TRENCHLESS

FOR GAS INFRASTRUCTURE

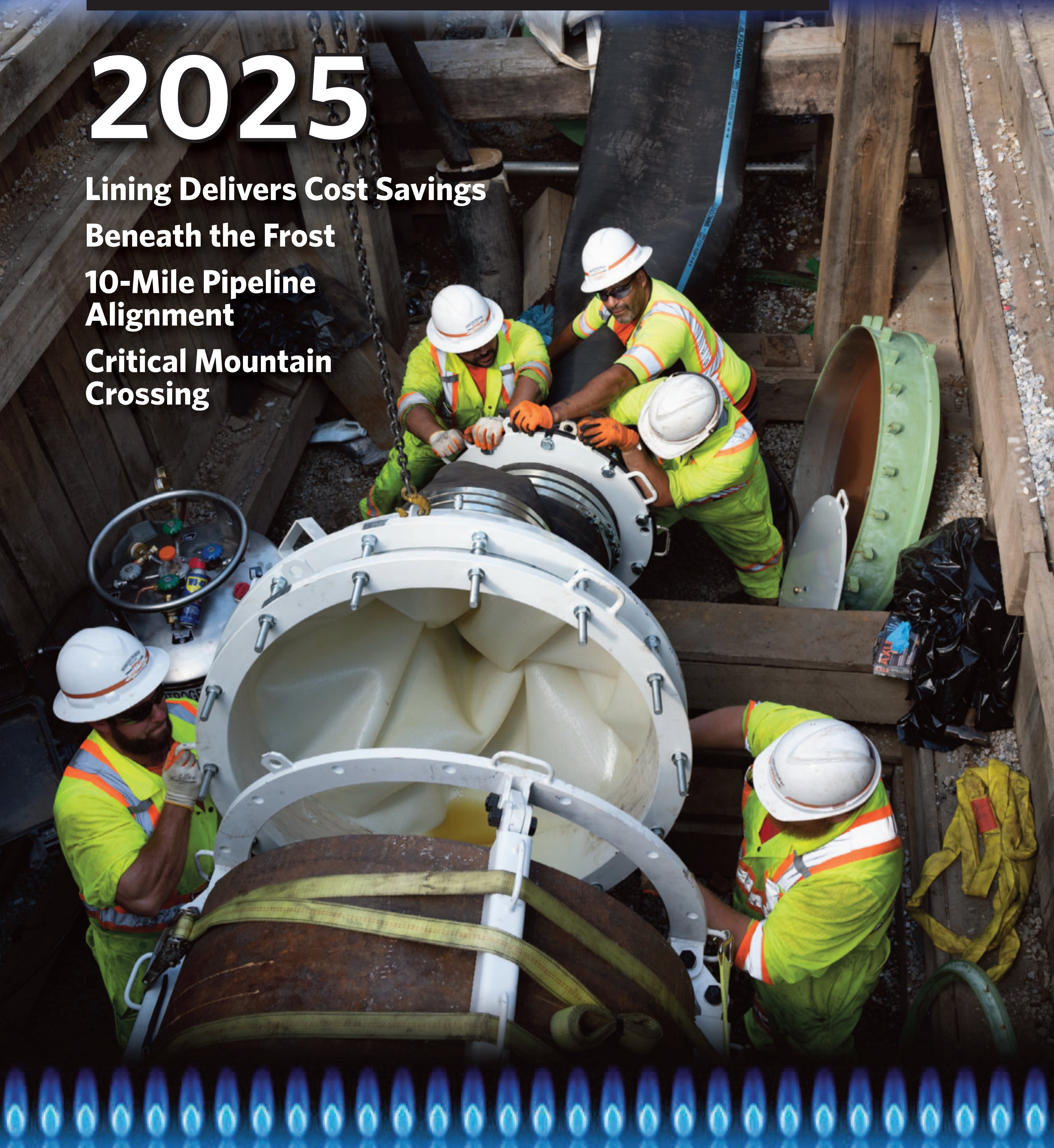
2025

Lining Delivers Cost Savings

Beneath the Frost

10-Mile Pipeline Alignment

Critical Mountain Crossing



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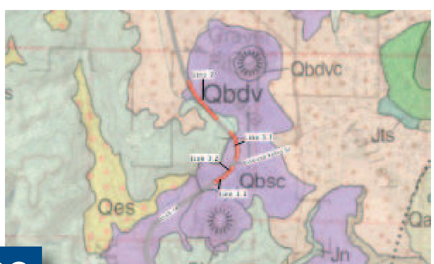

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MESSAGE FROM NASTT CHAIR

Greg Tippett, P.Eng, NASTT Board Chair

Greetings Members and Industry Partners

In an era where infrastructure demands continue to rise and public safety remains paramount, trenchless technology has never been more critical. As Chair of NASTT, I am proud to witness how our industry continues to lead the way—not only in innovation but in fostering safer work environments and communities. Trenchless methods are not just efficient alternatives to traditional excavation—they are vital tools in reducing accidents, enhancing worker safety, and protecting underground infrastructure.

One of the most compelling advantages of trenchless technology is its inherent ability to minimize disruption. With fewer open trenches and less surface excavation, there is a significant reduction in the risks associated with construction zones. Traffic incidents, pedestrian hazards, and utility strikes are all dramatically decreased when trenchless methods are employed. Techniques for both new installations and rehabilitation such as Horizontal Directional Drilling (HDD) and Cured-In-Place Pipe (CIPP) are leading the charge, offering robust, sustainable solutions while placing safety front and center.

A critical example of this is the prevention of cross-bores—an underground safety threat that has become increasingly recognized. Cross-bores, where new utility lines inadvertently intersect existing ones, particularly gas lines, can pose catastrophic dangers. Trenchless methods, when applied correctly and with thorough planning, significantly reduce this risk. This is why we must prioritize education and adherence to best practices.

To that end, I strongly encourage all industry professionals—whether new to trenchless or seasoned experts—to take full advantage of NASTT's Good Practices Courses, particularly in HDD and CIPP. These courses are designed by industry leaders and provide the foundational knowledge necessary to execute trenchless projects safely and successfully. They cover everything from planning and design to risk mitigation and quality assurance. Participants leave with a comprehensive understanding of how to avoid costly mistakes and, more importantly, how to keep crews and the public safe.

Thank you for your commitment to safety, excellence, and the advancement of trenchless technology.

NEW HEIGHTS. UNDER GROUND.

Both NASTT's HDD Good Practices Course and CIPP Good Practices Course have been recently updated with the latest innovations and technologies, and both are invaluable tools for advancing not just skills but safety cultures within organizations. Learn more about our upcoming courses being offered virtually as well as in person on our website at nastt.org/training/upcoming-events.

Additionally, I invite everyone to make the most of the NASTT Trenchless Knowledge Hub—your central resource for trenchless education, research, and case studies. The Knowledge Hub is an ever-growing digital library featuring technical papers, videos and more. It's an essential platform for staying informed on new technologies, emerging safety protocols, and real-world applications. Whether you're troubleshooting a project, training a team, or looking to deepen your knowledge, the Knowledge Hub is there to support you. Access it at knowledgehub .nastt.org.

As we continue to build and rehabilitate the underground infrastructure that supports our daily lives, let's remember that safety is not a feature—it's a foundation. Part of NASTT's mission is to promote technologies that protect both people and property, and it is through continued education, collaboration, and innovation that we will fulfill this mission.

Thank you for your commitment to safety, excellence, and the advancement of trenchless technology. Let's keep pushing forward—smarter, safer, and together.

Greg Tippett, P.Eng
Chair, NASTT Board of Directors

TRENCHLESS TECHNOLOGY PERSPECTIVE

Trenchless Technology Improves Construction Safety & Reduces Risk

George Ragula, RagulaTech Inc.

Welcome to the eighth edition of *Trenchless for Gas Infrastructure*, highlighting the cost savings, environmental advantages, safety implications and social benefits derived from the use of various trenchless technology methods. Trenchless applications offer a comprehensive set of construction and rehabilitation techniques for all gas distribution infrastructure, especially useful for America's aging inventory of gas pipelines, with numerous inherent benefits for enhancing safety and reducing risk – the number one priority of our great industry

As the fastest growing sector of the global construction industry, innovative trenchless technology methods offer the best opportunity to realize significant reductions in overall GHG emissions through a smaller construction footprint while at the same time providing a far safer work environment than traditional open cut excavation methods. Removing the need for an excavated trench greatly reduces the hazards to underground construction crews and the general public. Risk of accidents and injuries is reduced by greatly minimizing the need for extensive excavations, use of multiple types of heavy equipment, and disturbances to the surrounding environment and community.

A safer work environment is assured for construction crews by eliminating the need for extensive deep trenches, which, according to OSHA, are a major source of accidents and injuries to workers: "cave-ins pose the greatest risk and are much more likely than other excavation related accidents to result in worker fatalities. Other potential hazards include falls, falling loads, hazardous atmospheres, and incidents involving mobile equipment. Trench collapses cause dozens of fatalities and hundreds of injuries each year".

Additionally, advanced guidance systems and remote-controlled equipment improve accuracy and efficiency during construction, while reducing the chances of dangerous errors. High tech best practices training and sophisticated simulators necessary for successful HDD operations further inculcate safety awareness among construction workers.

The reduced risk of accidents and safer construction sites created by using trenchless methods extend to better safety and less risk for the surrounding community. Because excavations are the leading source of damage reports, utilizing trenchless applications is an excellent way to achieve damage prevention. Trenchless methods greatly reduce the traffic and social impacts of construction in neighborhoods leading to safer driving conditions and greatly diminished surface hazards for local residents and businesses. Greatly reduced excavations create less need for spoils removal which further minimizes the risk of accidents and impacts on the surrounding environment. Additionally, trenchless methods can minimize the risk of contamination of water sources and soil during construction and their associated proper disposal.

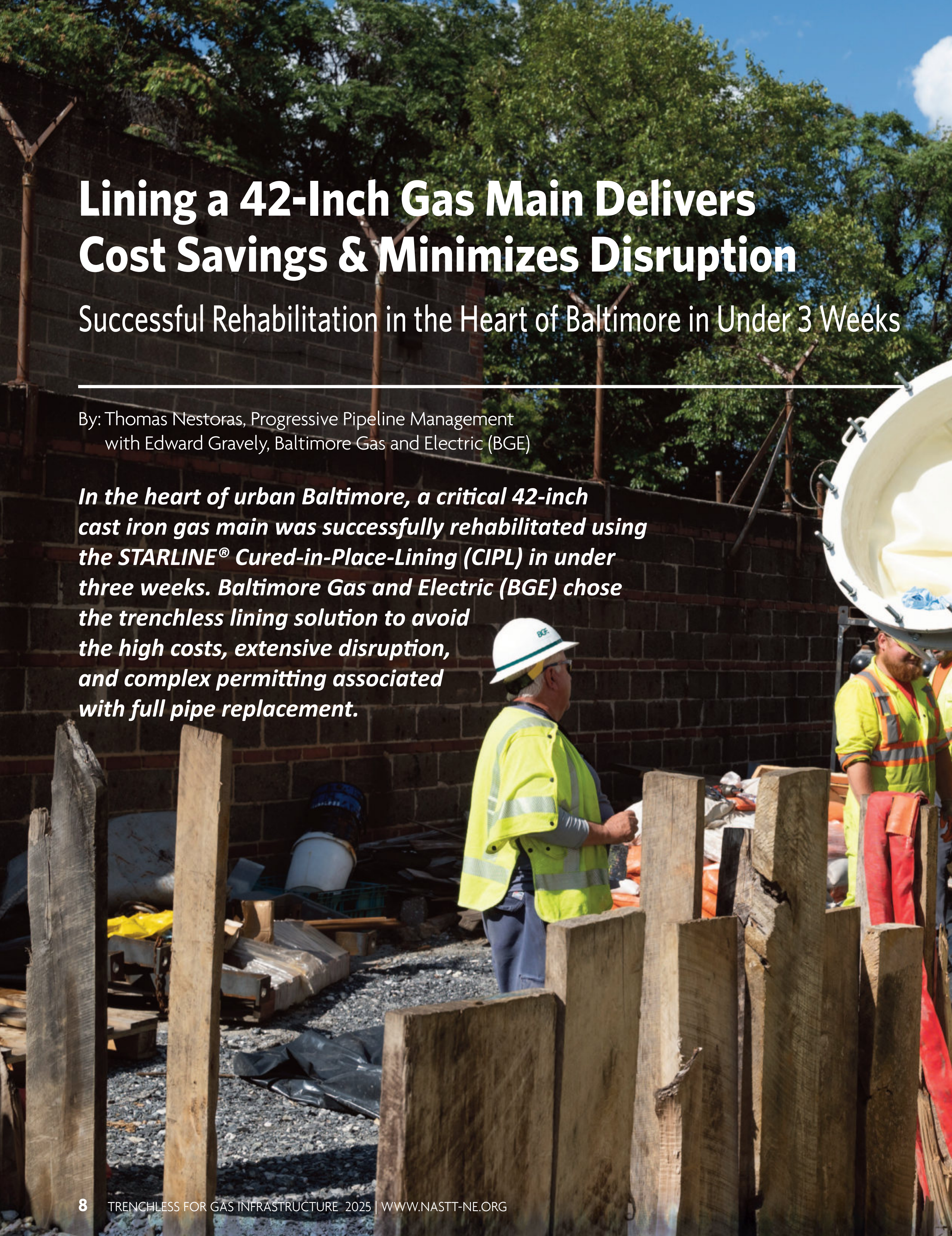
Overall disruption to existing infrastructure, natural habitats, and ecosystems is thereby minimized, making trenchless technology a far more benign and environmentally safer approach. By using these low impact methods to effectively rehabilitate and extend the life of existing infrastructure, the need for future excavations, and associated risks, can be eliminated. Installing or renewing gas facilities in their existing ROW enhances safety and prevents the damages associated with inserting new pipeline alignments into an already congested subsurface environment.

