in 8 long duration inspections. Their tool is neutrally buoyant which helps avoid debris on the bottom of the MRP. They also had the highest price.

Tool provider 2 proposed the most experienced team which included the

former developer of a standard industry tool. They also proposed a new, neutrally buoyant tool, hard shelled inspection device which minimizes the chances of it getting stuck in the pipe. They also offered the best price.

Based on HDR's review of the proposals and prior phone interviews with key staff the internal tool providers were ranked as follows:

1. Tool provider 2
2. Tool provider 1
3. Tool provider 3

HDR shared this evaluation and recommendation with CCW staff in a progress call and received approval to develop and execute a subcontract agreement with tool provider 2.

#### **Acoustic Ball Findings**

On February 1, 2024, tool provider 2 deployed the first of two internal acoustic

balls. A second ball was deployed on February 2, 2024, and both balls were successfully retrieved at the O.N. Stevens Water Treatment Plant after collecting acoustic data for the 101 miles of pipeline starting at the LNRA pump station. After the balls were retrieved from the custom extraction net within the raw water junction box the data was analyzed and a total of four acoustic events were detected. Two small leaks, a medium sized leak and a pocket of trapped air was detected. **Table 2** shows details of how each ball traversed the line and **Table 3** summarizes the results of the inspection.

**Figure 3** shows the insertion of one of the balls through a modified flange at the LNRA pump station. **Figure 4** shows a tracking unit along the alignment and **Figure 6** shows the two balls retrieved from the custom extraction net at the O.N. Stevens Water Treatment Plant.

| Traversal Detail            | Inspection Ball 1                             | Inspection Ball 2                             |
|-----------------------------|-----------------------------------------------|-----------------------------------------------|
| Insertion Location          | LNRA Pump Station                             | LNRA Pump Station                             |
| Retrieval Location          | O.N. Stevens Raw Water Junction               | O.N. Stevens Raw Water Junction               |
| Insertion Time              | 2/1/2024, 9:00 AM                             | 2/2/2024, 1:45 PM                             |
| Discharge into Junction Box | 2/3/2024, 7:02 PM                             | 2/4/2024, 7:04 PM                             |
| Duration of Traversal       | 58.03 hours                                   | 53.28 hours                                   |
| Distance Traversed          | 101.1 miles                                   | 101.1 miles                                   |
| Average Velocity            | 1.74 miles per hour<br>(2.56 feet per second) | 1.90 miles per hour<br>(2.78 feet per second) |

**Table 2. Tool traversal details**

| Acoustic Anomaly Number | Initial Station | Classification | Notes                                            |
|-------------------------|-----------------|----------------|--------------------------------------------------|
| 1                       | 335+62          | Small Leak     | Leak was at lower limit of sensitivity threshold |
| 2                       | 410+88          | Medium Leak    |                                                  |
| 3                       | 599+73          | Small Leak     |                                                  |
| 4                       | 613+11          | Air Pocket     | Length of air pocket = 25 feet.                  |

**Table 3. Tool findings summary**

## CONCLUSIONS

Overall, the MRP is performing reasonably well. The internal assessments found very few leaks and air pockets and the external assessments found no evidence of external corrosion and good overall maintenance practices.

Inline leak detection of the entire 101 miles of the MRP Phase 1 was successfully completed with two acoustic tools that were launched from the LNRA Intake Pump Station and retrieved at the O.N. Stevens WTP. This data was evaluated for the presence of leaks and air pockets. The tools identified 2 small leaks which were later determined to originate from leaking air valves and 1 medium leak which was determined to originate from a partially open blowoff valve. An air pocket was also detected by the first tool and not the second which suggests an air pocket was created during tool 1 insertion that was subsequently exhausted through nearby air valves.

Additionally, a failure and emergency repair of a 72-inch diameter section of the MRP provided an opportunity to perform electromagnetic, visual, and sounding evaluations of approximately 1,300 linear feet of the MRP. The evaluations did not find any evidence of wire breaks, pipe distress, cracks, or voids.

A hydraulic assessment was included in the project scope of work and indicated that excessive roughness in some pipe sections has increased to a point where the operational pressure exceeds the design pressure of the pipeline. In response, CCW modified pumping scenarios to reduce pressure at areas of concern and made pump station improvements to provide greater operational flexibility.

This project has ultimately given CCW confidence in the pipeline and provided data on what steps are needed to maintain pipeline reliability. These measures have allowed CCW to increase the flow-rate through the MRP and deliver additional water for the Corpus Christi community.

### Project Accomplishments:

1. Record Setting: Longest free-swimming inline leak inspection performed world-wide.

2. Industry Advancing: Advanced technologies available for municipalities with long-distance pipelines.
3. Improved Pipeline Reliability: Provided the data needed to proactively implement measures to improve reliability.
4. Advanced Operations: CCW and LNRA staff demonstrated a high level of commitment and dedication to the project success worthy of the UIC 2025 Asset Management Project of the Year Award the project received.
5. Collaboration: All stakeholders, including wholesale customers, worked together to get an important project completed.

## REFERENCES

Mary Rhodes Pipeline Desktop Condition Assessment (January 13, 2023). HDR, Engineering



### ABOUT THE AUTHOR

**Jerry Snead II, P.E.**, is an Associate Vice President and HDR's Condition Assessment Lead for TX, OK, AK and LA. Jerry has 27 years of experience and currently focuses on condition assessment, investigation, design, and rehabilitation of municipal pipelines. His involvement in professional society committees, including the ASCE Pressure Pipe Design committee and AWWA Air Release Valve committee, al-

lows him to stay current with pipeline best practices. His involvement with the Underground Construction Technology Association (UCTA) allows him to interact with and seek constructability input from local Contractors to ensure that his projects are constructible.



