



MID ATLANTIC JOURNAL OF

TRENCHLESS TECHNOLOGY

OFFICIAL PUBLICATION OF THE MID ATLANTIC SOCIETY FOR TRENCHLESS TECHNOLOGY

2016 EDITION



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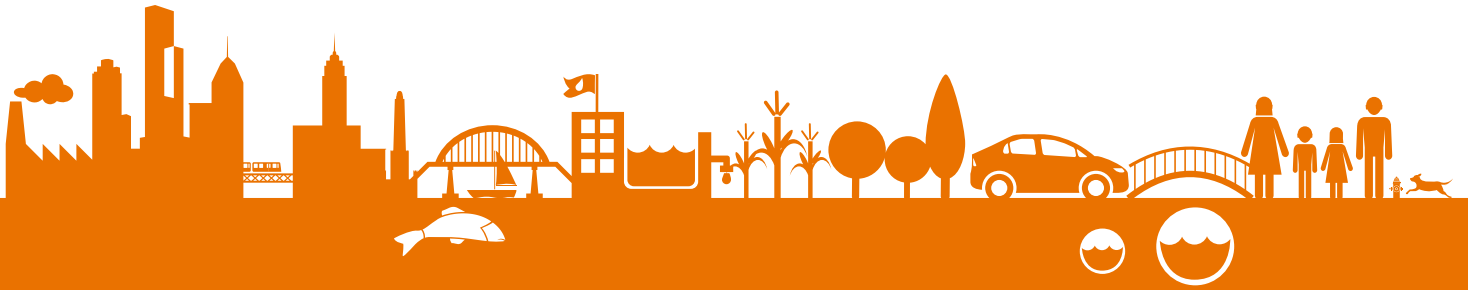
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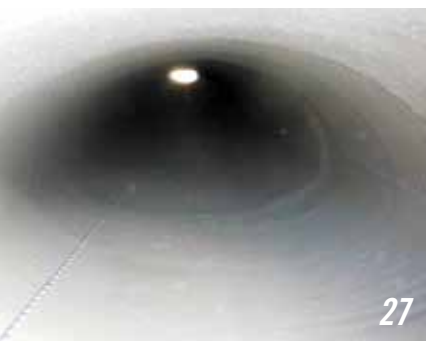


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Printed 05/16 in Canada



MESSAGE FROM MASTT CHAIR

Richard Thomasson, P.E., MASTT Chair

We are pleased to produce our second 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 services 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 23 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

“WE LOOK FORWARD TO YOUR COLLABORATION & PARTICIPATION”

NASTT developed course materials will be implemented in the future, tentatively in conjunction with the Newark, NJ seminar in the fall of 2016.

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 and wastewater assets to provide the level of service necessary to maintain a healthy nation.

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 P.E.



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Professional Water Asset Manager (PWAM)





GREETINGS FROM THE MASTT EXECUTIVE DIRECTOR

Leonard Ingram, Executive Director, MASTT

I want to extend congratulations to Mr. Richard Thomasson, P.E., Arcadis-US, on being inducted into the NASTT Hall of Fame this year. Richard was one of the original five founders of NASTT in 1990 and has been a strong supporter of the Society ever since. It was his idea to organize the MASTT Chapter in 2003. I was already the Executive Director of the SESTT and MSTT Chapters, so he approached me to help organize MASTT. Richard was elected Chairman and we have been actively conducting “Trenchless Technology, SSES and Buried Asset Management” seminars ever since to promote trenchless technology. “Congratulations Richard! A well-deserved honor.”

Listed below is the 2016 Tentative Preliminary Proposed Seminar Schedule for the Mid Atlantic, Midwest and Southeast Societies for Trenchless Technology. Please consider participating with these seminars as an exhibitor, food sponsor and/or presenter.

MASTT had a successful “Trenchless Technology, SSES and Buried Asset Management” seminar in Virginia Beach VA in November 2015. Representatives from Hampton Roads Sanitation District (HRSD) gave the presentation “HRSD’s Trenchless Technology Program”. ASCE Norfolk Branch was co-sponsor of the seminar. The network and learning was terrific.

MASTT had a very successful “Trenchless Technology, SSES and Buried Asset Management” seminar on April 6th & 7th, 2016 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 is planning a “Trenchless Technology, SSES and Buried Asset Management” seminar for Newark NJ on September 14th & 15th, 2016. We have been to Newark several times and the response was always over whelming. So, please plan to register early to support and attend the seminar to enjoy the networking and learning.

Sincerely,

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



MASTT SEMINAR

MASTT Baltimore Seminar



Wazir Qadir



Seminar Participants



Richard Thomasson P.E.

2016 TENTATIVE PRELIMINARY PROPOSED SEMINAR SCHEDULE:

SOCIETY	PROPOSED DATE	PROPOSED LOCATION	STATUS
MASTT	APR 6 - 7, 2016	BALTIMORE MD	CONDUCTED
SESTT	MAY 24 - 25, 2016	NASHVILLE TN	ORGANIZED
MSTT	JUL 20 - 21, 2016	DETROIT MI	PROPOSED
MASTT	SEP 14 - 15, 2016	NEWARK NJ	PROPOSED
SESTT	OCT 12 - 13, 2016	MIAMI FL	PROPOSED
MSTT	DEC 7 - 8, 2016	ST. LOUIS MO	PROPOSED



MESSAGE FROM NASTT CHAIR

Dr. Kimberlie Staheli, PH.D, P.E., NASTT Chair

Greetings MASTT Chapter Members! NASTT is having another great year, and I'm excited for our future during my term as Chair of the Board of Directors and beyond. As I'm sure you know, NASTT's 2016 No-Dig Show in Dallas was a huge success as we experienced a sold-out exhibit hall and had excellent attendance.

NASTT would never be where we are today without the dedication and support of our volunteers and our 11 regional chapters. I would like to thank the following MASTT Chapter Members that serve on our No-Dig Show Program Committee and volunteer their time and expertise to peer-review each and every abstract submittal to ensure the technical presentations are up to the standards we are known for: George Cowan, Paul Headland, Gregg Leslie, Peter Oram, George Ragula, Camille Rubiez, Ariamalar Selvakumar, Jim Shelton, Sunil Sinha, Richard Thomasson and Dennis Walsh. I would also like to extend a special thank you to the Program Committee members who also served as Session Leaders: George Ragula, Ariamalar Selvakumar, Jim Shelton and Richard Thomasson.

This year, we had the honor of inducting MASTT Chapter Member, Richard

Thomasson, into NASTT's Trenchless Hall of Fame. Richard is the original Chair of NASTT and is one of the five individuals that founded the society in 1990. Richard's commitment and loyalty to NASTT over the decades is considerable and honorable. He is a long-term member of the Program Committee and has contributed to the technical paper program numerous times. Congratulations, Richard!

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 MASTT member, George Ragula, for serving as an instructor for our Gas Good Practices Course.

During our strategic planning efforts, the Board of Directors identified goals of engaging larger groups of trenchless professionals to participate in the many volunteer opportunities provided by NASTT. These opportunities prove to be very satisfying and rewarding. NASTT has

a wide variety of ways to participate that allow involvement at any level. If you are interested in more information, please visit our website at www.nastt.org/volunteer. There you can view our committees and learn more about these great ways to stay involved with the trenchless community. Please consider becoming a volunteer – we would love to have you get more involved.

NASTT has a very promising future and the MASTT Chapter is stronger than ever. Thank you again for your continued support and dedication to NASTT and the trenchless technology industry.

Dr. Kimberlie Staheli
NASTT Chair



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MASTT BOARD OF DIRECTORS

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Richard Thomasson – Chair

Richard O. Thomasson has over 45 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 6 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 and associate for Woodard & Curran and leads the Natural Gas Service Line, based in East Windsor N.J. Dennis has a B.Sc. in Civil Engineering, University of Dayton, Ohio and a M.Sc. in Technology, Polytechnic University of New York.

Dennis retired from KeySpan Energy Co. 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 1990s to decrease its main and service installation costs.

In addition to his memberships in the American Gas Association and the Society of Gas Operators, Dennis also serves as a NASTT Board member and is on the annual NoDig Show Program Committee. He has designed numerous HDD installations for various utilities. When Dennis is not involved in trenchless projects, he consults on gas engineering and other utility projects.



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.

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UPCOMING TRENCHLESS EVENTS

June 9, 2016

NASTT Gas Good Practices Course
All Day
Smithfield, Rhode Island
Information: www.nastt.org/calendar

June 9, 2016

NASTT HDD Good Practices Course
8:00 AM - 5:00 PM
Montreal, Quebec
Information: www.nastt.org/calendar

June 14, 2016

NASTT Pipe Bursting Good Practices Course
8:00 AM - 5:00 PM
Vernon, British Columbia
Information: www.nodigshow.com

June 16, 2016

NASTT Pipe Bursting Good Practices Course
8:00 AM - 5:00 PM
Victoria, British Columbia
Information: www.nastt.org/calendar

July 20-21, 2016

MSTT Trenchless Technology, SSES & Buried Asset Management Seminar
Detroit, Michigan
(Date may change)
Information: mstt@engconco.com

September 14-15, 2016

MASTT Trenchless Technology, SSES & Buried Asset Management Seminar
Newark, New Jersey
(Date may change)
Information: mastt@engconco.com

September 22, 2016

World Trenchless Day
Everywhere 22.09.16
Information:
www.worldtrenchlessday.org

October 12-13, 2016

SESTT Trenchless Technology, SSES & Buried Asset Management Seminar
Miami, Florida
(Date may change)
Information: sestt@engconco.com

November 1-4, 2016

Geotechnics For Trenchless Construction
Colorado School of Mines
Golden, Colorado
Information:
csmospace.com/events/trenchless

December 7-8, 2016

MSTT Trenchless Technology, SSES & Buried Asset Management Seminar
St. Louis, Missouri
(Date may change)
Information: mstt@engconco.com

April 9-13, 2017

NASTT 2017 No-Dig Show
Gaylord Texan Hotel & Convention Center
Washington, D.C.
Information: www.nodigshow.com

March 25-29, 2018

NASTT 2018 No-Dig Show
Palm Springs Convention Center
Palm Springs, California
Information: www.nodigshow.com



MASTT Chair Richard Thomasson P.E. Honored with Induction into 2016 NASTT Hall of Fame

At the NASTT 2016 No-Dig Show in Dallas, long time MASTT Chair and NASTT founder Richard Thomasson P.E. was honored with induction into the 2016 NASTT Hall of Fame.

The Hall of Fame honors the outstanding accomplishments of exceptional individuals who have made significant contributions to the development of the North American trenchless industry, demonstrating exemplary service.

Richard is one of the five people who first founded NASTT in 1990. He served as the original founding Chair of the organization for its first four years, from 1990 to 1993, setting it on a course for future growth and success. Immediately prior to this he chaired the Planning Committee for the important International No-Dig 1988 in Washington DC.

Richard's commitment and loyalty to NASTT over the decades has been considerable, worthy and distinguished. He is a long-term member of the Program Committee and has contributed to the technical paper program numerous times. An ardent supporter and proponent of trenchless technology, Richard has also been involved with many other trade organizations over the years such as ASCE, WEF and BAMI-I.

His roots in the industry run deep with over 30 years of experience working with trenchless solutions. While at the Washington Suburban Sanitary Commission he directed many uses of new innovative technologies. Richard is continuing his involvement in numerous trenchless projects through his present work with Arcadis.

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.

Congratulations Richard on this honor recognizing your exemplary contributions to the advancement of the trenchless technology industry and to the growth and success of NASTT.

HOLISTIC APPROACH & TRENCHLESS METHODS SOLVE SEWER ISSUES UNDER COMPLEX CONDITIONS

Preserving Important Relationships with the Community While Completing the Work Effectively

By: Justin deMello, P.E., Woodard & Curran

A community of approximately 30,000 residents had been experiencing chronic backups and sanitary sewer overflows during wet weather events for years, but with its sewer interceptor location next to a river prone to flooding, a very busy interstate highway, and an active commuter rail line, rehabilitation, or even investigation, seemed like an impossible task. The complicated logistics of upgrading this aging piece of infrastructure was just the tip of the iceberg in carrying out this project successfully. Ultimately, by using a holistic approach and trenchless methods to minimize disruption to the surrounding community the town was able to significantly improve the health and stability of its sewer system efficiently, at reasonable cost.



