Midwest Journal of Trenchless Technology

The Official Publication of the Midwest Society for Trenchless Technology

2013

MSTT

Midwest Society for Trenchless Technology

INSIDE

- Pilot Tube Microtunneling in Sergeant Bluff
- Going Under Botanical Gardens in Omaha
- Pipe Bursting to Replace Old Sewer Laterals

MSTT Kansas City Missouri Seminar

"Trenchless Technology, SSES and Buried Asset Management"

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Illinois

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ALSO...

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Your Organization, Your Publication

Jeff
Boschert, P.E.

Welcome to the inaugural annual publication of the Midwest Journal of Trenchless Technology. The Midwest Society for Trenchless Technology (MSTT), founded in 1996, is the oldest NASTT chapter in the United States.

The idea for this organization began at the innovative ISTT worldwide videoconference. An Indianapolis group was assembled and organized by Dr. Tom Iseley with a select group of just over 20 industry attendees. The germination of this chapter was just one result of this meeting. At the conclusion of the videoconference, Dr. Iseley proposed starting the MSTT chapter to the group, and asked Mr. Mark Bruce and Dr. Sanjiv Gokhale to take the lead.

Before the meeting was over, MSTT was formed encompassing the states of Michigan, Illinois, Kentucky, Ohio, and Indiana. Once the news was out, other NASTT members asked to join us, and Iowa, Minnesota, Missouri and Wisconsin were soon welcomed to our ranks.

MSTT was granted approval to operate as a chapter of NASTT. In the winter of 1996-1997, under the leadership of Bruce and Gokhale, the chapter conducted its first programs at university campuses in the cities of Indianapolis, Louisville, Saint Louis, Kansas City, Cincinnati, and Chicago. These early technical events were a great success with a total of 1,000 attendees.

Today, trenchless is not new, but it is no less exciting. Driven by innovation in the industry, the benefits and uses of trenchless methods expand constantly. Our continued commitment to education and research supports the use and development of trenchless installations. This publication and those that will follow enhance our ability to deliver on the chapter's purpose to "advance the science and practice of Trenchless Technology for the public benefit, to promote and conduct education, training, study and research in said science and practice for the public benefit."

The MSTT's purpose is to "advance the science and practice of Trenchless Technology for the public benefit, to promote and conduct education, training, study and research in said science and practice for the public benefit."

We're proud of all we do, the growth of the trenchless industry and our part in it. Your support is critical to all that we do; we encourage you to join the NASTT/MSTT and get involved. See information on membership, education & training, and the annual No-Dig Show on pages 9, 11 and 46.

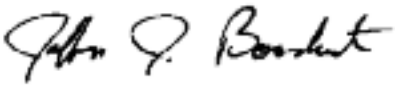
I want to give a special thank-you to our Executive Director Leonard Ingram for his efforts in coordinating, planning and managing all of our trenchless events, membership and volunteers.

We hope you enjoy the featured 'Midwest' articles in this inaugural issue, nearly all of which are based on 2013 No-Dig conference papers. For the complete papers, see www.nastt.org.

This is your organization and your publication, so please let us know what you think. To submit articles for next year's publication, or for questions and comments, contact Leonard, me or one of our board of directors.

Please contact me at jboschert@ncpi.org or (314) 229-3789, or check out our website at www.mstt.org if you are looking for information on trenchless technology or wish to participate in the NASTT Midwest Chapter.

Sincerely,



Jeffrey J. Boschert, P.E.
President, MSTT

Thank You for Your Support!

Leonard E. Ingram, Sr.

Since 2004, when I became the executive director of the Midwest Society for Trenchless Technology (MSTT), we have presented 23 two-day seminars in 13 cities throughout the nine-state Midwest region. Through this active education outreach, we have reached over 1,200 classroom attendees. If you know our exhibitors, food sponsors, presenters, guest presenters or ASCE co-sponsor members, please thank them for their support of our organization. We couldn't have such an active program without them.

Consider joining them as an exhibitor, sponsor and/or presenter at these upcoming 2013 regional events:

- KANSAS CITY, Misssouri, August 7-8 – presented by MSTT.
- MEMPHIS, Tennessee, September 11-13 – presented by SESTT.
- ST. PAUL (RED WING), Minnesota, October 16-17 – presented by MSTT.
- NEWARK, New Jersey, November 13-14 – presented by MASTT.
- LOUISVILLE, Kentucky, December 11-12 - presented by MSTT.

(Post-August dates are subject to change.)

The MSTT Kansas City "Trenchless Technology, SSES and Buried Asset Management" seminar will be held on August 7-8, 2013. ASCE Kansas City Section is the co-sponsor for the seminar. The guest presenter will be Mr. Andy Shively, P.E., Engineering Officer, Kansas City Missouri Water Services Department, with the presentation "Kansas City's Trenchless Program." The networking and learning will be terrific.

Please contact me for additional information about attending or becoming more active.

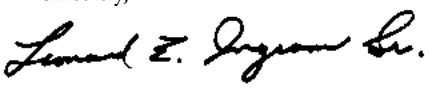
For the professionals responsible for design, installation and maintenance of infrastructure, certainty is critical and the greatest obstacle they face is fear of the new and unknown. As "trenchless technologists," it is our charge to educate these professionals with case studies, experiences and demonstrations to help them overcome these fears. That is why MSTT and NASTT conduct seminars and trade shows.

We plan to use the publication of the Midwest Journal of Trenchless Technology to further those efforts. The magazine will be an annual publication that highlights some of the many trenchless projects performed in and around the Midwest. One clear sign of our success is the continued growth in trenchless projects. Please help me thank the officers of MSTT and their companies for their support through the year and for making this journal a reality. The Board of Directors is listed in this journal.

The future of "water quality" is vital to maintaining our American standard of living. At each MSTT seminar, I ask how many of the attendees are attending a trenchless technology event for the first time. I usually get a show of hands that reflects over 50 percent. This means that the seminars are drawing interested participants on a first-time basis to learn. Therefore, the public will benefit from education about trenchless technology and how it can improve their current and future water quality. This makes me very proud to be a part of this process and a part of this organization.

Thank you for your support!

Sincerely,



Leonard E. Ingram, Sr.
Executive Director, MSTT

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A New Magazine! Congratulations, MSTT!

Michael Willmets
NASTT Executive Director

Communication can be the key to promoting education, and this is how we can share the many significant benefits of trenchless technology. Plus, what better way to showcase your trenchless champions than a new publication devoted to the volunteers of your North American Society for Trenchless Technology chapter?

This is the first time that MSTT, NASTT's Midwest Chapter, has published a magazine dedicated to delivering the latest trenchless news and articles to its membership. I'd like to recognize the many sponsors who have supported this initiative and the trenchless professionals who share their expertise in improving America's infrastructure. These are the people who make us all more responsible and aware of the social, environmental and fiscal benefits of the innovation solutions to municipal servicing.

As the trenchless industry continues to grow and take on new challenges, it is important for NASTT to serve and support our partners at the chapter level. Often referred to as the "NASTT family," we proudly represent municipalities and public utilities, consultants and engineers, manufacturers and suppliers, trenchless contractors and academia. Through the nine NASTT Regional Chapters and 13 Student Chapters, we reach out to all these various groups sharing our technical programs, continuing education opportunities, the No-Dig Show, forums and the latest NASTT technical publications.

With more and more municipalities and public utilities embracing trenchless technologies, I am extremely optimistic about the future of this industry and our not-for-profit society. The grassroots strength of our Chapters echoes that optimism.

Congratulations on the first edition of this publication and many more to come.


