



# MID ATLANTIC JOURNAL OF TRENCHLESS TECHNOLOGY

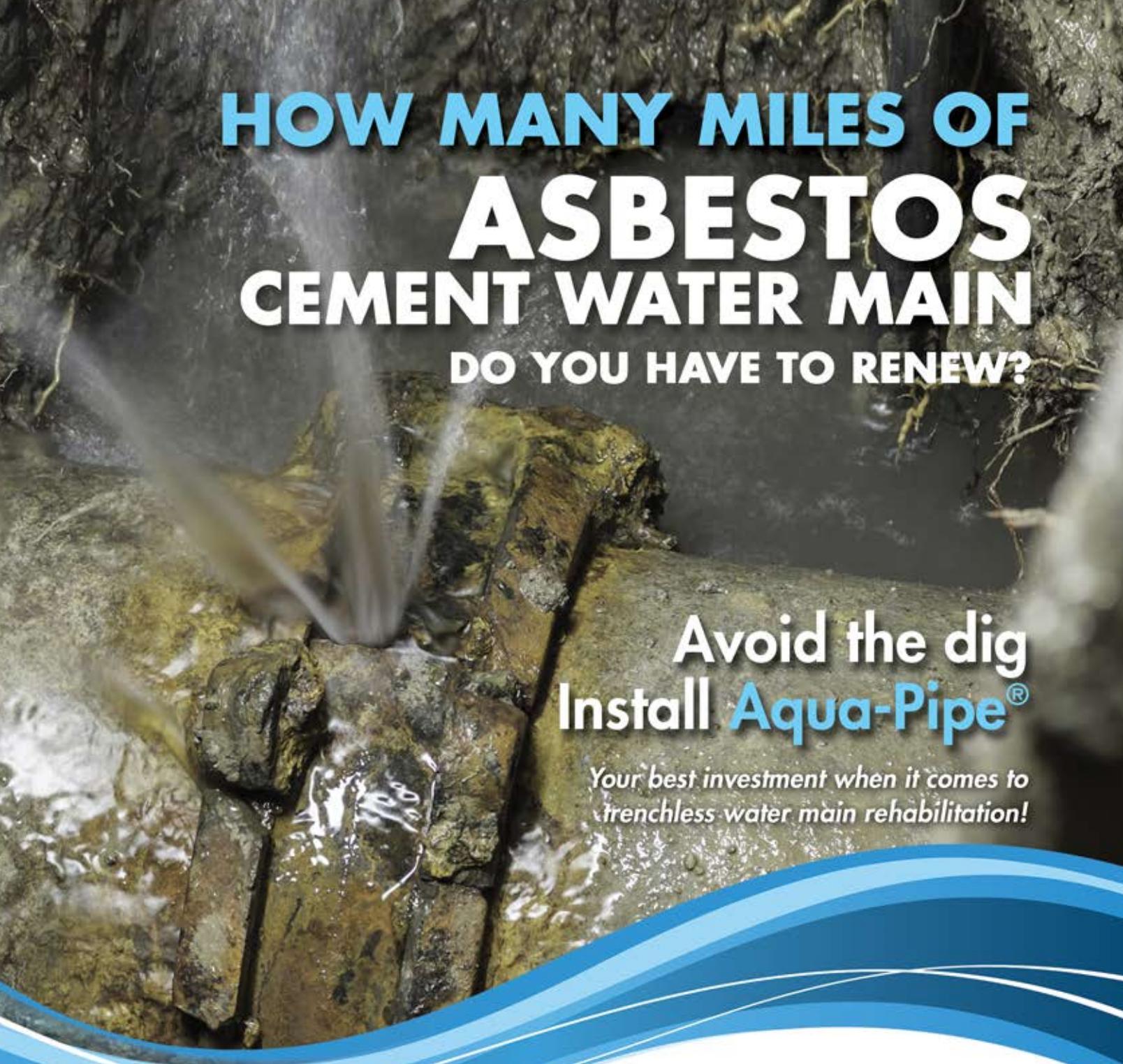
OFFICIAL PUBLICATION OF THE MID ATLANTIC SOCIETY FOR TRENCHLESS TECHNOLOGY

2017 EDITION



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under the National Mall***





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MASTT Chapter member Tri-State Utilities completed SSES evaluations and CIPP repair subcontracts on "Find and Fix" projects under the City of Charlottesville comprehensive sanitary and storm sewer rehabilitation program. The inherent efficiencies of "Find and Fix" have spurred remarkable progress in proactive asset management. The City has realized substantial savings from this streamlined program

### 30 Newark Seminar

A full day of trenchless technology presentations and networking focused on trenchless projects across the Mid Atlantic region. Featured presenter was Mr. Dino Ng, P.E., Associate Commissioner, New York City Department of Design & Construction. The seminar was co-sponsored by the ASCE North Jersey Branch, and certificates were issued for 5 PDH credits.

### 39 New Castle Uses A Sound Way

What started out as a university research project has developed into a tool that is being used worldwide. Preliminary acoustic inspection of sanitary sewer lines is another tool allowing municipalities to quickly address and reduce sewer overflows and blockages, while simultaneously providing an opportunity to reallocate and optimize resources. Acoustic inspections are now being written into CMOM programs.

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Cover photo courtesy Richard Thomasson P.E., ARCADIS-US



# MESSAGE FROM MASTT CHAIR

Richard Thomasson, P.E., MASTT Chair

We are pleased to produce our third publication of the Mid Atlantic Society for Trenchless Technology (MASTT) Journal. The MASTT was founded in 2004 as a Chapter of the North American Society for Trenchless Technology (NASTT), and serves the geographical region of Virginia, West Virginia, District of Columbia, Maryland, Delaware, Pennsylvania and New Jersey. This area has a huge population and many large municipalities. There has been ongoing interest in trenchless technology throughout our region because of the older water and sewer systems needing rehabilitation or replacement.

The many academic institutions in the Mid Atlantic region, and the presence of the nation's Capital, create a tremendous focus on infrastructure – which is primary in the trenchless technology industry. Many industry leading technology and service companies are located within the MASTT area. Numerous trade associations and research foundations are headquartered here, such as the National Association of Sewer Service Companies (NASSCO), which leads the service providers of many trenchless technology applications. All these factors make MASTT a valuable grassroots resource for

education, training, and promotion of the trenchless industry.

The new service products and innovations for trenchless technology have been used by public and private infrastructure owners across the Mid Atlantic region. Educating and introducing new trenchless technologies and services, MASTT has conducted 25 seminars throughout the Mid Atlantic area. These seminars have been very informative and have introduced trenchless technology to many people over the last 12 years. More short courses using NASTT developed course materials will be implemented in the future, tentatively in conjunction with the Richmond, VA seminar in the spring of 2017.

There is an overwhelming task ahead of bringing the water and sewer infrastructure up from its existing deteriorated state to a fully operational service level. Asset management has been promoted as the only practical method of getting a handle on this large problem. Condition assessment, rehabilitation and replacement of buried assets tie in seamlessly with trenchless technology. Environmental, social and economic factors are all greatly enhanced through applications of trenchless technology. We need to focus on performance, sustainability and resiliency of our water

**"WE LOOK FORWARD TO YOUR COLLABORATION & PARTICIPATION"**

and wastewater assets to provide the level of service necessary to maintain a healthy nation and provide safe water and good stewardship of our environment.

We feel that this *MASTT Mid Atlantic Journal of Trenchless Technology* is another step in providing information, education and focus on the growth and successes of the trenchless technology industry in the Mid Atlantic region. We look forward to your collaboration with, and participation in, MASTT!

Thank you,

Richard Thomasson  
Chair, MASTT



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# GREETINGS FROM THE MASTT EXECUTIVE DIRECTOR

Leonard Ingram, Sr., Executive Director, MASTT

The Chapter is doing great! With the seminar series "Trenchless Technology, SSES and Buried Asset Management" and the "Annual Journals" we are meeting our non-profit objectives which is "to advance the science and practice of Trenchless Technology for the public benefit". Since 2001, through MASTT, MSTT and SESTT, I have organized and conducted over 100 Trenchless Technology seminars, the majority of which have been two day seminars and well attended.

During early 2016 we conducted a very successful "Trenchless Technology, SSES and Buried Asset Management" seminar on April 6<sup>th</sup> & 7<sup>th</sup> at The Radisson

Baltimore Hotel at Cross Keys, Baltimore, MD. Mr. Art Shapiro, P.E., PMP, Chief Engineer and Mr. Wazir Qadir, Chief, Urgent Response Project Delivery Section, Baltimore Department of Engineering & Construction were the Guest Presenters with the presentation, "Trenchless Technology In Baltimore". ASCE Maryland Section was co-sponsor of the seminar. There was excellent networking and learning at the seminar.

MASTT conducted another "Trenchless Technology, SSES and Buried Asset Management" seminar in 2016 in Newark NJ on September 14<sup>th</sup> at the Wyndham Garden Newark Airport Hotel. Mr. Dino Y. P. Ng, P.E., Associate Commissioner,

NYC Department of Design and Construction was the Guest Presenter with the presentation "Trenchless Technology Applications In New York City". ASCE New Jersey Branch was the co-sponsor for the seminar. Please see pages 32-34 in this magazine for coverage and photos from the Newark seminar.

MASTT is planning a "Trenchless Technology, SSES and Buried Asset Management" seminar in Richmond VA on May 17<sup>th</sup> and 18<sup>th</sup>, 2017 and in Philadelphia PA \*Mount Laurel NJ) on November 1<sup>st</sup> and 2<sup>nd</sup>, 2017. So, please plan to register early to support and attend these seminars to enjoy the networking and learning.

Listed below is the 2017 Tentative Preliminary Proposed Seminar Schedule and the Proposed Journal 2017 publishing dates for the Mid Atlantic, Midwest and Southeast Societies for Trenchless Technology, of which I am the Executive Director. Please consider participating in these seminars as an exhibitor and/or food sponsor and presenter and with the journals with an article or an advertisement.

Thank you for your support!,

Leonard E. Ingram, Sr., PWAM  
Executive Director, MASTT

## 2017 TENTATIVE PRELIMINARY PROPOSED SEMINAR SCHEDULE:

SOCIETY	PROPOSED DATE	PROPOSED LOCATION	STATUS
SESTT	MAR 29 – 30, 2017	RALEIGH NC	CONDUCTED
MASTT	MAY 17 - 18, 2017	RICHMOND VA	PROPOSED
MSTT	JUL 26 - 27, 2017	MILWAUKEE WI	PROPOSED
SESTT	SEP 13 - 14, 2017	NEW ORLEANS LA	PROPOSED
MASTT	NOV 1 - 2, 2017	PHILADELPHIA PA	PROPOSED
MSTT	DEC 13 - 14, 2017	CINCINNATI OH	PROPOSED

## PROPOSED MASTT, MSTT AND SESTT 2017 JOURNAL PUBLICATION DATES:

SOCIETY	PROPOSED DATE	PROPOSED LOCATION
MASTT JOURNAL	PUBLISHED DATE	MARCH 31, 2017
MSTT JOURNAL	PUBLISH DATE	SEPTEMBER 15, 2017
SESTT JOURNAL	PUBLISH DATE	NOVEMBER 17, 2017



MASTT SEMINAR



# MESSAGE FROM NASTT CHAIR

Frank Firsching, NASTT Chair

Hello Mid Atlantic Chapter Members! As the year gets underway, I'm excited for the future during my term as Chair of the Board of Directors. The year is off to a great start. NASTT's 2017 No-Dig Show and ISTT's 35th International No-Dig in Washington, D.C. is set to be very successful on all accounts. The exhibit hall is a sell-out once again and we anticipate excellent attendance. We're looking forward to hosting delegates from all over the globe!

NASTT exists because of the dedication and support of our volunteers and our 11

regional chapters. There are many Mid Atlantic Chapter Members that served on our No-Dig Show Program Committee and volunteered their time and industry knowledge to peer-review the 2017 abstracts. These committee members ensure that the technical presentations are up to the standards we are known for: Paul Headland, Gregg Leslie, Peter Oram, Anna Pridmore, George Ragula, Camille Rubiez, Jim Shelton, Sunil Sinha, Richard Thomasson and Dennis Walsh. The Mid Atlantic Chapter is also home to some of our Session Leaders. Session Leaders are Program Committee members that have the added responsibility of managing a session of the technical program and working with the authors and presenters to facilitate excellent presentations. I would like to extend a special thank you to the Mid Atlantic Chapter Members that also served as Session Leaders: Peter Oram, Anna Pridmore, George Ragula, Richard Thomasson and Dennis Walsh.

In addition to the annual No-Dig Show, NASTT provides many trenchless training courses. We are focused on trenchless education and our highly-experienced instructors are dedicated to trenchless education, providing their expertise strictly on a volunteer basis. They donate personal time to travel around North America to provide high quality training on a host of trenchless technologies. I would like to thank Mid Atlantic Chapter Members, George Ragula and Dennis, for serving as instructors. George teaches our CIPL Good Practices Course and our Gas Good Practices Course and Dennis teaches our Gas Good Practices Course.