The gas industry plays an important role as environmental stewards and as effective custodians of risk. Today's increased and more complex inspection, repair, and replacement standards can be more effectively achieved by the use of innovative trenchless technology methods, and advanced robotics. Leak proofing gas pipelines using trenchless technology offers a means to further reduce GHG emissions from these leaks while preparing for the dawning hydrogen economy. With a focus on clean energy first of mind, trenchless technology applications are at the forefront in offering an immediately realized opportunity to make gas distribution systems more efficient and reliable while at the same time significantly improving safety and reducing risk for everyone.

Special acknowledgement and appreciation is due to NASTT and to the Northeast and Mid Atlantic regional Chapter members, for their forward-thinking support of ongoing outreach efforts to the natural gas industry.

George Ragula

RagulaTech Inc.,
NASTT Hall of Fame Member



Lining a 42-Inch Gas Main Delivers Cost Savings & Minimizes Disruption

Successful Rehabilitation in the Heart of Baltimore in Under 3 Weeks

By: Thomas Nestoras, Progressive Pipeline Management
with Edward Gravely, Baltimore Gas and Electric (BGE)

In the heart of urban Baltimore, a critical 42-inch cast iron gas main was successfully rehabilitated using the STARLINE® Cured-in-Place-Lining (CIPL) in under three weeks. Baltimore Gas and Electric (BGE) chose the trenchless lining solution to avoid the high costs, extensive disruption, and complex permitting associated with full pipe replacement.


CARRIER
starline
PPM

The 42-inch cast iron internal pipe surface was cleaned and prepared using grit and a spin blaster

BACKGROUND & SITUATION

A 42-inch cast iron main in urban Baltimore had been repaired over 75 times with internal clamps/mechanical seals. The large diameter original main, a critical gas source, dated back to the 1900s. Buried more than 10 feet deep, the natural gas pipeline segment ran beneath industrial businesses, an elementary school and residential areas. It also crossed underneath a railroad bridge overpass. In the fall of 2024, Baltimore Gas and Electric (BGE) selected Progressive Pipeline Management (PPM) to rehabilitate the 840-foot segment with Starline® Cured-in-Place-Lining (CIPL).

BGE ruled out replacing the gas main for multiple reasons. Replacement estimates were very high, there would have been significant disruption and a complex permitting process. Full 'trench and replace' strategy would have required road closures, and the use of expensive steel pipe. Excavation at that depth would be very costly, taking months to complete. Multiple permits would have been needed to dig under the railroad bridge. Traffic rerouting would have caused disruption to businesses, residents and the K-12 school for months.

Full 'trench and replace' strategy would have required road closures and the use of expensive steel pipe.

After the planning and preparation phases, PPM and Miller Pipeline completed Starline® Cured-in-Place-Lining (CIPL) of the cast iron main in approximately three weeks. Two separate inversions were conducted with the use of three excavation pits and specialized equipment. CIPL proved to be a cost-effective and critical strategy for BGE's leak reduction initiatives. It allowed the utility to take advantage of adding 100+ years of service life to the aging pipeline.

SCOPE

Once project plans were set, the utility and the excavation contractor excavated three access pits, and organized shutdowns and diversion to the gas service lines. Miller Pipeline removed the 75 internal clamps and mechanical seals that had been installed to prevent leaks.

The project was divided into two segments. The first, 208 feet long, was not straight and included four 90-degree vertical bends and two 45-degree vertical bends. After the first 90-degree bend, a 42-inch drip pot located about 18.5 feet deep required special consideration. A bridge of stainless steel was built and installed by Miller Pipeline to support the path of inversion and protect against any future unintended over-pressurization within the annular space of the drip pot fitting.

The second segment, 532 feet long, included three 45-degree bends and a 16-inch service tee that was being

The Starline® CIPL drum, liner and transfer hose moving into the pit for lining

abandoned, leaving a void in the pipe. Before lining, PPM installed a high strength carbon fiber Structural Reinforcement Patch (SRP) inside the pipe to cover over the void at the tee fitting.

As part of the standard procedure, PPM inspected both segments for anomalies or unaccounted for structural defects. Both traditional CCTV crawlers and advanced multi-camera models were used to allow the operator to navigate and traverse the multiple pipe offsets.

The internal pipe surface was cleaned and prepared using grit and a special tool called a spin blaster. Two high-CFM rated dust collecting vacuum units, creating over 50mph airflow, were deployed to reclaim the grit. Once the cleaning was completed, a second CCTV inspection confirmed the segment was clean and ready for lining.

The installation process began by loading the large diameter material into a large remotely steerable pressure drum.

Inside the pit, the 42-inch pipe is being prepared to receive the liner

Inside the transfer hose, the liner was pneumatically inverted and moved through the pipeline

The liner was pneumatically inverted and maneuvered through the pipeline while maintaining 8-psi during the ambient temperature curing. A bluetooth/cellular remote pressure device provided real-time pressure readings of the internal curing along with any possible fluctuations.

With the use of a newly designed anchoring device, PPM increased the workflow efficiency and preserved workspace within the center excavation. While segment one was curing, the crew simultaneously cleaned and lined the second segment. Each segment's cleaning, inspection, lining and curing took approximately three days.

After curing, the liner was depressurized, and the ends were cut out. Post-lining CCTV inspection confirmed full adhesion of the liner to the host pipe. BGE then performed a standard 25-lb, 24-hour pressure test before restoring the main to service and beginning road and curb restorations.

CHALLENGES

A major challenge was working within the confined space of the lining pit, located in an alley behind an industrial business. The excavated pit was 15 feet deep and 25 feet long, bordered by a brick foundation wall and a loading dock. There was extremely tight spacing for the heavy vehicles and crews required for cleaning, sand blasting and lining. Fast-moving crews had to have access to move, set up and operate the equipment. To lift equipment in and out of the constrained space, BGE brought in a crane.

Ensuring environmental and safety compliance was also critical. The geometry of the pipe and the depth of the pits meant that crews were working up to 8 hours a day inside a trench. Safety protocols and confined space entry procedures for BGE and PPM were put in place to protect the crews performing the clamp removals inside the pit.

Another major concern was water infiltration. The pipeline and excavations were below the water table for Baltimore. Water from a nearby culvert was deemed a significant contamination risk. As a safety precaution, BGE employed an environmental subcontractor to keep pumps running 24/7, preventing flooding and protecting the nearby stormwater system.

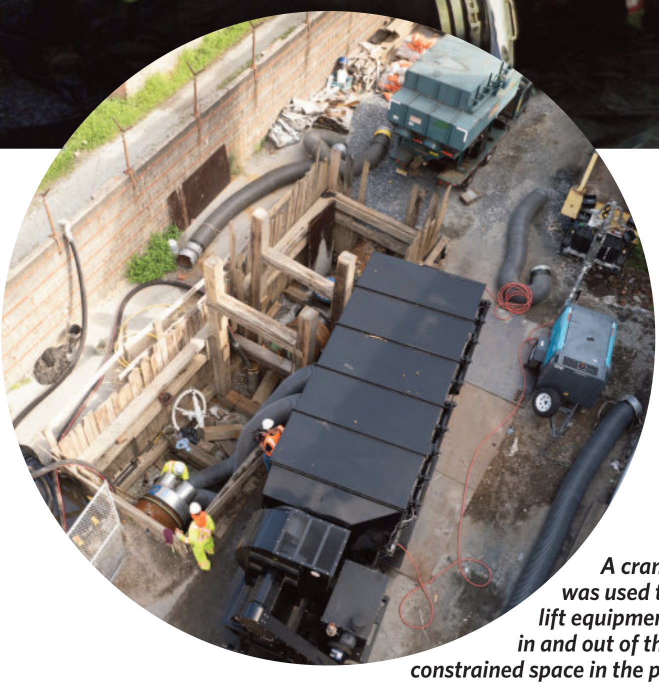
OUTCOMES & RESULTS

Due to careful planning and coordination among BGE, Miller Pipeline, and PPM, the lining was successfully completed ahead of schedule. Community disruption was minimal. Excavation and trenching did not extend into the roadway and traffic flowed with minimal interruptions.

The decision to line resulted in significant cost and time savings.

Rehabilitating the 42-inch pipeline with 3 pits in total over three weeks proved far more viable than full replacement. The decision to line resulted in significant cost and time savings. Had BGE opted for replacement of the main, deep pits would have been excavated every twelve feet. Excavating under the railroad bridge may have been nearly impossible because of the embedded steel pillars. The road would have been shut down for months, disrupting nearby businesses, residences and the school. The associated costs of the materials, excavations and environmental compliance would have been extraordinary.

The project team



A crane was used to lift equipment in and out of the constrained space in the pit

Progressive Pipeline Management (PPM) is a full service contractor and team of highly skilled infrastructure renewal specialists. For over twenty three years, PPM has been improving the safety and longevity of pipeline infrastructure. PPM holds the exclusive license in North America for the Starline® Cured-in-place-lining. The team has specialized expertise including gas pipeline rehabilitation, restoration of damaged or leaking infrastructure, PIPES ACT compliance, facilities pipe renewal and site services.

ABOUT THE AUTHORS:

Thomas Nestoras, the PPM Chief Operations Officer has specialized in innovative infrastructure renewal for over twenty years. His career in construction started from the ground up, giving him a unique perspective on all aspects of construction, project management and the technology used to recondition pipelines. From "job walk" assessments of projects to handing the finished product back to the client, he is known for identifying process improvements to reduce time and costs. He is an integral part of project management and innovations at PPM which often includes new technologies.

Edward Gravely is the Senior Project Manager, Gas Program Management for Baltimore Gas and Electric (BGE), the largest Electric and Natural Gas Utility in Central Maryland. Committed to powering a cleaner, brighter future, BGE serves more than 1.3 million electric customers and 700,000 gas customers in a diverse, 2,300-square-mile area encompassing Baltimore City and all or part of 10 central Maryland counties.

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Beneath the Frost: Trenchless Technology for Winter Resilience

By: Cole Byington, PE, Bond Civil & Utility & Jesse Lubbers, National Grid

INTRODUCTION

National Grid owns and operates a product storage facility in the northeast. As the current heating elements beneath an active product storage tank are reaching the end of their useful life, National Grid engaged Bond Civil & Utility (BOND) to provide a turnkey operation to install supplemental heating measures.

As part of the overall scope, BOND's Trenchless Division was called in to complete fourteen 150-foot-long bores beneath the active tank installing 4-inch steel casing to support the temporary heating measures. The bores needed to be accurate with inches of tolerance, requiring the utilization of accurate boring methodologies. BOND utilized its guided boring machine to complete all installations accurately within tolerance as an accurate pilot hole could be established.

The primary factor contributing to this challenging project was the loose granular soils consisting of gravel and cobbles which required the fabrication of a special pulling assembly to ensure successful installations. Additionally, the Project faced challenges resulting from tight spatial constraints, vibration requirements beneath the active tank, and dewatering.

PROJECT BACKGROUND

The National Grid tank facility includes multiple cryogenic tanks that must be kept at a consistent internal temperature. Each tank has a foundation heating system, which maintains the temperature of the tank foundation and surrounding soils.

Figure 1. Rig in Pit

Freezing beneath the tank can lead to frost heave, where the soil moves upward and outward due to the formation of ice. This movement can potentially damage the outer bottom of the tank if not properly addressed. Therefore, National Grid needed to explore various options to ensure the continued operability of the heating system.

Overall, there are three different zones, requiring 42 total conduits be installed to house the heating system. The initial phase discussed in this article focuses on the 14 bores in Zone 2.

PROJECT CONSTRAINTS

The BOND project team had to work within various parameters and scheduled stoppages outlined by National Grid. These constraints impacted the overall operation plan for the civil and trenchless works, but not the specific trenchless methodology selected to complete this project.