The interceptor was located next to a river that frequently flooded, an interstate, and a busy commuter rail line. Minimizing disruption to environment and community was a major consideration

As municipalities across the country continue to face issues with aging infrastructure, this project provides a remarkable case in point of how keeping an open mind and considering less traditional alternatives can help solve problems. It consisted of rehabilitating approximately 2,700 LF of 24-inch reinforced concrete pipe (RCP) gravity sewer bordered by a waterway, interstate highway and commuter rail line. These site constraints differentiated it from other projects where performing traditional open cut replacement of the pipe would not pose much of an issue.

Initial CCTV inspection of interceptor

As an initial measure to remedy the frequent overflows and backups, the town's Division of Public Works hired a pipeline assessment contractor to conduct a closed circuit television (CCTV) inspection of the interceptor. The inspection confirmed what the town had been hoping not to hear—rehabilitation was needed, and in addition to the interceptor's tricky location, there were going to be many challenges to overcome.

The inspection revealed a number of issues, including heavy root intrusion, grease buildup, groundwater infiltration, and overall deteriorated pipe conditions downstream of where the backups had been occurring. Portions of the interceptor contained roots and grease buildups that were blocking in excess of 75% of the existing pipe, and

“THE CIPP REHABILITATION WAS COMPLETED WITHOUT ANY DOWNTIME OR CHANGE OF SCHEDULES FOR THE COMMUTER RAIL OR INTERSTATE HIGHWAY—A FEAT THAT WOULD HAVE BEEN IMPOSSIBLE FOR OPEN CUT CONSTRUCTION.”

these blockages were so severe that a CCTV inspection could not be conducted on a 70-foot section of the interceptor. Due to these severe blockages, it was clear an expedited permitting, design, and completed solution was immediately necessary to avoid potential sewerage surcharging into nearby residences, sanitary sewer overflows into the resource areas during high-groundwater conditions, or even complete pipe collapse and failure.

Holistic approach to rehabilitation design

The town worked with consultant Woodard & Curran to discuss the benefits and drawbacks of each of the possible design alternatives that could be used to remedy the situation. These alternatives included root removal and cleaning, digging up and replacing the pipe, and trenchless rehabilitation.

One of the main concerns when evaluating alternatives was: if these challenges made the inspection itself difficult, how would they affect the outcome of rehabilitation efforts? Since a rootball was limiting the pipe to less than 25% hydraulic capacity, more than 70 LF of pipe could not be inspected, making it impossible at the design stage for the town and its consultants to tell if anything more severe was going on in this stretch of pipe. It was crucial that the approach chosen would address all the existing issues with minimal disruption to the surrounding area. This required innovative thinking and the implementation of progressive techniques. Also time was of the essence, since action needed to be taken before the next high-groundwater, wet weather event. This made a more traditional approach of an open cut excavation, requiring many man-hours for trench digging and installing the pipe, less optimal than the use of trenchless technology.

The project work ultimately involved constructing a 1,500 LF access road through 30-years of overgrown vegetation; locating manholes; mechanical root removal; cured-in-place pipe (CIPP); monolithic manhole liners; bypass pumping; wetland protection and restoration; and environmental, highways, and railroad permitting.

Using CIPP repair for efficient, cost-effective solution

After looking at the alternatives, the town decided to use CIPP repair to rehabilitate the problematic interceptor. CIPP was ultimately selected as the preferred repair method due



Following CIPP installation and post-CCTV inspection, the manholes were coated with a cementitious coating to seal up annular spaces between the pipe and the CIPP liner, providing additional protection from infiltration caused by the high groundwater table



CIPP helped improve worker safety by allowing the pipe to be rehabilitated underneath the nearby railroad while commuter trains continued their regular schedule

to ease of installation and reduced project footprint, cost, and impact to the surrounding area, which facilitated expedited permitting. Since it was critical for the project to be completed before structural integrity of the pipe degraded further, the engineer worked hand in hand with the local authorities to expedite the permits. Another factor lending urgency to the schedule was the work had to be completed before the groundwater level rose during spring snowmelt and the historical rainy season. Fortunately, the contractor was ready to deliver and install the CIPP within three weeks of taking the final pipe measurements.

Once the easement was cleared to allow vactor and camera truck access to select manhole structures, CCTV cleaning crews and root treatment crews worked feverishly to remove the roots from the pipe network. Fortunately, the 70 LF segment of pipe the engineer had been unable to assess during design was merely a 70 LF rootball impacting up to 75% of the cross sectional area likely resulting from 30-years of tree growth over the sewer easement. There were limited structural defects - aside from the rootball the pipe was structurally sound with the exception of a few offset joints. After the

roots were removed using a combination of high pressure water jetting and mechanical cutting the pipe was ready for CIPP liner installation.

The CIPP process took two weeks from start to finish and was completed with five, hot water cured shots ranging from 250 LF to 700 LF each. Following CIPP installation and post-CCTV inspection, the manholes were coating using a cementitious coating to seal up annular spaces between the pipe and the CIPP liner and provide additional protection from infiltration caused by the high groundwater table.

Overall capital cost and environmental impacts reduced significantly

The result of the project was a leak-free sewer interceptor that would no longer experience issues with hydraulic limitations stemming from infiltration. One of the additional benefits was the overall capital cost was reduced significantly by selecting CIPP over conventional open cut. If the town had chosen to go with a traditional, open cut alternative for repair, the cost could have been nearly \$1,000,000. By using CIPP, the cost was reduced by more than half to \$425,000.

Much of these savings can be attributed to the short length of the construction phase, limited easement clearing, no open cut excavation, limited need for wetland protection and restoration, and the negligible impact on the interstate highway and commuter railway.

There were also social benefits from choosing to complete the work using trenchless technology. The reduced overall cost of the project translated to better user affordability. In addition, the fact that the CIPP liner keeps out infiltration reduces the number of gallons of wastewater requiring treatment, thereby offsetting potential increases in water and sewer bills. One thing that was especially important for this project was how much faster CIPP could be installed than conventional open cut rehabilitation. Some estimate that this technology can actually cut project timelines by a factor of four. This fast installation is especially crucial when the project must be conducted in an extremely high traffic area impacting thousands of commuters per day, like this project. Using CIPP also helped improve worker safety by allowing the pipe to be rehabilitated underneath the nearby railroad while commuter trains continued their regular schedule, rather than digging through the railroad and impacting commuters. The CIPP rehabilitation was completed without any downtime or change of schedules for the commuter rail or interstate highway—a feat that would have been impossible for open cut construction.

Lastly, this method of rehabilitation had less of an impact on the environment than a traditional repair method, which is an important consideration for project owners. With the traditional open cut approach there would have been a risk of needing to dig

through wetlands, river banks, flood areas, and areas of endangered species, which can have a significant effect on those sensitive environments. With CIPP, none of that digging was required, avoiding any detrimental impacts to important ecosystems and habitat while also minimizing necessary restoration at the end of the project. With none of these environmental impacts, the permitting for the project was also simplified, saving the project team time that could be spent more directly on addressing the issues at hand.

Challenges overcome using trenchless technology


One of the challenges over the course of the project was clearing the easement to gain access to manholes for both design and construction. When communities fail to maintain infrastructure easements, it poses significant access challenges when emergencies occur. In this case, if the easement had been cleared on an annual basis, the environmental permitting and access would have been simple; however, when there is 30 years' worth of tree growth in a bald eagle habitat, the environmental permitting process requires significant consideration!

In the final analysis, these challenges were all overcome more easily using trenchless technology than if this had been an open cut repair project. It is important to note these challenges underlined how important holistic thinking is in determining pipe locations during the design stage of any sewer construction project. The project also shed light on how getting to the “root” of a problem before investing in other infrastruc-



The result of the project was a leak-free sewer interceptor that would no longer experience issues with hydraulic limitations stemming from infiltration

ture repairs can save a town significant capital investments and prolonged ad hoc repairs.

There is nothing better in the engineering world than finding the “right solution” to a problem. The right solution typically strikes the perfect balance on a project’s financial, environmental, and social bottom line. In this case, CIPP repair was the “right solution” due to its ability to solve the issue of sewer backups and overflows while saving the town money, protecting the environment, and causing minimal disruption—preserving important relationships with the community while completing the work effectively. 

ABOUT THE AUTHOR:



Justin deMello PE, is a project manager at Woodard & Curran with over a decade of experience working on wastewater, water, and water resource projects for municipalities and private sector clients.



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FREEDOM BURST!

Carson Corporation Completes Difficult Ductile Iron Project: Liberty State Park, NJ

By: TT Technologies Inc.

Static pipe bursting has been the method of choice for several high profile projects around the United States, but in terms of recognizable locations, a recent pipe bursting project at Liberty State Park may have the edge. In the shadow of one of the most iconic national monuments, Carson Corporation, Lafayette, New Jersey, demonstrated the capability of the static pipe bursting process, replacing a difficult ductile iron water main.

Carson Corporation has the distinction of owning and operating one of the largest directional drill rigs on the East Coast and has successfully completed projects throughout the country, in numerous locations, including under rivers, lakes and sensitive wetlands. The company also owns several other smaller directional drill rigs that have installed miles of trenchless piping. However, Carson Corporation is also experienced in other trenchless applications, including static pipe bursting.

Carson Corporation Civil Division Project Manager Tom Rusen has been involved with pipe bursting for over 20 years and oversaw the project at Liberty State Park. Rusen said, "There were actually three different trenchless technologies employed on this project, but it was static pipe bursting that was specified for the 8-inch ductile iron water main. The water line runs down the main road that comes into the park. Running next to the road is a row of Sycamore trees that have been there for over forty years and could not be disturbed. In addition, there is a row of 50 flags, one for each state, that couldn't be disturbed. As such the water main portion of the project was specified as trenchless pipe bursting to limit overall disruption and keep the park open and operating."

To burst and replace the 8-inch ductile iron water main with 10-inch HDPE, Carson Corporation used a Grundoburst 800G static pipe bursting system from trenchless equipment manufacturer TT Technologies, Aurora, Ill.

"THROW IN TIDAL WATER TABLES AND THAT SANDY SOIL, AND YOU'VE GOT SOME SIGNIFICANT OBSTACLES. THEY DID AN EXCELLENT JOB."

Static Pipe Bursting

The static pipe bursting method has received a great deal of attention because of its ability to install various product pipe materials. That has made static bursting more accessible and acceptable. The ability of the method to burst and replace ductile iron pipe has also set it apart from other pipe replacement methods.

According to TT Technologies Pipe Bursting Specialist Bill Jeffery, the static pipe bursting method has come a long way. He said, "We've seen the static pipe bursting

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process continue to gain momentum in the industry. It's become more versatile in terms of installing different pipe materials such as fusible PVC, HDPE and clay. But, as the project at Liberty State Park demonstrates, the capability of the method to take on difficult host pipe materials like ductile iron pipe is also a reason that static pipe bursting has become a sought-after rehab and replacement method."

Several things contribute to the effectiveness of the method. Specially designed bladed rollers are one important component. The bladed rollers are pulled through the host pipe by a hydraulically powered bursting unit. As they are pulled through, they split the host pipe. An expander attached to the rollers forces the fragmented pipe into the surrounding soil while simultaneously pulling in the new pipe.



Carson Corporation used a Grundoburst 800G static pipe bursting system to burst and replace approx. 3,000 feet of 8-inch ductile iron water main with 10-inch HDPE

The bursting rods are also critical to successful static pipe bursting. Jeffery said, "Quicklock style rods are securely linked, not screwed together like traditional drill stems or other static systems. We've found that this system provides the optimum in terms of strength of connection and elimination of rod torque. This style of rod also speeds installation and breakdown because the rods are easily and quickly removed at the exit pit as bursting is in operation. There's no time wasted screwing and unscrewing rods or having to deal with a potentially dangerous high torsion situation."