The North American Society for Trenchless Technology is a society for trenchless professionals. Our goal is to keep our finger on the pulse of our industry and

provide beneficial initiatives. To do that, we need the involvement and feedback from our professional peers. If you are interested in more information, please visit our website at [nastt.org/volunteer](http://nastt.org/volunteer). There you can view our committees and learn more about these great ways to stay involved with the trenchless community and to have your voice heard. Please consider becoming a volunteer – we would love to have you get more involved.

NASTT has a very promising future because of our amazing volunteers. Thank you again for your continued support and dedication to NASTT and the trenchless technology industry.

*Frank Firsching*

Frank Firsching  
NASTT Chair



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# MEMBERSHIP IN NASTT

Molly Margosian, NASTT Membership Coordinator

*Are you getting the most out of your NASTT membership?*

*Taking advantage of all NASTT has to offer? As your membership coordinator, I'm happy to guide you to resources so that you can fill your trenchless toolbox with up to date industry information, webinars, events, and so much more!*

*Did you know NASTT has the world's largest online trenchless library, filled with technical papers focusing on a wide variety of trenchless topics? All papers are all available for download to our members compliments of NASTT. We sell industry books too!*

*Does your organization exhibit at NASTT's No-Dig Show? Members can enjoy discounts on training and registration at our annual No-Dig Show.*

*Are you hiring or searching for a new position? Being a society member allows you to view and post career opportunities on the job board on nastt.org. This complimentary membership tool houses industry specific jobs and gives members the opportunity to search for potential jobs or post positions that are needing to be filled.*

*Are you interested in getting to know the next generation of trenchless champions? NASTT also offers membership to students! We are proud of our 18 NASTT Student Chapters with three that have just joined us in 2016. These student members are given the opportunity to attend the No-Dig show and learn about the trenchless world while networking with potential employers. Student chapters fulfill critical roles as not only volunteers at NASTT's No-Dig Show, but are the next generation of trenchless professionals.*

*Does your NASTT membership also make you a member of your Regional Chapter? Yes! Take the opportunity to work your local network and get involved with your Regional Chapter. Regional Chapters offer trainings and meetings, providing you the chance to expand your regional network. NASTT Regional Chapters encourage community outreach, and are a great tool to expand your knowledgebase and meet other individuals within your industry too!*

But wait, there's so much more! NASTT offers a weekly eNewsletter, blog, archived webinars on trenchless topics, and committee and volunteer opportunities for you. Now that you know a little more about what NASTT Membership has to offer, it's time to join us! Visit [nastt.org](http://nastt.org) and get your membership started today!

*Molly Margosian*

Molly Margosian  
NASTT Membership Coordinator

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## Richard Thomasson – *Chair*

Richard O. Thomasson has over 47 years of experience working in the water and wastewater field. He has been closely involved with Trenchless Technology for nearly his entire career. While at the Washington Suburban Sanitary Commission he directed many uses of new trenchless technologies, retiring after 31 years as the Director of Construction. He has worked with Parsons Brinckerhoff for 8 years, and Arcadis for the past 8 years, continuing his involvement in numerous trenchless projects.

Richard has a B.Sc. in Civil Engineering from Virginia Tech, a M.Sc. in Civil Engineering and a MPP in Public Affairs from the University of Maryland. He is presently in a Ph.D. program at Virginia Tech, and is a licensed P.E. in Virginia and Georgia.

As a Founding Director and the very first Chair of the North American Society for Trenchless Technology (NASTT), Richard believes fully operational water and wastewater systems are crucial assets for a healthy growing nation. In 2016 Richard was inducted into the NASTT Hall of Fame.

## Michael Delzingaro – *Vice Chair*

Michael Delzingaro is the VP & Director of Sales of Xylem Dewatering, including Flygt and Godwin brands.

Michael has 24 years of experience in the water industry and a background in entrepreneurial-driven businesses.

Michael holds a B.Sc. and M.Sc. in Mechanical Engineering from Villanova University as well as a Certificate in Technical Management from Purdue University, Krannert Graduate School of Management. He co-authored two patents for measuring thrust & torsion in gate and check valves.



## Dennis Walsh – *Secretary*

Dennis M. Walsh, P.E. is a Senior Project Manager – Horizontal Directional Drilling for Public Service Electric & Gas in New Jersey. Dennis is a 1972 graduate of the University of Dayton, Ohio with a B.S. in Civil Engineering and a 2002 graduate of the Polytechnic University of New York with a M.S. in Technology. He retired from KeySpan Energy Company in 2005 after a 28 year career in the gas utility field with a background in engineering, operations, construction, Quality Assurance and HVAC. He led KeySpan's efforts to expand the use of trenchless technology in the early 1990's to decrease its main and service installation costs. Prior to joining PSE&G, he was a consulting engineer for various consultants in the natural gas industry.

Dennis is a member of the Society of Gas Operators, and a Board Member of the North American Society for Trenchless Technology. He is also on the NASTT No-Dig Show Committee. Throughout his career, he has designed numerous HDD installations for various utilities. When he is not involved in trenchless projects, Dennis enjoys traveling and playing golf.



## Tom Wyatt – *Treasurer*

Tom Wyatt has over 40 years of experience in construction and wastewater facilities. Since 1999 he has focused on Trenchless Technology, Inspection, Rehabilitation, & Condition Assessment of Sanitary Sewers. He has helped municipalities with developing and incorporating procedures and programming elements for their CMOM programs. He strongly believes in using trenchless technology along with new technologies that make rehabilitation of Wastewater systems easier and more cost effective. He is currently an Associate with KCI Technologies Inc. in Newark Delaware., Tom is an active member in NASTT, NASSCO, WEF, CWEA, Voting member ASTM, ASHE and ACEC.

# MID ATLANTIC SOCIETY FOR TRENCHLESS TECHNOLOGY BOARD OF DIRECTORS 2017

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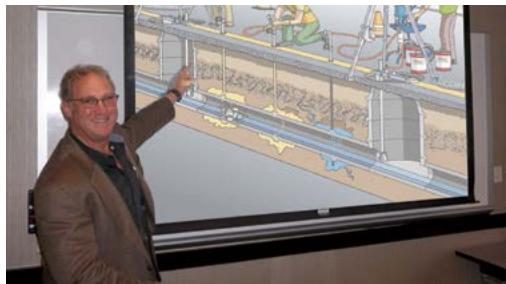
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**MSTT - MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY**

**SESTT - SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY**

SOCIETY	PROPOSED DATE	PROPOSED LOCATION	STATUS
SESTT SEMINAR	MAR 29 – 30, 2017	RALEIGH NC	COMPLETED
MASST SEMINAR	MAY 17 - 18, 2017	RICHMOND VA	PROPOSED
MSTT SEMINAR	JUL 26 - 27, 2017	MILWAUKEE WI	PROPOSED
SESTT SEMINAR	SEP 13 - 14, 2017	NEW ORLEANS LA	PROPOSED
MASST SEMINAR	NOV 1 - 2, 2017	PHILADELPHIA PA	PROPOSED
MSTT SEMINAR	DEC 13 - 14, 2017	CINCINNATI OH	PROPOSED

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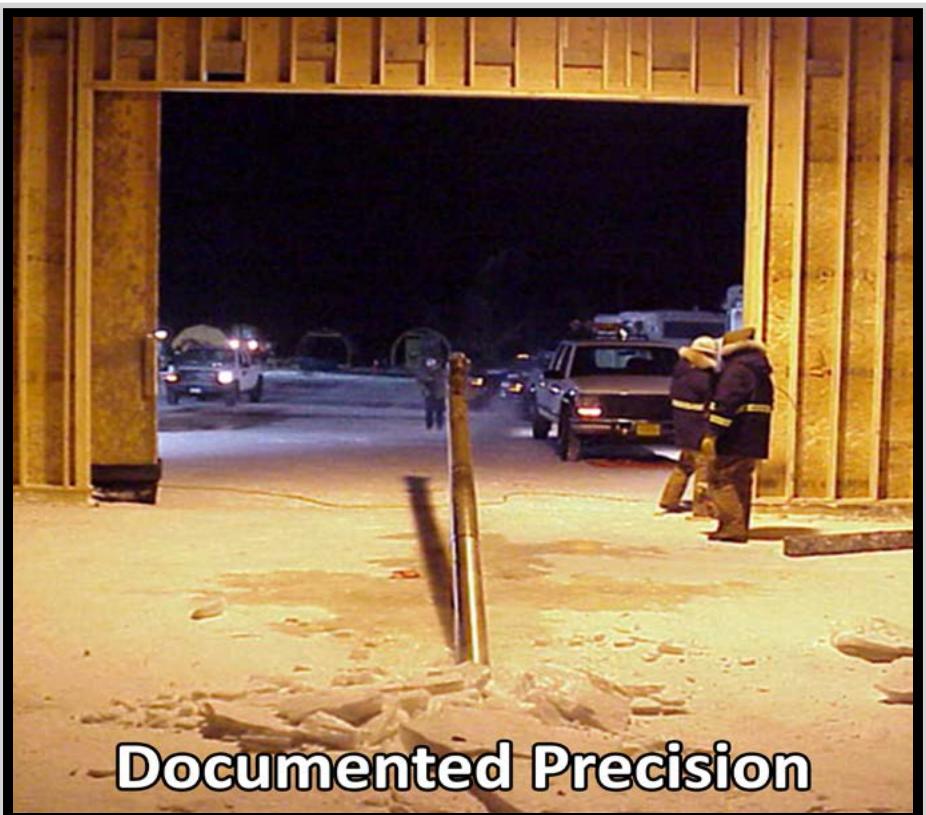
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# DC WATER B STREET NEW JERSEY AVENUE TRUNK SEWER

## Multiple Progressive Condition Assessment Modeling Approach for Historic Unreinforced Concrete Sewer under the National Mall

By: Essey Woldemariam, DC Water, Richard Thomasson P.E., ARCADIS-US

DC Water has been in existence since 1932 when it operated as the District of Columbia Department of Sanitary Engineering. The sewage treatment plant at Blue Plains was constructed shortly after formation of the agency. On April 18, 1996 the District of Columbia Water and Sewer Authority (DC WASA), an independent authority of the District of Columbia was

created. Among other operational changes, DC WASA's finances were no longer tied to the District's overall budget and allowed for all user fees collected to be reinvested into operations and capital improvements.

DC Water distributes drinking water and collects and treats wastewater for more than 672,000 residents and 17.8 million annual visitors in the District of Columbia.

DC Water also provides wholesale wastewater treatment services for 1.6 million people in Montgomery and Prince George's counties in Maryland, and Fairfax and Loudoun counties in Virginia.

To distribute drinking water, DC Water operates more than 1,300 miles of pipes, four pumping stations, five reservoirs and four elevated water storage tanks. To collect



*This historic unreinforced concrete sewer runs through the heart of the nation's Capital. The sewer extends approximately 22,700 linear feet and ranges in size from 6-foot-6-inch-diameter circular sections to an 18-foot-by-16-foot arched cross section.*

wastewater, DC Water operates 1,900 miles of sanitary and combined sewers, and nine off-site wastewater pumping stations. To treat wastewater, DC Water operates the Blue Plains Advanced Wastewater Treatment Plant, the largest advanced wastewater treatment facility in the world.

The B Street/New Jersey Avenue Trunk Sewer is one of the District of Columbia

Water and Sewer Authority's (DC Water's) most critical and oldest sewer assets. This historic unreinforced concrete sewer runs through the heart of the nation's Capital, traversing under Constitution Avenue and adjacent to the Capitol Building. The sewer extends approximately 22,700 linear feet and ranges in size from 6-foot-6-inch-diameter circular sections to an 18-foot-

by-16-foot arched cross section. Although previous investigations have been performed, the results are outdated and of poor quality; defects were not fully mapped or characterized; and some sewer segments were never inspected. Therefore, the true pipe condition remained unknown.

## CONDITION ASSESSMENT REPORT

The purposes of this Condition Assessment Report are to:

- Define the condition of the B Street/New Jersey Avenue Trunk Sewer and likelihood of failure by implementation of rigorous condition inspection and testing.
- Summarize the results of the inspection, testing, and assessment.
- Identify rehabilitation repair methods and associated costs for development of opinion of probable cost.

Inspections of the B Street/New Jersey Avenue Trunk Sewer performed in 2004 did not define the true pipe condition and likelihood of failure. In late 2011, DC Water, working with ARCADIS DC PC, began planning for further assessment of the B Street/New Jersey Avenue Trunk Sewer.