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7445 Morgan Rd. • Liverpool, NY 13090
Phone: 315-409-7552

Upcoming NASTT Events

August 7-8

MSTT Seminar – Trenchless Technology, SSES and Buried Asset Management
Embassy Suites Kansas City – Plaza
220 West 43rd Street, Kansas City, Missouri
Info: Leonard Ingram, 888-317-3788, mstt@bellsouth.net

August 28

NASTT's Trenchless Technology Short Course - New Installation
McCormick Place
Chicago, Illinois
Info: Michelle Hill, mhill@nastt.org

September 11-13

SESTT Seminar
Memphis, Tennessee
Info: Leonard Ingram, 888-317-3788, mstt@bellsouth.net

October 2

NASTT's CIPP Short Course
Kentucky Exposition Center
Louisville, Kentucky
Info: Michelle Hill, mhill@nastt.org

October 16-17

MSTT Seminar
St. Paul, Minnesota
Info: Leonard Ingram, 888-317-3788, mstt@bellsouth.net

October 28-29

Western Regional No-Dig Conference & Exhibition
Ala Moana Hotel
Honolulu, Hawaii
Info: Craig Camp, craig.camp@hatchmott.com

November 6

Rocky Mountain Regional No-Dig Conference & Exhibition
DoubleTree Hotel
Westminster, Colorado
Info: Bo Botteicher, bbotteicher@undergroundsolutions.com

November 7

NASTT's Pipe Bursting Good Practices Course
Westminster, Colorado
Info: Bo Botteicher, bbotteicher@undergroundsolutions.com

November 13

NASTT's HDD Good Practices Course
Calgary, Alberta
Info: www.nastt-nw.com

November 13-14

MASTT Seminar
Newark, New Jersey
Info: Leonard Ingram, 888-317-3788, mstt@bellsouth.net

November 14

Northwest Trenchless Conference
Coast Plaza Hotel
Calgary, Alberta
Info: www.nastt-nw.com

December 11-12

MSTT Seminar
Louisville, Kentucky
Info: Leonard Ingram, 888-317-3788, mstt@bellsouth.net

April 13-17, 2014

NASTT's 2014 No-Dig Show
Gaylord Palms, Orlando, Florida
Info: www.nodigshow.com

Choosing Pilot Tube Microtunneling Over Open-Trench Construction

Jeff Boschert, P.E.
National Clay Pipe Institute

Aaron Lincoln, P.E.
Veenstra and Kimm, Inc.

Mark Huntley
City of Sergeant Bluff

Patrick Minger
Minger Construction, Inc.

Sergeant Bluff, located along the Missouri River in western Iowa, is a community of 4,227. In 2009 the City moved forward with the First Street Lift Station Elimination and Sewer Project, which was planned to eliminate an aging and costly lift station by installing 4,000 linear feet of gravity trunk line sanitary sewer. The City critically evaluated installation methods, and estimated costs for open-trench and trenchless options.

Estimates for both options were presented to the City in February of 2009. The open-cut method's estimated cost was $1.125 million. The trenchless option was estimated at $225,000 (20%) more.

The City also considered each design option's impacts – including disturbance to traffic, condition of existing pavements, and conflicts with existing utilities. The project area included Sergeant Bluff's main east-west traffic corridor (with an average traffic count of 7,100 vehicles per day) and the primary corridor for student pickup and drop-off at a pre-kindergarten through fifth-grade school.

In the end, the City cited the following reasons as the drivers for the decision to select the more expensive, trenchless guided boring method of Pilot Tube Microtunneling (PTMT): potential cost overruns of open-trench construction; open-trench would require replacement of the entire street; the project corridor was critical for school traffic; existing utilities would be better protected using trenchless technology; and dewatering requirements at each shaft versus along the entire trench would better limit risk.

For the City of Sergeant Bluff, the value of maintaining traffic flow for the nearby school while limiting both the risks associated with dewatering and the potential for cost overruns made PTMT worth the investment.

"We're seeing more municipalities make the choice to install a premium pipe for

12-by-18-foot rectangular jacking shaft installing 15-inch pipe

the benefit of a longer service life," said Jeff Boschert, president of the National Clay Pipe Institute. "The low-impact, high-accuracy installation made possible by the pilot tube method gives system designers and engineers greater control and more options. The longer life of vitrified clay serves the long-term interests of the community."

The project, awarded to Minger Construction of Chanhassen, Minnesota, consisted of 15- and 21-inch gravity sanitary sewer lines installed at depths up to 23 feet. The soil conditions encountered included silty clays, lean clays and poorly graded sands with blow counts ranging from 2 to 21. The contractor tunneled from 16-foot-diameter working shafts, with a three-step pilot tube installation process utilizing both powered reaming heads and powered cutter heads in the final step.

Project Challenges

A number of obstacles were encountered along the way that reinforced the wisdom of the selection of PTMT for this project. The first significant challenge presented in the design phase: Slopes for the sewer exceeded the trenchless standard of the Iowa Department of Natural Resources (IDNR).

"The total allowable vertical tolerance for this project was 1.75 feet," said Aaron Lincoln, project manager for Veenstra & Kimm, Inc. "The standard accepted bore and case vertical tolerances allowed for over five feet of variance. Without IDNR accepting the tolerances of pilot tube microtunneling, the only means for construction would have been open-cut."

Veenstra & Kimm, Minger Construction and Akkerman, Inc. documented the accuracy of the guided bore machine for the IDNR using vertical tolerances of just 1/4-inch per 300 feet of tunneling, or a total of one foot for the entire project. This pin-point line and grade accuracy, consistently achieved using this installation method, was the key driver in the IDNR's decision to grant a construction variance.

Record-breaking floods along the Missouri River in 2011 provided the second major challenge by raising the water table significantly above normal levels. The pilot tube method allowed for isolated dewatering at jacking and receiving pits, eliminating the need for dewatering along the entire length of an open trench. Groundwater monitoring wells were installed throughout the project to help document the elevations during the project.

A third project hurdle, resulting from the increased water table, was the failure of an existing gravity sewer located near but upstream of the project. After multiple emergency pipe collapses, the success of the ongoing project made extending the scope of the PTMT work the logical solution. As a result, Minger

Jacking shaft installing 21-inch pipe in the final phase of the installation

Construction replaced the nearby failed trunk line with a 1,330-feet parallel line, without extending the original project completion date.

The Method Used

The tunnel pipe installation began with the excavation and construction of jacking and receiving shafts. All tunnel shafts were excavated with a Komatsu 200- or 400-track hoe with conventional bucket attachment. These shafts were lined with either a 16-foot-diameter steel caisson or a 12-by-18-foot conventional trench box. The contractor fabricated the caissons, with bolted connections and doors for pipe entrances and exits, in their shop. The bottom of each shaft was lined with a base stabilization Geogrid fabric beneath a minimum of 18 inches of crushed stone to stabilize the jacking frame and prevent uplift. This stabilized base was left in place beneath the permanent manhole structure to serve as a foundation upon completion of the tunnel drives.

An Akkerman 4812 guided boring machine was utilized to perform all steps of the pilot tube microtunnel process. This unit had a jacking capacity of 200 tons, 100 tons of pullback capacity, and 20,000 foot-pounds of rotational torque.

Installation of the 100-millimetre (four-inch) pilot tubes on line and grade was the first step. With 400-foot drive lengths, accuracy of 6 mm (1/4 inch) or better was achieved for all of the drives.

Next, a 16-inch-OD reaming head followed the path of the pilot tube. The front of the reaming head fastened to the last pilot tube in the same manner the pilot tubes fasten to each other. Following the reaming head were 16-inch-OD thrust (auger) casings which transported the spoil (displaced ground around the pilot tubes) to the jacking shaft for removal. During installation of the 16-inch casings, the pilot tubes were advanced into the reception shaft and were disassembled as the casings were installed. This step was complete when the reamer and auger casings reached the reception shaft and all spoil was removed from the bore.

The final (third) phase of the installation varied by the size of the final product pipe. For the 21-inch-diameter line, a powered cutter head (PCH) was installed behind the auger casings and advanced by product pipe. The PCH increased the bore to match the 24.5-inch OD of the vitrified clay jacking pipe. The soil remaining around the previously installed 16-inch-OD auger casings was taken into the PCH and discharged via the reception shaft by reversing the auger flight direction. As each section of auger casing was removed from the reception shaft, a section of product pipe was installed in the launch shaft until the process was completed.

For the 15-inch-diameter line, a powered reaming head (PRH) was installed behind the auger casings and advanced by product pipe. The PRH works in the same

Installing 21-inch pipe in the final phase of the installation

manner as the PCH but without a rotatable cutter face. This PRH increased the bore to match the OD of the 15-inch pipe at 20 inches. The remaining soil around the previously installed 16-inch-OD auger casings was taken into the PRH and discharged via the reception shaft by reversing the auger flight direction. The final 15-inch product pipe was then installed directly behind the PRH, providing the axial force required for advancement.