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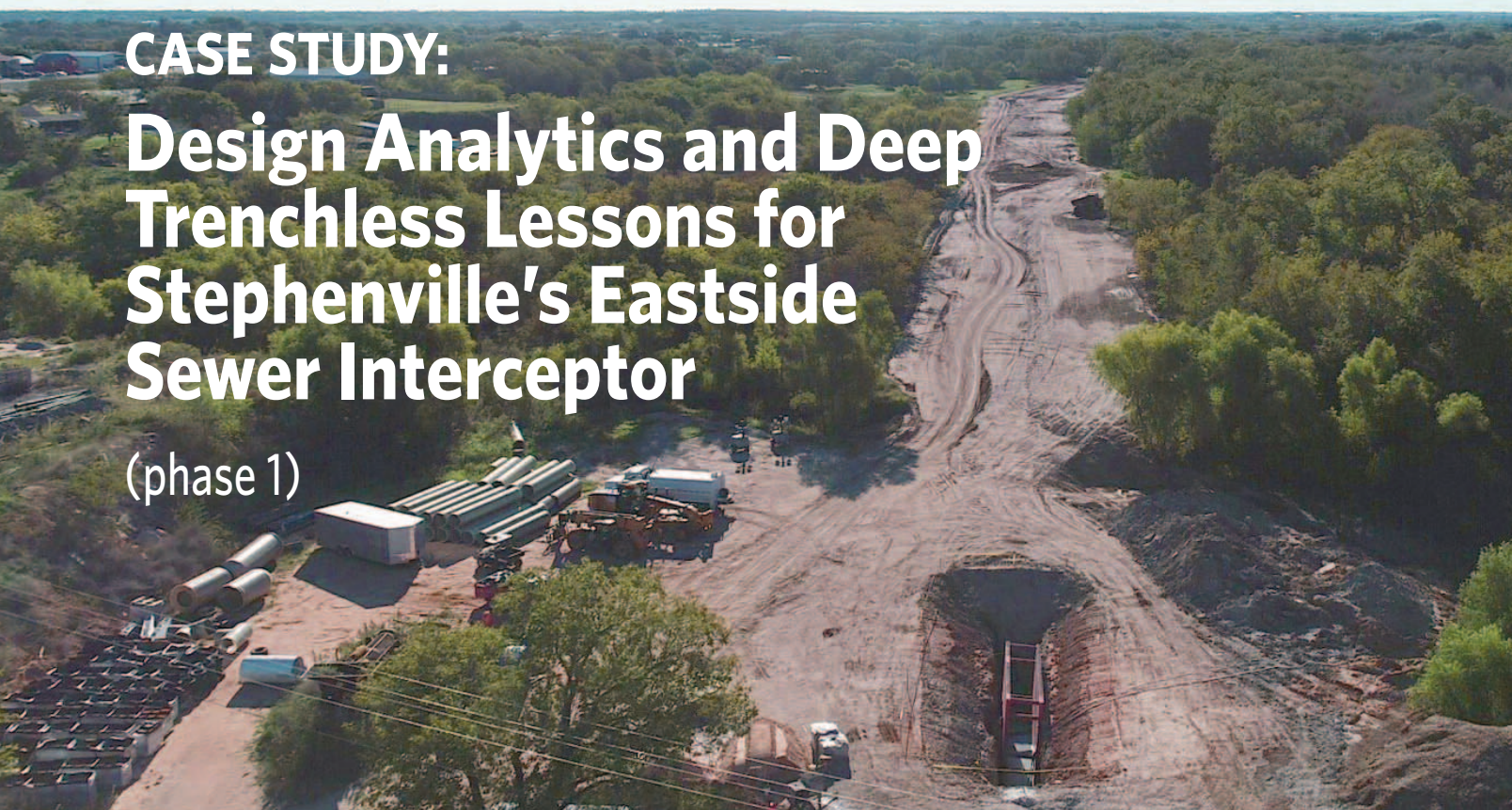
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# CASE STUDY: Design Analytics and Deep Trenchless Lessons for Stephenville's Eastside Sewer Interceptor

(phase 1)



*Figure 1: Aerial photo during construction – the critical crossings required trenchless methods*

By: Landon Allen PE, Parkhill,  
Ryan Kennerly PE, Parkhill,  
Jonathan Dimas, MH Civil  
Constructors, Inc.

## EXECUTIVE SUMMARY

The City of Stephenville delivered Phase 1 of the Eastside Sewer Interceptor to relieve capacity constraints and support long-term growth on the east side of town. The Project was designed by Parkhill and MH Civil Constructors Inc served as the Prime Contractor. The program combined open-cut installation with targeted trenchless crossings under high-risk obstacles, including major roadways, Public Parks, and the Bosque River. Within Phase 1, approximately 15,000 LF of new interceptor was constructed, including large-diameter FRP (30–48 inches) segments and multiple trenchless installations in 54- and 60-inch steel casings. A structured planning approach (GIS-based constraints review, risk-led method screening and adaptive field controls enabled successful delivery despite variable

ground conditions and fluctuating groundwater. A critical crossing and challenge that the project overcame was in the E. Washington Street crossing, where an originally planned auger bore was converted to hand tunneling in response to actual subsurface and access conditions—maintaining alignment control and safety while minimizing surface disruption. Overall outcomes include added conveyance capacity, reduction of safety risk, and improved reliability ahead of the City's growth trajectory.

## PROJECT BACKGROUND

Stephenville's collection system upgrades are tied to long-term service and growth needs on the City's east side and by reducing overflows and bottlenecks. Phase 1 of the Eastside Interceptor provides a new large-diameter backbone, with deep cuts in open-cut segments and trenchless crossings under transportation and environmental constraints. The work follows prior program elements at the Wastewater Treatment plant (WWTP) site (including lift station planning/feasibility) and supports

the City's path from an initial ~9 MGD to an ultimate ~25 MGD system capacity. The interceptor alignment navigates a small-city ROW fabric, parklands and the Bosque river corridor, as well as utilities and traffic. And although open-cut installation was used in a significant portion of the project (Figure 1), critical crossings required trenchless methods to navigate.

### Key owner goals:

- Add backbone conveyance capacity with long service life.
- Minimize community disruption at sensitive crossings.
- Maintain safety and control in deep installations and groundwater conditions.

### Program scale (highlights):

- 15,000 LF new interceptor (majority 30–48 in. FRP).
- Trenchless scope: 1,200 LF Hand tunneling + 1,674 LF Auger boring with 54–60 in. casings.
- Crossings under a river corridor, and state/US highways.



|                                      |                                                                                          |
|--------------------------------------|------------------------------------------------------------------------------------------|
| <b>Project</b>                       | Stephenville's Eastside Sewer Interceptor Program (Phase 1)                              |
| <b>Location</b>                      | Stephenville, TX                                                                         |
| <b>Pipe information</b>              | 15,000 LF of FRP, Pipe Diameter Ranging from 30 to 48 inches and Depths reaching 60 feet |
| <b>Installation Method</b>           | Trenchless Construction (Auger Boring, Hand Tunneling) and open cut excavation           |
| <b>Engineer</b>                      | Parkhill                                                                                 |
| <b>Owner</b>                         | The City of Stephenville                                                                 |
| <b>Contractor</b>                    | MH Civil Constructors Inc.                                                               |
| <b>Trenchless Equipment Utilized</b> | Barbco, Tenchbusch                                                                       |

## DESIGN CONSIDERATIONS

Design Considerations during the feasibility and design phase of this project included:

**1. GIS Constraints.** The design team synthesized available data on topography, floodplain mapping, existing utilities, traffic controls, and geotechnical information into a corridor-wide constraints picture (GIS), (Figure 2). This supported right-sizing the interceptor, setting pit locations, and screening trenchless versus open-cut alternatives where surface impacts would be unacceptable.

**2. Geotechnical and Groundwater.** Anticipated mixed soil condition based on Geotechnical Data Report and a high water-table near the river required conservative shaft support, face stability planning, and annulus grouting approaches. Recognizing residual uncertainty, the team planned for adaptive field decision gates at each deep crossing.

**3. Safety, Access, and MOT.** Deep shafts and tight ROWs near businesses and

roadways drove selection of compact work zones, staged traffic control, and night/low-traffic windows for critical activities. Confined-space protocols, gas monitoring, and alignment verification were specified for trenchless operations.