ARCADIS DC PC facilitated the planning activities and assembled and engaged a team of large-diameter sewer pipe and concrete specialists to develop a program of inspection, testing, and assessment of the B Street/New Jersey Avenue Trunk Sewer. The team included John Marshall, Chief Engineer of DACCO SCI, Inc. (DACCO SCI); JF White Contracting Company (JF White) to perform the manned inspection/testing; NDT Corporation (NDT) to provide oversight for ground-penetrating radar (GPR) and sonic/ultrasonic (sonic) testing; and REI Drayco to provided traffic control. Consequently, a work plan was prepared with recommendations for the following:

- Perform GPR testing over the ground surface of the pipeline.
- Perform CCTV inspection of the entire length of the sewer.
- Perform a manned inspection of the entire length of the sewer.
- Complete an evaluation and analysis of the results of the assessment.



National Museum of the American Indian



National Museum of Natural History



## **"JF WHITE PERFORMED THE MAN ENTRY INTO THE SEWER BY DESIGNING AND BUILDING A PONTOON TO FLOAT ON THE WASTEWATER IN THE CUNETTE AND SERVE AS A PLATFORM FOR THE INSPECTION EQUIPMENT, INCLUDING THE LIGHTING AND CAMERAS."**

The estimated costs for such an extensive program were significant, and various alternate strategies were explored to reduce costs. Subsequently, DC Water agreed on the following program:

- Perform GPR testing over the ground surface of the pipeline.
- Perform CCTV inspection of the circular pipe segments.
- Perform manned inspection of the arched pipe segments.
- Complete an evaluation and analysis of the results of the assessment.

GPR testing was completed in early 2012.

DC Water and the ARCADISDC PC communicated with the following agencies to provide notifications and secure permits or approvals for this project:

- District Department of Transportation
- Architect of the Capitol
- United States National Park Service
- Department of Consumer and Regulatory Affairs
- United States Capitol Police
- United States General Services Administration

The following documents were developed to facilitate inspection activities:

- A Wet Weather Protocol to provide guidance for cancellation of inspections due to wet weather
- A Risk Register to mitigate potential risks that could negatively impact the project and to present an overview of risk management procedures
- A detailed schedule for the manned inspection
- A Health and Safety Plan detailing the following information:

- Overview Summary
- Installation of Brackets, Safety Restraints, and Work Decks
- Manned Tunnel Inspection
- Emergency Management Plan
- Project Contacts
- Activity Hazard Analysis
- Manhole Traffic Plans
- Confined-Space Permit

### **INSPECTION METHODOLOGY**

The methodology for the comprehensive internal sewer inspection was developed by JF White in concert with DC Water and the Chief Engineer of DACCO SCI. The 2014 sewer inspection was performed only for surfaces above the flow in the pipe using the following methods:

- Visual inspection (with CCTV video documentation) of the arched sewer, with the exception of the siphons
- Non-destructive testing of the arched sewer using sonic and pipe-penetrating radar (PPR) techniques at intervals of approximately 200 feet or where directed by the Chief Engineer of DACCO SCI

JF White performed the man entry into the sewer by designing and building a pontoon to float on the wastewater in the cunette and serve as a platform for the inspection equipment, including the lighting and cameras. For propulsion, a tow cable was attached to the pontoon, and the pontoon was pulled upstream by a powered winch located at the exit manhole.

Large LED floodlights were used to illuminate the sewer to a high degree. With the high level of lighting, all points of the sewer could be clearly seen, which allowed accurate detection of defects and anomalies.

Because JF White's crew were the only persons entering the sewer, real-time communications were needed with

their support staff and DACCO SCI. Communications were provided through an umbilical cable extending from the entry manhole to the pontoon. The inspection engineering staff was located in a top side trailer equipped with real-time two-way voice communications.

Included in the umbilical cable were four video feeds from four cameras located on the pontoon. Three cameras were fixed on the pontoon and provided continuous real-time video of the left, right, and crown of the sewer. These three video feeds were recorded in synchronization so that they could be played back simultaneously using the appropriate software. The fourth feed was attached to a handheld high-definition camera that provided a close-up view of defects as required by DACCO SCI. The handheld high-definition camera was also used to provide real-time video of the laptop located onboard the pontoon as it recorded the results of the non-destructive PPR testing. The image of each camera was shown on separate large-screen monitors located in the top side trailer.

All aspects of the investigation were managed from the engineering trailer. The four video feeds and the real-time communication allowed the engineers to observe sewer defects and direct the test method to be used for a particular defect. The engineering team recorded the sewer anomalies on unfolded plans and inlet data forms during the inspection. The multi-camera video recording provided a high-quality visual record of all inspection activities.



*In this stretch of sewer, the walls show signs of moisture normally not seen in other sections, and much of the bench has failed and been repaired.*

PPR and sonic testing was performed by the JF White sewer inspection crew. The testing equipment and expertise were provided by NDT, which trained JF White sewer staff concerning the testing procedures. Using real-time video and voice communication, NDT staff supervised JF White from the top side trailer during each test.

The non-destructive tests and investigations of anomalous areas were not performed continuously. Concrete testing was performed at  $\pm 200$ -foot intervals to obtain a general understanding of the concrete properties. The results of these periodic tests were assumed to apply to other areas that were not tested but visually displayed similar conditions. Additional testing and probing were performed at locations that appeared to be anomalous; however, some irregularities may have been masked by sludge; therefore, some anomalous areas may not have been probed or chipped.

## FINITE ELEMENT ANALYSIS (FEA) MODELING APPROACH

Following the inspection of the sewer, structural analysis modeling was performed to identify the impact of the observed defects on the structural integrity

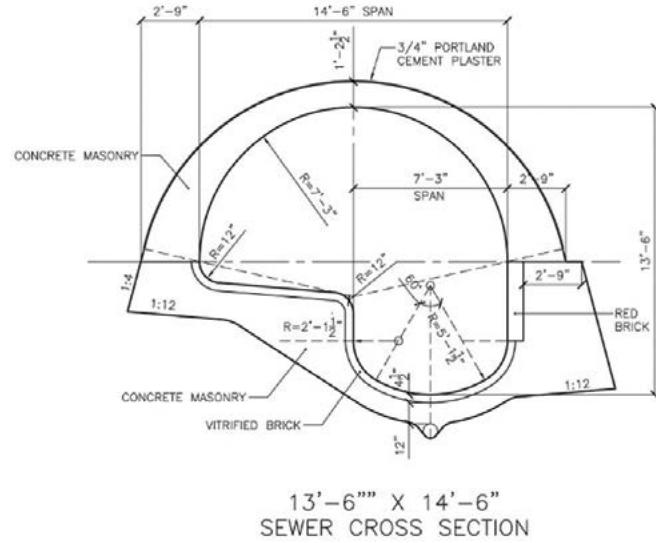
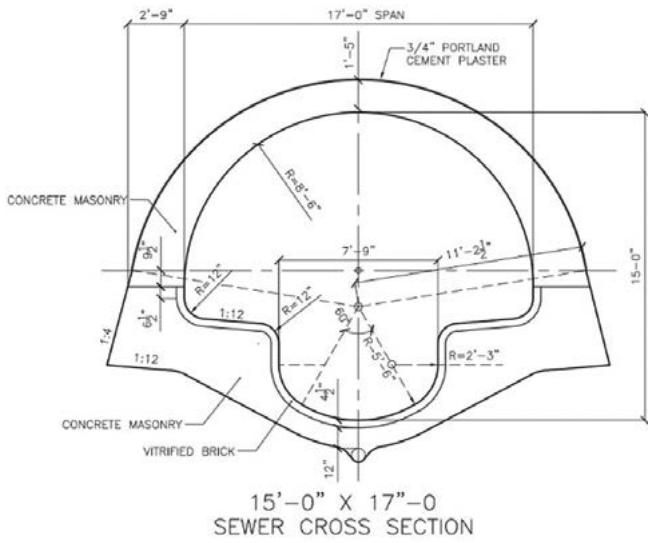
of the sewer. A baseline model was created to represent the as-built condition of the sewer based on the available drawings and documentation. The observed defects were then modeled, and the resulting stresses and safety factors were compared to the baseline condition as well as to industry standard limits. The intent was to use the analysis results in conjunction with observations from the manned inspection and the non-destructive test results to categorize the condition of the sewer and prioritize potential repair needs.

The structural analysis was performed using FEA modeling software. The analysis approach subdivides a sewer cross section into smaller elements (or "plates") and allows properties or defects to be accurately applied to specific areas along the cross section. FEA modeling also allows the production of output for each plate element, which provides a detailed summary of the stress contours and deflections.

FEA modeling was performed for two B Street/New Jersey Avenue Trunk Sewer cross sections using STAAD.Pro structural analysis and design software. The two cross sections analyzed were the 15-foot-high by 17-foot-wide double bench sewer and the 13-foot-6-inch-high by 14-foot-6-inch-wide single bench sewer. The 15-foot by 17-foot

sewer was selected because the 17-foot arch span is the most prevalent sewer width for the double bench sections. This span is present from South Capitol Street near the intersection of E Street, SE (Station 125+93) downstream to K Street, SE (Station 154+84), a length of 2,891 feet, excluding reconstructed cross sections. The 14-foot-6-inch span was selected because it is the widest arch span for a single bench section, and is present at 10th Street, NW and Constitution Avenue, NW (Station 66+56 to Station 68+64), a length of 208 feet, in front of the Museum of Natural History.

The structural analysis commenced by creating a two-dimensional model of the upper half of the sewer arch (from 9:00 to 3:00) for the 15-foot by 17-foot sewer section. The analysis then progressed to a two-dimensional model of the complete sewer cross section, an FEA model of the sewer arch, an FEA model of the sewer cross section, and finally the baseline model, which is an FEA model of a 5-foot length of the sewer cross section. As each increasingly complex model was created, the results were compared to the previous iteration to verify that the geometric and physical properties assigned to the more complex FEA models resulted in the sewer behavior and stress levels predicted by the simpler models.



15'-0" x 17'-0" Sewer Cross Section

13'-6" x 14'-6" Sewer Cross Section

The geometry for the FEA models was obtained from the existing record drawings, which were not completely legible or were missing pertinent dimensions for this task. The cross sections from the record drawings were referenced electronically into AutoCAD and scaled to the correct size. The cross sections were then redrawn based on the dimensions shown on the drawings, and the scanned images were used to supplement any dimensions not shown or not legible. After the cross sections were completed in AutoCAD, criteria were established to divide each cross section into approximately 12-inch-wide sections representing the plate elements in the FEA model. AutoCAD was then used to identify the joint coordinates and member thickness for all of the plates. This information was input into STAAD.Pro to build the FEA models.

Once the FEA models were built in STAAD.Pro, the loading on the sewer was calculated.

## RESULTS OF FEA MODELING

After the observed defects and test results were modeled, the output results were exported and the stresses in the plate elements were compared to the ultimate capacities of the sewer to determine the factor of safety against failure. The ultimate capacities were calculated as two times the allowable stresses determined from the more restrictive of ACI 318-68 and AASHTO Chapter 8. This approach resulted in a safety factor of less than 2, representing an exceedance of the allowable stresses (plastic deformation), and a safety factor of less than 1, indicating an ultimate failure. From a structural perspective, safety factors below or approaching 2 indicate an undesirable condition and deficiencies, while safety factors nearing 1 are critical and indicate the potential for failure. Given that assumptions were integral in developing the models, the accuracy of the non-destructive testing was limited, and the limitations of the analysis software, safety factors approaching these threshold values should be interpreted in the same manner as safety factors numerically below these defining criteria.

## Pipeline Inspection Summary

The observations from the visual inspection, results of the non-destructive testing, and output from the structural modeling were used in conjunction to form a comprehensive strategy for prioritizing the defects and recommending reaches of the sewer to be repaired.

To better define the criticality of the defects and to assist in prioritizing the repair and rehabilitation of defects, a four-tiered classification system was established. Tier I defects are classified as the most critical to the structural integrity of the sewer and should be considered top priority. Deficiencies classified as Tier II are significant defects; however, based on visual observations, non-destructive testing, and structural modeling, are less critical than Tier I defects. Tier III defects are not critical based on structural modeling; however, they do represent what should be considered as the next most severe condition. Finally, Tier IV is a category of non-structural deficiencies that were determined not to impact the structural integrity of the sewer, but may impact the maintenance and operations of the sewer.

The objective of the four-tiered classification system is to prioritize defects and need for repair; however, the intent is not to minimize the significance of any defects not included in these three tiers. All defects noted in this report result in some reduction (average concrete thickness of 23 percent) in structural capacity when compared to the as-built condition of the sewer. However, the comprehensive assessment performed has indicated that those defects, such as a single crown crack, do not represent a significant structural concern and should be considered a lower priority than the defects classified in the top three tiers.