Project Overview

Located in northern New Jersey on Upper New York Bay, Liberty State Park, at 1,212 acres, is well known for its amazing views of the Manhattan skyline, Ellis Island and the Statue of Liberty. The park draws millions

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of tourists and visitors each year. The Jersey City Municipal Utilities Authority provides water and wastewater service to Liberty State Park and Liberty Island, the location of the Statue of Liberty, which is operated by the National Park Service.

According to its website, engineering firm Hatch Mott MacDonald, Iselin, New Jersey, was retained in 2012 by the Authority to design replacements for the undersized water and sewer lines at the park.

The project included the use of horizontal directional drilling to install separate

2,400-foot-long water and sewer lines through the bedrock of New York Harbor. Static pipe bursting was proposed to replace approximately 3,000 feet of water main, and sliplining to rehabilitate 3,000 feet of sewer force main within the park. Carson Corporation was awarded the project, served as general contractor and faced one challenge after another at the Liberty State Park location.

Challenging Burst

The layout of the project made determining launch and exit pit locations a challenge. Rusen said, "In terms of launch and exit pits, we needed to work around several roads that run through the park. We knew we couldn't close the roads, so we determined where we needed to start and where we needed to finish. Based on where the roads were located and where the mains traveled, we were able to identify the locations for launch and exit pits."

Difficult soil conditions also added to the complexity of the project. Rusen said, "The soil in the area is comprised of mainly fill and very fine sand. In addition, there is a tidal influence. So at high tide, there is a significant amount of water to deal with. We had to continuously dewater throughout the project."

The existing ductile iron pipe depth averaged between 6 feet and 11 feet deep. Typical exit pits were 8 feet by 12 feet to accommodate the type of shoring boxes used by Carson Corporation. For launch pits crews used a 3-to-1 ratio to determine the appropriate size for the pit. For example, if the pipe depth was 10 feet, a 30-foot long launch pit was constructed. Before bursting could begin, Carson Corporation crews ran approximately 3,500 feet of 4-inch polyethylene SDR 11 water bypass.

"THE SOIL IN THE AREA IS COMPRISED OF MAINLY FILL AND VERY FINE SAND. IN ADDITION, THERE IS A TIDAL INFLUENCE. SO AT HIGH TIDE, THERE IS A SIGNIFICANT AMOUNT OF WATER TO DEAL WITH. WE HAD TO CONTINUOUSLY DEWATER THROUGHOUT THE PROJECT."

Bursting runs ranged from 250 feet to 700 feet in length. Rusen said, "We had runs that went extremely well and several that were difficult. The existing ductile iron was in great shape; it was a tough class of pipe that we were dealing with. One of the biggest issues was the very fine sand. That sand got into everything including the wheeled cutterhead, and slowed everything down. We had to put a plug into the new HDPE pipe to prevent the sand and water from getting into it." Despite the difficulty, bursting times averaged between 8 and 10 feet per minute, with a typical run taking about an hour and half to two hours to complete.

Rusen said, "With pipe bursting, it's all about the planning and setup and all of the preliminary work that dictates the result, but issues can surface at any time. At the end of the run, the pipe material changed to a pit cast iron pipe and the several turns and bends in the line, along with a significant bell joint, prevented us from finishing with pipe bursting. Each side of that bell was about a foot thick. It was impossible to burst, so we had to directional drill the last 850 feet of the project."

Jeffery said, "This was an extremely challenging burst. Tom and the Carson Corporation bursting crew really did a nice job managing all the variables of the project. Bursting ductile iron is difficult enough, but throw in tidal water tables and that sandy soil, and you've got some significant obstacles. They did an excellent job." 🙌



Static pipe bursting system, Quicklock bursting rods and the hydraulic power pack are on the trailer, ready to deploy, in the shadow of the Statue of Liberty

ABOUT TT TECHNOLOGIES:



For more than 45 years, TT Technologies has been the worldwide leader in trenchless technology. TT Technologies' complete line of trenchless equipment includes piercing tools,

guided boring tools, pneumatic, static and lateral pipe bursting systems, pipe ramming tools, bentonite mixing systems, constant-tension winches, directional drills and mini-directional drill rigs. Each year, more trenchless sewer, water, gas and electric rehabilitation and replacement projects are successfully completed with trenchless equipment from TT Technologies than any other. TT Technologies is the leader in trenchless!

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BAMI-I/TTC 2016 UPDATE

By: The Trenchless Technology Center (TTC)

Buried Asset Management Institute-Intl. (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.

Benefits of CTAM Courses to Professional Engineers

CTAM Courses benefit Professional Engineers with years of experience in management of underground asset infrastructure. Most State Licensing Boards require PDHs for P.E. license renewal. It is up to the individual to verify that the Board for the State she/he is seeking license renewal will allow the CTAM course certifications. Many P.E.s who have years of experience in water and wastewater systems have never developed and implemented formalized asset management plans. These courses are developed by industry professionals for industry professionals. Many of the course development professionals are P.E.s with many years of experience.



Dr. Tom Iseley introduces CTAM 300 course materials during classroom session in Raleigh NC.



Participants listen attentively. For the first time, all four CTAM courses were taught in a classroom format.

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 online and per request in classroom format. More than 600 individuals from 14 countries have enrolled in the CTAM program.

The CTAM program Certification Board is chaired by Richard Thomasson P.E., Arcadis, BAMI-I Vice Chair. Also serving on the Certification Board are Kurt Wright, SDG Engineering, CTAM-400 Chair; Jim Harris, Consultant, CTAM-300 Chair; Ronald Thompson, Southeast Engineering & Consulting; and Tod Phinney, Souder, Miller & Associates.

Three levels of certification available – Certificates of Completion, and the Associate Water Asset Manager (AWAM) and Professional Water Asset Manager (PWAM) designations. To date 48 AWAM and 11 PWAM certifications have been awarded.

Benefits of CTAM Courses to Municipalities

Municipalities benefit from participating in CTAM training and certification process. One benefit of these courses and certifications derived by smaller municipal systems may be related to the difficulty they have attracting/training/retaining highly skilled professionals to manage their underground asset infrastructure. The CTAM courses allow them to cost-effectively train inexperienced staff. It also provides a basis to recognize and reward individuals who attain the AWAM and/or PWAM certifications. This system of training and certifications also assists smaller municipalities with the hiring process and pay slotting for open positions.

The principles and practices of water asset management taught in the CTAM courses are appropriate for all sizes of utilities both public and private. BAMI-I makes a special effort to emphasize that this material was developed with a commitment to provide value to the 93% of utilities that serve fewer than 10,000 customers.

For more information, and application requirements, please visit www.bami-i.com



TRI-STATE UTILITIES TAKES ON NEWMARKET PLAZA AREA SEWER REHABILITATION PILOT PROJECT

Successful CIPP Main & Laterals Project One of Three Pilots Navigating Future Course for Area Wide I&I Reduction Program in Hampton Roads

By: A2B Publishing Inc.

Tri-State Utilities installs mainline CIPP, Newmarket Plaza Area

Headquartered in Chesapeake VA, Tri-State Utilities has, in over 25 years of work rehabbing sewers and storm drains, earned a solid regional reputation for strong technical expertise in trenchless utility rehabilitation, continuing the tradition set by company founder Steven F. McSweeney. An accomplished underground contractor, Tri-State earned the National Utility Contractors Association National Safety Award, and received local recognition as the Hampton Roads Utility & Heavy Contractor Association Contractor of the Year for both 2000, and 2008.

Employing over 65 people, Tri-State is well versed in the latest trenchless technologies, having garnered a wealth of experience on multiple projects trenchless pipe lining with CIPP. Cured-In-Place Pipe (CIPP) has

become the time proven application for rehabilitating sewers and storm drains known for its versatility because each liner is custom engineered and manufactured, precisely fitting the host pipe. CIPP liners have become an industry standard and were the choice for a sewer rehabilitation project in the Newmarket Plaza Area residential development in Newport News, VA. Earlier work had shown lining pipe in this area was feasible.

HRSD, the regional wastewater authority, was undertaking the “Locality System

Monitoring and Condition Assessment” pilot project to rehabilitate the Newmarket Plaza Area sanitary sewers and laterals as part of a major, area wide program to minimize Inflow and Infiltration (I&I). Once complete, the Regional Wet Weather Management Plan (RWWMP) will set out a program to reduce frequency and severity of Sanitary Sewer Overflow (SSO) events during rainstorms. It has to be ready in time for an October 1, 2017 deadline to comply with an Environmental Protection Agency (EPA)

“TO MEET OUR FEBRUARY COMPLETION DEADLINE WE CLOSELY MANAGED THE DAILY WORK OF AS MANY AS 6 CREWS, WITH 4 OF THEM BEING SUBCONTRACTORS ALL ON SITE AT ONCE.”

and Virginia Department of Environmental Quality (DEQ) Consent Decree (CD), so the entire multi-phase process is on a relentlessly tight schedule.

This Design-Bid-Build project was important because it was one of three pilots that were going to be used to evaluate the most effective construction delivery methods for the entire regional program, refining and

improving processes in preparation for a roll out of future local area I&I reduction projects under the RWWMP. By helping identify the most cost efficient and effective methods, the results and lessons learned from the initial three pilot projects would guide the approach for the future rehabilitation projects coming down the pipeline.

Tri-State Business Development Manager,

John Saintsing explains, "Using trenchless CIPP, our goal always is to provide good services and meet the needs of our customers while improving the environment. With the Newmarket Plaza pilot project, we took on a challenge to keep to our high standards while completing the work on the tight schedule required by HRSR. It was important - we knew we could be helping set a standard and blaze the trail for how future projects under the regional wet weather management plan would get done..."

Raising the bar a little higher, the project required Closed Circuit Television (CCTV) inspection of laterals to assess them for rehabilitation or replacement during construction work on the mains. This required close and careful coordination and staging of work among the subcontractors and crews on a tight work site and schedule.

As Saintsing noted, "To meet our February completion deadline we closely managed the daily work of as many as 6 crews, with 4 of them being subcontractors all on site at once."

The deadline was crucial. Successful on-time completion of the Newmarket Plaza



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Area project by Tri-State was an important step forward in the overall effort being made by HRSD to reduce SSO events.

HRSD

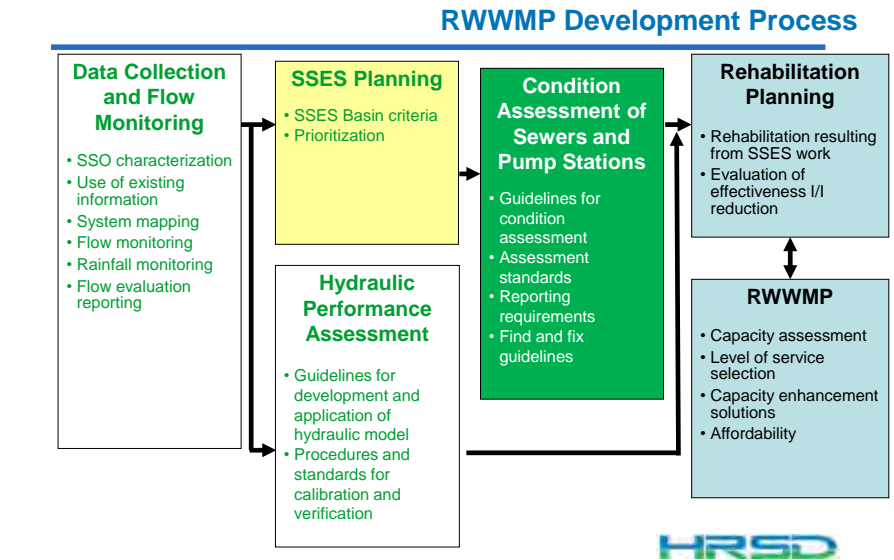
HRSD takes environmental protection very seriously and has an exceptional record of permit compliance. HRSD serves 17 cities and counties in southeastern Virginia, an area with a population of 1.7 million spread over 2808 square miles. The HRSD regional and local sewer networks comprise an extensive system within the coastal tidewater area surrounding Hampton Roads. The area has sensitive estuarine and coastal ecosystems, wetlands adjoining urbanized areas, port and military facilities. Drainage, especially during frequent wet weather events, is an ever-present challenge.