Unique to this project was a newly designed and built PRH assembly. Patrick Minger, president of Minger Construction, modified the PRH unit by relocating the hydraulic motor outside of the unit itself. The Minger Construction fabrication shop designed and built a frame which housed the hydraulic motor used to drive the auger flights. This "powered frame" was installed in the receiving shaft and connected to the auger flights, eliminating the need for staging the product pipe with hydraulic hoses to power the motor. This new design significantly decreased the staging time required and increased productivity in the final installation phase.

"The efficiencies we were able to achieve in the final phase make this method an even more competitively priced, attractive option," according to Minger. "We will be using this method again on future installations."

Not all communities have the option to specify premium products or premium installation methods, but for the City of Sergeant Bluff it was the right choice. The decision was thoroughly evaluated, and the community authorized the trenchless approach to maintain major traffic patterns, protect existing utilities, eliminate unnecessary pavement replacement, limit the likelihood of cost overruns and greatly reduce dewatering requirements.

This article is condensed from a paper presented at NASTT's 2013 NO-DIG Show.

To see the complete paper, visit the NCPI website at ncpi.org and follow the link in the left column under "NO-DIG Paper."

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Omaha, Nebraska

Accomplishing Sewer Separation through a Landfill and Botanical Garden with Trenchless Technology

Chris J. Koenig
Senior Project Manager
HDR Engineering Inc.

Trenchless technology continues to develop as an indispensible tool for engineers faced with design challenges that cannot be addressed by traditional open-cut sewer construction methods. In this project, trenchless methods were used to minimize disruption of garden exhibits and address challenging site conditions. But like all tools, trenchless methods have their limitations and their use must be carefully evaluated during development of a project.

One component of the City of Omaha's Combined Sewer Overflow (CSO) program is the separation of the sanitary and storm sewers in the Martha Street basin. The majority of the Martha Street basin consists of a residential area located on the bluffs that overlook the Missouri River. Previous projects had constructed separated sanitary and storm sewer systems within the residential areas using traditional open-cut methods. However, the separated sewers were recombined at the top of the valley that carried the combined sewer flow to the trunk sewer located at the base of the bluff. The valley drains from west to east with two branch valleys that extend to the south.

The valley was previously used as municipal landfill. The existing combined and storm sewers were located in the bottom of the valley and the landfill constructed above the sewers. Some landfill-related infrastructure components, including leachate collection piping and subdrain piping, were also located under the landfill.

The City ceased operation of the landfill in 1982. The City leased the site for development of botanical gardens in 1995. A majority of the site has been developed for the Gardens. The Gardens is privately funded with several industry leaders on the Board of Directors. It is open year-round with over 150,000 visitors each year.

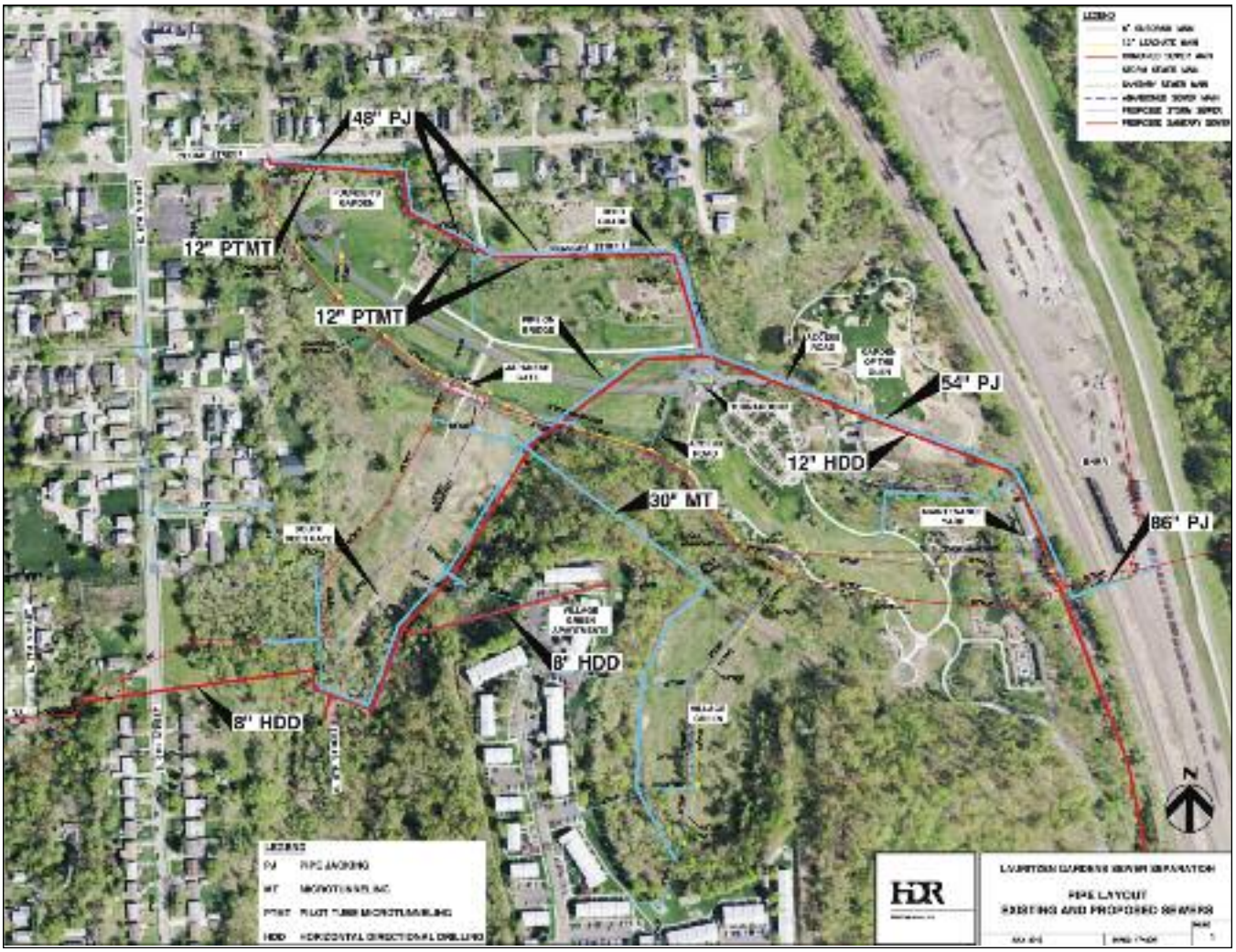
Field investigations of the existing sewers and landfill piping found all of the piping systems had extensive failures and were operating at a marginal level. The recommended solutions were to construct new sanitary and storm sewers through the site around the perimeter of the land and abandon all existing sewers and piping. The site will be filled with embankment and graded to divert all surface runoff to inlets located at the edge of the landfill.

The existing sanitary and storm sewers are located under the landfill with depths ranging from 50 to 60 feet. Constructing new sewers on the same alignment would have necessitated the removal of most of the landfill waste and extensive demolition of a majority of the Garden's exhibits. As well, it would have left a site that is unusable for a botanical garden. Lining or pipe bursting the existing sewers was considered for the conversion of the combined sewer into a storm-only sewer. However, the condition of the existing sewer precluded this option.

A portion of the project involves the construction of a new 18-inch sanitary sewer that extends from the east end of the Gardens south to an existing sanitary sewer lift station. The route for the sanitary sewer crosses under a hill, parking lot, and Interstate 80. The only feasible option available was to construct the pipe by horizontal directional drilling (HDD).

Pilot tube microtunneling was considered due to the flat relatively flat grade (0.9%). However, the length of the bore is approximately 1,525 feet. Microtunneling would have necessitated intermediate bore shafts in the Gardens parking lot with depths exceeding 50 feet – not a favorable alternative due to impacts to the area.

The alignment for one sanitary sewer



HDD was the only feasible option for a sewer route crossing under a hill, parking lot and Interstate 80

from a residential area crosses under an embankment fill for 6th Street that was constructed on 40 feet of rubble. The only feasible option available was to install the sanitary sewer by horizontal directional drilling under the rubble fill.

The method of pipe installation was changed for one segment of sanitary sewer pipe from pilot tube microtunneling to HDD. Trenchless construction had been selected for this segment due to the tight working conditions and number of Gardens exhibits.

The overall pipe segment is 815 feet long with a slope of 5.88 percent. The initial selected method was pilot tube microtunneling with an intermediate receiving pit.