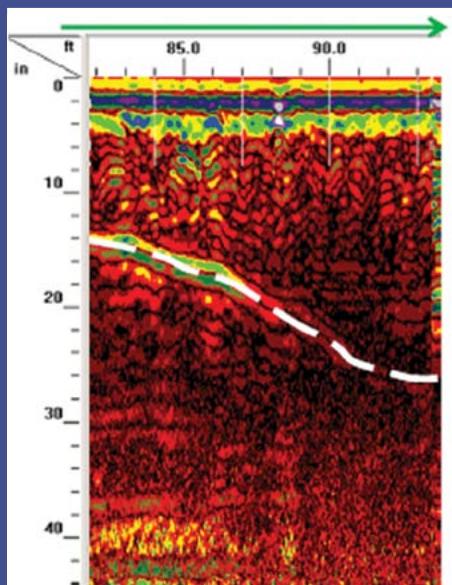
## SUMMARY

The observations from the visual inspection, results of the non-destructive testing, and output from the structural modeling identified areas with multiple crown cracks and areas where the bond strength at the construction joint has been significantly reduced as the most critical

## PPR TESTING

PPR scans were conducted at 113 locations, and each scan was a minimum of 5 feet in length. However, many factors can skew the results of the PPR test; therefore, the PPR test is considered to be qualitative. Shown by the white dashed line, the outside surface of the concrete sewer is clearly defined. This line is called a reflector and indicates the interface between two materials that have differing resistivity. In this case, the two materials are concrete and soil. The left side of the shows the crown, which is the thinnest portion of the structure; on the right is the base of the arch, which is the thickest part of the structure. Based on the Y axis scale, the base of the structure is 26 inches thick instead of the record drawing thickness of 33 inches. The crown is shown to be 14 inches, where the record drawing thickness is 15 inches.

Like sonic testing, PPR testing indicates the thickness of the concrete at the crown to be about the same as shown on the as-built drawings. Testing indicates that the concrete is substantially thinner at most locations near the base of the arched section when compared to the as-built dimensions. Similar to the sonic testing, the PPR test locations near the bases of the arched sections were selected based on visual observations that identified surface deficiencies such as scaling, soft concrete, and water and root infiltration. Therefore, it was anticipated that the non-destructive testing performed at these locations may identify reductions in concrete thickness.



defects that could potentially compromise the structural integrity of the sewer. Based on this prioritization, it is recommended that these areas be considered for immediate repair.

Locations where the concrete at the construction joint was observed to have “turned to gravel” or where it was described as “too soft” are slightly more ambiguous because non-destructive testing results could not be obtained for these areas. However, visual observations identified deterioration of the concrete that could result in a reduction in bond strength at the

construction joint. Because these areas do not display roots and water infiltration, and inspectors were not able to push the probing rod partially through the concrete, these areas are classified as less significant than the top priority side wall defects.

The structural modeling did not identify areas with multiple defects as a critical condition. However, the presence of multiple deficiencies could indicate conditions, such as settlement, high groundwater elevations, or unbalanced external loads, which are causing higher stress levels in these sections of sewer.

Therefore, these areas should be monitored and considered for repair after the top priority issues have been addressed.

Other defects were observed during testing at varying levels of severity. However, these areas were not determined to be a priority for repair based on structural modeling. The visual observations and non-destructive testing results also did not identify these areas as critical.

Although these areas are not identified as requiring repair at this time, it is recommended that they continue to be monitored and compared to the baseline conditions established by this inspection. If conditions are observed to change, they should be reprioritized as appropriate. Follow-up visual inspections are recommended at intervals of approximately every 5 years to monitor existing conditions.

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**Essey Woldemariam** has 14 years of experience as a Hydraulic Modeler, Design Engineer and Project Manager in the water and sewer industry. He worked initially at engineering consulting firms as a design engineer and hydraulic modeler but has worked at DC Water for the past 8 years where he has managed various projects and programs related to condition assessment, hydraulic modeling and design. He currently works as a Water and Sewer Regional Coordinator which involves managing regional flow allocation and cost share for capital and operating costs of joint use facilities.



**Richard Thomasson, P.E.**, is long time Chair of the MASTT Chapter, and one of the five original founders of NASTT in 1990. He was Chair of the Planning Committee for International No-Dig 1988 in Washington DC. Richard has continued his career involvement in numerous trenchless projects through his work with ARCADIS-US over the past eight years. ARCADIS is a leading global natural and built asset design and consultancy firm. In 2016 Richard was honored with induction into the NASTT Hall of Fame.

# FIND AND FIX ACCELERATES CIPP LINING PROGRESS BY TRI-STATE UTILITIES IN CHARLOTTESVILLE

By: A2B Publishing Inc.

**S**ituated in the scenic Blue Ridge Mountains foothills country of west Central Virginia, at the headwaters of the Rivanna River, the City of Charlottesville was first established as a town in 1762, and then incorporated as a city in 1888. Approximately 100 miles southwest of Washington D.C., Charlottesville was the historic residence of both Thomas Jefferson and James Monroe. Home of the University of Virginia, the City of Charlottesville serves a surrounding area of nearly 50,000 people.

Typical of many historic communities, the Charlottesville Department of Utilities has kept large portions of its extensive sanitary and storm sewer system in service for more than 100 years. This aging network is subjected to increasing capacity demand from a steadily growing population and commercial base, and from the effects of progressive deterioration. Sanitary sewer overflows have resulted from greater inflow and infiltration of external water enter-

## ***"FIND AND FIX" HAS ALSO SAVED THE CITY MONEY, AN ESTIMATED \$2 MILLION TO DATE OVER THE EIGHT YEAR PROGRAM DURATION"***

ing through manholes, cracked pipes and clean outs. Heavy rains also sometimes overwhelm the storm sewer system causing flooding and drainage issues in lower lying areas.

By adopting an innovative and multi-faceted "Find and Fix" approach which fast-tracked effective CIPP repair projects from design to completion, the Charlottesville Department of Utilities was able to alleviate its SSO and stormwater drainage issues with an accelerated program of effective long term repairs. Using the integrated "Find and Fix" method saved time and allowed the Department of Utilities to

perform comprehensive surveys of sanitary basins or neighborhood drainage areas and complete any necessary repair work more efficiently.

## **FOUND IT, DIDN'T FIX IT**

The Department of Utilities maintains over 170 miles of gravity wastewater lines, comprised of 6-inch to 30-inch pipe, and 5,570 manholes. This sanitary sewer system collects and transports wastewater to the neighboring Rivanna Water and Sewer Authority's Moore's Creek Treatment Plant. The separate stormwater system has a network consisting of 150 miles of pipe and 8,250 structures, encompassing a drainage area of ten square miles.

Maintaining this extensive network of aging infrastructure is a continuous challenge. Prior to 2008, there was minimal rehabilitation work done by the Department of Utilities on the extensive sanitary and storm sewer systems, and consequently little





Maintaining aging infrastructure is a continuous challenge

progress mitigating I&I. The traditional process, based on the conventional design-build model, requires expensive and time consuming engineering studies and multiple CCTV inspections before any rehab work can begin. Under the traditional approach, there are usually at least two CCTV runs – preliminary inspection and design concept evaluation – before a rehabilitation plan can be drafted and specified, so that the work can be put out to bid. Often, further SSES investigations such as additional manhole inspections, smoke testing, and cleanings have to be done before the design process for the repair is finalized. Average time of completion using the traditional approach was 8 - 12 months.

As deterioration progresses, and I&I gradually worsens, longer term planning gets sidelined by short term crisis management. Fresh problems that arise are not addressed in the studies just recently

completed. This can prompt another cycle of investigation, evaluation and study. Costs increase, engineering reports get shelved, and little progress is made on an actual repair program, except for stop-gap fixes here and there. Once the engineering study is finally completed, and design of the rehab project meticulously defined, specified and documented, funding must then be located, requisitioned and budgeted, often further delaying necessary repairs. Many problems are found, few get fixed.

## FINDING THE BEST APPROACH

Fortunately, in 2008, the City responded to the growing need for a proactive system-wide asset rehabilitation program by substantially increasing the sanitary sewer rehabilitation budget to \$3 million annually. Additionally, in 2012, the City implemented a stormwater utility fee generating \$1 mil-

lion per year in funding dedicated exclusively to repairs and capital improvements to the storm sewer system. These funding measures allowed the Department of Utilities to implement an integrated asset management strategy and commence a systematic city wide sewer evaluation and rehabilitation program. Along with the stable dedicated funding, a more streamlined approach was implemented.

Similar in process to the “design-build” construction method, the “Find and Fix” approach evolved in response to the shortcomings of the approach traditionally used for designing and completing repair work. Instead of using costly engineering reports and extensive drawings for each individual rehabilitation job, detailed standards are incorporated into an overall Specifications Book applicable across the entire rehabilitation program.

By integrating the preliminary SSES and subsequent repair work into the same workflow process, repairs are expedited. The “Find and Fix” method enables priority rehabilitation work to be completed in a matter of weeks, instead of months. Crews focus on the evaluation and repair of one sewer-shed or drainage basin at a time, performing a comprehensive survey, defining the scope of the repair work required, and quickly completing the necessary rehabilitation. Work is fast paced and allows a flexible range of options to be applied to each unique repair problem, resulting in a permanent long-term fix.

“Find and Fix” greatly reduces reliance on upfront CCTV inspections during the design phase. At the outset, the Contractor inspects the sewer system in areas deter-



Find and Fix has accelerated the pace of CIPP lining throughout the City





A dedicated fund helps the City alleviate stormwater drainage issues



Tri-State has coordinated carefully with property owners and all other stakeholders to minimize community impacts

## **"AVERAGE TIME OF COMPLETION USING THE TRADITIONAL APPROACH WAS 8 - 12 MONTHS"**

mined to be highest priority in previous reports. Reviewing data obtained from pre-flow monitoring, previous CCTV records, and other inspections, the Contractor performs additional SSES work. This includes a CCTV inspection, and then any further evaluations as required such as smoke testing, manhole inspections, dye tracing, and flow isolations. The Engineer then reviews videos within 5 days, defects are identified and a work order is issued. Once the repair work is completed by the Contractor a final CCTV inspection is done, and the data is archived.

A more compressed workflow is used to fast-track emergency repairs. The Engineer alerts the Contractor with a memo and map outlining the scope of the emergency repair job. The Contractor begins the work within two business days, and the rehabilitation is usually completed within a two week window.

## **ANNUAL CONTRACT**

Rehabilitation projects on sanitary basins or neighborhood drainage areas, and emergency repair needs as they arise, are both managed under a comprehensive sanitary and storm sewer rehabilitation contract. The specifications encompass over 200 bid items including CCTV, CIPP lining, point repairs, rehabilitation of manholes and stormwater structures, pipe bursting and pipe replace-

ment work. By focusing on a single sewer basin or drainage area at a time, critical asset inspections and repairs of known problem areas are both completed in a very short period of time.

The ongoing, multi-year project is renewable. The third comprehensive sanitary and storm rehabilitation contract was put to bid in January 2017 and work will begin under this contract in May 2017, with Linco Inc. being low bid.

## **TRI-STATE UTILITIES**

A strong regional proponent of trenchless technology, with a 25 year history in trenchless pipe lining with CIPP, MASTT Chapter member Tri-State Utilities completed SSES evaluations and CIPP repair subcontracts on "Find and Fix" projects under Charlottesville's comprehensive sanitary and storm sewer rehabilitation program. Tri-State's work was the subcontracted CIPP and SSES portion under General Contractor Commonwealth Excavating, Inc. based in Verona, VA. Commonwealth specializes in underground water and sewer construction services for local municipalities, utilities and businesses.

Tri-State Utilities is well equipped for the fast-track design-to-delivery approach of the "Find and Fix" method used in the Charlottesville program. According to Tri-State Business Development Manager, John Saintsing, "CIPP repair lends itself to an integrated approach. The CCTV is a necessary preliminary aspect of the repair. Inspection and prep is done in one pass." Cured-In-Place Pipe (CIPP) is the time proven application for rehabilitating both sewers and storm drains because each liner is custom fabricated and installed to precisely fit the host pipe.

The subcontracted projects completed by Tri-State, which included the Market Street 60-Inch Liner, Basin 13 and 21 CIPP Rehab and Point Repairs, and the Fairway Avenue Collector Sewer, have all demonstrated the benefits found in applying the "Find and Fix" method.

Frazier Engineering, based in Stanley NC, is the Engineer of Record, and manages the comprehensive program in conjunction with the City of Charlottesville. With the City responsible for the day to day inspections, Frazier Engineering and the City



*Tri-State Utilities is well equipped for the fast-track design-to-delivery approach of the "Find and Fix" method*

together designate additional work areas based on flow monitoring and maintenance records. A work order is then issued to the contractor for cleaning and CCTV of sewers in those project areas. As subcontractor, Tri-State's Utilities does the clean and CCTV work, then performs the final CIPP rehab based upon the review done by Frazier Engineering and the City.