HRSD operates over 500 miles of sewer, primarily large diameter force mains, along with 112 pump stations, conveying wastewater to 13 treatment plants. In total, the connected local sewer systems comprise a collection network of 7,000 miles, over 80% gravity sewer. The system has overall capacity to treat 249mgd and carries on average 165mgd wastewater to the treatment plants.

The HRSD system only handles wastewater intake from the localities. Each of the localities, including Newport News, has a separate system for handling storm water runoff; however during wet weather the local sanitary sewer systems can become flooded due to groundwater infiltration and from the inflow of storm water entering through



HRSD operates 13 treatment plants



manholes, cracked pipes and clean outs. This I&I from the local systems can overwhelm the capacity of the regional HRSD system, causing releases of untreated sewage into the surrounding environment. SSO events documented by HRSD have averaged 40/year over the past decade, ranging from a low of 15 occurrences to a high of 90. There needed to be a system wide organized response, so in 2010 HRSD negotiated a Consent Decree with the EPA embarking on a comprehensive program aimed at reducing SSO occurrences.

Locality System Monitoring and Condition Assessment

After the Consent Decree, necessary investigations, data collection, flow monitoring and condition assessment work followed to determine the problem locations. There had been previous I&I mitigation efforts and rehabilitation work performed in both the regional system and the localities; however a more comprehensive and systematic region wide approach was now mandated.

Because this investigative work confirmed the local sanitary sewer systems were a major source of I&I entering the regional conveyance system, HRSD entered into cooperative agreements with 14 local governing bodies. Assuming control over I&I improvements in all local collection systems, HRSD took responsibility for the funding and implementation of a regional plan of action, the

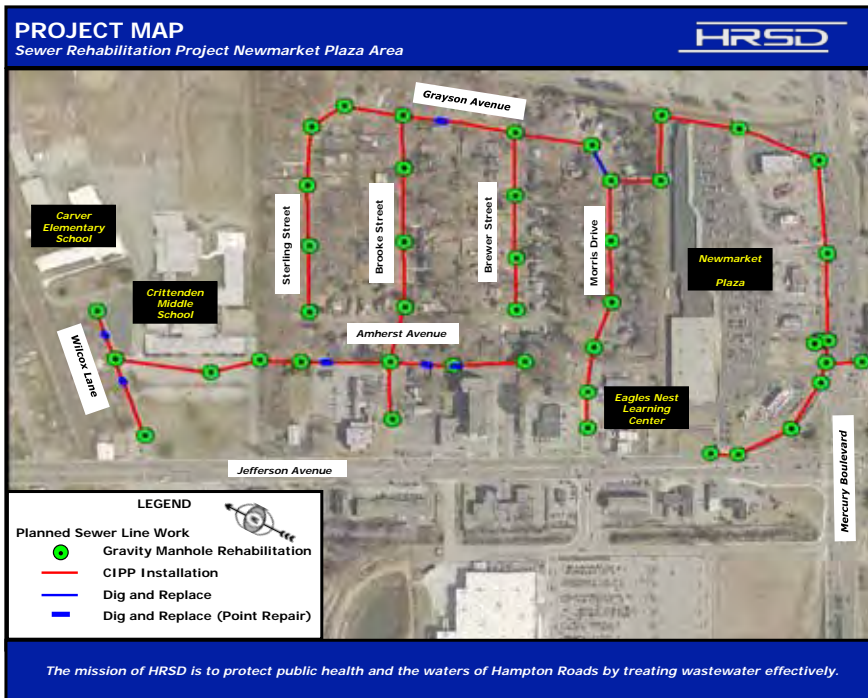
RWWMP, which would define an achievable level of service capacity management.

HRSD then did Sanitary Sewer Evaluation Surveys (SSES) in just over 110 priority basins. From past SSES work performed by the localities, and these HRSD priority basins, HRSD studied 450 priority sewer basins in the local systems. The work included pipe inspections, smoke and dye testing and flow isolation studies to measure the quantity of groundwater infiltration in dry weather. Investigations eventually narrowed the focus to 287 basins with significant I&I measurements. These are the immediate priority for rehabilitation projects in the RWWMP program.

Three Important Pilot Projects Setting the Course

Out of the 287 sewer basins identified as needing immediate attention, three basins were selected as pilot projects for immediate rehabilitation work, two in Virginia Beach (Basins #111 and #340), and the Tri-State Newmarket Plaza Area job in Newport News (Basin#008). All three pilot projects will help assess future options for work on the sewer basins identified as significant contributors of I&I. They will assist HRSD in evaluating how different methods will best fit the future projects anticipated in the RWWMP – essentially a process of figuring out the best tools for the tool kit.

The Newmarket Plaza Area job examined



the effectiveness of the traditional Design-Bid-Build construction method – Tri-State was the successful low bidder and was the General Contractor (GC). The other two pilots looked at alternative Design-Build and Unit-Price project delivery methods. The work on all three focused almost exclusively on rehabilitation or replacement of public assets – pipes, manholes and public sewer laterals, with a small amount of work on private laterals required in the Unit Price project (Basin #111). All three were in similar mixed residential and commercial neighborhoods.

With the push to complete the RWWMP on time, all three pilot projects were on a very tight schedule. Design work on all three occurred through summer 2015; construction began on the two Virginia Beach jobs in September 2015 and finished in December. Work commenced on the Newmarket Plaza October 2015, with completion February 2016. Each pilot project had a specific quantified target for I&I reduction, to be assessed after completion.

Design-Bid-Build CIPP Pilot

The goal for the Basin #008 Newmarket Plaza pilot was reduction of I&I intrusion by 70%.

Work was located completely within public property, extending to roughly 10 feet from the edge of the pavement. The project as designed entailed: CIPP of 9,754 LF of 6 to 12-inch gravity sewer main; replacement of 300 LF of 8 to 10-inch gravity sewer main; rehabilitation of 42 gravity sewer manholes totalling 300 VF; replacement of 3 gravity sewer manholes; CIPP of 94 LF gravity sewer laterals; and replacement of 48 gravity sewer laterals. CIPP lining work needed to be completed in a narrow time window, and during the mid-Atlantic stormy months.

Appropriately, the local Newport News office of Whitman, Reardon & Associates (WR&A) did the design and engineering for Tri-State’s CIPP project. Now in its 101st year, WR&A has a history of experience and familiarity with the Newport News sanitary sewer system. From 2009 - 2012, WR&A performed SSES condition assessment work in the central portion of the city including inspection of nearly 3500 manholes. WR&A gathered this data for use in developing sewer rehabilitation plans in compliance with the Consent Decree, and worked closely with city staff to identify sources of I&I, such as laterals, suitable for the “Find & Fix” approach mandated under the program.

The WR&A lead Engineering Consultant for the project, Scott Kenney, P.E., remarked “With the goal of reducing I&I, HRSD and WR&A focused on the addressing sewer laterals, acknowledging they are critical locations where I&I is prone to entering the sewer system.”

“Find and Fix” Approach Yields Results – Mains & Laterals

By their nature and sheer quantity, laterals can provide numerous points of potential intrusion, and are an important element to consider in a comprehensive I&I reduction program. CCTV inspection of the public owned portions of the sewer laterals for immediate rehabilitation or replacement as construction proceeded was an integral aspect of the Newmarket Plaza Area pilot project design.

As Kenney noted, “Rehabilitation of sewer laterals was based on a find and fix approach. Each lateral was CCTV inspected during construction. Based on condition of the lateral, it was repaired using CIPP or replaced. The intention of this project was to line all laterals and replace where existing conditions prevented lining such as offset joints, roots, fracturing, or other defects.”

With as many as 6 crews, 4 of which were subcontractors, on site at any given time, this “find and fix” approach required close coordination, work sequencing and teamwork along with use of innovative new technology. Tri-State Project Manager Jonathan Thomas P.E. was instrumental in making sure the job stayed on track and on schedule. He worked closely with Kenney and HRSD Project Manager Matt Poe P.E. in

CCTV inspection of laterals during construction





Lateral CIPP installed in bladder system, assembly placed in manhole



recommending rehab options and coordinating work with all the crews.

Showing a willingness to explore new methods and equipment, Tri-State for the first time used the new Rausch Lateral Launch System to inspect the public laterals. CCTV inspections from the Lateral Launch System helped incorporate the “Find and Fix” element into the process while keeping the project on track to achieve deadline. As Saintsing described it, “The Lateral Launch CCTV let us assess for rehab or replacement right on site. It got us as far up into the laterals as we needed to look, even into the transitions.”

In 6 weeks, from January into February, laterals subcontractor BLD Services lined an impressive 94 laterals. Twenty of the laterals

had transitions from 6-inch to 4-inch, which required either transitional liners or installation of new cleanouts.

Future with CIPP – Tri-State Utilities

With sewer laterals and manholes lined or replaced by end of February, and the mainline CIPP work completed in January, Tri-State successfully achieved the tight construction window while delivering their traditional high quality of work. Flow monitoring is now in place to assess the actual level of I&I reduction and post construction CCTV inspections are under review. Though measurement of results is preliminary, there are very good indications

it is a successful effort with strong likelihood of attaining the target 70% I&I reduction. Tri-State’s success on this CIPP pilot project is a key step in the actualization of the RW-WMP into an area wide program of sewer rehabilitation projects curtailing SSO events.

Benefits for the surrounding environment and community of using the trenchless CIPP method were present: disruption was minimal, traffic flow maintained throughout the project. All the work was within public right-of-ways, mostly using trenchless CIPP applications, with relatively little need for open-cut replacement of pipe and laterals. As expected, the impacts on the Newmarket Plaza neighborhood from the sewer rehabilitation project were negligible.

Scott Kenney feels Tri-State met the challenging schedule, kept their high standard:

“Tri-State Utilities and their subcontractors - BLD, D&S, and Basic Construction - did a great job. They had a very tight timeframe for completing this project and met all deadlines while still providing quality work – they busted their humps to get it done.”

HRSD is moving ahead with the RW-WMP. Given this impetus, the lessons learned from the integrated trenchless approach taken by Tri-State Utilities on the Newmarket Plaza Area project could serve as the standard for years to come. As Kenney summarized:

“This project was successful in rehabilitating an aged gravity sewer system with an emphasis on using a trenchless technologies first/ dig second approach. This mindset will pave the way in keeping up to speed with emerging trenchless technologies for future rehabilitation of aging sewer systems.”