**4. Hydraulic/service continuity.** Interceptor tie-ins and manhole sequencing were staged to avoid service interruption, bypass capacity and redundancy were identified where needed.

## TECHNICAL APPROACH — AUGER BORING & HAND TUNNELING

Why trenchless here? Trenchless methods were applied at locations where open-cut would have caused unacceptable traffic disruption, environmental impact, or risk to third-party assets. The

goal was to confine impacts to launch/receiving pits while maintaining grade control on a gravity sewer. Typical General Sequence applied to this project as follows, with some adjustments on a segment to segment basis.

### General sequence — Guided Auger Boring (Figure 3):

1. Survey and establish line/grade-excavate and support launch/receiving pits.
2. Install a guide system
3. Advance a cutting head from the launch pit, spoil is conveyed back through the casing.
4. Install steel casing pipe in segments as the bore advances, monitor thrust and line/grade
5. After breakthrough, place carrier pipe within the casing, set spacers and end seals, grout annulus if specified.

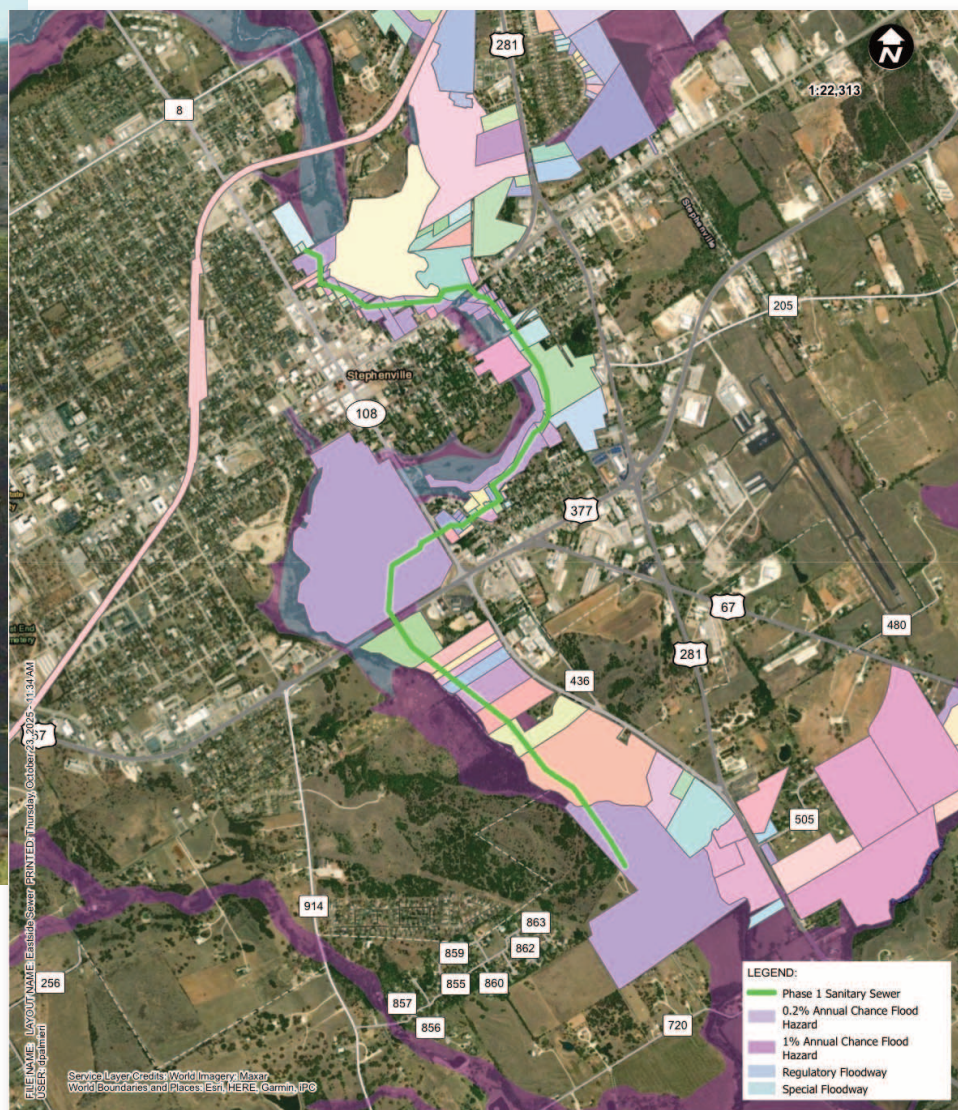


Figure 2: Project Alignment Map





**Figure 3: Guided auger boring offers production and accuracy in competent, predictable soils**

#### **General sequence — Hand Tunneling (with shield):**

1. Construct and support pits, set a tunneling shield sized to the design casing.
2. Excavate at the face in short rounds under the protection of the shield, hand tools/mechanical assists as allowed by ground.
3. Install/advance casing segments behind the shield, maintain line/grade using survey controls (Figure 4).
4. Manage groundwater with localized dewatering and face control, install temporary breasting as needed.
5. Complete breakthrough, install carrier pipe and seals, verify alignment/tolerances.

Guided auger boring offers production and accuracy in competent, predictable soils, hand tunneling, while slower, affords greater flexibility and face control in variable or unstable formations and in extremely constrained work zones.

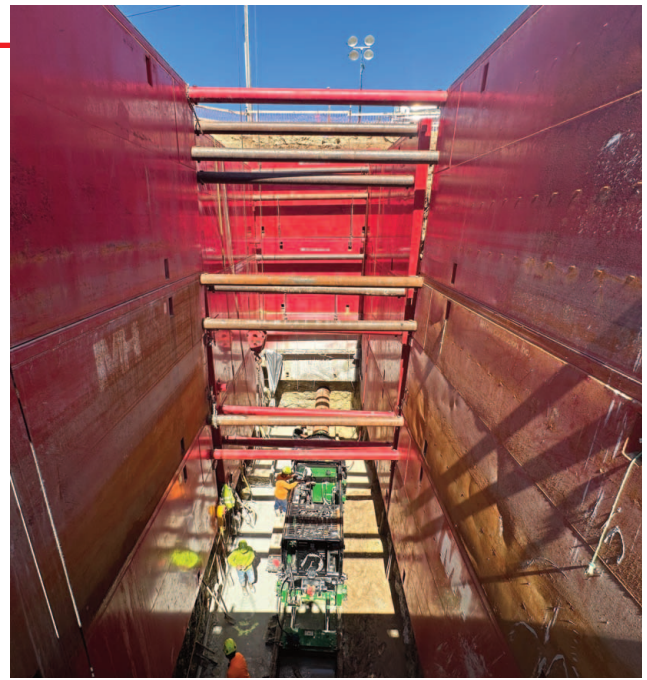
### **CONSTRUCTION & CHALLENGES**

One of significant challenges during this project was the Crossing at E. Washington Street, this was initially designed for guided auger boring to pass beneath an active roadway with minimal surface disruption and to maintain a tight grade en-



**Figure 4: Hand tunneling provides flexibility and face control in variable or unstable formations**





**Figures 5 and 6: Deep shafts required engineered trench boxes/shoring, and robust safety protocols**

velope for the gravity carrier. However, during pit excavation and probe checks, crews encountered ground variability and groundwater levels outside the anticipated range, coupled with tighter-than-expected utility clearances and limited work-window constraints at the surface. These factors increased the risk of face instability and loss of line/grade control if a conventional auger bore proceeded as planned. The team executed a method change to hand tunneling using a shield appropriate to the design casing diameter. This allowed shorter, controlled excavation rounds with immediate support, improved face control, and fine alignment adjustments. Continuous survey checks and conservative advance limits (short strokes) were used to maintain grade. Localized dewatering and breasting were applied to stabilize the face, loads and settlement were monitored to protect the roadway and nearby utilities.