Geotechnical investigation identified a layer of Kansan till with a potential for large stones. Pilot tube microtunneling allows only for minor adjustments in grade. Encountering a large stone during a pilot tube microtunneling operation necessitates the restart of the operation on a new alignment or an excavation from the surface to remove the obstruction. The decision was made to alter the alignment to remove the intermediate manhole and install the new sanitary sewer via HDD. HDD allows for more grade adjustments if an obstruction is encountered by backing the drill bit up and adjusting the slope. The design pipe grade for the segment is well above the minimum required for the HDD method.

The project had several other challenges that were addressed during design:

- Steep grades. An apartment complex is located on the south side of the Gardens and the existing sanitary sewer was routed through the landfill. HDD was selected due to steep grade and previous sloughing on the hillside.
- Entrance and exit angles for HDD installations. HDD requires sufficient space for the drill head to enter the ground at the specified grade which is predicated by the bending ability of the pipe.
- HDD pipe layout. Long pullback lengths and limited layout space within the Gardens required additional review to determine if pullback could be accomplished with breaks to fuse multi-

ple sections.

- Gas from the landfill. Decaying trash generates gas which migrates through the soil. Explosive levels of gas were noted in some of the manholes during a previous study by the Gardens. The entire site is classified as no smoking during construction.
- Unknown conditions. The entire Gardens area was used as an unlicensed dumping area prior to the start of the landfill construction. Previous investigations found debris that was likely dumped in a ravine and then covered up.
- Landfill crossing. The site constraints necessitated a sanitary and storm sewer crossing of the landfill. The original concept was to construct a pipe jacked tunnel under the landfill. However, the manhole depths would have exceeded 80 feet. The construction of a buried pipe bridge was selected as an alternate design to raise the construction above the landfill level in the landfill cap. Positive displacement auger cast piles were selected to support the concrete pipe bridge sections due to the requirement of maintaining the integrity of the landfill liner.
- Gardens coordination. The Gardens is a source of pride for the community with prominent citizens on the Board of Directors. Extensive coordination was required during the preliminary and final design. A large portion of the Gardens will be closed to the public for a period of six months during the initial sewer installations.

The final solution involved 630 linear feet of microtunneling, 2,262 LF of pipe jacking, 3,745 LF of horizontally directionally drilled sanitary sewer, and 1,144 LF of pilot tube microtunneled sanitary sewer.

Trenchless construction methods can be used to address challenging site conditions. However, like any construction method, the designer has to know which method is applicable for which situation.

The design team was faced with the task of assessing the condition of the existing sewers located under an existing landfill and then designing storm and sanitary sewers around and through the landfill, all the while working to preserve a very popular and elaborate botanical garden. Trenchless construction methods were the only feasible option in several of the locations. The construction will impact the Gardens and will necessitate the closure of portions of the Garden for almost a year. However, all of the exhibits were avoided with the use of trenchless construction. A few planting beds will be removed by the construction and then rebuilt by the Gardens. The Gardens is already developing ideas of what to do with the improved site when the project is complete.

The Challenges of Replacing a Failing Sanitary Forcemain Through a Former Landfill

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Chris Dufort
City of Elmhurst

The City of Elmhurst had experienced numerous breaks on a 60-year-old, eight-inch-diameter, 6,500-foot sanitary forcemain adjacent to Salt Creek, a major tributary of the Des Plaines River. All the breaks were concentrated in an area of Eldridge Park, a former landfill in the southern part of the City. Owing to the number of breaks, the Illinois Environmental Protection Agency (IEPA) issued a violation notice to the City requiring that they construct a replacement within two years. Additionally, Bureau of Land rules require that any material removed from the site is disposed of in another landfill.

Garbage wrapped around reamer after a first pre-ream

"Frac-out" contained with straw bales

Given that much of the route was through a heavily wooded area behind a berm, it was decided only to replace 1,350 feet within the park where all the breaks had occurred. Much of the area adjacent to the existing forcemain was within the floodplain. In addition, any excavated soil that could not be replaced would have to go to a landfill that could receive household waste, and the closest was almost 50 miles away. So although much of the forcemain would be shallow, with less than six feet of cover, it was decided that trenchless options would be preferable.

Pipe bursting or lining was ruled out after it became apparent that bypass pumping would be extremely difficult, with a four-lane state road between the park and the pump station. It was therefore determined to attempt to directionally drill a new alignment.

Soil borings from the geotechnical investigation indicated a mixture of topsoil and silty clay with landfill debris (wood, trace glass, etc.). None of the boreholes showed a clear demarcation between the landfill material, the clay cap, and final topsoil. They all indicated the soils as having very low bearing strengths.

Once the alignment had been determined, precautions had to be taken to protect the environment and the park during the drilling activities:

- Construction vehicle access – To limit damage to the footpath, specs were written stating that only rubber-tired or track vehicles would be permitted;
- No access to water near the southern drill pit;
- Protection of spoil piles with double rows of silt fence;
- Park user signage was placed at the entrances to the park if portions of the footpath were closed;
- Park user safety – Construction did not begin until after schools had resumed;
- Frac-out plan – Due to potential for environmental damage from frac-outs, a pre-approved plan was required from the Contractor;
- Restoration – Much of the park is made up of native plantings;
- Topsoil depth – To minimize material removal from the site, nine inches of topsoil was placed over excavated areas and two inches along footpath margins where grass has been "churned" by the vehicles.

Construction

Work began on the project site near the end of September 2012. The forcemain pipe material specified was a 10-inch High Density Polyethylene (HDPE) (DR11). The contractor suggested using an eight-inch Fusible Polyvinyl Chloride (PVC) (DR18 or

Typical cross section ground conditions

DR25).

The equivalent-size PVC pipe was lighter by more than half, which allowed the contractor to handle the material with equipment that had much less impact to the project site. For example, an eight-inch PVC pipe could be lifted by hand and placed into the fusion machine whereas a 10-inch equivalent-size HDPE pipe would likely require some type of machine (crane or forklift) to perform the same task. This allowed for a less congested site and addressed the Owner's concern for maintaining the usability of the park throughout construction.

Slightly smaller drilling equipment was utilized since the borehole would not need to be as large and the force required to pull the product pipe back would be reduced. Additionally, since the borehole size was reduced, the amount of drilling fluid necessary to complete the bore was also reduced, which would help address the environmental concern of having a frac-out.

Special consideration was given to the fact that this bore could take place in a layer of buried landfill trash and not soil. It was anticipated that the majority of soil conditions would be "jettable" which is to say that the drill bit would be able to achieve penetration by jetting the formation in front of it with drilling fluid and sliding the rod through the hole with an angled clay bit.