Frazier Engineering Principal Aaron Frazier feels the work that Tri-State has done under the "Find and Fix" program is benefi-

cial. The company has played an important role in the program implementation and overall effectiveness:

"Tri-State has performed their sub work, clean/CCTV and CIPP, very well, has always provided prompt, quality services. They've been very helpful in performing the find-and-fix project as implemented by the City and Frazier Engineering. Teamwork between the Engineer, Owner and the Contractors is a critical and essential to make a find-and-fix project successful."

In doing the work to date, Tri-State has encountered and successfully overcome numerous on-site challenges including difficult site access, steep slopes and cold winter weather conditions. Extensive coordination and consultation with nearby property owners, local businesses and the University of Virginia has been essential to keep the program moving ahead at a fast pace. Tri-State has often undertaken night work to minimize any traffic problems and overall impacts on the community.



*60-inch CMP CIPP. Integrated city-wide storm and sanitary sewer rehab program has streamlined comprehensive rehabilitation of both assets*



## **"THE "FIND AND FIX" METHOD ENABLES PRIORITY REHABILITATION WORK TO BE COMPLETED IN A MATTER OF WEEKS, INSTEAD OF MONTHS"**

Despite a few challenges, the expedited "Find and Fix" approach has substantially accelerated the City's comprehensive rehabilitation program. As Tri-State's John Saintsing reflected, "The program has really helped the City get on top of its maintenance cycle and become proactive in managing its assets".

### **FIND AND FIX: REAPING THE BENEFITS**

Over the past eight years the Charlottesville Department of Utilities has been able to replace or rehabilitate approximately 39 miles of sanitary sewer main, ranging in size from 6 inches to 21 inches, and approximately eight miles of 8-inch to 60-inch storm sewer main. Replacement or rehabilitation of existing sanitary and storm

sewer structures is also incorporated into the comprehensive system-wide process. To date, 139 sanitary manholes have been replaced and 927 have been rehabilitated using cementitious mortar. Additionally, 97 stormwater structures have been replaced and 121 rebuilt.

Under the comprehensive program 76 miles of sanitary sewer and 16 miles of storm sewer have been mapped from the CCTV inspections done. This archived data will prove crucial for the City's future ongoing asset management and rehabilitation programs.

This historic city has reaped the benefits of a program that expedites rehabilitation work by ensuring defects found are fixed, quickly. Sanitary sewer overflow and major drainage issues have been resolved, emergency repairs are now addressed in days, not months, and I&I and flooding issues have

been significantly reduced. This remarkable progress in proactive asset management and rehabilitation has been made possible because of the inherent efficiencies found in the "Find and Fix" approach.

Best of all, "Find and Fix" has also saved the City of Charlottesville money, an estimated \$2 million to date, and counting, over the eight year program duration. 

### **ABOUT TRI-STATE UTILITIES:**



*Tri-State Utilities, based in Chesapeake VA, has earned a solid regional reputation for strong technical expertise in trenchless utility rehabilitation, continuing the tradition set by company founder Steven F. McSweeney. Specializing in CIPP rehabilitation, Tri-State has earned the NUCA National Safety Award, and was given local recognition as the Hampton Roads Utility & Heavy Contractor Association Contractor of the Year for both 2000, and 2008.*



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# THANK YOU, TRENCHLESS CHAMPIONS!

NASTT instructors are experts in their field and volunteer their time to educate the trenchless industry. Thank you to our 2016 instructors and panelists for helping to advance NASTT's mission to educate, publish, research and train!

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Brad Anderson <i>Anderson Consulting</i>	Jason Holden <i>Akkerman</i>	George Ragula <i>PSE&amp;G</i>
Sam Ariaratnam <i>Arizona State University</i>	Tara Lamoureux <i>City of Casselberry</i>	Kaleel Rahaim <i>Interplastic Corporation</i>
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2016

# HOW DO YOU SOLVE A PROBLEM LIKE A CROSS BORE?

## Prevention and Recognition Are Two Distinct Challenges

By: Dan Lucarelli, Pennsylvania 811

**CROSS BORE:** An intersection of one underground utility or structure by a second utility resulting in a direct contact between the utilities. A Cross Bore compromises the structural integrity of either the utility or the underground structure. A Cross Bore is created when some utility is mistakenly and unknowingly installed to pierce or pass through another utility, e.g., when a gas or electric line installed by a mini-HDD, impact moling, or plowing, ends up passing through an existing sewer lateral.

For a plumber hired to clear a clogged sewer line, a cross bore can be a catastrophic event. Rotating cutting tools designed to clear roots and debris from a sewer lateral can easily cut through a utility line placed with horizontal directional drilling (HDD) trenchless technologies. How does the plumber eliminate the risk associated with not knowing what has clogged the line? More importantly, how can the utility line be initially placed without compromising existing underground facilities such as a sewer lateral?

The cross bore problem is really two different and distinct challenges: preventing cross bores during the installation of new facilities using trenchless technologies, and recognizing when an existing cross bore exists in order to safely mitigate. Each problem has its own set of risks and steps to mitigate risk.

### PREVENTION

**Installation.** Excavators using trenchless technologies such as a mini-HDD, a pneumatic missile or plowing should be following the HDD Consortium "Horizontal Directional Drilling Good Practices Guidelines" guide. In Pennsylvania, this guide is incorporated by reference in 73 P. S. § 176 et. seq. (the Pennsylvania "One

Call Law"), which means excavators are obligated to follow the guidelines when performing trenchless work.

Whether the excavator is working in Pennsylvania, or in other states, prevention of a cross bore during the installation of new underground facilities via HDD technologies is critical, and mostly involves common sense planning, observation and practices.

**Always call 811 in advance of your excavation.** State and federal law mandates that when excavation work is performed, the excavator must call 811 in advance of excavation.

**Identify every facility near or across the proposed excavation path** after the work site is marked by existing facility owners nearby. Remember that HDD drilling does not follow an exact known path.

**Expose every facility near or across the proposed excavation path** by exposing the facility with hand digging (potholing) or by using vacuum excavation technologies to protect underground facilities. This step is critical to ensure the HDD work can be monitored to ensure existing facilities are not compromised during the excavation.

**Plan the drilling path, and adjust the plan as necessary** to account for existing facilities across or near the drilling path. The plan may need to be adjusted (depth or path) based on existing facilities in the area.



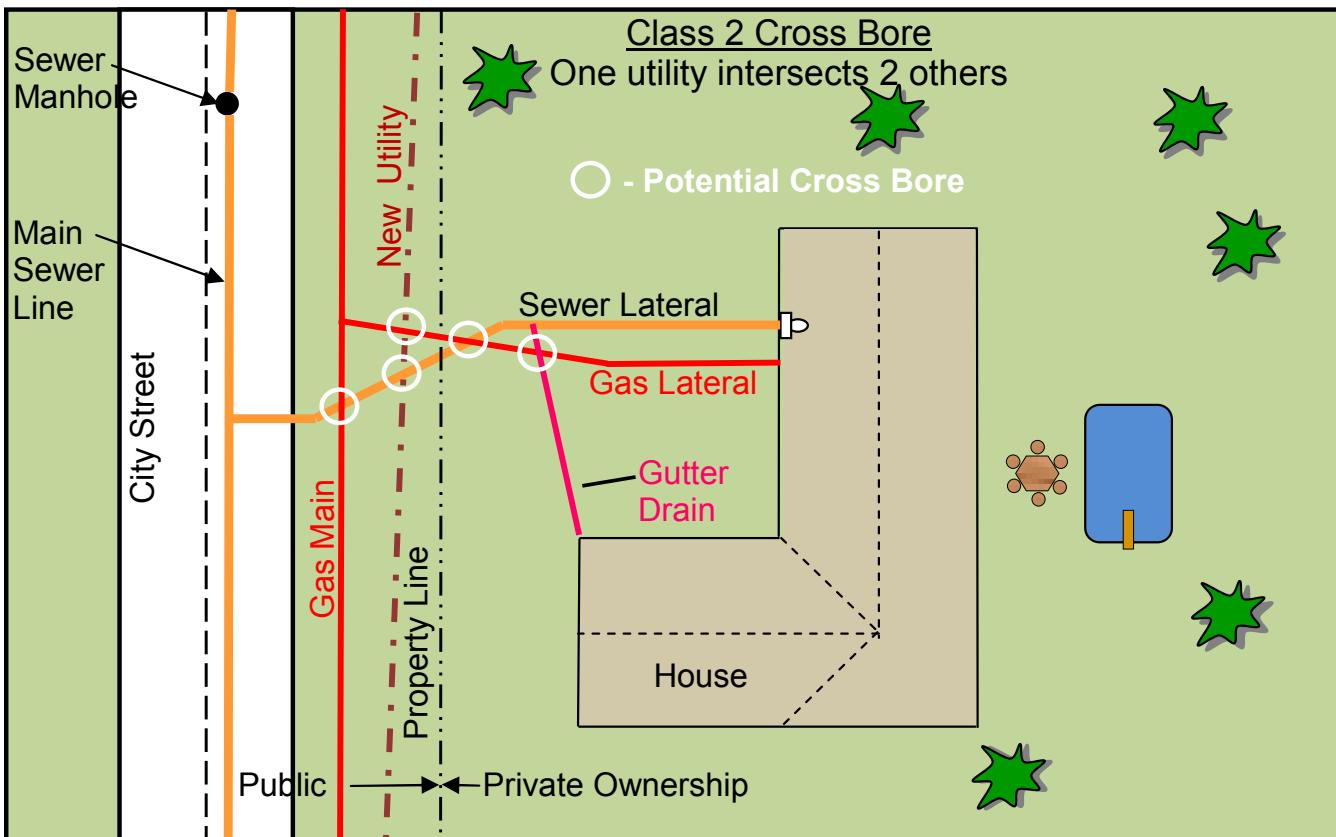
For a plumber hired to clear a clogged sewer line, a cross bore can be a catastrophic event.

**Use a spotter.** The equipment operator cannot see what is happening when HDD drilling or excavation occurs. The spotter should be empowered to stop the excavation at any time.

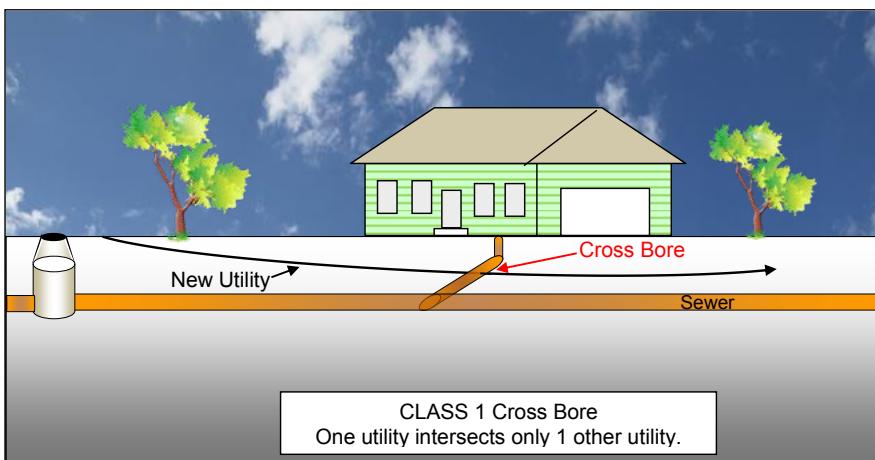
**Inspect existing underground facilities** after the work is complete and before backfilling begins. There should be a visible distance between existing facilities and the newly installed facility.

### RECOGNITION

**Clearing a sewer drain.** Clogged sewer drains present a special challenge to a plumber: What is causing the blockage? Is the blockage inside the structure or outside the structure? Once found, what



Courtesy CBSA [www.crossboresafety.com](http://www.crossboresafety.com)



Courtesy CBSA [www.crossboresafety.com](http://www.crossboresafety.com)



tool will reach it, and where should the tool be inserted? What tool should be used to clear the blockage?

In many instances, the tool of choice is a gasoline or electric powered rotary cutting tool designed to shred tree roots and debris and cut through organic material. The risk is that these tools can easily shred and cut through a plastic natural gas line a fiber optic cable, or an underground electric line. When this happens, the plumber,

**“...IMPORTANTLY, HOW CAN THE UTILITY LINE BE INITIALLY PLACED WITHOUT COMPROMISING EXISTING UNDERGROUND FACILITIES SUCH AS A SEWER LATERAL?”**

the structure occupants and nearby people are at great risk of injury due to the uncontrolled release of natural gas, disruption of 911 service, or electrocution. How does the plumber verify that the blockage is, in fact, caused by organic material and not by an underground utility line?

**Where is the blockage?** If the plumber determines that the sewer line blockage is within the structure, the risk that the blockage is due to a cross bore is minimal. This is the first step in assessing risk.

**Can the plumber see the blockage?** A sewer inspection system with a camera is a useful tool for assessing blockage and risk. In many instances, a plumber with a sewer

camera can determine if the blockage is caused by organic material (such as tree roots) or inorganic material (such as a yellow plastic gas line). If the plumber sees any inorganic material inside the sewer lateral, **stop work** and contact the local utility company for an assessment of the blockage.