The crossing was completed within the available window without surface settlement or utility impact. Although production was slower than an auger bore, the switch controlled risk and preserved quality objectives (alignment, carrier placement, and seal integrity). The lesson reinforced the project's decision-gate approach:

Design the bore & verify the geotechnical data but be prepared to pivot to other trenchless methodology (e.g. hand

tunneling) where conditions demand.

Throughout the corridor, the trenchless scope comprised multiple Auger boring and hand-tunneling installations totaling approximately 2,300 linear feet, constructed from deep shafts up to ~60 feet with individual drives reaching ~600 feet. Alignment tolerances were maintained to gravity-sewer standards. Following casing breakthrough, the carrier pipe was installed with spacers and end seals, and the annulus was grouted in accordance with the specifications; post-installation CCTV verified line/grade and joint integrity. A significant portion of the deep shafts required engineered trench boxes/shoring (see Figures 5 and 6). Robust temporary-works planning is imperative for excavations of this depth, including specifically designed shoring, safe access/egress, gas monitoring, and groundwater control.

## CONCLUSION

The Eastside Sewer Interceptor Phase 1 demonstrates how a constraints-led design, coupled with adaptive trenchless execution, can deliver major capacity in a small-city setting while minimizing disruption at critical crossings. The E. Washington Street pivot—from auger boring to hand tunneling—illustrates prudent risk management when observed field conditions diverge from assumptions.

## LESSONS LEARNED

- Get sufficient Geotechnical Data early specially borings data, for deep crossings it is prudent to add targeted probe holes/test pits and explicit contingency allowances. Even with a robust program, assume variability—especially near river corridors—and pre-plan method-change triggers.



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- Engineer decision gates. Pre-define triggers for switching methods (e.g., groundwater thresholds, loss of face stability, utility clearances) to avoid re-active changes.
- Select for control, not just speed. Hand tunneling can be the safer, more controllable option in mixed or unstable ground—even when it reduces production.
- Plan pits as systems. Shaft support, groundwater control, survey control, and spoil/traffic logistics determine trenchless success as much as the cutting face.
- Neutralize community impacts. Use trenchless at the highest-impact interfaces (highways/public parks) and confine disturbance to pits and staging zones.
- MH Civil noted that for trenchless drives approaching or exceeding ~300 feet, hand tunneling may be preferable to guided auger boring due to the higher likelihood of unanticipated soil variability and less predictable ground forces over longer lengths.

## ABOUT THE AUTHORS:



**Landon Allen, PE** is a Civil Engineer who specializes in Water Resources Engineering at Parkhill. He is an Associate at Parkhill who is an active member of TSPE, and has 10+ years of experience in the design, installation and replacement of buried water and wastewater pipelines. He was the Project Manager for this Graham Water Supply Pipeline project and graduated with a Bachelor's in Civil Engineering from Texas Tech University.



**Ryan Kennerly, PE, DBIA** has 15+ years of experience in the Civil Engineering industry. As a Principal within Parkhill's Water Resources Sector, his knowledge in the dynamic realms of fast-track Design-Build and CMAR industries enables him to effectively cater to the region's extensive water supply projects. He remains actively engaged with the local branches of ASCE, TSPE, TWUA, and DBIA, further enhancing his professional network and contributions to the industry.



**Jonathan Dimas** is a Senior Project Manager at MH Civil Constructors, Inc. with a Bachelor of Science in Civil Engineering from Texas Tech University. Since 2018, he has delivered a wide range of municipal water infrastructure projects, including water distribution systems, sanitary sewer improvements, drainage systems, transmission mains, force mains, and water and wastewater treatment plant construction. He leads multidisciplinary teams through all phases of construction and is committed to delivering safe, high-quality, and cost-effective infrastructure that supports the long-term needs of the communities he serves.



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# CUIRE Update: Advancing Research and Education in Underground Infrastructure

Compiled by: Nilima Parihar, CUIRE Graduate Research Assistant

The Center for Underground Infrastructure Research and Education (CUIRE) at the University of Texas at Arlington (UTA) has been actively involved in advancing technologies such as trenchless rehabilitation methods, underground infrastructure renewal, and supporting government and industry in innovation within this field. CUIRE has been assisting the Trenchless Technology & Pipe Conference (TTP) for the South-Central Chapter of the NASTT (SC-NASTT) in organizing the annual conference. CUIRE also plays a significant role in the Underground Infrastructure Con-

struction (UIC) conference by organizing CUIRE Schools every year.

CUIRE is involved in groundbreaking research, with over 16 PhD students actively contributing to its projects. Recent research endeavors include Water Research Foundation (WRF) projects "WRF 5239 Optimizing Sensor Networks and Advanced Sensing Techniques," "WRF 5292 - Pipeline Infrastructure Replacement Costs Guide," and

"WRF 5191 - Innovative Technologies to Improve Monitoring of Water Assets." Other projects include Development

of Innovative Pipeline Renewal Methods Using Polymeric Spray-Applied Pipe Linings (SAPLs) for High-pressure Pipeline Applications and Testing of Plastic Chambers and Modules for Stormwater Retentions under Truck Loading. In addition, CUIRE is working on two other WRF projects (5195 and 5216) on air monitoring of the Cured-in-Place-Pipe (CIPP) installations, with different types of resins and curing methods. By driving innovation and providing practical applications, these projects are helping to address critical infrastructure challenges in communities nationwide.



## 1 ADVANCEMENT IN SPRAY APPLIED PIPE LINING

By: Kawalpreet Kaur, Ehsan Rajaie, Paria Hamidzadeh and Mo Najafi

### Full-scale Short-Term Hole Spanning Testing

A short-term hole-spanning testing was performed at CUIRE for a 30-inch diameter host pipe with hole-spanning sizes of 4 and 6 inches, and the length of these pipe samples was 3 feet. The 6-foot spigot ends were used at both ends of the pipe samples to create a fully enclosed assembly with a total length of 15 feet. The liner thickness for the pipe sample with 4 and 6 inch holes was designed using a hole-spanning design equation provided in the AWWA Structural Classification of Lining Systems (2019). Figure 1 shows the experimental setup of hole-spanning testing at CUIRE.