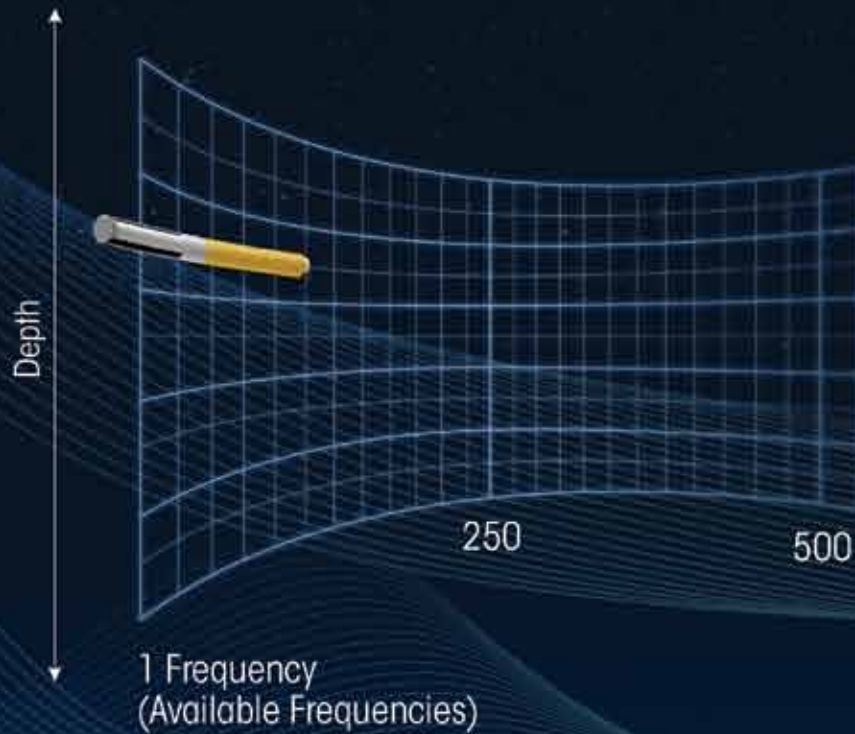
Steam curing. Community impacts were negligible

Key Project Personnel:

- Tri-State Utilities: John Saintsing, Jonathan Thomas P.E.
- Whitman Requardt & Associates: Scott Kenney P.E., Andy Landrum P.E., Lukas Terry,
- Hampton Roads Sanitation District: Phil Hubbard P.E., Bruce Hesselbee P.E., Matt Poe P.E.
- BLD Services: Nick Hollabaugh

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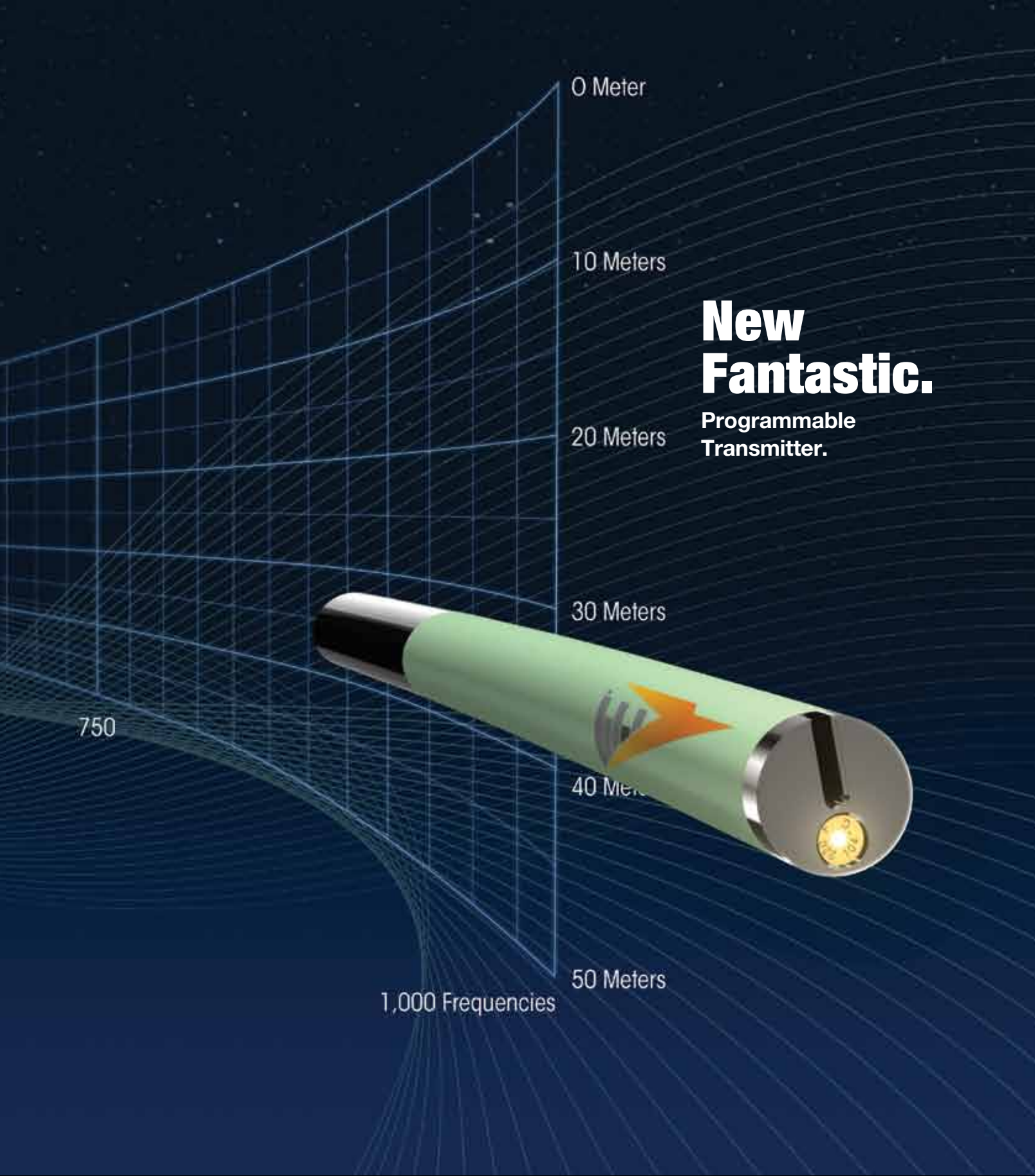
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10 Nobel Prize winners—the highest among Canadian universities



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Is the largest and most comprehensive higher education institution in New Jersey



Queens University
Affiliated with North America's largest and most productive ground engineering research group



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Approximately 400 teaching and research agreements in nearly 50 countries



University of Texas at Arlington
Creates an annual economic impact of almost \$13 billion in the region



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FIXING BIG CULVERTS WITHOUT DISRUPTING TRAFFIC IN GROTTOES, VA

By: Angus W. Stocking, L.S.

Material is dry, delivered to the staging area in bags, and mixed on site

Grottoes, Virginia, a town of 2,600, has the usual complement of underground infrastructure that make any town work, and in 2013 one significant asset, a large stormwater system, was in trouble.

The Virginia Department of Transportation (VDOT) gives the town funds for the maintenance of streets and stormwater networks, and as part of that arrangement, VDOT requires the town to conduct annual inspections. In the last report, a large set of elliptical CMP culverts didn't pass inspection. "Our consultant, Schwartz & Associates, told us the culverts were in poor condition," explains Grottoes Town Manager Jeff Nicely. "They said there was severe corrosion, and that individual sections were failing and misaligned. They recommended replacement."

This was a big deal. These are four parallel culverts and are quite large, 70-inches by 44-inches; perhaps more importantly, they run directly underneath Dogwood Avenue, one of Grottoes' two main thoroughfares. "It's true, we're a small town," Nicely says. "Still, shutting down Dogwood would cause real problems for us. But maintenance of the culverts is our responsibility, and we had to do something."

The town obtained cost estimates for trench-and-replace from Brunk & Hylton Engineering, Inc. and, as expected, the price was high and the plan called for significant and lengthy traffic disruptions. Fortunately, another idea occurred to Nicely. "At a Rural Water Association conference, we'd seen a process called CentriPipe that looked like it could be useful in this situation. The CentriPipe contractor in our area, Mike Shepherd, explained it to us, and we were very interested and asked Brunk & Hylton to look into it for us."

The CentriPipe process is a centrifugally cast concrete pipe (CCCP) solution based on spincasting technology developed by AP/M Permaform. It was originally used in vertical applications, especially in manholes, but beginning in the 1990s the process has been refined for horizontal applications and is quickly becoming a standard for large diameter pipe and sewer rehabilitation. In essence, the CentriPipe spincaster is pulled back through failing pipes while spraying very strong, highly adhesive, fiber-reinforced cementitious liner onto the pipe in thin layers. As the layers build up, typically to a design thickness of around two inches, they form a new, structurally sound concrete pipe within the old pipe.

"... USING CENTRIPIPE WAS 15 PERCENT CHEAPER THAN DIGGING UP THE OLD SEWERS AND REPLACING THEM. BUT THAT DOESN'T EVEN ACCOUNT FOR THE SAVINGS GAINED BY NOT DISRUPTING TRAFFIC FOR WEEKS"



The new culverts are smooth, seamless, watertight, and structurally stronger than the old CMP, with longer projected service life



Saving the town the hassles of disrupted traffic is an incalculable but significant benefit

This system has several advantages over competing solutions. Since it's an intrinsically structural solution, the structural strength of the failing sewer is immaterial—it just has to stay in place long enough to act as a substrate for the new concrete pipe. And since the new pipe is thin, and adheres tightly to the existing pipe or culvert—the material used, PL-8000 from AP/M Permaform, adheres to metal, clay, brick, and HDPE—sewer flow ca-

capacity is minimally affected, and no annular space is left between the old and new pipes, so there is no ground or stormwater flow in that area. And CentriPipe is also cost-effective; prices are generally less than for other large-diameter rehabilitation methods.

But most importantly for Nicely, CentriPipe is a trenchless solution. "Compared just on project cost, using CentriPipe was 15 percent cheaper than digging up the old sewers and replacing them. But that doesn't even account for the savings gained by not disrupting traffic for weeks." Nicely estimates that avoiding the costs of traffic monitoring saved another five percent or so, and says that saving the town the hassles of disrupted traffic is an incalculable but significant benefit. Also, the lengthy permitting process may have been eased by the relative lack of disruption and excavation.

The work is being done in two phases by Mike Shepherd's crew at D&S Contractors, and Arold Construction, both licensees of AP/M Permaform. Shepherd says the project was straightforward. "There were four parallel culverts, 112 feet long, for a total of

448 lineal feet. Fortunately, the CMP wasn't actually falling apart, so no spot repairs had to be done prior to casting the new pipe, we didn't have to pour a new invert, and we did the work in a dry month so dewatering wasn't an issue."

The crews did clean the culverts, using the CentriPipe spincaster as a high-pressure washer to clear out debris that could affect adhesion. They then made multiple passes, pulling the spincaster on skids and pumping PL-8000 that was mixed on site (the material is dry, and delivered to the staging area in bags) to build up a final thickness of two inches. This dimension and other specifications were established by consulting engineers contracted by AP/M Permaform.

Quality control was performed in two ways, says Nicely. The thickness of the new pipe is the key factor so, "We measured the old CMP, from the top of the corrugations, and compared that to the finished product. And we also drilled several holes along the new concrete, to verify thickness. Everything was to specification."

The new culverts are smooth, seamless, watertight, and structurally stronger than the old CMP, with longer projected service life. "We're quite happy with the results," Nicely says. "... and we expect to do the second phase, about 262 lineal feet, this year. Best of all, we never had to stop traffic." ✚

ABOUT THE AUTHOR:



Angus W. Stocking, L.S. has been writing full time about infrastructure since 2002. Feature articles by Stocking have appeared in several dozen infrastructure trade journals. Prior to taking up writing full time, he enjoyed a 14-year career as a licensed land surveyor, working in California, Idaho, Kentucky, and Wisconsin, including stints as a right-of-way surveyor for CalTrans and survey manager at Midwest-based consulting firm MSA Professional Services.



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JERSEY CITY WATER REHAB

Trenchless Solution Found For Replacement of Deteriorated Water Mains

By: Robert Dumais, Aqua-Pipe/Sanexen Water Services

With its population of approximately 262,000 people, Jersey City is the second largest city in the state of New Jersey, and has the fastest population increase — 5.9 percent — of any municipality in New Jersey since 2010. Like many other American cities Jersey City is also facing the challenges of aging water mains.

Newark Avenue is a thoroughfare of Jersey City. An approximate 4,000 foot section of Newark Avenue from the intersection of Summit Avenue to James Street, required much needed work on all of its underground infrastructure. Within that section is Indian Square, also known as “Little India.” This portion of Newark Avenue is vibrant with grocery stores, electronics vendors, video stores, clothing stores and restaurants and is one of the busier pedestrian areas of this part of the city, often stopping traffic for hours.

Newark Avenue and Indian Square were the scene of a lot of work in the summer of 2015. First, Newark Avenue was trenched open on 4,000 LF for the replacement of the sewer line. More trenching was done to perform much needed work on gas and electrical lines. By September, the residents and business owners were feeling the social and economic impact from the disturbance related to the construction, and the renewal of the water mains was still to be dealt with.

Newark Avenue has a 6-inch water main running from James Avenue on 3,400 LF, then the diameter goes up to 8-inch and the water main continues 600 LF up to the

intersection of Summit Avenue. This water main, believed to be from the early 1900s, has shown events of breaks.