The integrity of the tank foundation was critical, so vibrations as a result of operations and potential settlement had to be minimal. The foundation itself consisted of concrete across the bottom of

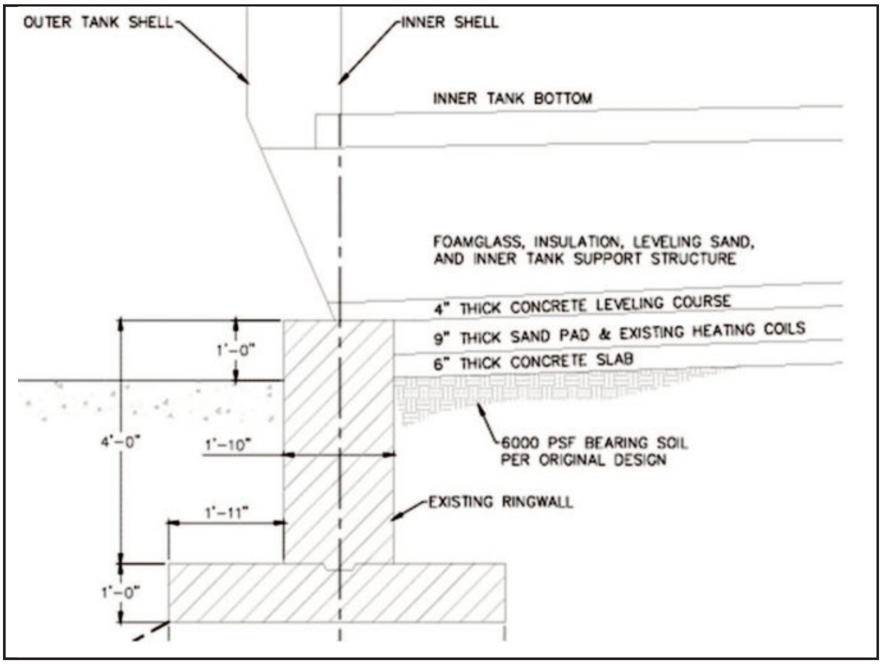

Figure 2. Tank Foundation Detail

the tank, with a deep ring foundation along the outer edge. Within the ring foundation was engineered fill and foam-glass insulation on top of concrete and sand pads that included the existing heating coils as seen in Figure 2. Vibrations and settlement needed to be kept to a minimum in order to mitigate any potential impact to this detailed foundation arrangment.

Finally, each conduit had to be installed within a 6-inch window, effectively making the tolerance 6 inches left, right, up, and down. Therefore the methodology selected had to be accurate while having minimal vibratory impact.

CROSSING DETAILS

The project included 14 crossings spaced 3 feet apart to be completed at depths of approximately 8 feet beneath the ground surface. Each bore was to accommodate a 4-inch steel casing that would house two smaller 1-inch conduits. The casing would then be filled with thermal grout.

Each bore was approximately 150 feet long and had to meet the aforementioned 6-inch tolerance due to the even heating distribution required beneath the existing tank. As pit space was limited, the product pipe had to be pulled back in 10-foot joints as opposed to thrusted through the existing borehole.

Based on the crossing parameters and the constraints outlined above, BOND had to select the optimal installation method to ensure the best outcome for National Grid.

Subsurface Conditions

The installation depth placed the bores beneath the ring foundations and engineered fill into layers of granular fill and glacial outwash deposits over marine clay. The bores themselves were located primarily within a dense sand and silt with gravel and dense gravel with sand layers.

As is typical with glacial outwash and other similar soil strata, cobbles and boulders were also expected to be encountered. This expectation was confirmed as the pits were excavated for the test installations as seen in Figure 3.

Groundwater was encountered at approximately 7 feet deep. Due to the size of the pits and volume of groundwater intrusion, BOND had to prepare for up to 120,000 gallons of water per day to be pumped out of the pit and disposed of.

Figure 3. Cobbles and Boulders from Pit Excavation

Figure 4. GBM in Operation

Figure 5. GBM Steering Display

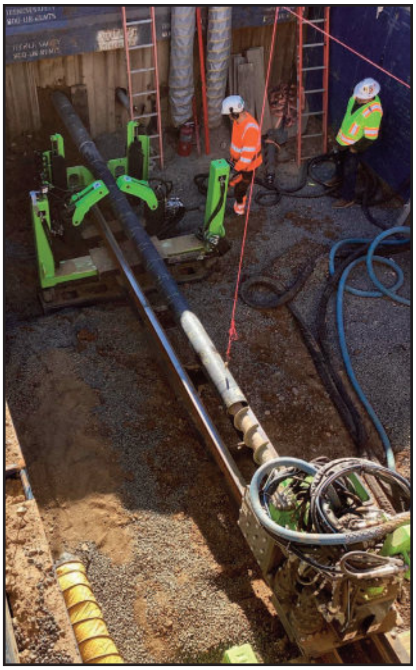

Figure 6. Down the Hole Hammer Machine in Pit

TRENCHLESS METHODOLOGIES CONSIDERED

The BOND trenchless teamed proposed three potential trenchless methodologies for this project. Each methodology would need a test bore to be completed prior to being selected for the project. The three methods considered were guided boring, guided pneumatic hammering, and a down the hole horizontal hammer. To ensure the best outcome for National Grid, each method was evaluated based on accuracy, vibration measured, settlement potential, and required pit size.

Guided Boring

The guided bore method consisted of completing a guided pilot beneath the tank and pulling the pipe back towards the launch pit utilizing an Akkerman 240A Guided Boring Machine (GBM). The leading piece of the downhole assembly is a tri-hawk head, specifically meant for varying geology. Using a theodolite with advanced remote-controlled optics set to the desired line and grade, the GBM operator visually tracks the position of the steering head of the pilot tube in real-time. Essentially, a target and crosshair are utilized to ensure the pilot advances towards the fixed exit point. This is typically achieved with inches by the rig operator.

Guided Hammer

The guided air hammer utilized pneumatics to progress through the soil and mitigate the risk due to the cobbles and boulders. Prior to engaging the hammer, BOND utilized the GBM to advance as far as possible. When an obstacle was encountered, the guided pilot assembly was tripped back towards the launch pit to change from the dirt tri-hawk bit to the hammer assembly. This left a temporary void beneath the tank, which increased settlement risk beyond National Grid's tolerance. Typically, air hammers are mainly used in rock boring applications as they tend to slowly drop each joint in soft soils due to the assembly's weight. While the trial was completed successfully and within tolerance, due to the temporary void left due to tripping operations, this method was not deemed as the most optimal for the application.

Methodology selected had to be accurate while having minimal vibratory impact

Down the Hole Hammer

Finally, the down the hole hammer option was utilized in a successful trial installation. Down the hole hammers can handle varying conditions including boulders or hard rock without issue, making it an appealing option for this application. The primary reason this methodology was not utilized was that while typically accurate, the down the hole hammer has no method of steering or guidance that could guarantee the tight tolerances previously mentioned.

Trial Installation Results

Trial installations were completed successfully with all tested methods, but ultimately the conventional guided pilot bore was selected as the most optimal methodology. This methodology was the most accurate on a consistent basis and not only met the requirements noted above but did not require tripping back, leaving a void beneath the tank.

The primary benefits related to the GBM method was the lack of vibrations, minimal to no cuttings, and the highly accurate and steerable nature of the methodology.

Figure 7. Tri-Hawk (Left) and Pulling Assembly (Right)

BORING PITS

Pits were excavated on each side of the existing tank. Each pit length was sized to accommodate all 14 bores, resulting in a 47-foot-wide pit. The length had to stay at 12 feet, due to spatial constraints. Another reason the GBM was utilized was due to it fitting snugly within the narrow pit. As a result of the narrow pit, instead of thrusting the product pipe in the borehole as is typical, the pipe had to be pulled back, one 10-foot joint at a time.

GUIDED PILOT OPERATIONS

Once the boring machine was set up, a survey was conducted to confirm the appropriate alignment of the machine. The GBM utilizes a laser target and crosshair system for steerability. The crosshair and target inside the pilot tube will be aligned and secured to ensure that this point is fixed throughout the duration of the pilot pass.

The guided pilot is advanced approximately 3 feet at a time as each pilot tube is pushed forward into the front face of the launch pit. As the pilot is advanced, the GBM operator steers based on the steering display above the controls. In utilizing this methodology, BOND had the best opportunity to meet the tight tolerances required for this project.

The primary difficulty related to the guided pilot and specifically the accuracy, was the presence of cobbles and boulders beneath the tank. If hit at a slight angle, the obstruction would push the pilot tube off course, requiring the GBM operator to make corrections to the pilot. The GBM operator knew as soon as an obstruction was encountered, allowing adjustments such as lowering thrust, increasing rotation or lubrication, and letting the bit "chew" on the obstruction as opposed to pushing around it. These adjustments had to be made as there was limited potential to trip back and make corrections. Additionally, minor amounts of bentonite-based fluid were pumped for lubrication which assisted in keeping the hole accurate.

Bottom Hole Assembly (BHA)

For the pilot process, BOND utilized a Tri-Hawk bit as opposed to the alternative pilot tube "paddle" bit that could also have been used. The tri-hawk bit was utilized as it's ideal for the mixed ground conditions encountered in this project. The two bits are shown in Figure 6.

PULLBACK OPERATIONS

Once the pilot was completed, BOND connected the leading edge of the product pipe to the pulling assembly. Due to pit size constraints, one 10-foot-long joint of pipe was pulled in at a time. After each joint was installed, operations paused for welding and inspections prior to continuing.

Pulling Assembly

Initially, BOND's pulling assembly consisted of a swivel shackled to pad eyes connected to the pilot tube and product pipe. While the initial pullbacks were successfully completed using this assembly, on the third installation, a boulder fell into the gap between the swivel and pad eye, resulting in abnormally high pulling loads and a failure in the swivel. To combat this, BOND fabricated a shroud that encompassed the entire pulling assembly, eliminating the gap, and mitigating the risk of a boulder interfering entirely.

The main difficulty when sizing the pullback assembly was finding a swivel with a diameter of 4 inches or less while having as high a tensile capacity as possible. Ultimately, a swivel was utilized that was 3 inches in diameter and had an ultimate tensile load of 90,000 lbs.

Figure 8. Shrouded Pulling Assembly

CONCLUSIONS

As a whole, the project was a success with one pullback being completed on average every week. One of the more engaging exercises was trialing the different trenchless methodologies and selecting the optimal one for this specific project through a collaborative effort with National Grid.

The lessons learned, such as the shrouded pulling assembly, will be utilizing on the following phases of the project to optimize efficiency and increase the overall success of the project. BOND will be utilizing what was learned on this phase in the following phases of this project.

ABOUT THE AUTHORS:

Cole Byington, PE is a well-versed and experienced Trenchless Engineer. He is tasked with oversight and completion of Trenchless Engineering projects and construction-based engineering support. Cole brings a decade of Trenchless Engineering experience that includes Design-Build projects, Horizontal Directional Drilling, Jack and Bore, Direct Pipe and general engineering and construction project management across various sectors and regions.

Jesse Lubbers is a seasoned Project Manager with 20 years in engineering consulting, specializes in energy infrastructure. At National Grid, he serves as the leader of trenchless technology for NY Transco's Propel NY Energy Project, managing major crossings for subsea and terrestrial cables. His work enhances New York's grid resilience and energy delivery.

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A Case Study in Evaluating an Approximately 10 Mile Natural Gas Pipeline Alignment in Southern Utah

By: John W. Diamond, PE, Terracon Consultants

ABSTRACT

A pipeline operator recently evaluated an approximately 10-mile new natural gas pipeline alignment near the city of St. George, Utah. The proposed project consists of a 20-inch diameter steel distribution pipe that will be installed using a combination of open trenching and trenchless methods to cross existing roadways and drainage features. Subsurface conditions along the proposed alignment were variable and consisted of loose to very dense silty sand underlain by weakly cemented sandstone bedrock, and hard basalt. There were several parts of the alignment where the sandstone and basalt bedrock were exposed at the ground surface.

The scope of work included an evaluation of depth to bedrock and rock rippability along the proposed alignment, which included subsurface exploration and sampling as well as the use of geophysical methods to evaluate the excavatability of the subsurface materials. The scope of work also included the design of five proposed trenchless crossings of existing roadways and drainage features. Four different trenchless crossing methods were selected based on the variability of the subsurface conditions that were encountered along the proposed alignment. This paper presents a summary of the methods that were used to evaluate excavatability along the proposed pipeline alignment as well as a discussion of the factors that were considered in selecting the trenchless methods at the proposed crossing locations.

INTRODUCTION

The project consisted of the evaluation and design for installation of a 20-inch diameter, high pressure natural gas pipeline in Washington County, Utah. The majority of the pipeline will be installed using open trenching methods, but there are five locations where trenchless crossings of existing roadways and drainage features will be required. The proposed pipeline alignment is located north of St. George, Utah as shown on Figure 1.

The geologic materials that are exposed at the ground surface along the proposed alignment consist of unconsolidated silty sand as well as exposed sandstone and basalt bedrock. The project owner was aware that rock excavation would be required in some areas. However, the depth to bedrock beneath the unconsolidated deposits was not well documented resulting in excavation cost implications to the project if rock was encountered at shallow depths and rock excavation was necessary along substantial portions of the alignment.

In addition to the sections of the alignment to be installed using open trenching methods, there were five locations where trenchless crossings were required to install the pipeline under existing roadways and drainage features. Three of the proposed trenchless crossing locations had right-of-way (ROW) constraints that prevented the use of horizontal directional drilling (HDD) methods. Two of these locations were in areas where unconsolidated deposits extended to depths of 10 to 15 feet below existing ground surface and one proposed crossing location was in an area where basalt bedrock was encountered within 5 feet of the ground surface.