In addition to the experimental study, Finite Element Modeling (FEM) was utilized to simulate and analyze the behavior of the SAPL liner under hydrostatic pressure in a hole spanning corroded scenarios. A three-dimensional (3D) visual of the FE model was created to show strain distributions, deformation patterns, and stress concentration zones at the hole spanning liner system. This visualization helps identify the areas most affected by the pressure. Figure 2 illustrates the FEM model geometry and meshing of a 4-inch hole spanning pipe sample. Figure 3 (left) shows the maximum strain

distribution in the hoop direction for a 4-inch hole spanning pipe sample. Figure 3 (right) represents the localized maximum strain distribution around the hole spanning in the hoop direction for a 4-inch hole spanning pipe sample.

The FEM results confirmed the experimental findings, showing that the liner can withstand hydrostatic pressures of 500 psi without cracking or failure. The combination of experimental and FEM data offers a solid foundation for improving design standards and increasing the reliability of SAPL systems under high-pressure conditions.

### Full-scale External Buckling Testing

Evaluating the buckling effects caused by groundwater hydrostatic pressure on polymeric SAPL liners due to water within the annular space between the liner and the host pipe is an important criterion for the AWWA Class III structural classification of the lining system. Figure 4 shows the external buckling test setup.

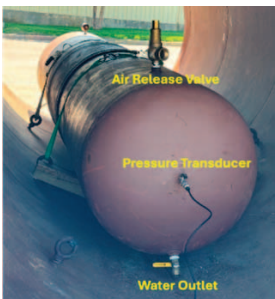


Figure 1. Experimental Setup for Hole Spanning Testing

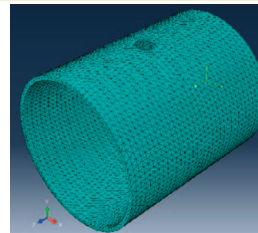


Figure 2. FEM Model Geometry

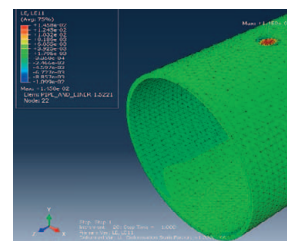


Figure 3. Maximum Strain Distribution in Hoop Directions (L) and Localized Maximum Strain Distribution Around (R)

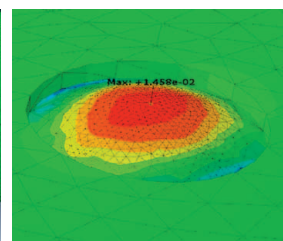
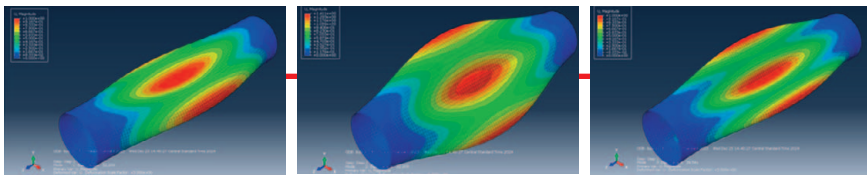


Figure 4. Experimental Setup for External Buckling Testing





**Figure 5. Buckling Modes of Liner Pipe Sample: (Left) First Mode, (Middle) Second Mode, and (Right) Third Mode**

FEM was an important part of the external hydrostatic buckling test study. It performed as a strong tool to validate experimental results and provide additional insights into the buckling behavior of SAPL under external hydrostatic pressure. The integration of FEM allowed for detailed analysis of material behavior, geometric imperfections, and structural failure modes that are challenging to capture through experimental testing alone. Three-dimensional (3D) FEM was employed using ABAQUS software to simulate and analyze the critical buckling pressures and deformation patterns of SAPLs. Figure 5 shows the different buckling modes of the liner pipe sample under external hydrostatic pressure.



**Figure 6. Polymeric Lined Pipe Sample**

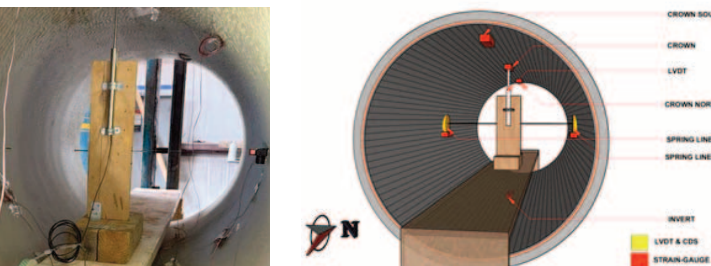
### Three Edge Bearing Test for SAPL Liner for Application in Culverts and Gravity Pipes

This project focuses on evaluating the structural performance of polymer-lined reinforced concrete (RC) pipes using the Three-Edge Bearing Test method as outlined in ASTM C497 – 2020. The test assesses how different lining thicknesses of the polymer lining system affect the RC pipes' load-bearing capacity and crack resistance under

applied vertical loads. This research supports collaborative efforts between CUIRE, the City of Dallas, PPG Protective & Marine Coatings, and Thompson Pipe Group. The test objectives were:

1. To determine whether the polymeric lining enhances structural performance, specifically the pipe's resistance to initial cracking and its ultimate load capacity, and,
2. To provide guidance on material selection and lining thickness decisions for future infrastructure applications involving reinforced concrete pipelines.

A total of seven 36-inch diameter RC pipes, each 8 feet in length, were used for testing. One pipe serves as a control pipe sample, while the remaining six were internally lined with a protective polymeric Spray Applied Pipe Lining (SAPL) at three different thicknesses: 0.25, 0.5 and 1 inch. (two pipes per SAPL thickness). Figure 6 represents a polymeric-lined RC pipe. The lining system was applied using a spin-cast machine to achieve the required thickness. During the test, different sets of data, such as load applied with the three-edge bearing test machine, deflection at the crown of the lined pipe, and strain data at different critical points of the lined pipe, were collected and analyzed to determine the structural performance of the lined pipes. Figure 7 illustrates the instrumentation setup in a polymeric-lined pipe. Figure 8 represents the pipe samples under loading conditions.



**Figure 7. Instrumentation Setup in Polymeric Lined Pipe Sample**

The results demonstrated that the polymer lining significantly enhances structural performance, particularly the pipe's resistance to initial cracking and its ultimate load-bearing capacity.

The ultimate load capacity of the pipe sample with a liner system was increased at varied thicknesses of the lining system provided. Therefore, the SAPL lining installation increases the load capacity of the RC pipe samples. These findings not only validate the improvement in the structural capacity of RC pipes lined with a polymeric system but also provide valuable data to inform future improvements and innovations in the SAPL rehabilitation process for underground infrastructure and pipelines.



**Figure 8. Polymeric-lined Pipe under Three-Edge Bearing Loading Condition**

2

## CIPP SOLUTION REDUCES ENVIRONMENTAL IMPACTS

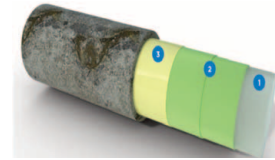
By: Parisa Beigvand, Salar Bavili Nezhad, Sevda Jannatdoust, and Mo Najafi

Many resins used in CIPP contain styrene, a Volatile Organic compound (VOC) that can evaporate into the air during the tube installation and especially during the curing process. While low levels may not be harmful, high exposure can affect workers and even people nearby. That's why it's crucial to find better ways to manage or even prevent these emissions. Communities are right to ask: Is there a cleaner way to fix our pipes?