**Is the structure served by underground utilities?** If so, the plumber should visually inspect the area around the sewer lateral, looking for indications that the sewer

lateral may be near other underground utilities with a potential for conflict or cross bore.

The plumber should always assume that a blockage is caused by a cross bore until evidence supports otherwise: a blockage inside the structure, a camera inspection, and no underground utilities near the sewer lateral. If there is doubt, the plumber should check with local utility companies to verify before beginning the drain clearing work.

**A CROSS BORE:** can be a catastrophic event. The risk can be minimized on installation with adherence to the HDD Consortium “Horizontal Directional Drilling Good Practices Guidelines” guide, and can be minimized when a plumber clears a clog by adhering to good practices, common sense and a healthy dose of skepticism about the nature of the blockage.

In Minnesota, utility companies have implemented “Call Before You Clear”. Utilities are joining together to ensure that there are no conflicts with underground natural gas lines. The plumber contacts the natural gas utility that serves the structure to assist with the assessment of a cross bore. The [www.callbeforeyouclear.com](http://www.callbeforeyouclear.com) service is supported by Xcel Energy, Alliant Energy, CenterPoint Energy, Minnesota Energy and GMG Gas, Inc. XcelEnergy also supports “Call Before You Clear” in Wisconsin, North Dakota, and Michigan. In addition, Southwest Gas supports “Call Before You Clear” in Arizona, California, and Nevada, and Ameren Illinois supports it in Illinois.

In Pennsylvania, the plumber contacts Pennsylvania 811 and indicates “drain clearing” when asked about the type of work. Pennsylvania 811 then sends an emergency ticket to the underground utility companies serving the structure. Then, the utility companies assist the plumber with the risk assessment of a cross bore. ■

#### ABOUT THE AUTHOR:



Dan Lucarelli is the Director – Marketing and Education for Pennsylvania One Call System, Inc. He can be reached at [djlucarelli@pa1call.org](mailto:djlucarelli@pa1call.org).

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# MASTT NEWARK TRENCHLESS TECHNOLOGY SEMINAR

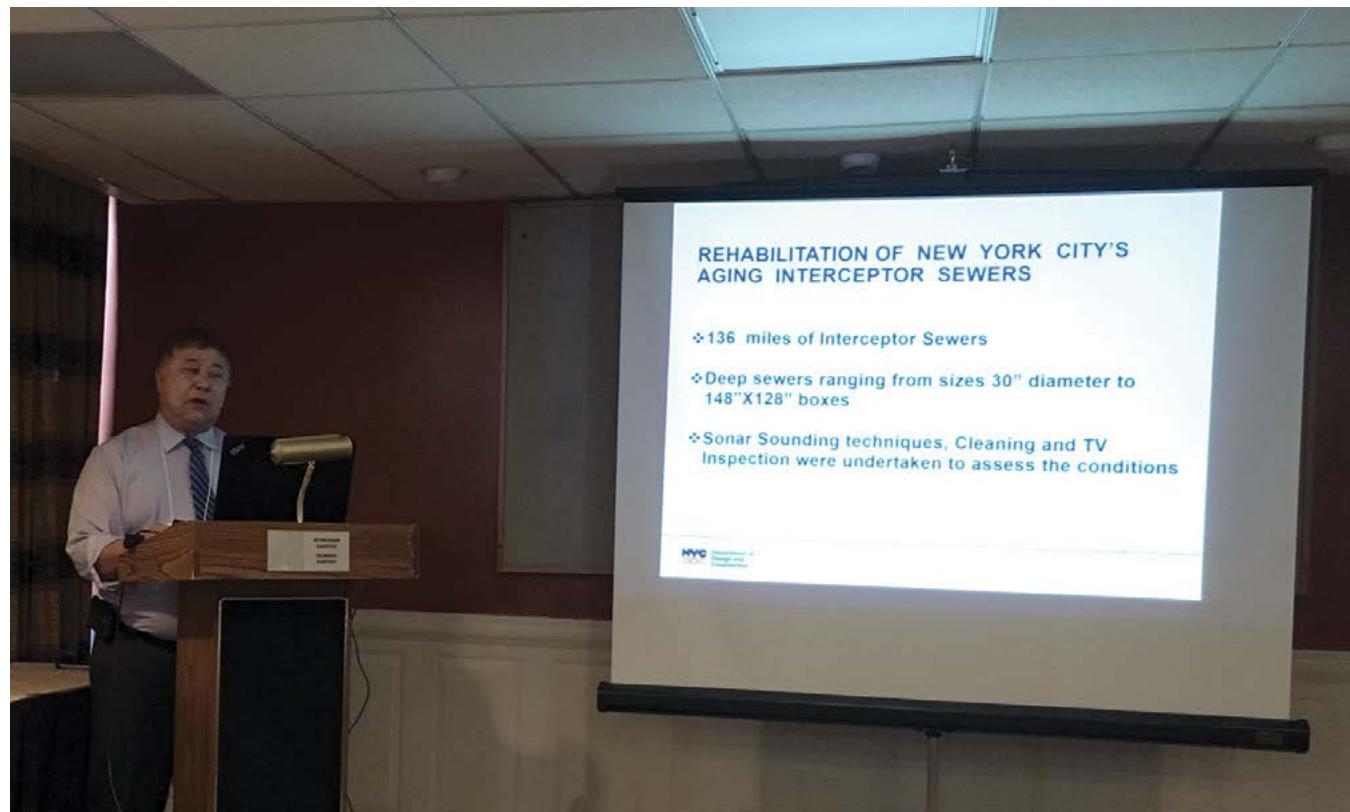


## Trenchless Projects across the Mid Atlantic!

At the MASTT Trenchless Technology SSES and Buried Asset Management Seminar held Wednesday, September 14, 2016 in the Wyndham Garden Newark Airport Hotel, Mr. Dino Ng, P.E., Associate Commissioner, New York City Department of Design & Construction, was the featured Guest Presenter. Mr. Ng delivered an outline of "Trenchless Technology Applications in New York City", an engaging and informative topic for the 40 seminar participants. The scope and quality of the material presented on the New York City program was impressive, and was followed with a lively Q&A discussion.



Seminar participants listen attentively as Steve Matheny, Logan Clay Products, explains Pilot Tube guided boring



Mr. Dino Ng, P.E., Associate Commissioner, New York City Department of Design & Construction, gives presentation on "Trenchless Technology Applications in New York City"



MASTT Trenchless Technology seminar was an informative opportunity for networking and learning



Jointly sponsored with the **ASCE North Jersey Branch**, the full day seminar offered a great opportunity to learn more about different trenchless technology topics from knowledgeable industry experts in a small informal classroom setting. Continental breakfast, lunch and morning/afternoon refreshments were provided with the generous support of **Akkerman Inc.**, **National Clay Pipe Institute**, **Pipeline Inspection Partners Corporation**, and **ARCADIS U.S., Inc.**

The sessions included the following topics and speakers:

**WELCOME ADDRESS and "Liquid Assets" Overview Video,**  
Leonard Ingram, SESTT Executive Director

**Overview of Trenchless Technology and NASTT Education Efforts,**  
Dr Tom Iseley, P.E., Civil Engineering Professor, Louisiana Tech University



**Guided Boring Using Pilot Tubes - Methodology and Case Studies,**  
Steve Matheny, P.E., Logan Clay Products Co

**Rehabilitating Potable Water Mains with a Polyurea Liner by SIPP,**  
Bruce Birdwell, 3M Water Renewal Group

**Pilot Tube Microtunneling,**  
Yovani Zelaya, Akkerman Inc.

**Inspection Tools for Determining Remaining Useful Life,**  
Ed Diggs, Pipeline Inspection Partners Corporation (on behalf of CUES)

**BAMI-I & Certification of Training in Asset Management (CTAM) Program,**  
Dr. Tom Iseley, P.E., Buried Asset Management Institute - International

**Consent Decree Sewer Design & Construction,**  
Richard Thomasson, P.E., ARCADIS U.S., Inc.

**Cross Bore Inspections and Laser Pipe Profiling,**  
Walter Jenness, Tri State Environmental Services

**Bypass Pumping,**  
Ryan W. Booth, Xylem

**The Trenchless Technology Center,**  
Dr Tom Iseley, P.E., The Trenchless Technology Center

The MASTT seminar in Newark New Jersey was well-attended and educational, with informative trenchless presentations, product demonstrations, opportunities for networking and exchanging ideas. The seminar was approved by the New Jersey Board of Professional Engineers and certificates were issued for 5 PDH credits. Participants were also glad to stick around for a drawing of two one hundred dollar bills at the end!

For information dates and locations of the 2017 MASTT Trenchless Technology, SSES and Buried Asset Management seminars planned for the Mid Atlantic, visit:

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# FAST REAM FAST BACK HDD

## Overall Lighter Construction Site Presence

By: Diane Farnsworth, Melfred Borzall, Inc



Attaching cable and product to the swivel in preparation for a direct pullback with the FastBack System. The cutter on the FastReam housing will enlarge the bore to pull multiple pipe

With the steady growth of the fiber sector to city and suburban households and businesses, as well as small utility infrastructure installation and restoration, the need for trenchless construction with a minimal footprint and less disruption continues to grow.

In the mid 2000s the HDD industry began to rebound from the recession of 2000. By the late 2000s major telecommunication carriers were once again investing heavily in fiber deployment, HDD installation jobs were booming and drill manufacturers began to see a customer driven demand for mid-sized and compact drills. By 2015 sales began to shift from the larger 100,000+ lb. thrust/pullback drills for pipeline work to the smaller 20,000 lb. and under thrust/pullback drills for fiber work. This change was also reflected in the tooling being sold with a clear demand for the smaller HDD tool market.

About the same time Melfred Borzall (MB) engineers saw the need for a more

efficient boring system suited to limited space and time constraints. Fiber and small utilities often called for a series of short bores less than 100 feet and pulling multiple pipe or ducts. "Drillers needed to get more bores done in a day. We were looking to design a system that did quick, efficient direct pullbacks by simply adding the swivel and product to the cutting tool," said Eric Melsheimer, Engineer and President of Melfred Borzall. "We designed our existing bits and blades to accommodate a specifically designed component that allowed a swivel and product to be attached to the cutting device immediately after the pilot bore, so within minutes of completing the pilot bore drillers were pulling back utility lines without removing the housing or cutting head."

### "THE MAJOR IDEA BEHIND THE FR/FB SYSTEM® IS A METHOD FOR QUICKLY INSTALLING SERVICE LINES TO HOMES AND BUSINESSES"

Once in the field, the FastBack® was an immediate success, however the need for larger bores in congested urban areas was still a concern for contractor but the constraints of limited space and small receiving pits remained. "A small receiving pit means less landscape or pavement being removed and replaced," Melsheimer said. "On some jobs there isn't the option for a pit large enough to remove the drill head and attach a backreamer. We decided to see if we could take the cutting blades from our best reamer and adapt them to a housing to give it reaming capabilities."

Using the same concept as the FastBack® for a direct pullback after the pilot bore, the transmitter housing was designed so cutters could be attached to both the front and/or back of the housing. The blades could also be set up in incremental sizes to

**"WE LISTEN TO THE FEEDBACK AND TRY TO IMPROVE ACCORDING TO WHAT THE NEED IS."**

enlarge the pilot bore in a two-step process up to 12 inches and adapt it to different soil types.

With the FastReam/FastBack System® (FR/FB) back out in the field together, drillers were finding the system to be extremely versatile. Not only was there a noticeable savings in time, but also fewer environmental disturbances and restoration costs, and an overall lighter construction presence not having to excavate larger pits and haul in heavy equipment and tools.

Dana Villiere from HDD Parts Plus of the Rockies, Denver, CO is on the road about ten hours a day making deliveries and visiting job sites. Currently he has about 30 customers using the FR/FB System® and Villiere has seen the system in a variety of situations.

"They're a real efficient tool," said Villiere. "I have customers who use them for different types of jobs—some who are doing the smaller utility installation and multiple bores. Others use them on larger diameter and longer bores with the same benefit of the direct pullback."

Recently he had a customer doing a job where a short part of the bore went under several previously installed utility lines. The FR/FB System® was used because of the direct pullback feature.

Troy Tharp, owner of Hardcore Drilling, Inc. in Denver, CO was contracted by Xcel Energy to put in a six-inch Bore-Gard conduit and run electrical lines to a substation in Denver. The job consisted of multiple bores totaling 12,000 feet. Boring from the road they had to consider traffic and limited space conditions. One 560-foot bore crossed under several utilities including sewer, gas, storm drain, fiber and phone.

After setting up for the pilot bore and subsequent direct pullback, Thorp's crew located each utility and dug a small pit at each one so they could have a visual to steer through during the pilot bore or without do any damage when pulling back. Using a Ditch Witch JT2720 they did the pilot bore, then set up the housing with 8



An example of the FastBack System boring close to existing utilities as well as in tight, closed-in conditions. In this instance it was a fiber installation next to a sewer main and a fence. The driller was able to pull his utilities without removing any structures or disrupting any existing utilities

and 10-inch cutters on the housing for the direct pullback.