The project scope included:

- Subsurface field exploration
- Seismic Refraction Survey
- Geologic Outcrop Mapping
- Laboratory testing
- Estimating depth to bedrock along the proposed open trench portions of the alignment
- Providing recommendations related to the feasibility of and type of trenchless method at each of the proposed crossing locations
- Providing Geotechnical recommendations regarding planning, design and construction of the proposed trenchless crossings including:
  - Development of construction plans for each of the proposed crossings
  - Providing recommendations for control of inadvertent fluid releases and related contingency planning for the proposed HDD crossings
- Providing recommendations for field engineering and observation during trenchless installation

GEOLOGY AND GEOTECHNICAL CONDITIONS

The proposed alignment is located north of the city of St. George in Washington County, Utah. The near surface geology along the proposed alignment consists of

Figure 1: Site Location Map

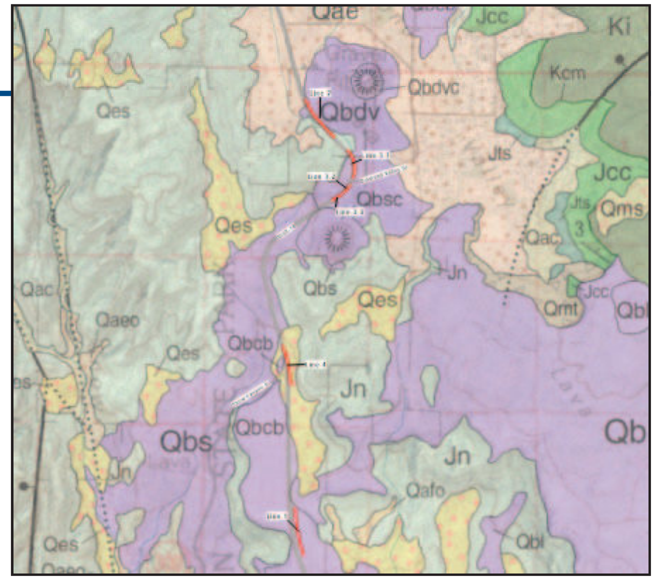

Figure 2: Site Geologic Map (Biek et. al., 2010)

a combination of unconsolidated silty sand underlain by sandstone and basalt, and areas where consolidated sandstone and basalt bedrock are exposed at the ground surface as shown on Figure 2.

The subsurface conditions along the proposed alignment were explored by performing 14 subsurface explorations and by completing 5 seismic refraction lines as shown on Figure 3 below. 9 of the borings were completed at the proposed trenchless crossing locations and five additional borings were completed in the proposed open trench portions of the alignment. Representative soil and rock samples were obtained from the borings using a Standard Penetration Test (SPT) split spoon sampler and Modified California sampler (MCal). Samples of the underlying rock were collected at several of the exploration locations using rock coring methods. Soil and rock samples obtained from the borings were collected for laboratory testing. Laboratory tests were performed on selected samples to aid in classification and to evaluate the pertinent physical and engineering properties of the soil and rock along the proposed alignment.

The boring locations were placed a close as possible to the proposed pipeline alignment with the exception of the borings that were drilled at the proposed HDD crossing locations. The borings at the proposed HDD crossing locations were intentionally offset from the planned alignments to reduce the risk of inadvertent returns during HDD drilling operations through preferential flow paths created by the exploration boreholes. Upon completion, the borings at the proposed HDD crossings were abandoned by placing a cement and bentonite grout mix from the bottom to the ground surface using a tremie to further reduce the risk of inadvertent returns through the exploration boreholes. The borings at the other trenchless crossing locations and in the open trench portions of the alignment were backfilled with auger cuttings.

DEPTH AND RIPPABILITY OF ROCK

The depth to rock was estimated along the proposed alignment using a combination of measuring the depth to rock encountered in our borings, interpretation from exposed rock outcrops, and from interpretation of the results of the seismic refraction survey. In general, the estimated depth to rock varied along the

Figure 3: Alignment Map

alignment from ground surface to more than 10 feet below ground surface (bgs). The estimated depth to rock was useful for the project owner and contractor for estimating quantities of rock excavation that would be required during pipeline installation. Based on the results of the field investigation, the estimated rock depth and associated length along the proposed alignment are summarized in Figure 4.

Depth to Rock	Estimated Length (ft)
<5 feet	7,100
5-10 feet	2,300
Deeper than 10 feet	44,200

Figure 4: Estimated Rock Depth and Associated Length

The data collected as part of the field investigation was used to provide a general indication of the anticipated difficulty of excavation along the proposed alignment. Excavatability is highly dependent on the equipment used and field testing with the planned excavation equipment is critical to confirm the estimates that are provided based on field investigation methods. The exposed rock encountered along the alignment consisted of sandstone and basalt. To provide information about the anticipated difficulty of trenching, a combination of Schmidt hammer readings and observation of the rock joint spacing were used. Rock strength values were estimated using the Schmidt hammer readings and by correlating rock strength to blows with a rock hammer (Katz, O, & et al, 2000). The sandstone outcrops observed adjacent to the proposed pipeline alignment were generally competent with a few small aperture fractures and minor weathering.

Based on the data collected using the Schmidt Hammer, the sandstone ranged from medium strong to strong, and the estimated unconfined compressive strength of the sandstone ranged from 2900 to 9000 Pounds per Square Inc (psi). The basalt outcrops that were observed at the ground surface along the alignment were generally highly fractured and rubbly. The exposed basalt ranged from medium strong to strong and the estimated unconfined compressive strength of the basalt ranged from 1100 to 6100 psi.

The Seismic Refraction Survey results indicate that seismic velocities (Vp) in the unconsolidated sediments near the surface range from 0 to approximately 3,000 feet per second (fps). The Vp of very dense cemented soils and/or weathered bedrock typically range from approximately 3,000 to 7,500 fps. The Vp of marginally rippable material ranges from approximately 7,500 to 8,500 fps. Materials with velocities higher than 8,500 fps are considered to be non-rippable. Based on the results of the Seismic Refraction Survey, the unconsolidated sediments near the surface are expected to be excavatable using conventional earthwork equipment but materials with Vp greater than 3,000 fps are expected to require heavy duty excavation equipment. In general, the results of the geophysical survey indicated that cemented soils and/or weathered sandstone may be encountered in some locations of the alignment near the ground surface and marginal to non-rippable rock is expected to be encountered in some portions of the alignment at depths between 5 and 10 feet below ground surface. It is likely that more competent, less weathered basalt with a higher unconfined compressive strength will be encountered at depth during open trench excavation and this material is anticipated to be marginally rippable to non-rippable. The average Point Load Index and joint spacing observed in the rock outcrops along the proposed alignment were plotted on the chart below to assist with correlating this information with rock excavatability (Tsiambaos, 2009).

Critical that geology, geography, and geometry are all considered in order to select the appropriate trenchless method.

The feasibility and actual production rates for rock excavation is dependent on the equipment used, and the local degree of weathering, rock strength, and fracture spacing.

TRENCHLESS DESIGN & EQUIPMENT

Five potential trenchless crossings of existing roadways and drainage features were identified along the proposed alignment. The subsurface materials and depth to rock varied at each of the proposed trenchless crossing locations as summarized below:

- Crossing 1 – Silty Sand with gravel to 15 feet underlain by basalt
- Crossing 2 – Silty Sand with Gravel to 10 feet underlain by basalt
- Crossing 3 – Silty Sand with Gravel to 6 feet underlain by basalt
- Crossings 4 & 5 – Silty sand with gravel to 12 to 38 feet underlain by basalt and sandstone

Crossings 1, 2, and 3 all had geometric constraints due to the existing pipeline ROW that prevented HDD methods from being considered at these locations. The local transportation department required that trenchless crossings be a minimum of 5 feet below the bottom of the existing roadway pavement. At crossing 1 the presence of coarse gravel and the spatial constraints of the existing ROW made pipe ramming at a depth of approximately 10 feet below existing ground surface the most feasible trenchless method.

Crossing 2 consisted of a 2-inch lateral to provide gas service to an existing development. The subsurface conditions at the proposed crossing location consisted primarily of silty sand with gravel underlain by basalt. Due to the presence of coarse gravel and the small diameter of the proposed lateral, pilot tube was determined to be the most feasible method for this proposed crossing. Subsurface conditions at crossing 3 consisted of silty sands and gravels underlain by shallow basalt bedrock at depths less than 5 feet. Due to the presence of coarse gravel and the expectation that basalt would be encountered very difficult and expensive drilling conditions were anticipated at this crossing location. Because we anticipated that basalt would be encountered

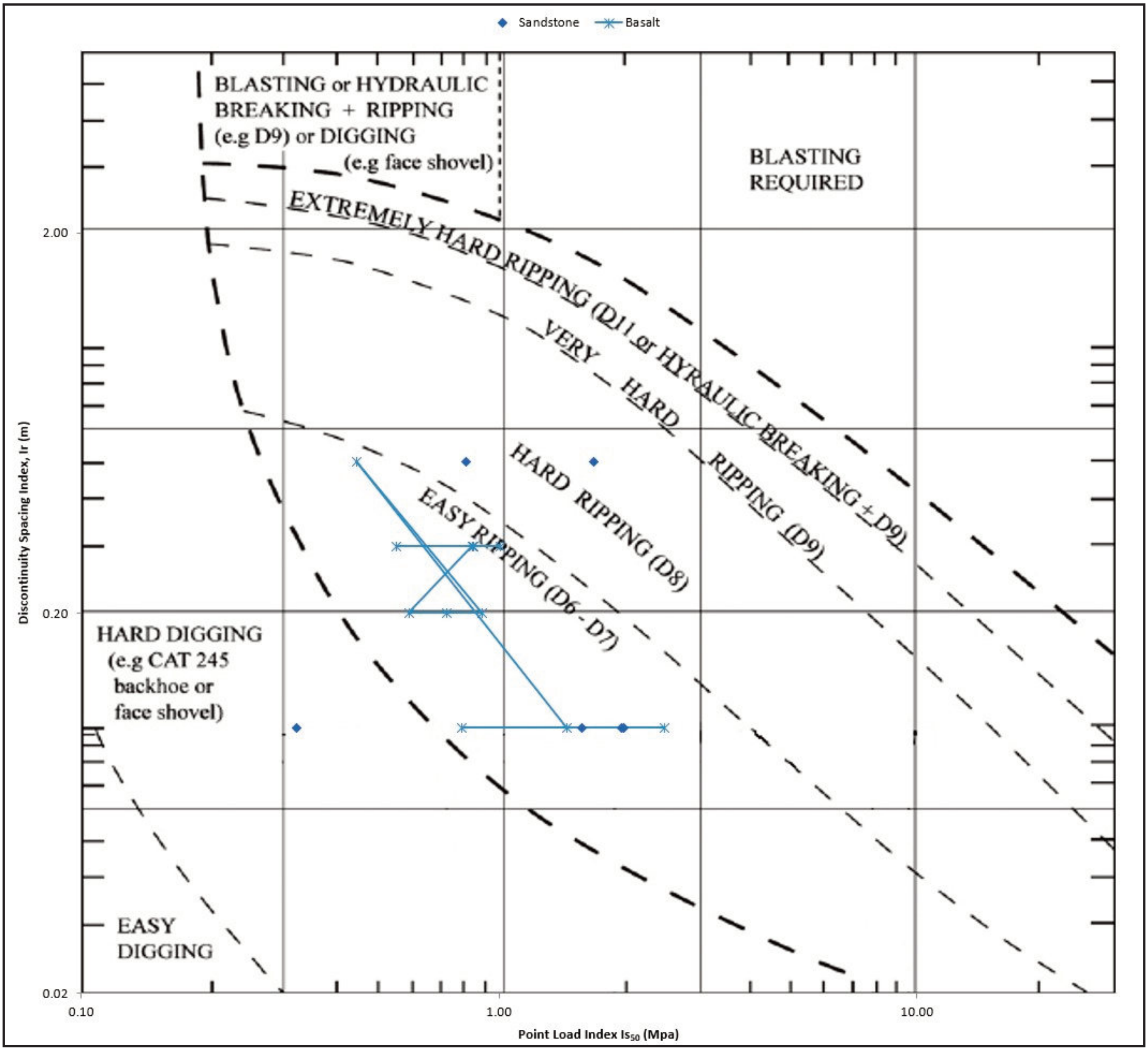

Figure 5: Rock Strength vs Excavatability (Tsiambaos, 2009)

during drilling at this location, it was determined that a small-bore unit (SBU) with rock disc cutter head or similar drilling method would need to be used. This crossing was designed with the proposed borepath completely within the rock to avoid a mixed face condition.

As part of the trenchless design of crossings 1, 2, and 3, we performed settlement calculations to evaluate the potential for impacts to the existing roadway. Our settlement calculations were performed by considering a maximum bore diameter of 22 inches and a maximum overcut of one inch on the bore diameter for auger bore methods, a minimum embedment depth of 10 feet, and using the soil conditions encountered in the borings at each of the crossing locations. The unit volume of the resulting settlement trough at the ground surface was considered to be approximately equal to the volume of soil 'lost' during boring. The estimated settlement over the crown of the bore at the ground surface was estimated to be less than 0.5 inch at each of the crossing locations.

Results of the field investigation indicated that the subsurface conditions at crossings 4 & 5 consisted of medium dense to dense silty sand with varying amounts of clay and gravel underlain by basalt at crossing 4 and sandstone at crossing 5. The fine-grained sands that were encountered generally have less than 20 percent fines leading to possible borehole stability issues, and potential for loss of fluid circulation. Water was lost during the field investigation while coring in the sandstone and the use of loss of circulation materials are anticipated to maintain borehole stability and reduce fluid losses during HDD drilling operations.

Based on the soil profile at crossings 4 and 5, the potential for inadvertent returns was evaluated using a combination of cavity expansion theory and the Delft equation in conjunction with a qualitative assessment of the inadvertent return risk. The results of the preliminary analysis indicated that approximately 45 feet of cover would be required to provide an adequate factor of safety against inadvertent return during HDD drilling at the proposed crossings. Based on the existing topographical and ROW constraints at the proposed crossings, the final design geometry resulted in bottom tangent depths of approximately 45 and 65 feet below the existing ground surface.