TRENCHLESS OPTION

Rajiv Prakash, P.E., staff engineer at Jersey City Municipal Utilities Authority, knew that the replacement of the water main would have required digging another trench. Considering the previous inconveniences to the residents and business owners of Newark Avenue and the presence of other utilities adjacent to the water main, a traditional replacement by open-trench was not an option. He considered trenchless options for the water main renewal.

Jersey City has been a long-time user of cement mortar lining and is very familiar with this form of water main rehabilitation. However, from recent water main breaks on Newark Avenue, Prakash had considered a structural form of water main rehabilitation.

In October 2014, Prakash along with Hatch, Mott MacDonald vice president Earl Schneider, P.E., visited a jobsite in Woodbridge, N.J. The jobsite was the stage for the trenchless structural lining of water main us-

ing the Aqua-Pipe technology from Sanexen. The work consisted of structurally lining 3,000 LF of 6-inch pipe providing water to 52 residences. “This technology has great potential and we have potential applications in mind in the near future,” said Schneider when he left that site tour.

Prakash recalled that visit and he knew that Aqua-Pipe would be the answer for the Newark Avenue water main rehabilitation. Prakash, Schneider and Sanexen Water met to discuss the feasibility of Aqua-Pipe. The water main was running in a straight line with no evidence of severe bends. The street crossing and associated “T” connections were clearly identified; valves, fire hydrants and water services (connections) were clearly located. The liner insertion pits, 6 feet by 9 feet in size, were to be located at the “T” connections from incoming water mains from side streets, at fire hydrant 6-inch branches and at fire protection services (4-inch connections). Approximately 70 service connections were to be re-opened from inside the pipe using robotics. Newark Avenue was an excellent candidate for structural lining with Aqua-Pipe. Schneider put members of his Hatch, Mott and MacDonald team to prepare

***“THE TRENCHLESS REHABILITATION OF WATER MAINS
USING A STRUCTURAL LINER IS AN OPTION WE ARE NOW
PUTTING FORWARD WHEN IT COMES TO MANAGEMENT
OF OUR AGING WATER MAINS”***

technical specifications for the structural lining of the water main.

The rehabilitation of the Newark Avenue water main was planned in two phases; Phase 1 was to cover the structural lining of 2,000 LF of 6- to 8-inch from Summit Avenue to Tonnelle Avenue (including the Indian Square neighborhood) while Phase 2 was to cover the remaining 2,000 LF of 6-inch water from Tonnelle Avenue to James Avenue. However, a major challenge related to the construction schedule of Phase 1 was thrown on the table.

PHASE 1 CHALLENGE

Originally, the construction of Phase 1 was scheduled in October as the repaving of that section of Newark Avenue was planned for early November. Indian Square is home to the largest outdoor Navratri festivities in New Jersey. Navratri is an important festival and it was opening on Oct. 16 on Newark Avenue. With the construction that took place all summer, it had been decided that Newark Avenue was to be totally reconstructed and repaved for the opening of the Navratri festival. It was mid-September when Sanexen Water was faced with that change of schedule.

The general contractor was early at work with the installation of the water by-pass and the excavation of required access pits. Sanexen Water put in extra efforts to mobilize equipment and crews earlier than planned. The water main was cleaned prior to lining. As time was of the essence, two methods of cleaning were used. One is using a combination of high-pressure water and mechanical reamer. This turned out to be slower than usual in this heavily tuberculated water main. To speed up the cleaning process, scrapers were used to aggressively remove the tuberculation from the pipe and restore it to its original diameter.

As a final preparation to installing the CIPP liner, service line plugs were robotically inserted into each residential service connections. The purpose of this operation is to prevent the resin used to cure the liner in the main from travelling up each service, resulting in a plugged service. The resin is used in excess quantity to fill the voids around the services, ensuring there is a tight

adhesion and no water can infiltrate behind the cured liner. This preparation was made complicated as many of the 57 total service connections showed damages from the aggressive cleaning operation. Such service connections had to be robotically reshaped in order to make the insertion of the service line plugs possible.

Once the interior of the main was prepared, the Aqua-Pipe liner was inserted and cured inside the main. From the inside of a refrigerated truck, a liner is injected with resin between its two layers of woven fabric. The liner is pulled from the truck into the access pit and into place inside the water main through rollers.

Once inside the host pipe, the liner was pressurized with hot water. While curing, the polymeric resin was pushed along the host main, creating adherence, filling any void or cracks. The hot water is circulated inside the liner for complete reticulation and then left to cooldown overnight. The next day, the crew performed a camera inspection to ensure the liner was properly installed. Once completed, the liner inside the main was pressure tested and met the requirements under ASTM F1216. In four days, a total of seven liners (five liners of 6-inch diameter and two liners of 8 inch) were successfully installed inside the water main of Newark Avenue.

Following this, service connections were reinstated using robotic equipment to drill through the liner and the service plug. Six services connections, damaged by the aggressive cleaning, had to be dug up for reinstatement.

As final steps, new fittings, hydrants and valves were connected by the general contractor just as if it was a full replacement. It was then chlorinated and tested before being commissioned. Work went on to backfill all access pits and excavation. On Oct. 16, the Navratri Festival opened with a fully restored and newly paved Newark Avenue with an estimated 25,000 visitors on Friday and Saturday.

Prakash was pleased with the completion of Phase 1 in the short schedule and believes that Aqua-Pipe was a good solution. "The location of the water main, the presence of other underground infrastructures, the business and social activities that are part of



Newark Avenue, made Aqua-Pipe the perfect solution for a fully structural rehabilitation of the water main," said Prakash.

The construction of Phase 2 of the structural lining of the Newark Avenue water main was scheduled to begin in early November. When Phase 2 is completed, Jersey City MUA will be the leader in structural lining installation in the state of New Jersey.

Aging of water main is a largely acknowledged concern. For many years, trenchless rehabilitation of water mains consisted of non-structural options and they provided a solution pertinent to problems and issues of the time: corrosion, brown water, etc. Despite previous non-structural lining work, the aging process has now weakened the structural capacities on many of these pipes. Now, Jersey City MUA, like other utilities, is experiencing increasing numbers of breaks and leaks on such aging water mains.

"The trenchless rehabilitation of water mains using a structural liner is an option we are now putting forward when it comes to management of our aging water mains," said Prakash.

The structural lining of the Newark Avenue water main is a preview of many more similar projects to come in the United States. 🇺🇸

ABOUT:  aquapipe

Aqua-Pipe is a proven economical and viable alternative to issues related to water mains where, in the past, the only solution was to dig and replace.

SOUND SEWERS: NEW CASTLE COUNTY, DELAWARE

NEW INSPECTION TOOL HELPS MAXIMIZE MAINTENANCE RESOURCES



By: Tom Wyatt Sr. KCI Technologies Inc

One benefit of this technology is that there is zero contact with the sewage, and crews don't have to modify flow conditions in order to perform the assessment

Everything we flush, pour and rinse down the drain makes its way into our extensive network of sewer pipes below the ground. The system is designed to move wastewater away from houses and commercial buildings to massive sewage treatment plants. But in order to keep these networks functioning properly it's essential that utility and maintenance crews regularly inspect and clean the lines. Yet, the challenge often faced is where and when to perform these activities. KCI worked closely with officials in New Castle County, Delaware to test a new inspection tool that can help prioritize resources and operations.

Residents in the county generate over 50 million gallons of wastewater each day. To service this need, the sewer maintenance department is responsible for ensuring that approximately 1,800 miles of sanitary sewer pipe and roughly 55 thousand manholes remain in proper working order. Man-

dated by their environmental regulator, the Delaware Department of Natural Resources and Environmental Control, the county is required to clean 500 miles of sewer each year. This routine maintenance helps to remove debris, deposits, roots and grease from the sewer lines and reduce frequency and severity of sanitary sewer overflows and main line stoppages.

The county uses data from past problem areas to determine how often a segment needs to be cleaned. Based on the total miles of pipe and the required amount of cleaning, the sewer maintenance department set their target cleaning frequency to every three years. Pipes in newer neighborhoods can often be pushed out four to six years without having to be cleaned as frequently, but older

infrastructure or areas with root or grease issues may need attention as often as once a year.

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. We recognized that the pre-determined routine maintenance plan wasn't effectively maximizing the county's resources. While cleaning and inspecting pipes is essential, crews could be spending time in areas that don't need to be cleaned because they don't know in advance whether the system is blocked. So when I attended an industry

“BY INTRODUCING NEW TOOLS LIKE THE SL-RAT TO OUR CLIENTS, WE CAN HELP THEM BECOME MORE EFFICIENT AND BETTER SERVE THEIR CUSTOMERS.”

conference I was intrigued to learn about a recently developed low-cost tool, the Sewer Line Rapid Assessment Tool or SL-RAT, which provides a quick blockage assessment. By introducing new tools like the SL-RAT to our clients, we can help them become more efficient and better serve their customers.

Manufactured by InfoSense Inc., the portable onsite assessment tool uses acoustic-based technology to detect blockage conditions in gravity-fed sewers. Originally developed for a specific municipal customer, the technology is best suited for pipes with a six to 12 inch diameter, where the majority of overflows occur. Placed over top of two adjacent open manholes, a transmitter sends an acoustic signal down the pipe, and a receiver listens and interprets the sound. The technology measures the dissipation of sound energy in the airspace between the two units. Any obstructions within the pipe like roots or grease will block the sound waves and create an energy gap.

One of the benefits of using sound energy is that it can easily navigate around bends and obstacles in the pipe, and the type of pipe material doesn't affect the results. In less than three minutes, the device produces a numerical output on a zero to 10 scale, which relates to the segment's blockage condition. This rating is based on years of ex-



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

perience and research and is designed to be conservatively cautious. Zero signifies that the pipe has multiple obstructions affecting the flow while a reading of 10 indicates that the pipe is completely unobstructed.

In one day, a typical two man crew is able to inspect anywhere from 8,000 to 10,000 LF of pipe depending on the terrain. Crews essentially leap frog down a sewer line, moving one unit at a time to the next manhole to inspect multiple segments. The only piece of information field technicians are required to input is the approximate length of the pipe segment.

One of the greatest benefits of this inspection tool is it helps to quickly prioritize

where to focus cleaning operations. If a blockage is detected, crews can perform a more detailed inspection method, like closed-circuit television (CCTV) or move forward with cleaning the pipe. "It does not replace cleaning; it does not replace CCTV," said George Selembro, CEO of InfoSense Inc. "This is something you do in front of those more expensive operations so you can spend the time cleaning the pipes that actually need it."

A municipality or utility can tailor the rating system to their own needs. When KCI began using the technology, crews would perform an assessment with the SL-RAT and then validate the results with CCTV video to gather visual evidence of what each rating represented. Based on these evaluations, the county decided that any pipe receiving a score of 7 or above was in good condition and would require no current action, while a rating between 4 and 6 was considered fair and would need to be cleaned within three months, and a pipe with a score of 3 or below was in poor condition and required immediate action. KCI then conducted a pilot study to assess what percentage of the county's pipes were actually in need of cleaning.

In the pilot study area our team assessed over 56,000 LF of sewer lines. Without the acoustic analysis, the county would have spent time and money cleaning all of these pipes, but based on the on-site SL-RAT assessments, the ratings revealed that only 10 percent of the pipes required immediate action: 51,083 LF were good, 4,581 LF



Since results are immediately displayed in the field, crews are quickly able to determine what areas need attention.

were fair, and 1,140 LF were poor. “We’ve always suspected a lot of pipe doesn’t need to be cleaned, so that is what attracted us to the technology,” said Robert Roff, New Castle County Operations Service Manager. “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.” In addition, to time and cost savings this technology is also helping cities meet their compliance efforts.