"Being able to attach the blades and do the direct pullback was an advantage," Thorp said. "It's quick and versatile. We were able to get in, get the job done and get back out with very little disruption."

Thorp uses FR/FB System® to do a few small, utility and single phase electrical or cable replacement bores, but typically does more of the larger diameter, longer bores of several hundred feet or more.

"The major idea behind the FR/FB System® is a method for quickly installing service lines to homes and businesses," says Melsheimer. "Our design concept is for a tool that addresses all of the contractor's require-

ments, so we continue to refine for different ground conditions and different drill sizes. We listen to the feedback and try to improve according to what the need is."

---

**ABOUT THE AUTHOR:**



**Diane Farnsworth** has worked in the HDD industry full time since 2000. She received her B.S. in Journalism Communications from California Polytechnic State University, San Luis Obispo, CA and has worked for Melfred Borzell for 16 years as a Marketing Specialist. She also writes part time for various journals.



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- Fort Collins Utilities
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- Halifax Water
- Hamilton Township Municipal Authority
- JEA
- Johnson County Wastewater
- King County
- Metro Wastewater Reclamation District
- Miami Dade Water and Sewer Department
- North Davis Sewer District
- Norwich Public Utilities
- Orange County Sanitation District
- Peters Township
- Pinellas County
- Port of Seattle
- Portland Water District
- PSE&G



These organizations will be attending NASTT's 2017 No-Dig Show,  
April 9-13 in Washington, D.C. Plan to join them by registering at [nodigshow.com](http://nodigshow.com).



# PROVIDING CUSTOM TRENCHLESS SOLUTIONS FOR SEWERAGE AND INDUSTRIAL STRUCTURES

By: Jerry Trevino, Protective Liner Systems

*Structures are restored to their original design thicknesses using Cementitious Based Liners*

**S**ince 1984, Protective Liner Systems has been protecting underground and above ground sewerage, industrial tanks, and secondary containments. Not all structures and containments are created equal nor are they subjected equally to physical and chemical environments, therefore, Protective Liner Systems has developed and different types of protection materials and different rehabilitation methods to satisfy to different exposures and conditions.

## CEMENTITIOUS BASED LINERS AND RESURFACERS

Deficient and corroded concrete structures may be corroded to the point that over one inch of the original concrete or more may have been dissolved by low PH atmosphere. In many cases the concrete has been dissolved to only a fraction of the remaining thickness. Since the original concrete material was not designed to withstand acidic conditions, the original design thickness, weight, strength have been compromised. These structures must be cleaned, all loose and

weak concrete removed, and then restored with high-strength more chemical resistant cementitious repair materials such as a fiber reinforced pozzolan and micro silica filled cement. Calcium aluminate based cement can also be used. Both of these cement types can withstand lower PH environments. Structures must be restored to their original design thicknesses using these types of cements. Protective Liner Systems manufactures various blends of PerpetuCrete brand cements to meet these needs.



## EPOXY COATINGS AND LINERS

Polymeric 100% solids liquid applied coatings are utilized over resurfaced or new concrete structures to protect against low PH environments, groundwater infiltration and abrasive effluent in the structure. The epoxy provides a corrosion protective barrier against harmful chemicals, gasses and aggressive abrasive agents found in the sewer environments. Protective Liner Systems manufactures epoxies that bond to wet



*PerpetuWall can be installed on all types of structure, any size, and at any physical geographical location*



A fiberglass cured-in-place liner can be installed to protect and strengthen any host structure

concrete, or newly applied resurfacers. PLS products are user friendly and do not use any products containing dangerous isocyanates such as MDI or TDI.

### FIBERGLASS CURED-IN-PLACE COMPOSITE LINERS

Structure enhancing liners can be achieved by using fiberglass / epoxy composites. Many structures were installed underground with the old philosophy of "out of sight, out of mind", therefore, many structures have poor original design strengths with possible deficient materials. Since it is very difficult and expensive to perform an accurate material strength assessment on every structure such as manholes, a fiberglass cured-in-place liner such as PLS PerpetuWall can be installed to protect and to strengthen the original host structure. Protective Liners PerpetuWall can be installed on all types of structure, any size, and at any physical geographical location. The perpetual liner can be designed to withstand very high hydrostatic pressures, and can strengthen the host structure by 100%. PerpetuWall can withstand structural move-

ments such as seismic, freeze/thaw cycles and shock and vibrations.

Protective Liner Systems has developed different solutions such as PerpetuCrete, PerpetuCoat and PerpetuWALL, and methods to resolve today's infrastructure problems. It has designed all products without the use of harmful curing agents such as Isocyanates and without any solvents. Protective Liner Systems has successfully provided liners for over 250,000 structures. 

#### ABOUT PROTECTIVE LINER SYSTEMS:

### ProtectiveLinerSystems

Infrastructure Rehabilitation

*Protective Liner Systems has been providing trenchless cured-in-place solutions since 1984. Not all structures require extreme solutions, so therefore, PLS also provides cementitious and polymer solutions. Learn more about these trenchless methods and solutions at [www.protectivelinersystems.com](http://www.protectivelinersystems.com)*

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# NEW CASTLE COUNTY USES A SOUND WAY TO PRIORITIZE CLEANING

## An Opportunity to Re-allocate and Optimize Resources

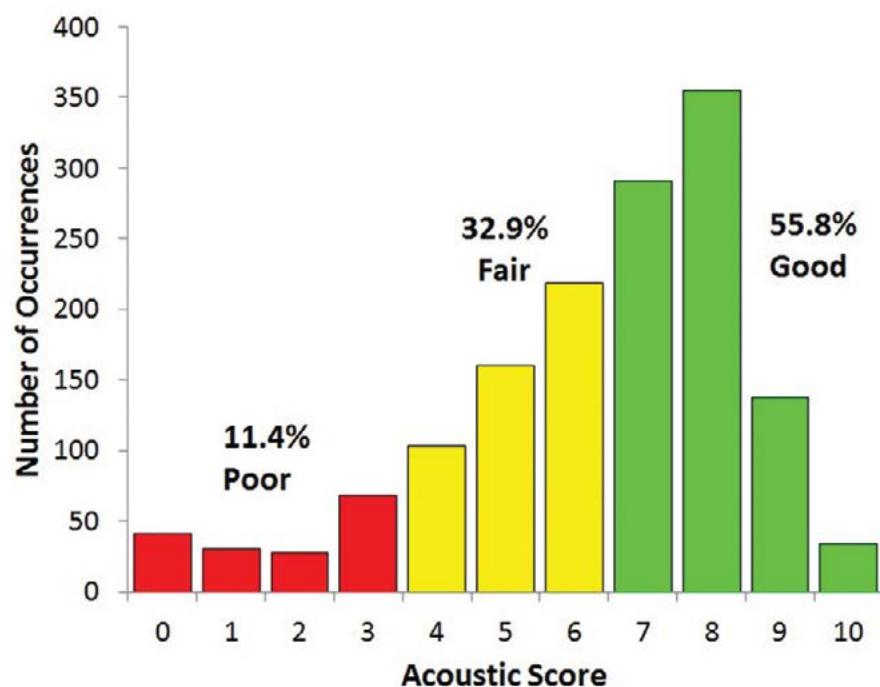
By: George Selembo, PhD, InfoSense, Inc.

New Castle County is one of three counties in the state of Delaware. Over 550,000 residents in the county generate 50 million gallons of wastewater each day, which is conveyed to treatment facilities using 1,700 miles of underground sanitary sewer pipes. As part of maintaining this system, it's essential that maintenance crews regularly clean and inspect these lines. Over the last 30 years, New Castle County, Delaware has moved away from a reactive approach to its sewer maintenance and began focusing on preventative measures. One of the first initiatives was a regular cleaning program. As part of a mandate from the Delaware Department of Natural Resources and Environmental Control (DNREC), New Castle County is required to clean 500 miles of sewer lines per year, which roughly equates to a 3 year cleaning frequency for the entire system.

Robert Roff is the Operations Service Manager for New Castle County, and has a staff of just under 50 people that help maintain the collections system. In addition, New Castle County hires contract service providers that perform inspection and cleaning operations. KCI Technologies is one of these service providers. KCI has been managing sanitary sewer investigations for New Castle County for the past decade. Under an open-end contract, KCI is responsible for identifying, evaluating and implementing new and emerging technologies that can help the sewer maintenance department operate more efficiently. While attending an industry conference in early 2013, KCI Project Manager Thomas Wyatt Sr. and Rob Roff learned about a new rapid inspection technology that they believed would help improve operational



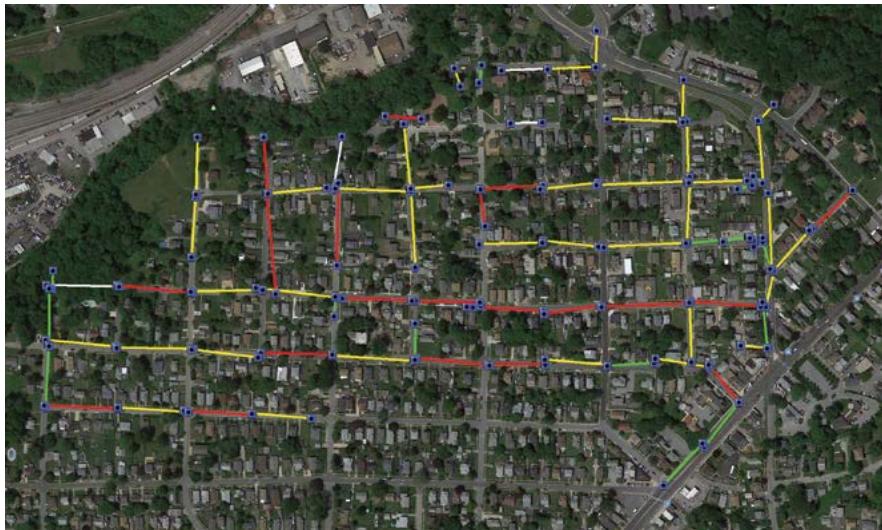
*The basic premise behind the SL-RAT is that if sound waves can travel unimpeded from one manhole to another, then flow should be able to make it through the pipe*



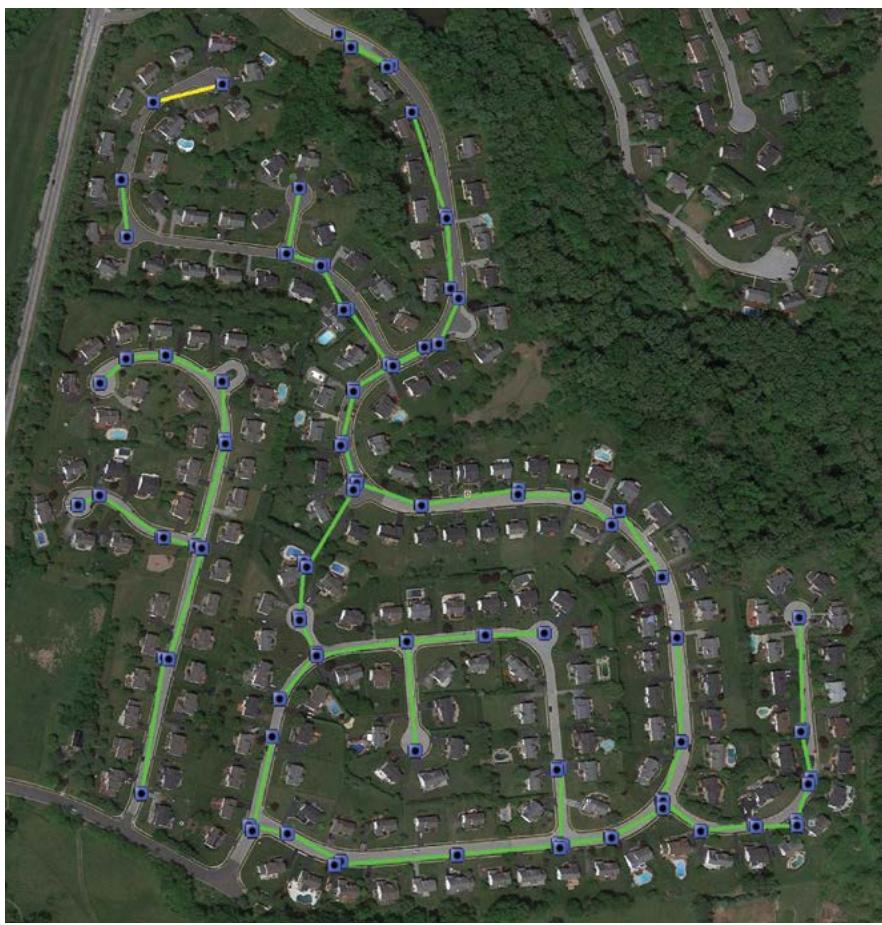
*In the pilot study over 55 percent of the pipes received a "Good" score (7 - 10) and only 11.4 percent needed immediate cleaning*

## **"WE'VE ALWAYS SUSPECTED A LOT OF PIPE DOESN'T NEED TO BE CLEANED, SO THAT IS WHAT ATTRACTED US TO THE SL-RAT TECHNOLOGY"**

*- Rob Roff, Operations Service Manager, New Castle County*



*Commonly encountered sanitary sewer defects, such as roots, grease and breakages naturally obstruct acoustic energy, and results in a lower score*



*SL-RAT creates a significant opportunity to re-allocate resources to help avoid "cleaning clean pipe"*

efficiency. In 2014, a pilot study was initiated to understand the impact of using this novel technology.