ABOUT THE AUTHOR:

John Diamond, PE, is Assistant Geotechnical Service Line Director for Terracon's Western Operating Group. He has 22 years of experience with geotechnical design, geohazard investigations, feasibility evaluations, and alternatives analyses for open-cut and trenchless pipeline installation, electrical transmission lines, and power generation facilities. John received a B.S. Degree from Weber State University, a M.S. Degree from the University of Idaho, and an MBA from the University of Utah.

CONCLUSIONS

The subsurface conditions that were encountered along the proposed alignment generally consisted of unconsolidated silty sand overlying sandstone and basalt bedrock. A combination of geotechnical borings, evaluation of exposed rock outcrops, and interpretation of the results of a seismic refraction survey were used to estimate the depth to rock and excavatability of the sandstone and basalt along the proposed pipeline alignment.

Five potential trenchless crossings of existing roadways and drainage features were identified along the proposed alignment as part of the evaluation. The appropriate trenchless method for each of the proposed crossings was selected by evaluating the geology, geography, and geometry at each location. 3 of the proposed crossings had geometric constraints due to the existing pipeline ROW that prevented HDD methods from being considered at these locations and pipe ramming, pilot tube, and a SBU with rock disc cutter head were determined to be the most feasible trenchless methods based on the existing subsurface conditions at each of the proposed crossing locations. Settlement calculations were performed for each of the proposed crossings in order to evaluate the potential for impacts to the existing roadway and less than 0.5 inches of settlement was estimated for each of the proposed crossings.

The subsurface conditions and available ROW at 2 of the proposed crossings made HDD methods feasible at these locations. Subsurface conditions at these locations consisted of medium dense to dense Silty Sand with varying amounts of clay and gravel underlain by basalt and sandstone. The fine-grained sands that were encountered may result in borehole stability issues and potential for loss of fluid circulation during HDD drilling operations and loss of circulation materials are anticipated when drilling in the sandstone to reduce fluid losses.

The potential for inadvertent returns was evaluated at crossing 4 and 5 using a combination of cavity expansion theory and the Delft equation in conjunction with a qualitative assessment of the inadvertent return risk. The results of the preliminary analysis indicated that approximately 45 feet of cover would be required to provide an adequate factor of safety against inadvertent return during HDD drilling at the proposed crossings. The final design geometry resulted in bottom tangent depths of approximately 45 and 65 feet below the existing ground surface.

When evaluating the feasibility of a proposed trenchless crossing, it is critical that the geology, geography, and geometry at the site are all considered in order to select the appropriate trenchless method. There are many different methods that can be considered based on the natural and anthropogenic constraints at a site and not every method is appropriate for all site conditions. For this evaluation, multiple trenchless methods were considered in order to select the appropriate tools for the geologic, geometric, and geographic conditions that were encountered at each crossing location.

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Critical Crossing for Mountain Valley Pipeline Completed with Horizontal Hammer Boring

Herculean Task Completing Route through Mountainous Terrain

By: Richard Revolinsky, Geonex Inc, (GEO)

Mountain Valley Pipeline (MVP), a 42-inch diameter steel natural gas pipeline began construction in 2018. The herculean task of completing the nearly 303-mile route from northern West Virginia to southern Virginia through mountainous terrain deployed a variety of trenchless technologies, specifically chosen for their ability to mitigate environmental disturbance as well as overcome the adverse and challenging ground conditions.

By spring of 2023 contractors had completed approximately 282 miles of pipe installation and right-of-way restoration, but the final 21 miles of pipeline wouldn't be complete and the pipeline in service until June 2024. Part of the final push to completion include crossing of the Stoney Creek in Ripplemead VA.

The 320-foot-long Stoney Creek Crossing required the installation of 42-inch steel pipe. The bore would begin with crossing a 105-foot right-of-way below an active section of Norfolk Southern (NSF) rail line through cobbles and boulders. Once out of the NSF right-of-way, the installation would then continue below the Stoney Creek which serves as habitat for the Candy Darter, a U.S. Fish & Wildlife classified threatened species. After crossing the creek, the installation would continue until terminating outside the limits of adjacent creek braids where crews could tie-in to the open cut section of the pipeline.

The installation was completed utilizing a GEONEX™ Horizontal Hammer Boring (HHB) system by means of Atlantic Underground, a trenchless construction contractor located in Deltaville, VA. Familiar with the ground conditions of the area, Mike Kidd of Atlantic Underground was confident in the GEONEX™ system and HHB to be successful and offered several risk mitigating factors proven beneficial to this critical crossing.

Horizontal Hammer Boring shares several characteristics with other new installation trenchless methods, combining them in a manner making the complete solution extremely effective in a variety of subsurface conditions. The pneumatic hammer of the HHB method is located within the lead piece of casing. The hammer accelerates a full-face cutting head forward to break the rock and simultaneously engage an internal steel collar that pulls the casing along the bore path. Instead of pushing from the rear which often leads to deviations in a path of least resistance, pulling the casing along the path created by the cutting head results in highly predictable results.

The cobbles and boulders encountered required a search for an effective trenchless method

Carbide buttons on the cutting head create pin-point fracturing of the rock, and the linear breaking action improves penetration rates through cobbles which tend to roll when utilizing other bore methods that rely on a rotating head to cut and break the material. With each stroke of the pneumatic hammer, compressed air is released through the cutting head which conveys the cuttings into the casing pipe where they are then carried back to the launch pit by hollow-stem rotating auger.

Monitoring and adjusting the operating parameters is crucial to the success of HHB. The GEONEX™ system offers remote control operation with real-time display and adjustment of rotation torque, forward thrust and control of air flow. Along with other features of the system, the umbilical style allows for completely hydraulic and pneumatic operation in the launch pit which is beneficial when the installation is below the ground-water table and the risk of flooding in the excavation is high.

HHB was not the first choice for the Stoney Creek Crossing. Previous attempts included auger boring and pipe ramming. Auger boring proved ineffective due to the cobbles and boulders despite the variety of cutting heads utilized. Additionally there was concern regarding the potential

A variety of trenchless technologies were chosen to overcome the challenging ground conditions

for an in-rush of water from the saturated ground below the creek could damage the diesel-engine of the auger bore machinery in the launch pit.

The length of the installation and ground formation proved difficult for pipe-ramming as well. Attempts by previous contractors varied in success. The pipe-ramming method only fragments the material encountered by the steel pipe and does not fragment the entire cross-sectional area of the pipe being installed. While ultimately, pipe-ramming was able to install a small diameter steel casing, damage and deflection of the casing required abandonment of the casing, and a search for an alternate method.

Extensive analysis of the HHB method, GEONEX™ experience and the potential risk and risk-mitigating factors was performed prior to the ultimate selection and deployment of the GEONEX™ HHB system.

Familiarity with the method in North America while growing remains limited. HHB is more common in Europe where the bulk of GEONEX™ systems operate and serves as home to the Finish based company who can boast of more than 200,000 meters installed. Today in North America there are 17 GEONEX™ systems which range in capacity from 5-1/2- to 48-inches diameter, of which only (3) contractors own the (5) HZR1200 machines capable of performing the 42-inch installation exist.

Environmental concerns were a top priority

Environmental concerns regarding the Candy Darter and potential contamination of the Stoney Creek were a top priority. A special, non-petroleum based biodegradable oil was required to be used to lubricate the pneumatic hammer. Furthermore, the release of compressed air below the creek could potentially lead to turbidity in the creek which posed risk for the Candy Darter, so strict controls were put into place to prevent disturbance to the creek.

In March of 2024, Atlantic Underground and GEONEX received notice to proceed. Expedited delivery of equipment and seamless coordination among the parties involved enabled the installation to begin within 3 weeks of notice. Once in place, the first 105 feet of the

NSF ROW was completed within 18 hours. By the end of the 6th day of work, the complete 320 feet of 42-inch casing was installed.

Upon completing the 320-foot installation, MVP crews excavated the receiving pit and removed the peripheral portion of the cutting head, allowing complete retraction of the auger string, hammer and cutting face through the casing. The GEONEX™ equipment was removed from the launch pit at which time consecutive sections of product pipe were welded onto the end of the installed steel casing. A pipe-ram was used to advance the installation of the product pipe while pushing out the steel casing, providing the new complete length of product pipe installation in a little less than 3 weeks.

After completion of the installation, an MVP representative indicated that the project included over 350 bores in the same type of ground, stating "Knowing what we know now about the Horizontal Down-Hole Hammer Boring method and GEONEX, we could have utilized this method on several challenging bores and saved months on the project.

Horizontal Hammer Boring is extremely effective in a variety of subsurface conditions

ABOUT THE AUTHOR:

Richard Revolinsky is the North American Operations Manager for Geonex Inc. He has served the trenchless industry for the past 10 years in various roles as Project Manager for Auger Boring and HDD projects and material sales. He is committed to furthering the Trenchless Construction industry with viable innovative solutions.

Detection of Axially-Oriented Features in Difficult-to-Inspect Pipelines with Robotic Technology

State-Of-The-Art Circumferential Magnetic Flux Leakage Sensor

By: Intero Integrity Services

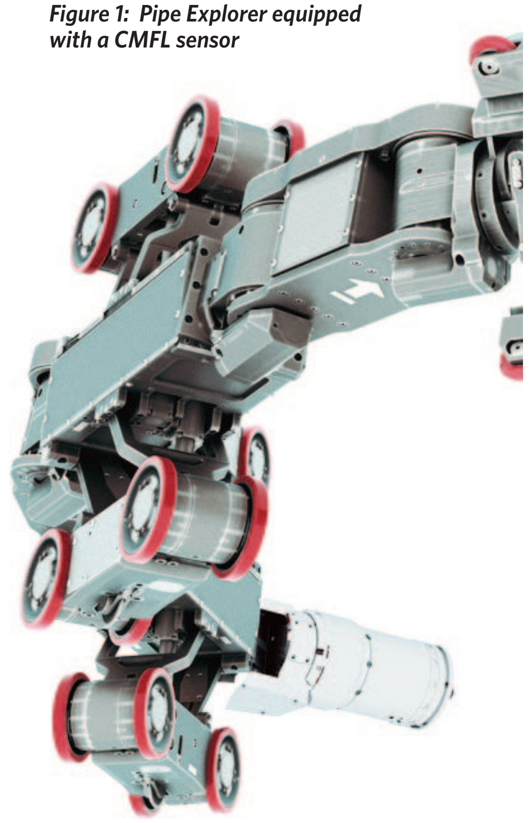
In the beginning of 2022, Intero introduced a sensor technology aimed at mitigating integrity concerns associated with long seam welds in challenging-to-inspect pipelines. After extensive research, development, and testing spanning several years, a circumferential magnetic flux leakage (CMFL) sensor was successfully created and integrated into the Pipe Explorer robotic pipeline inspection platform (Figure 1). The development of this technology was made possible through NYSEARCH, and the Northeast Gas Association [1].

Numerous pieces of literature and research have documented integrity issues related to long seam welds [2] Specifically, low-frequency-welded ERW pipes and flash-welded pipes are particularly vulnerable to selective seam weld corrosion, cracks, and axially-oriented anomalies that tend to develop in the vicinity of the long seam weld [3]. A failure in the seam weld of such pipes has the potential to propagate over a significant distance along the pipe, leading to the rapid release of substantial quantities of product into the environment. Although free-swimming inline inspection is a highly valuable approach for evaluating these pipe types, not all pipes are readily compatible with free-swimming inline inspection tools for many combinations of reasons. These pipes are commonly referred to in our industry as unpiggable, difficult-to-inspect, or challenging-to-inspect due to several categories of reasons [4]:

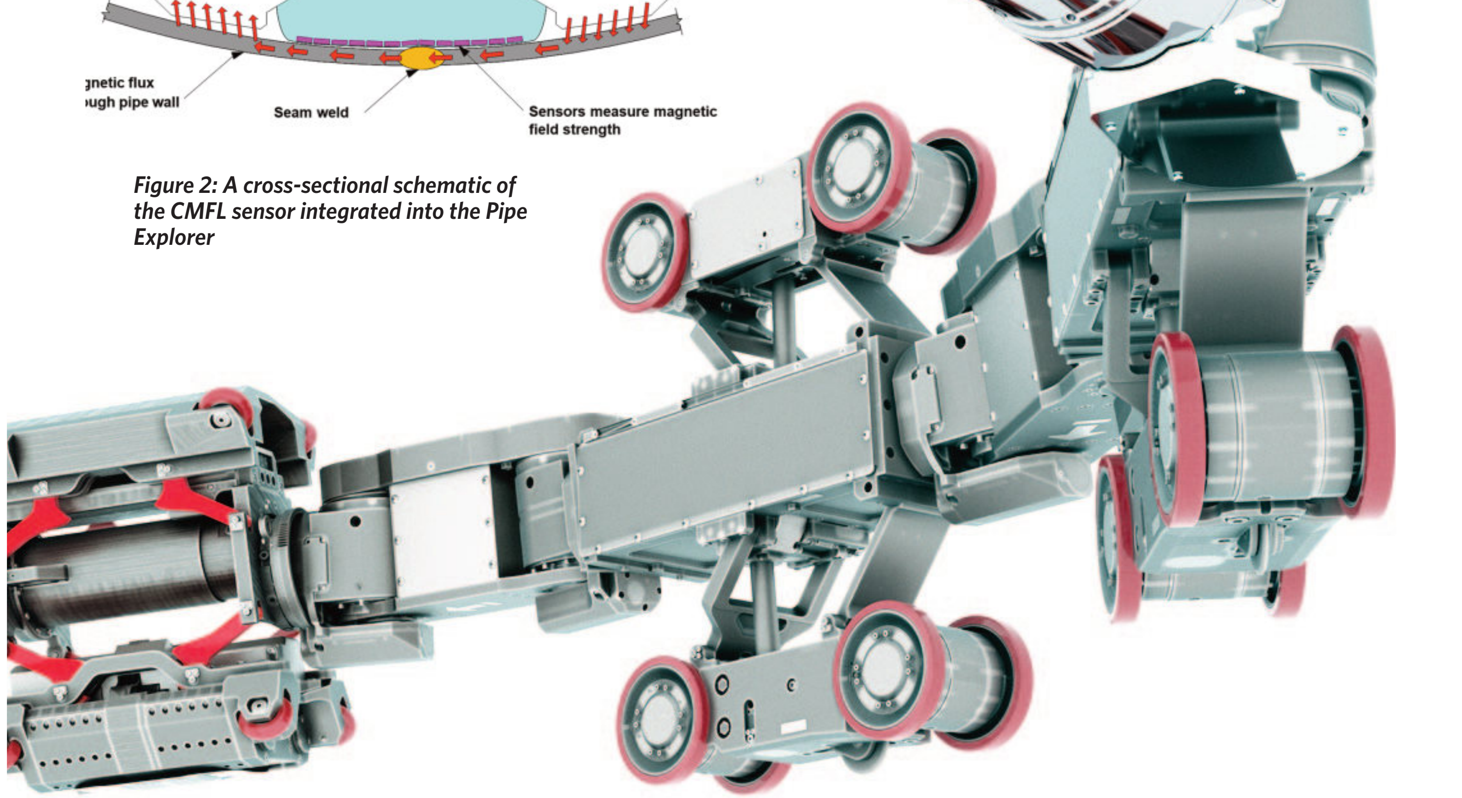
- Certain features in these pipelines act as barriers that prevent the passage and navigation of free-swimming inspection tools. Examples of such features include mitered bends or elbows, short-radius bends or elbows, and unbarred tees.
- These pipelines lack the necessary infrastructure for launching and receiving free-swimming inline inspection tools, such as launchers and receivers.
- These pipelines have limited flow characteristics, as they operate at pressure and flow levels that are insufficient to propel traditional free-swimming inspection tools.
- The configuration and features of these pipes are unknown, which significantly elevates the risk of traditional inspection tools encountering navigational barriers.
- These pipelines cannot accept a liquid medium as a coupling agent for ultrasonic sensing technology, and natural gas services cannot be interrupted.

Before the introduction of inspection tools designed for challenging-to-inspect pipes, pipeline operators had been relying on other assessment methods for their difficult-to-inspect pipes, such as hydro or pressure tests, direct assessment, or sometimes opting not to perform any assessment at all. The emergence of robotic inspection now offers an alternative for inspecting these pipelines, enabling a deeper understanding of their integrity conditions. Ultimately, this technology equips pipeline operators with valuable data that can be used to make proactive decisions regarding the operations and maintenance of these pipelines.

Figure 1: Pipe Explorer equipped with a CMFL sensor



One of the most notable distinctions between robotic pipeline inspection and free-swimming inspection tools is the method of propulsion. Robotic tools use internal motors for propulsion, rather than relying on the pressure differential of the pipeline product for movement. Another significant difference is the de-



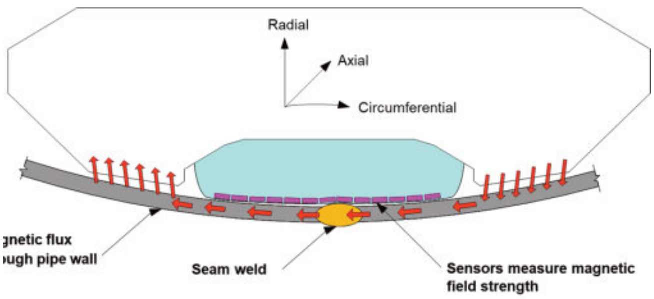


Figure 2: A cross-sectional schematic of the CMFL sensor integrated into the Pipe Explorer

Robotic inspection technology equips pipeline operators with valuable data

gree of control. While free-swimming tools lack control and are influenced by the flow of the product in the pipeline, robotic tools can be controlled in real-time, either through a cable or tether connection or by means of a wireless signal. Depending on the sensor systems employed, the data acquired by robotic tools can be either identical or similar to that obtained by traditional tools.

Robotic pipeline inspection systems, like Intero's Pipe Explorer, provide the means for inline inspection of pipes that are not suitable for conventional free-swimming inline inspection methods. For natural gas pipelines, the Pipe Explorer can be deployed and retrieved through an industry-standard hot tap fitting, all while ensuring the normal operating condition of the natural gas pipeline is maintained, thereby ensuring that gas services remain unaffected.

Once it's deployed inside the pipeline, the Pipe Explorer is equipped to locate and measure metal loss such as corrosion, using an axially oriented MFL sensor, as well as identify dents and mechanical damages through a laser sensor. With the recent inclusion of a CMFL sensor, the Pipe Explorer is now equipped to not only find and measure axially-oriented features such as selective seam weld corrosion but also to detect axially-oriented anomalies on or near the long seam weld (Figure 2). The addition of a CMFL sensor addresses anomalies with dimensions that are considered axial-slotting in the Pipeline Operator Forum (POF) Anomaly Classification System.

In summary, the integration of a CMFL sensor into the Pipe Explorer robotic pipeline inspection platform has allowed operators the evaluation of anomalies near long seam welds in pipelines ranging from 10 inches to 26 inches in diameter. As of 2024, Intero has assessed over 30 kilometers of 16-inch and 20-inch pipelines using the robotic inspection method, thereby improving the safety of these pipelines through a deeper understanding of their integrity conditions, surpassing the capabilities of conventional inspection methods. The data obtained has facilitated proactive maintenance efforts, addressing various issues like selective seam weld corrosion and other axially-oriented anomalies. Continuous improvements in algorithms, technology, and operations will further enhance the capabilities of this service offering. Furthermore, there are ongoing efforts to extend this service offering to cover pipelines with 30-inch diameters.

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ABOUT INTERO INTEGRITY SERVICES:

With a range of innovative techniques to overcome even the most difficult circumstances in critical infrastructure, Intero Integrity's high-precision data provides a comprehensive overview and prepares pipeline operators with the information necessary to prolong asset lifecycles.

Assessment of Long Seam Weld in ERW and Flash-Welded Pipes Using Circumferential Magnetic Flux Leakage Technology

For over twelve years, Intero has been inspecting unpiggable pipelines with Pipe Explorer, developed in 2012 in cooperation with NYSEARCH, using robotic in-line inspection robots to reveal imminent threats, including internal and external corrosions, mechanical damages, and other threats. Intero now offers a service that assesses long seam welds in pipelines for cracks and crack-like features on or near the long seam weld.

Since 2016, Intero has identified the need to inspect crack-like features in long seam welds. Following years of development and rigorous testing, a state-of-the-art circumferential magnetic flux leakage sensor was developed and integrated onto the Pipe Explorer robotic in-line inspection robots to assess long seam welds for threats in unpiggable pipelines that were previously unaddressed. The industry's focus on enhancing safety measures was paramount in the effort to develop this service offering.

Requiring minimal excavation and with the ability to assess under live conditions, this robotic technology can help operators address pipelines that are unpiggable due to difficult obstructions such as bends, valves, vertical sections, and other constraints as well as pipelines with pressure levels below what is needed to propel traditional smart pig technologies. Further, the robotic platform travels long distances from one excavation and does not require a tether for power or communication. The accuracy of the integrated sensor is equivalent to that of current sensing provided with traditional in-line inspection tools.

Long seam weld assessment services in unpiggable pipelines are available on the Explorer 16/18, which inspects 16- and 18-inch pipelines, and by the Explorer 10/14, which inspects 10-, 12- and 14-inch pipelines.

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NASTT

NO-DIG SHOW 2026

Call for Abstracts

SUBMISSION DEADLINE: JUNE 30, 2025

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2026 No-Dig Show in Palm Springs, CA at the Palm Springs Convention Center March 29-April 2, 2026. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry.

The abstracts must be submitted electronically by June 30, 2025 on the NASTT website:

nastt.org/no-dig-show

The No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at nastt.org.

Steel Gas Transmission Line Installation under the Cross Bronx Expressway

By: Robert Titanic, Bortech Company Inc.

A 300-foot 48-Inch utility tunnel was bored under this vital roadway corridor, the most congested in the US.

UTILITY TUNNEL UNDER THE I-95 CROSS BRONX EXPRESSWAY

The New York Post identifies the I-95 Cross Bronx Expressway as the most congested corridor in the United States. On average drivers waste 86 hours stuck idling in traffic on this particularly busy stretch every year. As part of a multi-year program to install approximately seven miles of 36-inch gas distribution main operating above 125 psig throughout Bronx County, Owner Con Edison (ConEd) needed to construct a 300-foot 48-Inch Steel cased utility tunnel directly under this vital roadway corridor. This challenging utility tunnel project is a small but essential part of a multi-year program to install approximately seven miles of 36-inch gas distribution main operating above 125 psig throughout Bronx County.

ConEd's overall multi-year program is intended to replace an existing 1948, 24-inch, 245 psig transmission main from the Bronx River Tunnel to the Bronx Westchester Border with a new 36-inch main. The 36-inch main will connect a new 36-inch, 350 psig main in the north from the Bronx Border to White Plains, which is already in progress, to the planned replacement of a 24-inch main located in the Bronx River Tunnel in the south. This new 300-foot 36-inch main will thereby serve as a new high pressure 36-inch connection to the entire Hunts Point 350 psig system.

The installation of this 36-inch, 350 psig Maximum Allowable Operating Pressure

(MAOP) pipe is required to comply with PHMSA's Pipeline Safety rule, effective January 1, 2021. PHMSA revised the Federal Pipeline Safety Regulations to improve the safety of onshore gas transmission pipelines. The rule requires an Operator to have traceable, verifiable, and complete records necessary to establish the MAOP, per 192.619(a) including records for a hydrostatic pressure test in accordance with 192.517(a). If records are not available to comply with the rule, PHMSA provided six (6) methods to reconfirm the MAOP of a main. Method 4, Pipe Replacement was the only feasible method that provided for the continual safe delivery of natural gas to Con Edison customers. New York State recently incorporated these changes into the New York State Gas Safety Regulations, 16 NYCRR 255.

As a proactive and responsible owner, ConEd recognized that the climate is changing so it originally chose to microtunnel a shorter route for the utility tunnel under the Cross Bronx Expressway in order to minimize the construction footprint and time required for fabrication (instead of open cutting resulting in massive traffic delays with unfavorable permit stipulations extending the schedule considerably). The benefits of using this microtunneling method included reducing the carbon footprint of mechanized equipment and hauling away overburden in addition to not having to further worsen the existing traffic congestion and idling motor vehicles. Microtunneling would also reduce the need for additional natural and fabricated resources (i.e., steel pipe).

LEFT: Boulders as large as 10 feet were excavated and removed from the jacking shafts.

RIGHT: Methods were selected that could best minimize the construction footprint

CHANGE OF PLANS NECESSARY

Contrary to the preliminary boring explorations taken at the site during the design phase of the project, nested cobbles and boulders were encountered when test holes were drilled at the entry and exit locations of the proposed jacking and receiving shafts on Noble Avenue. Boulders as large as 10 feet in diameter were excavated and removed from the jacking shafts. Additional horizontal probing was performed using a guided bore method pilot tube to better understand the actual ground composition along the proposed bore path. Here, obstructions in the form of boulders were encountered at the center and outer edge of the proposed tunnel at a distance of 60 feet from the proposed tunnel face.

With these major obstructions encountered, a change in plans was necessary. The Owner ConEd consulted with Bortech Company, Inc., to inquire about utilizing Horizontal Hammer Technology with Down the Hole (DTH) Tooling. Bortech has extensive experience with this method having built their first Horizontal Hammer system in 2004 and installing hundreds of these types of crossings over the 20 years since then. The team at Bortech Trenchless Division was convinced that the Horizontal Hammer Boring (HHB) method was the correct method of application given the obstructions, mixed and varying ground composition. Additionally, the Bortech team did not think they would be able to successfully deploy one of their MTBMs of this diameter in these difficult ground conditions. Ultimately after extensive discussions, the Con Edison Construction and Engineering departments agreed that this was the best approach to take given the underlying geology.

Bortech had been previously successful at getting the HHB method approved and permitted by the New York State Department of Transportation (NYS-DOT), with a successful tunnel installation under the Sprain Brook Parkway in White Plains NY. Using this track record Bortech was able to obtain quick approval again by submitting a history of successfully completed projects supported with acceptable settlement and vibration monitoring data.

HORIZONTAL HAMMER BORING (HHB) METHOD

The horizontal drilling rig is a rack and pinion frame powered by hydraulic motors for rotary and thrust. This drilling equipment has a variable thrust and rotary torque. Using larger hydraulic motors Bortech increased the rotary output to 110,634 ft-lbs. The diesel over hydraulic "out of pit" power pack is positioned at ground level so there is no combustion engine in the jacking pit and all functions of the drill are radio remote controlled above the jacking pit. Remote-controlled functions include drill thrust and rotary pressure and speed, DTH hammer variable pressure, water into the airstream for dust control, hammer oil volume into the airstream, hydraulic rams to adjust both line and grade and hydraulic stabilizing casing arms.