### What Makes Low-Emission Liners Different?

In this category, EnviroCure® is a special liner made by United Felts (Figure 9). What makes it unique is its outer polymer coating. This layer acts like a shield, preventing styrene from escaping into the air while the tube is being installed and cured at high temperatures. The EnviroCure® liner is installed just like traditional liners, allowing contractors to use the same CIPP equipment and process with no additional training or equipment required.

To evaluate this innovative liner, a comprehensive air quality monitoring plan was implemented, incorporating both baseline and operational air sampling. Real-time monitoring was conducted using Photoionization Detectors (PIDs), while average concentrations of VOCs were measured using Summa canisters and sorbent tubes.



**Figure 9. EnviroCure® Components**

### Results and Discussions

The highest real-time monitoring result was just 0.99 parts per million (ppm). Styrene levels in the air samples, as shown in Table 1, stayed way below the safety limits set by the EPA, NIOSH, and OSHA. This means a new type of liner with an extra barrier coating system that effectively traps styrene inside the tube, protecting both the public and the workers.

**Table 1. Canister Results: Styrene Concentration Above Termination**

| Enviro-Cure® Tampa, FL | Regular CIPP Steam Cure Forney, TX | Regular CIPP Hot Water Cure Garland, TX |
|------------------------|------------------------------------|-----------------------------------------|
| 5.65 ppm*              | 6.12 ppm*                          | 25.5 ppm*                               |

\*ppm: parts per million

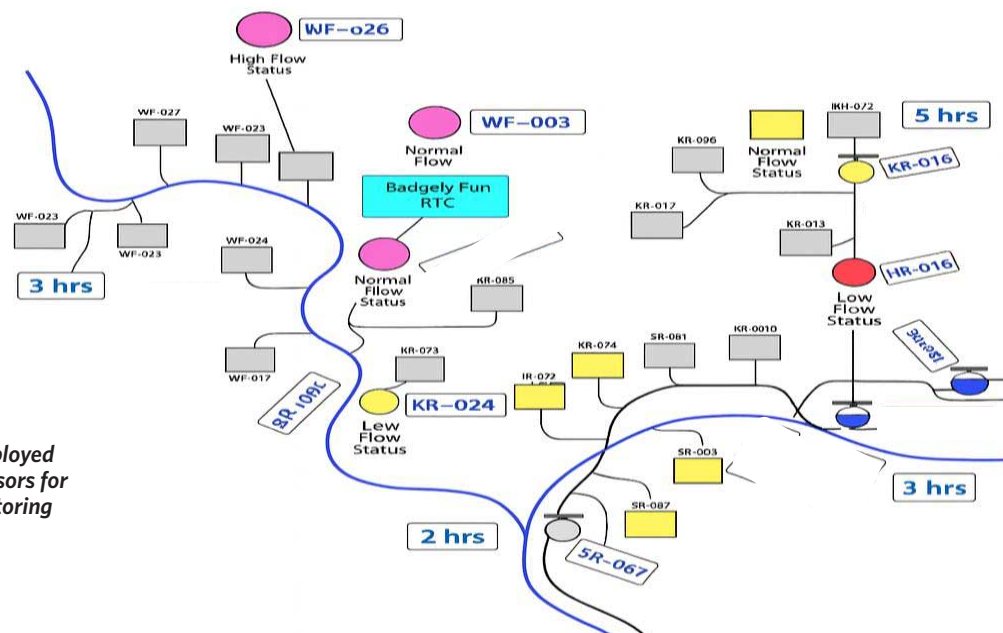


Figure 10. Field-deployed Level and Flow Sensors for Smart Sewer Monitoring

## OPTIMIZING SENSOR NETWORKS AND ADVANCED SENSING TECHNIQUES FOR ENHANCED COLLECTION SYSTEMS MANAGEMENT

3

By: Mo Najafi and Marjan Moradi

Sensors deployed throughout wastewater and stormwater collection systems play a critical role in monitoring physical, hydraulic, and environmental conditions. These sensors include flow meters, depth and pressure sensors, temperature and acoustic devices, as well as water quality probes that measure parameters such as pH, turbidity, chlorine, and dissolved oxygen. Strategically installed at key locations—such as manholes, interceptors, and pump stations—they enable continuous, real-time observation of system performance. As shown conceptually in Figure 10, field-deployed level and flow sensors installed within sewer structures provide utilities with continuous depth and velocity measurements. These devices stream real-time data into supervisory control and data acquisition (SCADA) systems, where they are used not only for daily operational management but also for regulatory reporting, planning, and early detection of overflows and blockages. By providing ongoing insight into system behavior, these sensor networks support more proactive and informed infrastructure management.

The continuous data generated by these sensors offers insights that transform utility operations. With real-time feedback, utilities can identify performance issues early, reduce emergency responses, and optimize maintenance planning. This results in lower operational costs, improved compliance, and enhanced environmental and public health protection. The integration of this data into analytics platforms allows for predictive modeling, anomaly detection, and performance forecasting—empowering utilities to shift toward proactive management approaches.

A wide range of stakeholders benefit from real-time monitoring and intelligent decision-support systems. Utility operators leverage sensor data for daily operations and real-time control,

while engineers and planners rely on long-term data trends for asset management and capital improvement planning. Information collected through SCADA systems, remote telemetry units, and cloud-based platforms is analyzed using artificial intelligence and machine learning models. These tools generate intuitive outputs—such as intelligent dashboards—that deliver actionable insights, alerts, and operational recommendations tailored to utility needs. As shown in Figure 11, advanced sensor networks gather and transmit data from many points across a combined sewer system. They combine inputs such as level, flow, water quality, and rainfall, then send this information to decision-support platforms. There, algorithms and control systems assess upstream and downstream conditions, optimize flows, and coordinate responses across the network in real time. These systems support a shift from reactive to proactive management by enabling predictive analytics and autonomous optimization.

Through scalable optimization techniques and AI-based forecasting tools, the research aims to develop practical solutions adaptable to utilities of varying sizes and system complexities. This effort is supported by participating organizations that contribute operational insights, including American Water, Great Lakes Water Authority (GLWA), Loudoun Water, Orange County Government, South Platte Renew, Trinity River Authority of Texas (TRA), Underground Infrastructure Magazine, WaterOne, Anglian Water, and WSSC Water. Project outcomes will be published in late 2026 and will include a guidance document, case studies, technical tools, and outreach materials. These will be shared through workshops, conferences, and industry platforms to help utilities transition toward smarter infrastructure management. The research team also invites utilities, municipalities, and industry professionals to participate in a survey on sensor deployment, data analytics, and AI integration. Insights collected will directly inform the guidance document and support the development of data-driven management strategies.