Approximately 300 feet from the entry of the first bore, an

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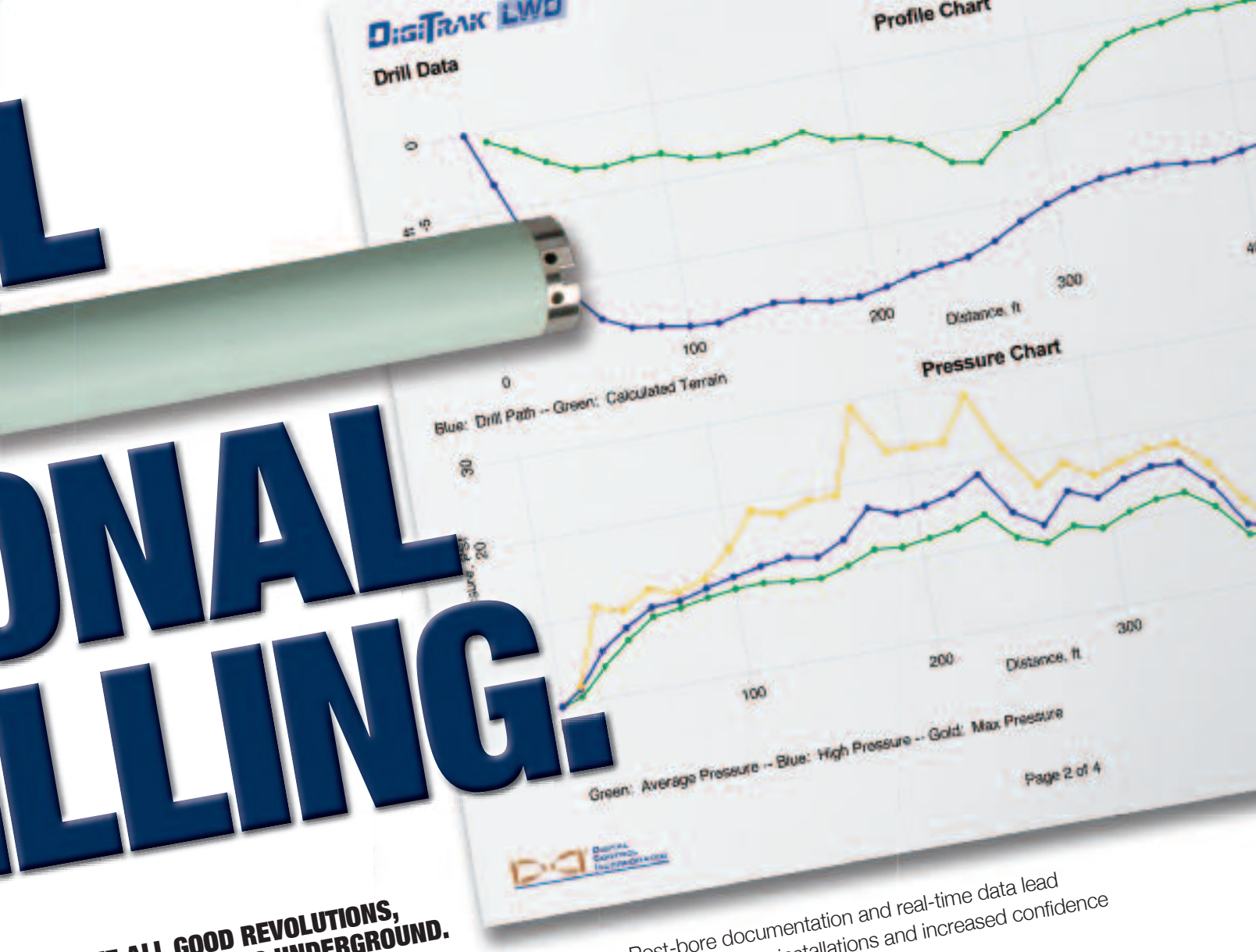

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obstruction was encountered that barred directional control. At one point, the locating system was no longer able to pick up the signal from the drill head, so the contractor had to cease drilling. The drill head was dug up and it was determined that the obstruction was a large chuck of reinforced concrete.

A considerable amount of vibration and heat was generated within the drill head and damaged the locating probe (damage was sustained to the probe's internal antenna, which precluded transmission of the locating signal). The probe was repaired, a new rock bit was installed on the drill head, and the concrete chuck was removed from the bore path.

Upon reaching the center pit it was discovered that the Concrete Storm Sewer pipe that would be crossed had only five feet of cover. The project team determined that the existing storm line could be replaced with a 12-inch PVC line, thus reducing the thickness of the pipe and allowing the forcemain to be installed on top of it. Additionally, the finished surface could be re-graded to add cover over the top of the forcemain and conform to the cover requirement of six feet.

At the location of the second bore, due to the topography of the ground and the need to drill under the existing utilities that crossed the bore path, the drill penetrated the surface at a severe angle, placing the bore in the "landfill proper" where there was no significant bearing strength to the soil formation being drilled. At a depth of approximately 38 feet, it was determined that the as-drilled bore path deviated too far from the planned alignment. The next course of action was to re-grade the surface where the drill was set up and enable a punch in angle at a more common 20 percent, which allowed the bore path to remain at the planned depth of about six feet.

"It is important to allow for emergency excavations — and not just one (10 were allowed for in this bid), especially when ground conditions are unknown."

Pulling head and reamer at beginning of pull

The pipe was pulled in from the central pit and appeared at the drill rig with no visible signs of any damage. There were no surface heaves, but there was one location where drilling fluid "fraced-out" to the surface. The frac-out was immediately contained with bales of hay and silt fence to prevent spreading of the material. The ability to use erosion and sedimentation control devices to contain any frac-outs allowed the contractor to continue with his work while abiding by the owner's "no heavy equipment" restriction.

Lessons Learned

- Consideration of the material specification and how it can impact construction operations – in this case a smaller, lighter pipe still met the project requirements and allowed the contractor to reduce his footprint and impact to the area.
- If you can keep the bore path above or even in the clay cap, you have a good chance of getting the pipe successfully installed. If you pierce the clay cap and are drilling through a formation of landfill debris there is no significant bearing strength to the soil formation and the driller's ability to maintain directional control of the drill bit is drastically reduced.
- It is important to allow for emergency excavations – and not just one (10 were allowed for in this bid), especially when ground conditions are unknown.

Conclusions

Though doubtful at times during the project, the HDD process worked, enabling the installation of a new force-main through the landfill while eliminating the very expensive requirement to transport and properly dispose of landfill waste that would have been generated through conventional open-trench methods.

As is the case with any type of trenchless construction method, the importance of a thorough subsurface condition examination cannot be overstated. Soil borings were taken, as-built information was gathered, and a good profile was developed so that the project team could proceed with a high level of confidence that they would be drilling in a competent soil and be able to manage the various risks on this project.

Although this is a City-owned force-main, it goes through Park District property, and the involvement of Park District officials during all parts of the planning, design, and construction process made for a very cooperative working environment.

Indianapolis, Indiana
Lessons Learned from Microtunneling Through Glacial Deposits for the Castleton Relief Sewer

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Citizens Energy Group is currently involved in numerous construction projects utilizing deep Combined Sewer Overflow (CSO) tunnels, trenchless pipelines and direct-bury pipelines to aid in completion of their Long Term Control Plan (LTCP). The goal of the LTCP is to reduce CSO discharges into the local waterways and to aid in meeting their CSO Consent Decree.

The Castleton Relief Sewer consists of approximately 13,800 feet of relief sewer that is 36 to 42 inches in diameter. The project was divided into two phases based on horizontal and vertical alignment constraints, and the presence of critical structures adjacent to the proposed sewer, Phase I being microtunnel and Phase II open-cut. Although the microtunnel and open-cut portions of the project were designed concurrently, they were bid as two separate contracts in an effort to minimize construction duration.

Phase I (microtunnel) involved nearly 2,800 linear feet divided into four drives (813, 790, 680 and 484 feet). Some other details:

- Pipe Diameter – 42 inches internal diameter (ID), 52.5 inches outer diameter direct-jacked reinforced concrete pipe (RCP);
- Ground Cover – Depths ranging from approximately 10 to 30 feet from the ground surface to the tunnel crown, and approximately five to 25 feet below the water table;
- Groundwater – Groundwater level ranges from approximately two to 10 feet below ground surface.

Issues include the presence of several critical structures along the alignment, including an existing multi-barreled culvert, a drainage ditch, City park improvements and the Keystone Avenue bridge.

Citizens' engineers included United Consulting and Black & Veatch Corporation (B&V). Construction Management services were provided by Commonwealth Engineers, and the microtunnel contractor for Phase I was Bradshaw Construction.

GROUND CONDITIONS

The project alignment passed through a major glacial outwash and till depositional environment with intermixed sands, silts, clays, cobbles and boulders.

A detailed geotechnical investigation and hydrogeological model to determine the effects of dewatering on nearby water wells was completed during the design phase of the project. This factual information was presented in the project's geotechnical data report (GDR). The data was evaluated and reorganized into concise and contractually relevant baselines within the geotechnical baseline report (GBR), and specific to the means and methods anticipated on the project. Baseline values and statements were provided for pertinent geotechnical parameters, groundwater elevations, hydraulic conductivities, the presence of contaminated soil and groundwater, the presence of obstructions, and to distinguish behavioral "Soil Engineering Units" relevant to pit and microtunnel construction.

The "Tunnelman's Ground Classification System" (Terzaghi 1950, & Heuer 1974), which describes how soils, if exposed, will behave in a tunnel, was used in conjunction with the engineering properties of the soils to determine "Soil Engineering Units" (see graph).