For the 48-inch casing needed for this project, a 34-inch class DTH Down Hole Hammer was used. Bortech used Mincons

I-95 Cross Bronx Expressway is the most congested corridor in the US. Sending pad 40 feet in length to accommodate both drill and 20-foot casing length segments

Spiral Flush Pilot Bit for their patented air control technology. Keeping the air pressure and volume inside the casing pipe and not charging the surrounding ground is Bortech's policy. Ground formation and distance into the bore hole determined the amount of air feeding, rotary pressure and speed required for optimum hammer production rates. Borehole stabilization and lubrication through the use of Foam and Polymer Hole Control injection into the air supply to the down hole hammer were used to reduce external casing friction. When clay formations became visible in the return spoils a clay thinner deflocculant was added to the air supply.

It is Bortech policy and standard operating procedure to either use whip-socks and or hose restraints on all air connections. In addition, the non-hose end was affixed to a stationary piece of equipment or structure whenever it was possible. The ring bit of the hammer is integrated into the hammer pilot bit and the pneumatic powered supply to the hammer was activated by advancing the drill carriage. This crowds the down hole hammer assembly through the air augers, which initiates the hammer action to advance the casing, pilot and ring bit against the bore path medium. The hammer action ceases when there is not enough resistance from the bore path medium, or when there is no crowding from the drill bit into the medium.

The first casing length is called "The starter casing". The starter casing for this project was 16.8125 feet in length and 48.82 inches in diameter. The starter casing contains the following: pilot bit, ring bit, weld casing shoe, DTH hammer, shock-sub, cross over, hammer shroud, air auger segment and cover skin. This assembly was collared into the ground formation and stabilized using the hydraulic casing arms. These arms secured the casing onto the rig frame and counterbalanced the hammer recoil along with the down hole shock absorbing sub. The casing pipe was supported by the frame of the rig at the desired line and grade. The rig frame was equipped with hydraulic rams adjustable in both horizontal and vertical orientations.

During drilling, the hammer assembly inside the lead casing pipe advances and is rotated by the carriage rotary and thrust functions. The drill rig advances the casing pipe as needed by the requirements of the formation resistance. The hammer pilot bit meshes with the drive shoe that is joined to the starter casing thus becoming an integral part of the starter casing assembly. The hammer action pulls the casing pipe into the borehole until the entire casing pipe is installed. Each section of casing is welded to the previously installed casing pipe. This process is repeated essentially in a cartridge installation method until the pilot bit reaches the receiving pit.

Drill rig advances the casing pipe as required based on formation resistance

Drilling through obstructions, mixed and varying ground composition took 5 ½ weeks

The lead casing line and grade is monitored with a total station and an electronic level. The hydraulic rams on the rig are adjusted to keep the lead casing on the desired line and grade while advancing the hammer through the ground medium. For this project, the rigidity of the 48-inch steel casing pipe and straight welded segments resulted in the best overall accuracy. Typically, obstructions like the boulders and cobbles encountered on a project like this would impact the accuracy of a conventional jack and bore method, requiring personnel entry and hand tunneling to remove the obstruction in an attempt to maintain line and grade. In comparison, the HHB hammer action breaks all forms of rocks into small fragments and flakes. Therefore, line and grade positioning are maintained while advancing through rock formations and limiting any disturbance to the medium outside of the pilot and ring bit surface areas.

CONSTRUCTION

The sending pit floor was excavated on the north side of the Cross Bronx Expressway at Noble Avenue, and a concrete pad was installed as per the owner's specification. The sending pad was 40 feet in length to accommodate both the drill and the 20-foot casing length segments. The elevation of the sending pad was placed at 3 feet below the invert of the casing to accommodate the drill frame height. This also allows for easy access for welding the bottom portion of the casing pipe.

After this initial setup, drilling began on February 22 2024, with holeout into the exit pit 5 ½ weeks later on April 1. Over the duration of the project, actual hammer bore penetration rates were 10.8 feet/hour in large boulders and competent rock and 21.1 feet/hour in mixed sand, silt clay and weathered cobbles. As discussed, ground formation was highly variable. Weathered Schist and Gneiss as well as competent hard boulders 8 to 10 feet in size, clay, silt, sand, and cobbles were all encountered in different places along the borepath.

Each 20-foot casing length segment was welded according to ConEd's specifications that produced non-defective x-ray quality pipe beveled joint welds. Welding and magnetic particle testing of each welded butt joint averaged 7 hours. There were several downtime days due to natural gas leaks detected in the ground around the project site. This is not an uncommon scenario given the age of the underground utility infrastructure in NYC. No welding could be performed until these gas leaks were resolved.

Ground water infiltrated the casing pipe through the face of the starter casing from entry point of the tunnel and ceased when reaching 93 feet. Therefore, four casing welds needed to be performed under these conditions adding several days to the overall schedule. Preliminary boring logs had not indicated the presence of any groundwater. It took time to come up with a solution as well as get the change in method approved. A new method was innovated by Bortech that prevented the water from passing the invert of the pipe during the welding and cooling process. This method is proprietary and did not require any dewatering and or well points. The groundwater penetration also added several days to the overall schedule. At 213 feet Bortech installed a hydraulic casing pusher assist to overcome any potential elevated skin friction on the casing pipe. The longer casing pipe sits without advancing, the greater potential for the ground to consolidate and increase drag on the outside of the casing pipe.

Following the installation of the 48-inch casing pipe, Bortech designed and fabricated a 36-inch push plate and front roller system to push the 36-inch gas main inside the 48-inch steel casing pipe.

CONCLUSION

At Bortech Company, Inc., we are dedicated to pioneering innovative solutions in horizontal utility tunneling. Our commitment to safety, precision, and sustainability drives us to exceed industry standards and deliver projects that enhance infrastructure while minimizing environmental impact. With a team of experienced professionals and cutting-edge technology, we tackle challenges head-on, ensuring timely and efficient execution. We believe that collaboration and transparency are key to successful partnerships, and we strive to build lasting relationships with our clients, stakeholders, and the communities we serve.

ABOUT THE AUTHOR

Robert Titanic is founder and CEO of BORTECH, he continues to develop evolving means and methods that result in real solutions when installing underground utility tunnels in complex and varying underground lithology. Robert is respected worldwide, not only for his thirty-year career as an engineer, but also for his inspirational leadership qualities and innovative means and methodology regarding drilling. A problem solver by nature, He continues to enjoy the industry and the hard working people who are committed to more innovative, reliable, environmentally responsible and safer approaches to constructing underground utility infrastructure.

Locating and Characterizing Pipes Without Excavation

By: GTI Energy

APEX surveys along a roadway

Lead is a toxic metal that can pose serious human health risks, even at low levels. To avoid lead leaching into drinking water, it is critical to locate buried water pipes and identify the materials that they are made of so lead pipes can be replaced. To do this in a non-intrusive and accurate manner will deliver significant cost reductions by eliminating the need to excavate as well as avoiding the potential for third-party damage to other utilities.

A new project underway intends to advance the state-of-the-art for buried asset identification approaches, applying technology used for military purposes to water infrastructure systems.

With funding from the U.S. Department of Defense (DoD), GTI Energy is partnering with White River Technologies, Inc. (WRT) to advance and demonstrate an above-ground electromagnetic induction (EMI) technology for detecting the location and identifying the composition of underground water pipelines.

The EMI technology, called APEX, incorporates a novel, three-dimensional (3D) transmit and receive induced signal design for obtaining accurate localization and characterization of buried metal objects and infrastructure.

The 3D design concept was developed, tested, and demonstrated as part of the DoD's Strategic Environmental Research and Development Program (SERDP)-Environ-

Locating issues are a leading cause of damage to underground pipelines

mental Security Technology Certification Program (ESTCP) Munitions Response program to detect, characterize, and clear buried unexploded ordnance. It has also been successfully demonstrated by GTI Energy on applications for natural gas utility pipeline mapping in a California Energy Commission-funded project. The mature technology will now be validated first in a controlled test environment, followed by a field demonstration on water pipe networks at DoD facilities.

DoD will benefit from the implementation of this cost-effective and scalable technology, and there is potential to use it to help cities across the country minimize the need to excavate, enabling faster identification of lead pipelines that can reduce future health risks.

APEX is used to map buried pipelines during test study

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Addressing Systemic Inefficiencies in the Damage Prevention Process

By: Jay Rendos, Continuum Capital

Failures in the nation's 811 system, designed to prevent damage to underground utility lines, are leading to $61 billion annually in waste and excess costs, and additionally creating unnecessary public safety hazards. These issues are particularly notable in states where implementation and accountability are weakest, according to a recently released independent review titled"811 Emergency". The review, commissioned by the Infrastructure Protection Coalition (www.ipcweb.org), brings attention to the significant costs of inefficiency within the system. The Infrastructure Protection Coalition (IPC) is a group of associations representing broadband, electric, natural gas, oil, sewer, transportation, and water industries who design, construct, maintain, or locate these underground systems with both union and non-union workforces. These are regular users and stakeholders who rely on the 811 system to operate safely, effectively, and efficiently.

The primary reasons for the waste and cost overruns found in this study include:

- Utilities and third-party locators needlessly dispatched to locate lines for construction projects ultimately do not occur;
- Inadequate instructions provided to locators, causing wasted time or additional work;
- Destruction of location marks by construction, requiring reinstallation; and
- Contractors wait time when location efforts exceed the legal notice period.

These costs amount to $61 billion in waste, inefficiency, and excess cost that are embedded in the system and largely invisible.

Another association that is identifying challenges and collecting data to address

Measuring Performance: Circle of Accountability

- Currently defining baseline performance metrics for the DPI
- **Excavators** (final, implemented)
    - Damages / 10,000 work hours (calculated same as work hours for TRIR)
- **Owners/Operators** (final, rolling out in 2024)
    - Damages Caused by Mapping Errors / 1,000 Locate Tickets Received
    - Projects Completed / # of Mapping Records Updates to Records Department
    - Trouble Locate Tickets / Locate Tickets Received
- **Locators**
    - Under discussion within DPI Metrics Sub-Committee; focus is on-time performance and damages caused by locating errors.

CGA

systemic challenges in the damage prevention process is the Common Ground Alliance's (CGA) Damage Prevention Institute (DPI). DPI's mission is to address inefficiencies in the damage prevention process through a system of comprehensive participant accreditation and metrics, creating the foundation for a consolidated benchmarking and true peer review process.

The value of the DPI extends beyond individual organizational performance documentation. By enabling comparisons to industry benchmarks and facilitating analysis of behaviors that lead to different damage prevention outcomes, the DPI fosters a culture of continuous improvement. Achieving reductions in damages requires individual organizations in the industry to be accountable for their shared responsibilities. The program creates healthy competition regarding improved safety, while peer reviews empower participants to enhance their performance with the support of industry peers.

As CGA continues to drive the damage prevention industry data collection, standardization and analysis, the DPI plays a crucial role in creating an environment of shared accountability for all stakeholders. The purpose of the DPI is to deliver additional insights into the systemic behaviors that lead to improved safety outcomes in the damage prevention industry.

The DPI fosters a culture of continuous improvement

Reporting requirements for DPI participants are established through a collaborative process involving the DPI Metrics Committee, the DPI Advisory Committee and the CGA Board of Directors. Monthly reporting of damages into DIRT is mandatory for CGA members participating in the DPI. This rigorous reporting schedule is designed to enhance their ability to react more quickly to damage data trends. Currently, DPI-eligible stakeholders include excavators, locators, design and engineering firms, and facility owner/operators, each playing a vital role in the damage prevention ecosystem.