To participate, please contact Ms. Marjan Moradi at [cuire@uta.edu](mailto:cuire@uta.edu)



## 4

## PIPELINE INFRASTRUCTURE REPLACEMENT COSTS GUIDE

By: Paria Hamidzadeh, Marjan Moradi and Mo Najafi

Water utilities across North America are under growing pressure to replace aging pipelines that were mostly installed in the mid-20th century. These pipelines are now reaching the end of their service life, resulting in more frequent failures and increasing maintenance costs. However, many utilities struggle with planning because cost data is either outdated, overly general, or doesn't reflect real-world conditions. The Pipeline Infrastructure Replacement Costs Guide is being developed to address this gap by offering practical, accurate, and easy-to-use information that utilities can rely on when making decisions about pipeline renewal and replacement.

This guide focuses on estimating direct construction costs including labor, materials, and equipment, for commonly used methods. These include traditional open-cut replacement and a range of trenchless technologies like cured-in-place pipe (CIPP), pipe bursting, horizontal directional drilling (HDD), spray-applied pipe lining (SAPL), and jack and bore. The goal is to provide water utilities with clear and realistic cost data that they can use during the early planning stages of capital projects. The guide is being designed to be regionally adaptable, meaning that users will be able to adjust cost estimates based on local conditions, inflation, project size, and site-specific characteristics. While it doesn't calculate social or environmental costs directly, these will be discussed to help utilities understand the broader impacts of each method.

*This guide focuses on estimating direct construction costs including labor, materials, and equipment, for commonly used methods.*

One of the biggest benefits of this project is that it uses real bid data and change orders collected from utilities across North America. This helps ensure that the cost curves are grounded in actual market conditions. The project team will use modeling tools such as regression analysis and artificial neural networks to develop predictive cost models. These models will make it easier for utilities to estimate costs based on factors like pipe diameter, depth, and soil type. This is especially useful in avoiding cost overruns and improving long-term planning.

The guide will serve as a practical tool for utility managers, engineers, and planners. It can help them compare different replacement methods, build reliable budgets, and support funding requests. It also aims to reduce uncertainty during the planning phase and promote the use of trenchless technologies, which are often less disruptive and more cost-effective than open-cut methods, especially in urban areas.

To make sure the guide stays useful over time, it will be built as a "living" tool. A web-based version will be developed and maintained by the Center for Underground Infrastructure Research and Education (CUIRE) at the University of Texas at Arlington, in part-

nership with the Water Research Foundation (WRF). This online version will allow for regular updates as new cost data becomes available. That way, utilities will always have access to the most current and relevant information. The project began in 2025 and is scheduled to run for 18 months. The approximate publication date for the guide is early 2027. All utilities, agencies, designers, consultants, contractors are encouraged to participate in this project.

For more information, please contact Ms. Paria Hamidzadeh at [CUIRE@UTA.EDU](mailto:CUIRE@UTA.EDU) or 817-272-9177.

## 5

## SEWER PIPE CONDITION EVALUATION USING ENSEMBLE MACHINE LEARNING

By: Mahnaz Rouhi, Mo Njafi, Vinayak Kaushal, and Jin-Zhu Yu

Aging sewer infrastructure and rapid urbanization have placed unprecedented strain on municipal networks, often leading to costly, reactive maintenance. This research proposes a data-driven, ensemble machine learning framework that integrates Decision Trees, K-Nearest Neighbors (KNN), Logistic Regression, and Support Vector Machines (SVM) to predict the condition of sewer pipes with high accuracy. Trained on over 4,800 historical inspection records including both structural and environmental factors, our model achieved 74.2 percent accuracy and a 70.6 percent F1 score, outperforming standalone classifiers.

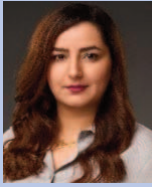
The practical implications for the industry are significant. The ensemble model enables proactive maintenance planning by accurately identifying deteriorating pipes before failures occur. With a recall rate of 74.2 percent, municipalities can reduce emergency repair incidents and optimize their resource allocation potentially decreasing unnecessary inspections by over 30 percent. Maintenance activities can also be prioritized using predicted condition ratings, allowing infrastructure managers to make more strategic investment decisions and prevent service disruptions.

This study demonstrates how artificial intelligence can address real-world challenges in civil infrastructure. By leveraging a soft-voting ensemble approach and applying robust preprocessing techniques like Min-Max scaling and one-hot encoding, the framework adapts to the complex, nonlinear patterns found in sewer system data. A simulated pilot study further validated the model's integration with real-time sensor inputs, underscoring its scalability for smart infrastructure management.

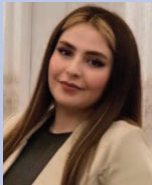
Looking ahead, the research lays the groundwork for more advanced, resilient urban systems. Future enhancements will incorporate real-time monitoring, transfer learning, and explainable AI to further improve accuracy, transparency, and adoption. Ultimately, this work offers a transformative path forward for municipalities seeking to modernize their asset management strategies through machine learning.

*A transformative path forward for municipalities seeking to modernize their asset management strategies through machine learning.*

## ABOUT THE AUTHORS:



**Parisa Beigvand** is a Ph.D. candidate actively involved in research projects funded by the Water Research Foundation (WRF), focusing on air emissions from Cured-in-Place Pipe (CIPP) rehabilitation. Her work aims to better understand and mitigate environmental impacts associated with trenchless pipeline renewal technologies.



**Paria Hamidzadeh** is a Ph.D. candidate in Civil Engineering at the University of Texas at Arlington and a researcher at CUIRE. Her research focuses on trenchless technology, pipeline renewal, and rehabilitation. With a 4.0 GPA, she has been involved in multiple projects related to the design, testing, and evaluation of manufactured-in-place composite pipe (MICP) and sprayed-applied pipe linings (SAPL). She is currently contributing to the WRF 5292 project, where she is developing a locally adoptable cost estimation guide for pipeline infrastructure renewal and replacement.



**Sevda Jannatdoust** is a Ph.D. candidate conducting research supported by the Water Research Foundation (projects 5216 and 5195), focusing on air emissions from Cured-in-Place Pipe (CIPP) rehabilitation. She analyzes data from these projects to understand the environmental impacts of trenchless pipeline renewal and develop strategies for more sustainable infrastructure solutions.



Dr. **Kawalpreet Kaur**, Ph.D., is a postdoctoral research associate with a research interest in trenchless technology, pipeline rehabilitation, and asset management. Her current research focuses on designing, testing, and evaluating spray-applied pipe linings (SAPL) and underground stormwater storage infrastructure materials. She conducts various experimental tests to assess their suitability for field applications.



Dr. **Vinayak (Vinny) Kaushal** is an Associate Professor and Graduate Advisor of Construction Engineering and Management in the Department of Civil Engineering at UTA. His research focuses on sustainable underground infrastructure, trenchless pipeline technologies, and AI-driven asset management. He has co-authored over 110 peer-reviewed publications and served as Co-PI on more than \$1.8 million in research grants at CUIRE. Dr. Kaushal is the author of *Construction Mechanics: Concepts and Applications* (Cognella, 2025) and a licensed Professional Engineer in Texas.