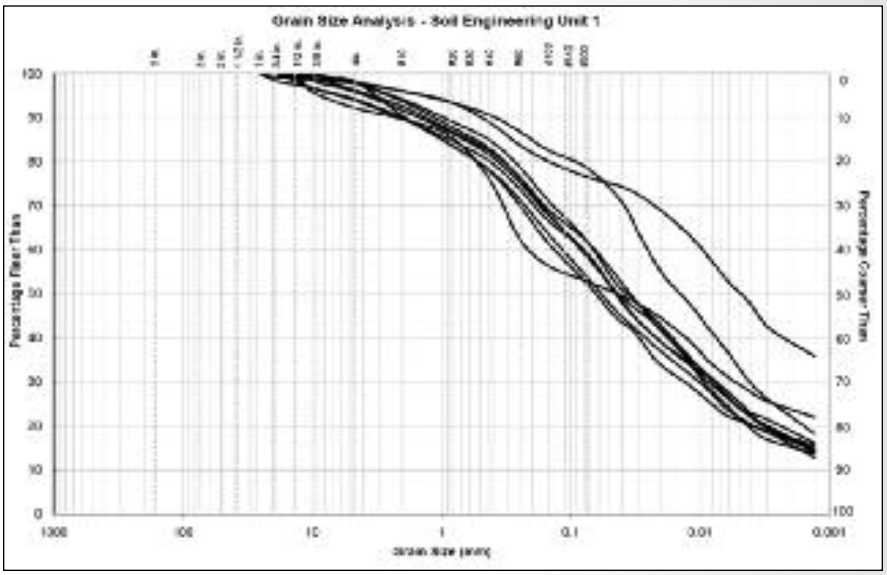
DESIGN REQUIREMENTS

The design allowed for the contractor to select their preferred construction means and methods. However, it was deemed necessary in some instances to dictate means and methods which, if unsuccessful, posed great financial or safety risk to Citizens Energy Group. Pressurized slurry microtunneling was a requirement based on the prevailing ground conditions and presence of structures along or adjacent to the tunnel alignment, including the Keystone Avenue Bridge.

Design of temporary support for the five pits (two jacking pits and three receiving pits) was the responsibility of the contractor congruent with performance-based requirements contained within the contract.

Additional requirements for microtunneling and pit construction were incorporated into the specifications and drawings and included the following:

- Geotechnical instrumentation, with threshold and maximum allowable values, included surface monitoring points, subsurface shallow monitoring points and groundwater observation wells;
- Specific microtunnel boring machine (MTBM) requirements which were verified by submittals during construction;
- Temporary support requirements which accompanied construc-



Combined Grain Size Analysis of Soil Engineering Unit 1

tion considerations provided in the GBR;

- Annular space and pit grouting requirements.

Due to the high cost and potential schedule delays associated with encountering a boulder, it was deemed imperative to evaluate and properly describe the definition of an obstruction (whether a naturally occurring boulder or man-made fill) in the contract. In the end, a baseline number of anticipated obstructions was provided in the GBR which was written in conjunction with the specifications. (McKelvey, et al. 2008)

Five pits were constructed for the project; two jacking and three receiving. Construction requirements for each shaft varied due to geology, size, depth and dewatering restrictions. Three of the pits required steel sheeting with whalers to enable excavation and slab construction in the wet, while the remaining pits used conventional liner plate and excavation in the dry.

MICROTUNNELING

Based on previous experience in Indianapolis and information provided in the contract documents, Bradshaw made the decision to equip the Herrenknecht AVN100XC MTBM with a mixed-face cutterhead. This choice allowed the MTBM the possibility of mining through the glacial deposits, which included cobbles and boulders, rather than becoming obstructed and requiring a rescue shaft. (Figure 3)

During the excavation of the first two pits, more boulders were encountered than could be reasonably expected from the information contained in the GBR. In order to limit above-ground settlement, the design team, Citizens and contractor decided to employ the use of bentonite slurry for microtunneling instead of water alone. This helped to minimize the potential of settlement while the MTBM consumed boulders. While this decision ultimately decreased production rates, it also decreased the potential for surface settlement.

The contractor encountered zones laden with cobbles and boulders which affected progress rates, but did not completely stop forward progress. By definition, this condition was not considered an obstruction. However, it represented a differing site condition (DSC) as it was materially different than what was described in the GBR, and caused a measurable decrease in production rates. As the project progressed, Bradshaw became quite adept at operating the MTBM to mine through the difficult conditions while maintaining good alignment control.

Design of microtunnels through glacial deposits requires a thorough understanding of the behaviors the ground will exhibit during mining. The mixture of sand, cobbles and boulders encountered during microtunneling for the Castleton Relief Sewer created an extremely abrasive environment which caused significant wear of the MTBM cutter-face, cutter-arms and cone-crusher. This resulted in the need for repairing the portions of MTBM face exposed to the ground prior to re-launch.

Herrenknecht AVN100XC with Mixed Face Cutterhead

Following the first drive, higher grade steel was installed in the cone-crusher and on all high wear surfaces; subsequent drives required less rebuild work as a result. For future microtunnel projects in granular glacial deposits, the following is recommended:

- Provide clear baselines in the GBR which describe the types and percentage of granular material anticipated to be encountered and their abrasive nature through laboratory testing. (NAT, 2012)
- Consider performing laboratory tests which can estimate soil abrasivity, such as those described by Gharahbagh and Rostami. (NAT, 2012)
- Specify the use of slurry additives (bentonite or polymer) for use during mining in granular soils.
- Slower production rates should be considered a good trade-off for maintaining alignment control and surface settlement.

It is the opinion of the authors that subsurface risk should be shared equitably between the parties by providing clear and concise language within the contract, including the definition of what constitutes a boulder/obstruction (impedance of progress, size, strength, etc.), baseline statements which clearly define assumptions on what will be encountered, provisions for payment if a boulder/obstruction is encountered, and means and methods acceptable if a rescue shaft is required. For microtunnels in glacial deposit, the contract should clearly state the differences between obstructions which stop forward progress and cobbles/boulders which impede progress.

Due to the high demands placed on the RCP while mining through glacial deposits, the pipes should be specified with ASCE 27 Type C joints, which allow for alignment flexibility, including cast-in-place stainless steel collars and an O-ring type rubber gasket. It was deemed important to ensure a pipe with full butt-ends was specified to ensure even distribution of jacking loads and avoid point loading the pipe.

Finally, based on Bradshaw's previous Indianapolis microtunneling project, which involved much wider RCP, it was determined size does matter. The two projects had similar boulder-laden soils, but the much heavier MTBM used to microtunnel the 72-inch RCP in the previous project was not deflected from line and grade during excavation of the boulders as in the Castleton Relief Sewer with its smaller and lighter MTBM.

REFERENCES

- *Gharahbagh, E.A., Rostami, J., (2012), Study of Soil Abrasion Testing and Soil Abrasivity Index for Application in Mechanized Soft Ground Tunneling, NAT Conference Proceedings 2012.*
- *Heuer, R.E., (1974), Important Ground Parameters in Soft Ground Tunneling, Proceedings of Specialty Conference on Subsurface Exploration for Underground Excavation and Heavy Construction, ASCE, New York, NY, pp–41-55.*
- *McKelvey, J.G., Goodfellow, J.F., Hirner, C., (2008), This is Where the Money Is! The Impact of Contract Front End Documents on Tunneling Projects, NAT Conference Proceedings 2008.*
- *Terzaghi, Karl, (1996), Soil Mechanics on Engineering Practice, Third Edition.*

Bowling Green, Ohio
The Design and Construction Cost of a Water Line Underneath I-75

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The City of Bowling Green, located in Wood County in northwest Ohio, has a population of approximately 29,000. The City owns and operates its public utilities systems, including a water treatment plant and water distribution system. The municipality serves approximately 9,000 residential, commercial, and industrial customers (The City of Bowling Green 2010).

Typically water distribution systems are designed in a grid format, which allows for optimized flow throughout the system (American Water Works Association 2003) (Alperovits and Shamir 1977). However, sometimes dead end lines (with only one end connected to the grid) occur. Several large commercial users as well as the City's Wastewater Treatment Facility are served by a dead end line. If this water line should fail, an overflow of raw wastewater could spill into the environment and commercial users would lose service.

The proposed water line connects the dead end line, creating a loop that reduces the risk of an interruption in water service. The loop will also create a second feed to the wastewater treatment plant and industrial park, and meet increasing demands in the northeast area of the city. This study attempts to evaluate installation alternatives, close the loop, and eliminate the dead end in the distribution system.

The analysis started with investigating the subsurface conditions to determine soil properties and existing utilities, investigating the Ohio Department of Transportation (ODOT) policy for utilizing trenchless methods, and calculating the size of the pipeline based on current and future demands. Then the research team investigated four potential methods of installation and developed cost estimates from contractors, historical data, and estimating software to propose the method of installation that provide the best value to the residents of Bowling Green.