### **USING SOUND WAVES TO PRIORITIZE CLEANING**

Preliminary acoustic inspection of sanitary sewer lines was developed as a concept over 12 years ago as part of a collaboration between Charlotte Mecklenburg Utilities and the University of North Carolina – Charlotte. The resulting commercial product from this effort is the Sewer Line Rapid Assessment Tool (SL-RAT®). This patented technology can quickly determine the extent of blockage in a pipe and enables the user to deploy cleaning resources much more effectively. There are more than 160 customers using this technology worldwide and over 60 million feet of pipe have been inspected.

The patented technology is based on measuring the signal received from an active acoustic transmission within a sewer line segment. A transmitter (speaker) is placed on an opened manhole, and generates sound waves that are sent down the pipe. A receiver (microphone) on an adjacent manhole listens for these sound waves and provides a rating from 0 to 10 in under 3 minutes. Commonly encountered sanitary sewer defects, such as roots, grease and breakages naturally obstruct acoustic energy, and results in a lower score. This tool allows utility operators to quickly determine whether a pipe segment warrants further attention.

Worldwide results from acoustic inspection show that 70 percent of pipes on average receive a "Good" score, indicating no immediate risk of blockage or overflow. This creates a significant opportunity to re-allocate resources to help avoid "cleaning clean pipe". It's important to note that acoustic inspection does not replace cleaning or detailed inspection, it helps to prioritize where and when to use those much more expensive resources.

The SL-RAT inspection requires no prior preparation of the pipe other than opening the cover sufficiently to insert the speaker and microphone elements just below the plane of the manhole. The SL-RAT works in almost all small diameter (6-inch to 12-inch) gravity-fed pipe and manhole geometries as well as with all types of pipe material.



*It is not uncommon to inspect over 10,000 feet in a day with a two person crew*

It is not uncommon to inspect over 10,000 feet in a day with a two person crew. The raw results of each inspection are immediately available to the field operator and the inspection data can be uploaded to a cloud-based application called the Sewer Line Data OrGanizer, or SL-DOG, for sharing, editing, and visualization in Google Earth or enterprise GIS platforms.

## PILOT STUDY RESULTS SHOW OPPORTUNITY FOR IMPROVEMENT

As part of the initial pilot study, 56,000 linear feet were evaluated in mid-2014. Four grouped areas were selected for this pilot study, and acoustic inspections were performed by KCI. The inspection crews saw unprecedented productivity. An average of 7 line segments (1,450 linear feet) per hour was achieved. The total field time for the entire study was approximately 50 hours. In addition, the results showed that less than 10 percent of the inspected pipes needed immediate cleaning, which created an opportunity to better allocate resources to pipes that actually needed attention. Pilot studies have continued, and to date over 1,450 inspections have been performed (320,000 linear feet). On average, over 55 percent of the pipes received a "Good" score (7 – 10) and only 11.4 percent needed immediate cleaning (acoustic score of 0 – 3).

"We've always suspected a lot of pipe doesn't need to be cleaned, so that is what attracted us to the SL-RAT technology," said Rob Roff. "Instead of having an entire sub-basin that is supposed to be cleaned every three years from top to bottom, the SL-RAT is going to enable us to go through the whole system ahead of the cleaning crews and determine what pipes actually need to be cleaned and which ones don't."

## NEXT STEPS

Even though New Castle County has seen a dramatic reduction in SSOs by implementing preventative maintenance programs, there is still an opportunity to re-allocate and optimize resources. Use of the SL-RAT has been approved by DNREC and the EPA to count towards the annual 500 mile annual cleaning requirement. There are no immediate plans to reduce cleaning, instead they'll use the preliminary acoustic inspection data to focus cleaning efforts on the

pipes that actually need it. "We'll probably still stick with actually cleaning 500 miles a year, but with the SL-RAT evaluation we'll be reaching more of the overall collections system" says Rob Roff.

## TECHNOLOGY ACCEPTANCE AND USE IS INCREASING

What started out as a university research project in Charlotte, NC, has developed into a tool that is being used worldwide. Over the past several years, more and more cities are incorporating the concept of preliminary screening into their asset management programs. In the US, municipalities under consent order are now getting approval to make use of the SL-RAT.

"It's exciting to see acoustic inspection being formally written into CMOM programs for cities that are under consent decree. This gives them access to another tool which will allow them to quickly address and reduce sewer overflows and blockages, while simultaneously reducing costs and making better use of resources" says Alex Churchill, COO of InfoSense. 

### ABOUT THE AUTHOR:



**George Selembo** is the CEO and a co-founder of InfoSense, manufacturer of the award winning Sewer Line Rapid Assessment Tool. Dr. Selembo has a PhD in Chemical Engineering and MBA from Penn State University, and is a professional engineer in Pennsylvania. He has over 20 years of experience in wastewater applications with a focus on bringing new technology to the industry.

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## **MICROTUNNELING SPECIALISTS**



# BAMI-I ELECTS NEW BOARD DURING UCT 2017 CONFERENCE

By: The Trenchless Technology Center (TTC)

## New Board members elected at the BAMI-I meeting held during the UCT 2017 Conference, January 31, 2017 in Fort Worth, TX:

Dr. Tom Iseley (Louisiana Tech University, TTC & BAMI-I)  
 Jim Anspach (CARDNO TBE)  
 Dan Buonadonna (CH2M)  
 Gregory Chol (City of Aurora, CO)  
 Sriram Ganesan (Perma-Liner)  
 Karol Giokas (RJN Group)  
 Erik Hromadka (Global Water Technologies)  
 Tod Phinney (Souder, Miller & Associates)  
 Jim Raulston (Buried Asset Technologies Group, LLC)  
 Camille Rubeiz (Plastics Pipe Institute)  
 Bill Shook (A/PM Permaform)  
 Ron Thompson (Strada Professional Services, LLC)

Nick Zembillas (Subsurface Utility Engineering, LLC)  
 Dennis Doherty (Haley & Aldrich)  
 Jim Harris (Jacobs)  
 Leonard Ingram (MASTT, MSTT & SESTT)  
 Matthew Klein (Utilities, Inc.)  
 Robert Melton (SpectraShield)  
 George Martin (Greenwood Metropolitan District, SC)  
 Cameron McHargue (City of Hickory, NC)  
 Mohammad Najafi (University of Texas, Arlington,  
 Richard Thomasson (Arcadis U.S., Inc.)  
 Jerry Trevino (Protective Liner Systems)  
 Kurt Wright (SDG Engineering, Inc.)

## BURIED ASSET MANAGEMENT INSTITUTE-INTERNATIONAL (BAMI-I)

The Buried Asset Management Institute - International (BAMI-I) is a non-profit corporation whose main purpose is to educate and assist those who have an interest in applying best buried asset management practices to extend the life and efficiency of their assets. Although BAMI-I has been mainly focused on water and wastewater systems, the principles of asset management apply to all different types of buried assets including for instance gas distribution pipes, electric cables.

Good buried asset management practices will:

- Maximize life-cycle value of assets
- Sustain economic development
- Protect public health
- Improve the environment
- Enhance the quality of life

The purpose of BAMI-I is to provide a center of excellence for owners of underground water infrastructure to join with industry and researchers, using sound science, to evaluate and/or develop buried asset management protocols for application worldwide.

## CERTIFICATION IN TRAINING OF ASSET MANAGEMENT (CTAM)

The Certification of Training in Asset Management (CTAM) is an exclusive four part series in Asset Management coursework and certification. The CTAM program was developed by BAMI-I in conjunction with the TTC (Trenchless Technology Center) at Louisiana Tech and IUPUI (Indiana University-Purdue University at Indianapolis), in partnership with UIM: Water Utility Infrastructure Management, and is hosted by the Trenchless Technology Center at Louisiana Tech. CTAM is offered as 4 online courses and per request in classroom format. More than 700 individuals from 14 countries

have enrolled in the CTAM program.

There are three levels of certification available – Certificates of Completion, the Associate Water Asset Manager (AWAM) and Professional Water Asset Manager (PWAM) designations. To date 57 AWAM and 12 PWAM certifications have been awarded.

For more information, and application requirements, please visit <http://bami-i.com>

## ABOUT THE TRENCHLESS TECHNOLOGY CENTER (TTC):



*The Trenchless Technology Center (TTC) at Louisiana Tech University was established by Dr. Tom Iseley in 1989. It was created to promote research, development and technology transfer in the trenchless technology industry. The TTC is a cooperative research hub for academia, government and industry, and has world-class research and testing facilities at the National Trenchless Technology Research Facility (NTTRF) in South Campus at Louisiana Tech.*



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# A DISTURBANCE IN THE FORCE

## Simple. Powerful. Affordable

By: Mike Young, Underground Magnetics

Along with the advancement of drill rigs through the last 25 years there have also been major advances in electronic guidance systems. These systems are vitally important to the success of the HDD industry and without them, there would be no "directional" in Horizontal Directional Drilling. Guidance is the heart of any HDD project's success because precision locating is essential for control and bore path accuracy.

For most HDD projects today walkover guidance systems are the predominant method in use for tracking the bore location in real time. There has been major evolution in the features offered by these walkover systems since they were first introduced, and they have become complicated and more expensive.

Among other advanced features walkover systems now offer contractors the ability to log their bores, and within minutes of finishing the project, send the

information directly to the home office. Downhole transmitters now have hundreds of frequencies to choose from to help overcoming active interference, which can adversely affect the data being shown by the receiver. All these advancements now come with a big price tag. Many of the contractors we have spoken to are excited to hear about another choice in the market.

Just like a few companies dominate today's HDD rig industry, for the last 25 years there have only been a few companies producing electronic guidance systems. Underground Magnetics thinks there is room for another option in the market place. A guidance system offering high performance at a low competitive price. Something simple, powerful and affordable.

The new Mag 3 locating system was developed from the ground up to be simple and powerful. Our philosophy is to offer a commonsense locating system,



Bart Loving, Advanced Underground is impressed





developed to be easy to use but with powerful features. The system includes a multi-frequency transmitter that has real depth and data capability of over 100 feet. The "Bore-To" function which allows contractors the ability to set the locator out front and drill towards it, has a distance of over 80 feet. It's so simple, once you start drilling the operator never needs to push a button.

Underground Magnetics is a new company but not new to the industry. We are a core group of three, who combined, have over 70 years' worth of experience in servicing, engineering and producing HDD locating equipment. We believe that the locators on the market, while very good systems, are becoming priced out of the range of a lot of contractors. Many first-time users of the Mag 3 expected less performance and power because the price was so reasonable. The new Mag 3 has more than exceeded their expectations!

Bart Loving at Advanced Underground, Omaha NE is impressed with the range and power of the Bore-To feature:

"The Bore-To feature works better than I thought. So far we can get 80 feet out, and that's with little interference. We had a bore with moderate interference and we still got about 50 feet out of the Bore-To feature. I'd say if you walk the bore path and figure out what frequency will work best, you shouldn't have any trouble going 80-100 feet out. It has three different frequencies, which is a super nice feature."

Another Mag 3 user, Ryan Foster at Black Diamond Cable in Colorado Springs feels like he got a good system with the Mag 3 but even better got two systems for the price of one. This was a big deal especially because he just purchased a new drill rig, as his business was growing. He's very happy with the support he's gotten from Underground Magnetics as well as the training not only for his old crew, but also his new rookie crew, which have never run HDD rigs before.

"Mike has a lot of experience and that was a huge help in training my guys."

Back at Advanced Underground, Loving is so impressed with the Mag 3, it has

quickly become the go-to locating system, "It's very comparable to higher priced systems. Pretty user friendly. We are super happy with it."

Best performance and price ratio for a walkover system. Strong in areas of active interference. Simple powerful affordable. The new Mag 3 locating system at Underground Magnetics. We think there's a new player in the game. 

#### ABOUT THE AUTHOR:



**Mike Young**, President, Underground Magnetics Inc. has a thirty year history in the HDD industry, owning and working for many of the well-known drill rig manufacturers and HDD guidance system producers. Mike is still helping innovate new products for the HDD industry today.

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