The Environmental Protection Agency (EPA) conducted a study evaluating the effectiveness of using the SL-RAT. Their results concluded it can enhance a sewer cleaning maintenance program. This formal study is helping many cities streamline the process of gaining approval to use the technology to meet environmental regulations. In New Castle County, their regulator and the EPA agreed and approved that assessments produced by the SL-RAT would

count towards the county’s annual 500 miles of required cleaning. Whether crews are cleaning the pipes or proving them to be clean, New Castle County will be meeting their compliance efforts while saving time and using taxpayer dollars more efficiently. Recognizing the importance of providing

**“THIS IS SOMETHING YOU DO
IN FRONT OF THOSE MORE
EXPENSIVE OPERATIONS SO
YOU CAN SPEND THE TIME
CLEANING THE PIPES THAT
ACTUALLY NEED IT.”**

the best service available to their residents, New Castle County is planning to put their projected savings right back into their maintenance program.

Although, most of us don’t think about where our wastewater goes after it disap-

pears down the drain, KCI is constantly evaluating new methods that can help improve sewer maintenance programs. By using the SL-RAT New Castle County can easily determine where they need to focus their resources and operations, and eliminate unnecessary cleaning.

ABOUT THE AUTHOR:

Tom Wyatt Sr. is Project Manager for KCI Technologies Inc. of the New Castle County



DE sewer investigation program. A strong advocate for use of trenchless technologies, Tom has over 40 years’ experience in wastewater systems.

He is current Treasurer of MASTT.



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TECHNOLOGY THAT MAKES A DIFFERENCE IN VACUUM EXCAVATION SYSTEMS

By: Frank Russo, Tellus Underground Technology

Whether you perform your vacuum excavation projects using hydro-excavation equipment or dry-excavation machines, the key to long-term success resides in your output per unit of input, or better known in the business world as “productivity.” The resources that make up your input are capital and labor, while output is measured in total revenue or gross product. Productivity improvement is a never-ending process that is vital to any business because it provides that business with an essential ability to do more with less. It has been said that “Productivity is never an accident. It is always the result of a commitment to excellence, intelligent planning and a focused effort.”

The wild card in the “productivity equation” is the introduction of advancements in technology. The impact that technology can have on your business is captured in the statement: “Once technology rolls over you,

if you’re not part of the steamroller you are part of the road.” It is also important to be conscious of the fact that when a business has achieved the position of a market leader it becomes easy for the people in that business to believe that things will never change, but the seeds of its demise are rooted in the belief that success means invincibility. There is always someone who is willing to adopt new technology to improve their position in the marketplace.

FILTERS THAT NEVER NEED CLEANING

The latest technology advancement in the vacuum excavation business is a new type of computer controlled filtration system that has the ability to separate all of the excavated dirt and water from the soil-conveying air stream and will operate for years without cleaning. When this technology is designed into a vacuum excavation system,

the improvements in productivity exhibit themselves in the form of better digging performance, lower initial equipment cost and lower operating cost.

Most modern vacuum excavation systems include a soil collection tank and a vacuum producer that provides the air flow to move soil from the excavation to the spoils tank. This mobile pneumatic conveying system must be supported by an engine to provide power to the vacuum producer and an air compressor or high-pressure water pump used to break up or liquefy the soil in the excavation. The engineering expertise utilized to package these devices into a functioning vacuum excavation system has existed for many decades and is now available from a couple dozen vacuum system manufacturers in a multitude of sizes and configurations. Large systems designed to move large quantities of excavated spoils are packaged on 50,000 to 80,000 lb. GVW (gross vehicle



weight) trucks. Smaller rigs are packaged to excavate smaller 8-inch to 24-inch diameter holes necessary for the performance of utility location or the repair and maintenance of underground infrastructure. Even to the casual observer of this equipment market, it is easy to see that some manufacturers may design their systems around larger vacuum producers and spoils tanks with a greater

“TECHNOLOGY HAS IMPROVED THE UNDERGROUND UTILITY LOCATING BUSINESS IN A WAY THAT HAS GIVEN SERVICE PROVIDERS THE ABILITY TO OBTAIN EQUIPMENT THAT IS MUCH BETTER SUITED TO THEIR UNIQUE REQUIREMENTS.”

soil capacity, but in the final assessment, the only differences that can be readily evaluated by the end-user are found in the price for a given size unit and the product support that follows the purchase and delivery of a new unit.

WHAT MAKES THE DIFFERENCE

The game changer has been the development of revolutionary methods of separating the soil from the pneumatic conveying air stream. The process of vacuum excavation demands that substantial quantities of soil must be conveyed using huge quantities of air to move the soil to the spoils tank. A filter is positioned between the spoils tank and the vacuum producer to collect all of the dirt that bypasses the spoils tank so that only clean air will be allowed to travel through the blower and out through the system exhaust silencer. The filtration equipment available on many of today's conventional vacuum excavation systems range from simple washable air filter cartridges to three-stage systems that include cyclone separators combined with particle filters. While these filters have been able to

satisfy the basic requirements of the vacuum excavation process, they all have a tendency to restrict the vacuum air flow as they load with dirt. The end result is a reduction in performance until such time as the filters can be cleaned to restore full functional flow in the system.

Recently, revolutionary filtration systems have been developed that have the ability to satisfy the unique needs of the vacuum excavation process. These systems have the ability to improve operating efficiency by constantly cleaning themselves while the system is in operation so there are no variations in vacuum flow such as occurs in conventional filters when they are loading with dirt. This means suction hoses will be less susceptible to clogging and the operator can spend more time excavating and less time unclogging the vacuum hose. In addition, since dirt does not accumulate in the filters there is never a need to dedicate revenue-producing time to the undesirable task of cleaning filters. It is also important to note that this filtration technology has the unprecedented ability to perform equally as well in hydro excavation systems as in dry excavating equipment.




EQUIPMENT DESIGNS FOR UNDERGROUND LOCATING

If the components that define productivity are input and output, and the resources that determine the input component are capital and labor, then it is easy to see that the purchase cost of a vacuum excavation system and its regular operating cost are major capital components of the productivity equation. In the past, large hydro-vac trucks that were designed to move substantial quantities of soil were pressed into service digging the small holes necessary for locating underground utilities, but eventually some astute people in the locating business realized that this was like using an elephant gun for rabbit hunting. Before long, some locating providers began to understand the business opportunity that existed if they could obtain equipment

that utilizes the latest filtration technology along with lightweight system designs that can be mounted on smaller, less expensive trucks. With new vacuum truck designs, underground utility locators can now produce output levels that match the output of the large hydro-vac trucks at a fraction of the cost of doing business with systems that were originally designed to produce trenches and large excavations.

Technology has improved the underground utility locating business in a way that has given service providers the ability to obtain equipment that is much better suited to their unique requirements. This improved equipment can now deliver productivity improvements in the form of reduced up-front cost by eliminating capabilities that are unnecessary for the locating environment. Productivity improvements also exist

in reduced vehicle size and four-wheel drive capability, thus improving dig site access and maneuverability. And finally, these smaller and lighter systems have lower operating costs resulting from reduced fuel consumption and decreased maintenance costs. 

ABOUT THE AUTHOR:



Frank Russo is the founder and CEO of Tellus Underground Technologies. Russo and his team have been involved in the development and production of advanced equipment and operating methods for the underground utility locating and gas distribution industries for more than 25 years. He can be reached at frusso@tellusunderground.com

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NEW VIPER ROCKREAMER RESETS HDD STANDARDS

Three Unique Projects Highlight Durability Versatility & Value

By: Horizontal Technology, Inc.

Horizontal Technology Inc.'s new Viper RockReamer is designed in part to alleviate the epidemic of split-bit reamers catastrophically losing cutters down-hole. The Viper provides added strength and the best possible down-hole cutter security in addition to longer hours, smoother rotation and better penetration rates. This amazing HDD tool is the compilation of decades of down-hole tool experience, engineering and HDD customer input. From 8 3/4-inch to 72-inch, the Viper is now on the shelf and ready to go, offering a variety of features to benefit drilling contractors.

Right after it was introduced, three, unique, out-of-the-box, projects highlighted the new Viper's durability, flexibility and direct economic value. There couldn't have

been more challenging tests. The Viper offered solutions in these real life circumstances, providing bottom line economic benefits to the HDD contractors.

Project #1 - Durability:

Drilling 1,500 LF of parallel 32-inch and 36-inch lines in 30,000 PSI granite with high quartz content was the equivalent of taking final exams on the first day. Final hole sizes of 48 inches and 54 inches had to be completed in some of the world's toughest rock.

The 32-inch line was first and the 8 3/4-inch pilot hole times confirmed the hard formation reports with some joints taking up to 5 hours. Because the Viper is designed to allow greater weights with less torque, the decision was made to do passes of 24-inch,

36-inch and 48-inch passes - big bites out of a hard formation like this! The Viper is designed with the largest bearing capacity of any HDD tool ever used. This reduces torque, allowing the operator to increase weight which improves the penetration rate with less stress on the rig. The V8 with 24-inch TCI cutters were pulled towards the rig and the performance exceeded expectations. The reaming times matched the pilot hole even though almost five times the amount of formation was being removed. After about 57 reaming hours the Viper and the 24-inch cutters still looked great so the reaming continued.

The next pass used a five cutter, JV-20 Jumbo Viper dressed with 36-inch TCI cutters. Getting the large bite to shoulder up in such hard formation would take a few joints.

Basically the tool was bouncing on the harder rock, just inching its way down while being pulled towards the rig. After the tool shouldered up many of the gage inserts were damaged. To avoid reaming an under gage hole the 36-inch was opened with a new set of TCI cutters. Although removing about 40% more formation than the 24-inch, the Viper's 36-inch penetration rates remained about the same. The performance through hard rock was impressive.

The next pass used the original 36-inch in tandem, just ahead of the JV-32 Jumbo Viper dressed with 48-inch TCI cutters. The idea was to stiffen the reaming assembly and centralize the 48-inch helping it transition into the rock until fully shouldered up. This worked much better as the tool was allowed to cut its way down, eventually shouldering up across the full 360 degrees. At that point the 36-inch Viper was removed and the 48-inch pass proceeded.

Although the amount of formation being removed was again substantially greater, the penetration rates weren't much slower. This was attributed to the Jumbo Viper five cutter design, the increased bearing capacity and the skills of the driller. The tool was being rotated at the right RPM to ensure maximum penetration rates with the matching pull weight. A good mud program kept as clean a hole as possible and the combination allowed the Viper to perform as designed.

With the experience from the first drill, the second finished even quicker. Was it



possible to "one up" the first accomplishment by going to 54-inch in three passes? The 28-inch, 42-inch and 54-inch plan was ready before the second pilot hole was completed. The great thing about Viper RockReamers is the versatility – sizes can be changed simply by adjusting the body size and cutter size. This saves contractors money and avoids down time.

The Viper's first test couldn't have been better, an incredible success. The Viper cutters lasted longer than any cutter anyone had ever seen. Some runs were in the 150 hour range with the cutters appearing to have many hours left. The entire project was completed ahead of schedule and the contractor used less than a third of the hole openers expected.

Project #2 - Versatility:

The second project, consisting of 6 bores totaling almost 14,000 LF, demonstrated another aspect of the Viper's advantage to

HDD contractors. The plan was to drill 12 1/4-inch pilot holes and then open to 26-inch, 36-inch, 46-inch, 58-inch and possibly 64-inch. The contractor estimated that reaming would take about 6,000 hours and more than 61 hole openers would be needed to bore through what was expected to be an extremely hard formation. Even the smallest split-bits were in the \$50,000 range and the largest approached \$150,000 for each tool. Millions would be spent just on hole openers alone.

Rigs and equipment were mobilized and the pilot holes began, encountering only hard clay and shale, none of the very hard formation projected. Wow – this was an extreme change from the conditions expected! What now? Every hole opener on the job site was TCI but the proper cutter style for these conditions was MT. Before the first pilot hole was even finished the TCI cutters were replaced with MT, at no cost to the contractor or downtime waiting for the appropriate tooling.

The Viper's ability to adjust cutter styles to match the formation meant that the 26-inch, 36-inch 46-inch and 58-inch tools already on site could be converted quickly and easily. And this wasn't the final change. The actual drilling factors dictated multiple changes in the planned hole opening sizes: from pilot hole to 26-inch, 40-inch and then a reduced final hole size of 54-inch. To further complicate the situation, some segments did require a combination of interchangeable MT and aggressive TCI cutters.