Figure1. Location and alignment of the proposed water line

The soil in the project area consists of mainly clay and loam to depths of 80 inches (Web Soil Survey 2012). Portions of the project may go deeper, so a visual inspection of the project site was conducted which showed no presence of bedrock. The City's Engineering Division determined that the desired pipe size is 16 inches. ODOT's "Accommodation of Utilities" policy gives detailed guidance for the procedure of crossing state-owned right-of-ways; horizontal directional drilling (HDD) or auger boring are acceptable methods (Ohio Department of Transportation 2007).

INVESTIGATED METHODS

Open cut a trench and cross the Interstate by diverting traffic.

Open-cut installation allows the project to progress in a continuous and consistent fashion, allowing the project to progress at a steady pace (Washington, Trench and Excavation Support Options And Excavation Slope Design 2012). However,

trenching is dangerous, and shoring or sloping increases costs. Returning the area to its original condition is another added expense. The cutting of asphalt paving and subsequent repairing of asphalt significantly reduces the lifespan of the pavement. (Shahin & Associates Pavement Engineering 2002)

A cost estimate was developed to accommodate traffic diversion. "ODOT's Manual for Uniform Traffic Control Devices" was utilized to determine the requirements (Ohio Bureau of Traffic Engineering 1999). Safeway of Perrysburg, Ohio, provided a cost estimate for a traffic diversion plan. The cost of the demolition of asphalt and road base was developed using RS Means. The remaining estimate was derived from historical data. The total estimated cost is $512,300.

Cross the Interstate by means of horizontal directional drilling.

Advantages of HDD include: no interruption of traffic flow, minimal surface and subsurface disturbance, and minimal surface restoration after project completion. (Abraham et al.). The cost of HDD is quite competitive when compared to traditional open-cut installation. HDD is not without its limitations, as intersecting utilities can pose problems, placing constraints on the depth of installation. There is also the possibility of surface heaving and subsidence (Baik 2003).

A local HDD contractor was consulted and provided a cost of $125 per linear foot. The contractor's estimate was compared to an RS Means estimate which delivers a price of $130 per linear foot for a total cost of $39,000, comparable to the $37,500 contractor's estimate. Finally, drilling fluid costs were obtained from a contractor. The total estimated cost from bid tabulations, contractors estimate, and drilling fluid totals $517,000.

Cross the Interstate by jacking and boring (auger-bore).

Auger boring under the interstate is the third examined method. The boring equipment, which includes a casing, auger boring machine, augers, and cutting head, is located in the jacking pit. The receiving pit accepts the casing as the auger-boring machine drives the casing under the obstruction (Abraham et al.). Auger boring casings range in various sizes up to 60 inches. Drive lengths can range up to 300 feet. Site restoration is limited. Auger boring is particularly useful in unsuitable soils; boulders as large as one-third the size of the casing can easily be handled and removed from the casing. Furthermore, the casing acts as the borehole, eliminating the possibility of borehole cave-ins during the process. (Abraham et al.)

One downside to auger boring is the substantial investment required due to the many different-sized cutting heads and augers. Setup and bore pit excavation can also be more costly than other trenchless methods due to the forces required to drive the cutting head and auger (Abraham et al.).

The total cost to install the project by auger boring from bid tabulations is $658,000.

Postpone the project and install during road reconstruction by open cut.

Finally, postponing the project and installing the pipeline during road reconstruction is a viable method of installation worth exploring. ODOT plans to reconstruct the Interstate in the near future. The pipeline could be installed by means of open cut while the road is being rebuilt and traffic is already diverted.

Postponing the project and having the water line incorporated into the design of the highway reconstruction may lower the overall cost. If ODOT were to pick up the cost of traffic diversion and remove the asphalt and sub-grade, the City could pay the cost to install the water line across the highway. Once the water line was installed, it could be encased in concrete. The total cost to postpone the project would be $512,400.

QUANTITIES AND COSTS

Quantities were estimated for the project by obtaining historical data from the City of Bowling Green's Engineering Division. Pricing, not available from historical data, was estimated using RS

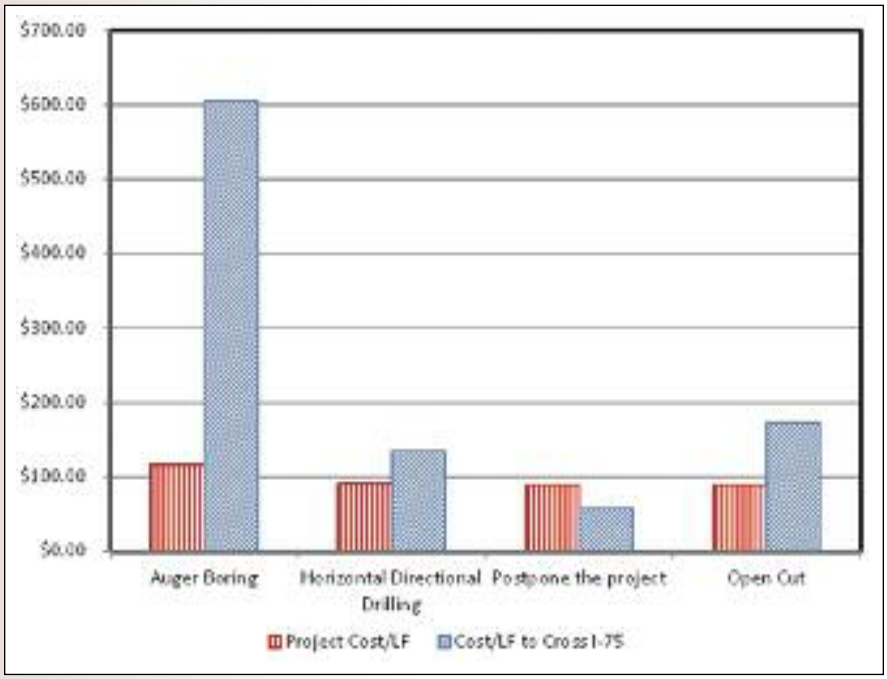


Figure 2. Comparison of project cost by method

Means cost-estimating software. Estimates from local contractors were sought to verify the validity of the estimates and historical prices.

This project requires the installation of approximately 5,700 feet of 16-inch PVC-DR18 water line. The Interstate crossing consists of a total of 300 linear feet with 80 linear feet of asphalt. There are also two connection points. Open-cut construction is most suitable method in 5,400 LF outside of the interstate crossing because they are mostly in grassy areas that require minimum restoration. Therefore, the cost of the project is broken down into two phases: the open-cut portion and the interstate crossing.

The installation of the new water line will improve the quality of water and the water distribution system's performance. The least expensive method of installing the water line is the open-cut method as shown in Figure 2. However, open cutting across the Interstate does not seem likely. The next least expensive method is to postpone the project and install the water line when the highway is being reconstructed. The timing of this method may not coincide with the needs of the community due to the construction of a new water tower in the area. This makes the horizontal directional drilling, the next least expensive method, more attractive. ODOT may be convinced to allow the water line to be constructed without a casing, making this the most economical way to complete the project.

REFERENCES

- *Abraham, Dulcy, Baik, Hyeon Shik, & Gokhale, Sanjiv. (2007). Development of a Decision Support System for Selection of Trenchless Technologies to Minimize Impact of Utility Construction on Roadways. Purdue University. doi: 10.5703/1288284313183*
- *A Decision Support System for Horizontal Directional DrillingTunneling & Underground Space Technology, 200318 (1), 99.*
- *American Water Works AssociationWater Transmission and Distribution (3rd ed.)Denver, COAmerican Water Works Association2003*
- *Design of optimal water distribution systems.Water Resources Research1977Vol 13 (6) 885-900*
- *Development of a Decision Support System for Selection of Trenchless Technologies to Minimize Impact of Utility Construction on RoadwaysLafayette, INPurdue University2007*
- *Ohio Bureau of Traffic Engineering Ohio manual of uniform traffic control devices for streets and highwaysColumbus, Ohio Ohio Bureau of Traffic 1999*
- *Ohio Department of TransportationPolicy for Accommodation of UtilitiesPolicy for Accommodation of Utilities2007 http://www.dot.state.oh.us/districts/D10/Right_of_Way_Permits/Documents/Manuals/Utilities%20Manual.pdf*
- *The City of Bowling GreenWater Distribution & Wastewater Collection - Water Distribution2010 http://www.bgohio.org/departments/utilities-department/water-distribution-wastewater-collection/water-distribution*
- *Trench and Excavation Support Options And Excavation Slope Design http://www.pdhcenter.com/courses/g111/g111.htm*
- *Trench and Excavation Support Options And Excavation Slope Design2012 http://www.pdhcenter.com/courses/g111/g111.htm*
- *Web Soil SurveyWeb Soil Survey2012 http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx*

Cities Fight Back Against Sewer Inflows

Pipe bursting is the method of choice for replacing homeowners' laterals

Daniel C. Brown
TechniComm

Infiltration and inflow (I/I) of storm water into a city's sanitary sewer system can be a major problem. King County, Washington, estimates that I/I makes up 75 percent of its peak flows during the winter, and much of that comes from private property. In any location with an aging sewer system, the rising volume of I/I can require new and larger wastewater facilities to convey and treat larger volumes of flow. That means higher capital expenditures, often to the tune of millions of dollars.