DPI focuses on evaluating three specific metrics to ensure they are meaningful and support improvement across the industry. The three focus areas are:

Excavator Metrics

- Damages ÷ 10,000 Work Hours (calculated same as work hours for TRIR)

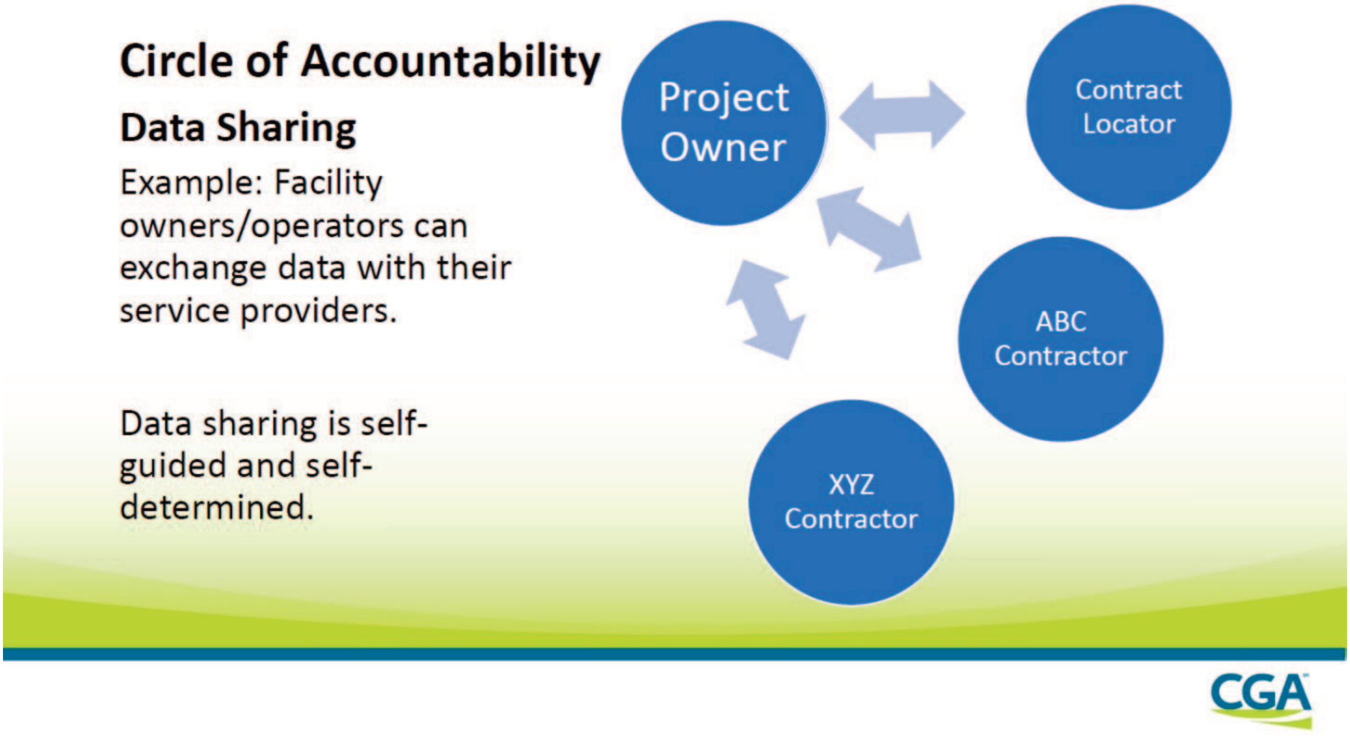
Locator Metrics

- On-Time Tickets ÷ Total Number of Tickets
- Damages Caused by Locating Issue ÷ 1,000 Locate Tickets Received

Facility Owner/Operator Metrics

- Damages Caused by Mapping Errors ÷ 1,000 Locate Tickets Received
- Projects Completed ÷ # of Mapping Records Updates to Records Department
- Trouble Locate Tickets ÷ Locate Tickets Received

The DPI also implemented a confidential peer review model aimed at fostering collaboration and knowledge-sharing within the industry. This model facilitates participants sharing key successes and challenges in reducing dig-ins to buried in-



frastructure and allows collaboration on industry benchmarking and systemic improvements.

Since the inception of DPI in April 2022 and formal launch in January 2023, DPI builds on the industry-leading insights of CGA's Next Practices Initiative to set standards for collaboration and performance improvement. By utilizing a stakeholder-centered approach to develop performance metrics, DPI reflects commitment to Best Practices and dedication to improving the reliability of the U.S. damage prevention system for everyone involved.

As DPI and CGA continue to evolve, their efforts complement the efforts of the Infrastructure Protection Coalition. Their combined efforts will improve the nation's 811 system metrics used to prevent damage to underground utility lines and ultimately reduce waste, excess costs, and public safety hazards. Support for these initiatives offers a practical path toward a safer and more efficient utility landscape.

ABOUT THE AUTHOR:

Jay Rendos is a consultant with Continuum Capital, which provides management consulting, training, and investment banking services to the worldwide energy, utility, and infrastructure construction industry. Jay brings over thirty years of experience and works primarily with gas/electric utilities, power generators, pipeline companies, and energy companies to support the planning, design, construction, and operation of capital assets. He is a recognized expert in both natural gas utility construction, operations, and maintenance along with power generation facility construction and operations including very specialized experience in reduced and no carbon emission facilities powered by natural gas, nuclear, or renewable sources.

What is the Damage Prevention Institute?

- **Launched:** January 2, 2023
- **Goal:** Address systemic issues through comprehensive:
  - Participant accreditation
  - Peer review
- **Benchmarked performance data for all participants**
  - Performace measurement in DPI focuses on the "circle of accountability"
- **Peer reviews**
  - What can we learn from each other that can improve performance?
  - Address systemic challenges in damage prevention

About IPC

811 EMERGENCY
$61 Billion Lost in System to Protect Underground Utilities

The Infrastructure Protection Coalition (IPC) is a coalition of industry groups who represent regular users and stakeholders in the 811 system and want to see it run safely and efficiently. Members include:

American Pipeline Contractors Association (APCA - www.americanpipeline.org) – Founded in 1971, APCA represents merit shop pipeline and station contractors operating throughout the US constructing energy infrastructure.

Distribution Contractors Association (DCA - www.dcaweb.org) – Founded in 1961, DCA represents contractors operating throughout the US constructing, replacing, or rehabilitating natural gas pipeline, electric cable, fiber optic cable, and duct systems.

National Utility Contractors Association (NUCA - www.nuca.com) – Founded in 1964, NUCA represents contractors completing utility construction and excavation throughout the US in the water, sewer, gas, electric, treatment plant, telecommunications, and excavation industries.

National Utility Locating Contractors Association (Nulca - www.nulca.org) – Founded in 1994, Nulca represents utility locating professionals operating throughout the US.

Power & Communications Contractors Association (PCCA - www.pccaweb.org) – Founded in 1945, PCCA members construct electric power facilities, including T&D lines and substations; broadband facilities, including telephone, fiber optic, and cable television systems; energy infrastructure, including renewable power generation facilities and gas and oil pipelines; and water/sewer infrastructure of all types.

Infrastructure Protection Coalition • www.ipcweb.org

How One Utility is Receiving Long-Term Value in the RFP Process

Driving Long-Term Value and Efficiency Together

By: Dan Lorenz, P.E., Joe Knows Energy

In today's competitive energy sector, utilities must go beyond price when evaluating vendors in the Request for Proposal (RFP) process. Long-term strategic value, efficiency, and collaboration are critical factors that drive sustainable success.

To explore this approach in depth, we spoke with Chris Hearn, the Category Management Leader for UGI Corp, which includes both UGI Utilities and UGI Energy Services. With over eight years of experience in strategic management, Chris has played a key role in evolving UGI's procurement strategy towards a value-based approach.

Guiding the conversation is Harold Woods, Director of Strategic Outreach at Joe Knows Energy. With 34 years of experience in the energy sector across multiple roles, Harold brings a deep understanding of industry challenges and best practices. Together, they discuss how UGI is redefining its RFP process to drive long-term success.

Chris Hearn

Harold Woods

SHIFTING THE FOCUS FROM PRICE TO VALUE

"When reviewing RFP submissions, our primary goal is ensuring that suppliers can deliver the services we need at a reasonable price while maintaining high standards for safety and quality," explains Hearn. While cost is an essential factor, UGI's approach recognizes that the lowest bid doesn't always equate to the best long-term solution.

Instead, the company actively builds deeper relationships with suppliers to drive long-term efficiencies and mutual benefits. "A strategic supplier may not offer the lowest price, but through collaboration, we develop efficiencies that create significant savings over time," Hearn adds. UGI's focus on total cost of ownership ensures that long-term value is prioritized over short-term cost reductions.

ENSURING A LEVEL PLAYING FIELD

While UGI is committed to fostering fairness in the RFP process, this does not mean treating all vendors as direct apples-to-apples comparisons. Instead, the focus is on ensuring all suppliers have access to the same information and the opportunity to present their full value.

"We make sure that every vendor is given the same level of transparency and opportunity to demonstrate what they bring to the table," Hearn states. "That includes not only pricing but also value-added services, innovation, and long-term strategic benefits. Our job is to take the time to fully understand the potential impact these services can have on our organization and factor that into our decisions."

COMMUNICATION AND COLLABORATION: THE KEYS TO EFFICIENCY

Many utilities rely on standard three-to-five-year contracts, but UGI takes a different approach by fostering open communication between procurement and vendors throughout the contract's duration. "Staying close to our suppliers allows us to gather critical feedback, address potential cost drivers, and proactively plan for future improvements,"

"Staying close to our suppliers allows us to gather critical feedback, and proactively plan for future improvements"

— Chris Hearn, Category Management Leader, UGI Corp.

Hearn explains.

One common industry challenge is that procurement teams often lack visibility into ongoing vendor relationships, with communication happening directly between suppliers and operational teams. UGI actively bridges this gap, ensuring that procurement remains engaged and informed. "Quantifying value can be challenging, but by maintaining open dialogue with internal business lines, we ensure alignment and maximize supplier performance," says Hearn.

ENCOURAGING VENDORS TO DEMONSTRATE INDIRECT VALUE

A major differentiator in UGI's RFP process is allowing vendors to showcase their full value beyond a simple pricing structure. "We encourage suppliers to submit comprehensive bid packages, including professional business plans and execution strategies. These additional details highlight value that isn't necessarily captured in a standard bid sheet," Hearn notes.

Additionally, vendors who offer innovative solutions, proactive problem-solving, and long-term partnership potential stand out in UGI's selection process. Suppliers who demonstrate a commitment to continuous improvement and operational efficiency provide added value that extends beyond pricing metrics.

BUILDING LONG-TERM RELATIONSHIPS FOR SUSTAINABLE SUCCESS

A key factor in UGI's procurement success is its strategic approach to supplier relationships. "We don't just set contracts and forget them. We evaluate ongoing performance, benchmark key metrics, and ensure suppliers are consistently delivering value," Hearn emphasizes. This feedback loop is crucial in identifying opportunities for improvement and fostering continuous innovation.

Hearn also highlights the importance of engaging with suppliers before an RFP is issued. "While we maintain structured communication during the RFP process, suppliers should take advantage of pre-

"We establish key performance metrics that guide our decision-making process and ensure our strategy remains effective,"

— Chris Hearn, Category Management Leader, UGI Corp.

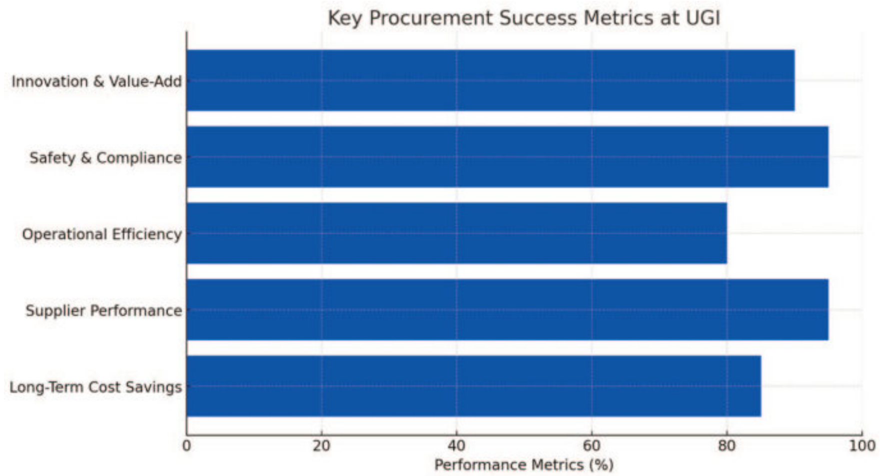
RFP discussions to clarify expectations and align their offerings with our needs," he advises.

MEASURING SUCCESS IN PROCUREMENT STRATEGY

Success in procurement isn't just about securing the lowest bid—it's about building partnerships that drive long-term efficiency and sustainability. "We establish key performance metrics that guide our decision-making process and ensure our strategy remains effective over time," Hearn explains. These metrics help quantify both direct and indirect value, ensuring that UGI's procurement strategy continues to evolve and adapt.

By embedding performance-based evaluations and continuous improvement goals into supplier agreements, UGI ensures that vendors are held accountable for delivering sustained value.

"The value Joe Knows Energy brings is clear—through strategic collaboration, proactive engagement, and a focus on long-term efficiency, they have helped us refine our procurement approach and ensure sustained value beyond just pricing," Hearn states



ADVICE FOR OTHER UTILITIES

For utilities looking to shift toward a value-based procurement approach, Hearn recommends starting with a data-driven strategy. "Understanding key spend categories, engaging business lines, and aligning with suppliers are critical steps," he advises. Beyond cost, utilities should consider factors such as operational efficiency, safety, and proactive planning when evaluating suppliers.

"Procurement professionals should remember that financial benefits come in many forms—not just upfront savings but also through efficiency improvements, better safety practices, and long-term strategic alignment," Hearn emphasizes.

CONCLUSION

UGI's progressive approach to procurement demonstrates how utilities can extract long-term value from the RFP process by prioritizing relationships, communication, and strategic collaboration. By focusing on total cost of ownership, performance-based metrics, and ongoing supplier engagement, UGI is fostering partnerships that enhance efficiency, safety, and service quality—setting a new standard for procurement excellence in the energy sector.

As Hearn summarizes, "The more we understand and plan, the better strategies we can implement. Procurement isn't just about buying—it's about driving value together."

ABOUT THE AUTHOR:

Dan Lorenz P.E., Founder and President of Joe Knows Energy, has over 35 years leading construction, training, and inspection services companies. He is passionate about elevating safety and quality cultures with frontline professionals. Joe Knows Energy provides staffing, recruiting, and consulting services to the utility and energy industries. To find out more, visit their website: www.joeknowsenergy.com or contact Dan at 614-989-2228 or dan@joeknowsenergy.com.

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