All these adjustments were made at no cost to the contractor. A high percentage of the project costs were related to hole openers. With the Viper, the contractor saved by not having to buy 64-inch hole openers (up to 17 had been projected) and didn't have to



buy the 58-inch either. The cost of each size would have ranged around \$150,000 per tool.

The Viper allowed the contractor to use the same cutters on a variety of bodies creating different size openers with already purchased cutters. Numerous sets of cutters were used in the 100 hour range and not a single set of arms were damaged. In addition to its outstanding down-hole performance, the Viper enabled the contractor to adjust to changing conditions without delays or down time.

Project #3 – Value:

A 60-inch sewer line required a 72-inch final hole opening pass in limestone, two drills totaling about 4,000 LF. Milled tooth HDD hole openers of 30-inch, 42-inch, 54-inch, 66-inch and 72-inch were necessary. Based on the projected hours, at least two tools of each of the five sizes would be required, built in advance to prevent expensive down time.

Instead of having to buy ten expensive split bit hole openers, the Viper gave the ability to use the same cutters on multiple size passes. The cutters from the 42-inch were reused on the 66-inch. The cutters from the 54-inch were used again on the 72-inch. After this, the same cutters were taken off the larger tools and placed back on the 42-inch and 54-inch for the second drill. One cutter set had over 160 hours and another set finished with just under 200 hours. Both were still in relatively good condition and could have gone further and longer.

Three unique projects, three tough tests demonstrating the new Viper RockReamer durability and flexibility - all resulting in tremendous savings for the HDD contractors, and dramatically raising the HDD hole opening standard. The Viper RockReamer is the latest and greatest in the evolution of HDD hole openers.

According to John English, President of Horizontal Technology Inc., "The best engineers & the best HDD rock drillers have

had a major impact on the design of this tool. The Viper RockReamer has improved the hole opening capabilities of the entire HDD industry." †

ABOUT THE AUTHOR:



John English, President of HTI has worked with, and on, roller cone reaming tools since 1977, starting with Grant Oil Tools. He first became involved in horizontal hole openings for river crossings in 1988 and found the drilling conditions were far different than vertical hole opening. The harsh conditions dictated design changes. With Kent Rives he built the first custom HDD hole opener using the "Q" cutters in 1990. This evolution continued with the variable sized Lo-Torque in 1994 and then the more versatile, stronger, RockReamer in 1998. These improvements continue today, as HTI celebrates 20 years serving the HDD industry.


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HUBBELL ROAD CULVERT RELINE

By: Hugh B. Mickel, P.E., Contech Engineered Solutions LLC

Located in western Monroe County, New York, Northampton Park boasts 973 acres of recreational activities for hiking, camping and more – including a downhill ski slope and rope tow, a model airplane field, hiking trails and Salmon Creek, a popular source for trout fishing. The creek runs west to east directly under Hubbell Road just south of Route 31.

The Monroe County, New York Department of Transportation had been keeping watch on the condition of a large culvert under Hubbell Road in the western part of their county. In 2014, they decided it was time to take action before the condition of the culvert got any worse, which would have caused major issues with the roadway above. The normal approach to this type of project would be to excavate the old structure and replace it with a new structure of some type. For this particular project, engineers at the county felt an in-place rehabilitation approach might be the best solution.

The 10.5-foot diameter culvert, which carries Salmon Creek under Hubbell Road

was sitting under 31 feet of cover, so it would not be an easy excavation. Lengthy disturbance of the creek was not desirable. Another critical issue was the location of the culvert. It sits between two sections of Northampton Park and is heavily wooded all around the culvert. A key project goal became the protection of mature trees that covered the roadway slopes on both sides and on top of the culvert. The southwest corner of the culvert was adjacent to the recreational ski slope too. The county made it a priority to minimize any disruption to the surrounding areas and recreational activities that both local residents and tourists enjoyed. To help with the development of a solution that appropriately accommodated all of these challenges, they engaged Costich Engineering D.P.C. a firm that has been tackling civil engineering, land surveying and landscape architecture challenges in the area for 38 years.

Upon initial examination of the culvert, Costich determined that it was an early version of field bolted structural plate cor-

rugated metal pipe. They sought out the insights of the product's inventor, Contech Engineered Solutions LLC, which remains the leading manufacturer of this type of culvert. Contech developed galvanized MULTI-PLATE® pipe in 1931 and still produces it today, along with aluminum structural plate, other bridge materials, and many additional types of drainage and sanitary pipe products. Contech representatives visited the site and confirmed it was first generation MULTI-PLATE® from the late 1930s. Given the age, the performance of the culvert had far exceeded normal expectations for galvanized steel culvert materials. The thorough inspection confirmed the original structure's size and the current geometric shape. This information indicated it would be a good candidate for segmental sliplining, provided the hydraulic modelling results would allow it.

A sliplining approach would allow the county to update the culvert without disturbing the surrounding forest and nearby park. After discussions with the permitting



“USE OF THE CONTECH DUROMAXX STEEL REINFORCED LINER SYSTEM ALLOWED THE REHABILITATION OF THE CULVERT AT A SUBSTANTIAL COST SAVINGS AND REDUCTION IN CONSTRUCTION DURATION OVER TRADITIONAL CULVERT REPLACEMENT METHODS”

agencies at the state level, a full hydraulic analysis was done. It revealed that a 108-inch diameter pipe would carry the 100 year storm event without substantially increasing the headwater depth. In an effort to minimize the removal of more than a few trees, the engineer recommended the use of SPR™ PE spiral wound steel reinforced polyethylene pipe from Contech. This type of pipe is essentially manufactured in place using a steel reinforced profile strip that is fed into a winding machine and cage that are set up at the opening of the culvert. Although it is not typically the least expensive approach to sliplining, it is one of the most non-invasive. Costich developed plans and specifications, and the project was advertised with public bids to be opened on April 22, 2015. A key provision of the specification was a section on value engineering in the event a contractor could creatively accomplish all of the required goals for the project, but in a different manner.

Ironwood Heavy Highway, LLC of Rochester, New York was the low bidder, and they immediately pursued approval of a value engineering proposal using the factory made version of steel reinforced polyethylene pipe. It is named DuroMaxx® Steel Reinforced Polyethylene (SRPE) and is also a product manufactured by Contech. DuroMaxx is an exceptional pipe made with an ideal combination of materials. 80 ksi steel reinforcing (SR) ribs provide the

strength while the pressure rated polyethylene (PE) resin provide the durability. The combination of these materials result in an extraordinarily strong and durable pipe. DuroMaxx is designed with a smooth, inner wall for outstanding hydraulic capacity providing properties for long-term service and performance in the most demanding environments. Once sliplined into the existing pipe, DuroMaxx would provide a complete structural solution along with a hydraulically smooth inner wall suitable for the expected water flow.

Ironwood determined there was adequate access at the upstream end of the culvert and sufficient room to conduct all construction operations without removal of any of the large trees that covered the roadway slopes. Only two smaller trees would need to be removed approximately 20 feet west of the toe of the western slope (at the upstream end). This approach netted the county nearly \$50,000 in savings, approximately 15% of the original contract value. It also allowed all construction activity to be performed at the level of the culvert itself, so no short term lane closures of Hubbell Road would be necessary.

A value engineering package was submitted and quickly approved by Costich Engineering and Monroe County officials. Shop drawings from Contech were then submit-

ted, along with a detailed structural design performed by CBC Engineers & Associates, Ltd. of Dayton, Ohio. The structural calculations followed the load resistance factor design (LRFD) method per section 12 of the American Association of State Highway and Transportation Officials (AASHTO) bridge design standards which contains a method specifically for steel reinforced polyethylene pipe. This ensured that the proposed DuroMaxx liner pipe solution would deliver the required structural performance with the highest of confidence, in a manner that was supported by the bridge engineers of AASHTO. Costich then evaluated the structural calculations and shop drawings for the pipe and confirmed that DuroMaxx was suitable and would meet accepted industry standards for this application, including support of HL-93 live loads and the full height of cover at this site.

William C. Keihl of Ironwood Heavy Highway affirmed, “Contech representatives provided support throughout the project, including cost alternatives beginning at bid time and during the value engineering proposal development. The engineering guidance and expertise greatly helped in the success of this project. Ultimately, the proposal’s acceptance by Monroe County and Costich Engineering representatives illustrated a sincere belief that the concept



of a contractor providing an alternative idea can lead to win-win solutions to the owner and the travelling public. Ironwood Heavy Highway, LLC thoroughly evaluated all steps in the process of this installation and executed the plans perfectly. A rare project where all participants formed a team that trusted one another's contributions."

Construction activity began with normal site mobilization activities and the cleaning of the culvert. Once clean, the contractor decided to place a concrete pavement in the invert in order to facilitate the sliplining process. With onsite support from Contech, Ironwood installed the DuroMaxx SRPE liner pipe through a segmental sliplining method by placing the 37.5 foot long segments one at a time. The segments were pushed into place from the western end of the culvert pipe along the continuous invert pad using a mini excavator and a pushing frame. Partial bulkheads were built at the trailing end of each segment in order to facilitate a higher initial grouting volume. The partial bulkheads were approximately 24 inches high and were located just downstream of each of the three joints. Internal expanding bands with flat gaskets were placed at each joint to seal them for grouting. They were removed afterward, and HDPE couplers were welded into place forming watertight joints. Longitudinal floor beams and screw jacks were placed strategically along the invert. The screw jack extended up and through twelve o'clock grout ports. This system provided some, but not all of the resistance to counter the fluid grout buoyant loads. The second part of the hold down resistance came from water that was placed in the invert and held in place with short dams built inside the pipes with sandbags and plastic sheeting.

Project Manager at Costich Engineering, D.P.C., Michael P. Montalto, commented, "The use of the Contech DuroMaxx Steel Reinforced liner system allowed the rehabilitation of the culvert at a substantial cost savings and reduction in construction duration over traditional culvert replacement methods while meeting all of the County's design standards for culvert and bridge rehabilitation. The Contech team



was an invaluable resource during the Value Engineering evaluation process."

The grout was placed in a three-stage process that balanced the buoyant loads equally. The third lift was substantially taller than the first two. When the grout topped the springline of the new pipe, the additional grout would not contribute to the uplift loads, rather it contributed only to the lateral pressures being exerted on the new liner pipe. Utilizing a non-structural, cellular grout, Ironwood was able to completely fill the void space in the shortest amount of time while minimizing the effort required to hold down the new liner pipe. Each stage was pumped through factory installed 2 inch diameter grout ports in the DuroMaxx. Shape monitoring during each stage was done to ensure that only a minimal amount of movement occurred in the new liner pipe while grout was being placed. Nozzle pressure was held to 5 psi or less. The entire portion of the annular space between the reline pipe and the existing structure was completely filled with grout for the full length of the structure before the internal bands were removed. Ironwood continually evaluated the uplift/buoyancy forces exerted by the grout on the reline pipe and took adequate measure to prevent flotation of the pipe by making adjustments to the interior water ballast, the grout pumping location and grout flow rate.

The total installation took only five days and once completed offered a new pipe that is expected to last in excess of 100 years. All involved parties including Ironwood Heavy Highway, Costich Engineering and the Monroe County DOT were extremely satisfied with the outcome of this effective, sliplining solution.

The solution to reline the failing culvert which carried Salmon Creek under Hubbell Road from Colby Street and Route 31 with 108-inch diameter DuroMaxx SRPE proved to be both a cost-effective and relatively easy process in comparison to what would have been an extensive undertaking if the culvert had been replaced with open excavation methods. The trenchless method also spared all disruption to the nearby park. 🏗️

ABOUT THE AUTHOR:



Hugh B. Mickel, P.E. is the Vice President of Reline Technologies for Contech Engineered Solutions and has been with the company for

30-years with 19-years of direct experience relining pipes, culverts and small bridges. Hugh holds a B.S. in Civil Engineering from Purdue University and has been a registered Professional Engineer since 1990.

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