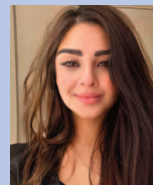
**Marjan Moradi** is a Ph.D. candidate in Civil Engineering at UT Arlington and a researcher at CUIRE, specializing in sustainable infrastructure and AI-driven sensor networks. With a 4.0 GPA and a background in architecture, urban design, planning, policy, and civil construction management, she contributes to WRF Projects 5239 and 5292, advancing smart utility management.



**Salar Bavili Nezhad**, Ph.D., M.ASCE, is a faculty member in the Department of Engineering Technology at Wayne State University and a former CUIRE student. He has received multiple honors, including the NASTT Student Scholarship (2023–2025) and ASCE/UESI Pipelines Conference Student Scholarship (2025). His research focuses on trenchless technology and air quality monitoring for CIPP projects, supported by DC Water and the Water Research Foundation.



**Ehsan Rajaie**, a Ph.D. candidate at the University of Texas at Arlington and infrastructure engineering assistant at Tarrant Regional Water District, has received the prestigious 2024 AWWA Scholarship, selected from over 800 applicants across the US and Canada. He is also the recipient of the 2025 NASTT Argent Memorial Award and the Outstanding Ph.D. Student Award in 2023 and 2025 from UTA's Civil Engineering Department.



**Mahnaz Rouhi**, is a Ph.D. candidate, S.M.ASCE, and Graduate Research and Teaching Assistant at the Center for Underground Infrastructure Research and Education (CUIRE) at The University of Texas at Arlington. Her research focuses on developing machine learning frameworks for sewer pipe condition assessment and risk-based asset management. With a background in chemistry, she is also interested in water treatment and sustainable infrastructure. Mahnaz has authored several papers and a proposal for the Water Research Foundation (WRF) and has presented her work at multiple ASCE/UESI conferences.



Dr. **Jinzhu Yu** is an Assistant Professor of Civil Engineering at UT Arlington, with courtesy appointments in Computer Science and Industrial, Manufacturing & Systems Engineering. He earned his Ph.D. in Systems Engineering from Vanderbilt University and completed postdoctoral work at Rensselaer Polytechnic Institute. His research focuses on resilient and smart infrastructure systems, covering resilience, risk and reliability analysis, disaster management, and system optimization. He is a recipient of the University of Texas System Rising STARS Award.

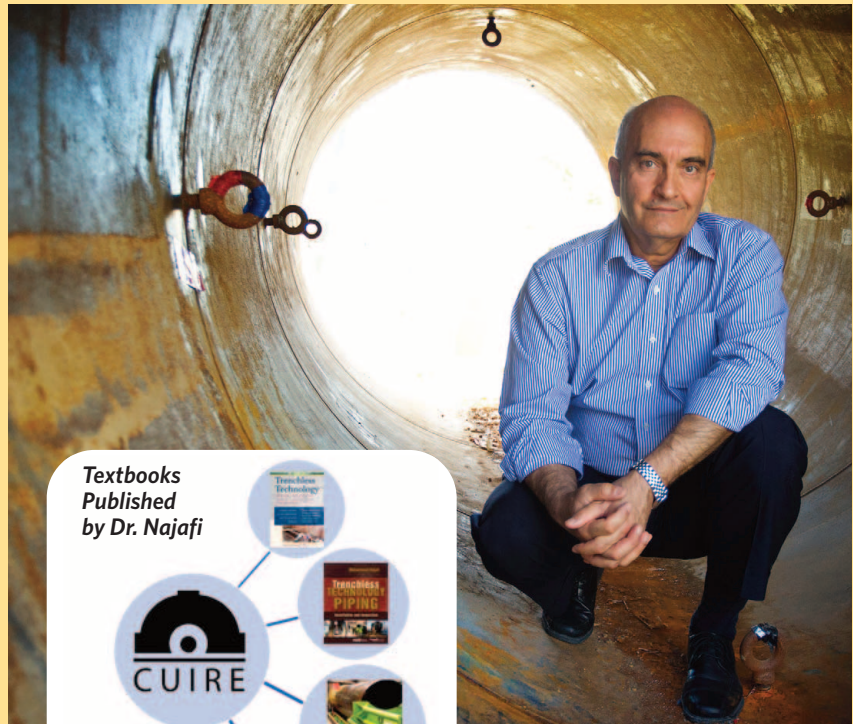


## CUIRE Director Dr. Mo Najafi Recognized by Texas Tech University as Distinguished Alumnus

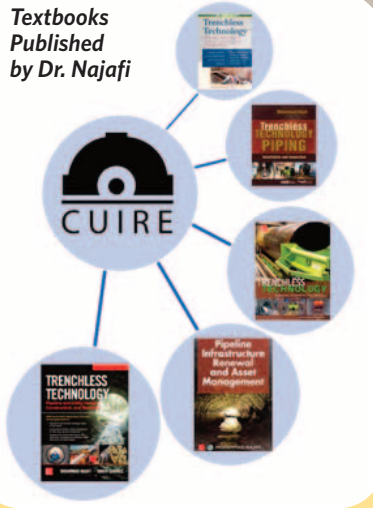
The Texas Tech's Civil, Environmental, and Construction Engineering (CECE) Department proudly highlights the remarkable contributions of Dr. Mohammad "Mo" Najafi, a distinguished alumnus whose work has shaped the trenchless technology industry.

Dr. Najafi earned his bachelor's degree in civil engineering from Texas Tech University in 1976, setting the foundation for an illustrious career in research, education, and industry advancements. With a deep-rooted passion for construction and infrastructure, Dr. Najafi pursued higher education, eventually obtaining his Ph.D. and becoming a professor of civil engineering at the University of Texas at Arlington (UTA).

Throughout his career, Dr. Najafi has made significant contributions to the development and promotion of trenchless technology. Trenchless technology is a construction method that installs or repairs underground infrastructure without digging up the surface. It's used to install or replace pipelines, gas lines, sewer systems, and more. As the founder and director of the Center for Underground Infrastructure Research and Education (CUIRE), he has played a crucial role in advancing research and fostering industry partnerships. His efforts have helped establish leading trenchless technology centers, including the North American Society for Trenchless Technology (NASTT) student chapter and the Trenchless Technology Center (TTC).



**Textbooks  
Published  
by Dr. Najafi**



In addition to his academic achievements, Dr. Najafi is a prolific author, having written some of the most influential books on trenchless technologies. His works, including Trenchless Technology: Pipeline and Utility Design, Construction, and Renewal, serve as essential references for

engineers, researchers, and students alike. His leadership in professional organizations, including ASCE and UESI, further underscores his commitment to advancing civil engineering practices.

Dr. Najafi's journey exemplifies the impact of a Texas Tech education, inspiring future engineers to push boundaries and lead in their respective fields. The CECE Department celebrates his achievements and contributions to the industry, reinforcing the department's commitment to fostering leaders in civil engineering.

— "Wreck 'Em, Dr. Najafi!"



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