And much of the inflow water comes from private homes' sanitary laterals, which are the connections from the house to the sewer main in the street. Yet the homeowner also owns those laterals. So, if so much extra water gets into the sewer system through private laterals, how can a village solve its I/I problem?

In Wisconsin, a number of towns and villages have discovered a solution. When these villages replace a sewer main, they require by city ordinance for the homeowner to replace the lateral into his house. Yes, it amounts to a one-time tax, and in Wisconsin it averages from $2,000 to $3,000. But the homeowner gets the security of knowing that his sewer lateral has

been replaced with a leak-free pipe that will last 50 years or more. And sometimes the villages offer extended payment plans for the cost of the lateral.

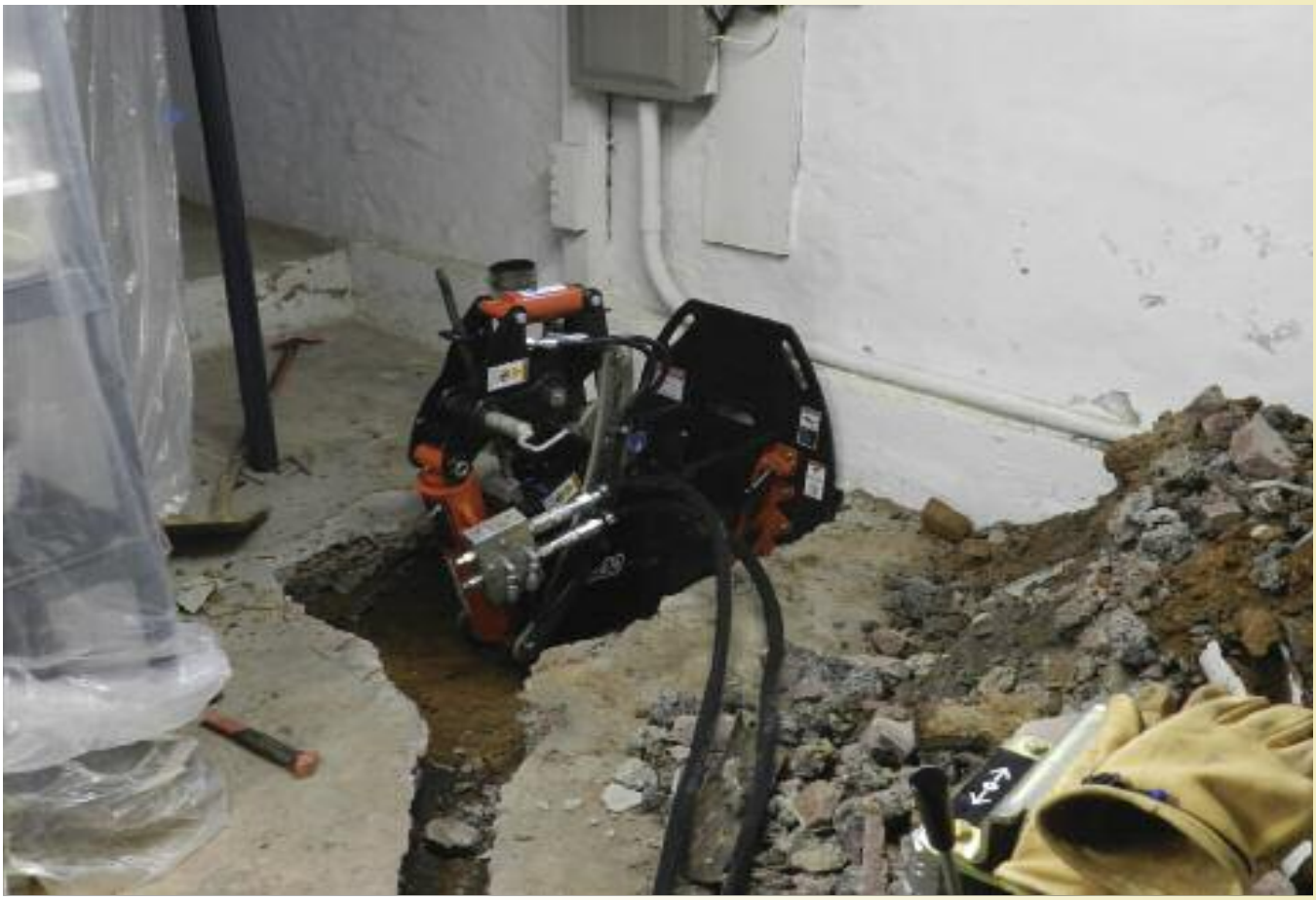
Since 2006, the Village of Kimberly, Wisconsin, has replaced some 450 to 500 laterals, says Dave Vander Velden, street commissioner for the village. "We're trying to eliminate infiltration and inflow," says Vander Velden. "Our program consists of replacing mainline sewer in the street, and with that the laterals that are not Schedule 40 (plastic) pipe or high density polyethylene pipe (HDPE). If it's not plastic, our ordinance requires it to be replaced."

He says most of the laterals in the older areas of the village are six-inch clay pipe, with some cast-iron pipe. Early on, the sewerline line replacement contractors did mostly sliplining of the old pipe, but Vander Velden says pipe bursting has become the predominant method in recent years. With pipe bursting, a new pipe is simply pulled through the old one, which gets burst by an expander.

"Instead of requiring the entire length of the lateral to be dug up and replaced, pipe bursting typically only requires a small hole in the homeowner's basement floor and a small excavation at the main"

Why has pipe bursting taken over? "There are more contractors that have the equipment to do it," he says. "Back in 2006 and 2007, there were only a few contractors that did that work. But now, there are many more that have gotten into it. A lot more towns and villages are trying to reduce their I/I, so there are a lot more people replacing laterals. With our old programs, we would replace the mainline pipe but did not replace the laterals. Then we'd test them and find that we did not really reduce the inflows."

Vander Velden says pipe bursting is "probably one of the less intrusive and better ways to replace laterals." Instead of requiring the entire length of the lateral to be dug up and replaced, pipe bursting typically only requires a small hole in the



homeowner's basement floor and a small excavation at the main – which may be opened up anyway, to replace the main. With pipe bursting, a homeowner's front yard is undisturbed.

On occasion, the village had discovered laterals with severe angles, and those cannot be sliplined. "But for the most part, even those laterals that have several angles and bends can be pipe bursted," says Vander Velden. "The old pipe is usually six-inch clay, and we replace it with four-inch HDPE."

On average the laterals run 30-plus feet in length. Sticks of HDPE come in 20-foot lengths, so typically two sticks of pipe are fused together to make the new lateral.

Most homeowners elect to replace the lateral when the mainline sewer contractor is replacing the main. "That way they're going to get the best bang for their buck from a contractor who is doing multiple laterals as he goes down the line," says Vander Velden. "We give them different payment options. They can pay it all when they receive the bill. Or they can put it on their property taxes for that year, or they can put it on a five-year payment program. With those, we charge one percent interest over the prime rate of our local bank."

How does Vander Velden rate the success of the Kimberly lateral replacement program? "We have 100-year-old homes in some neighborhoods, and the age varies," he says. "We've done these programs in different neighborhoods. And in homes that have sump pumps connected to drain tile, we find it very successful.

"For the most part, we're keeping 70 to 80 percent of the groundwater out of a project area. So we're reducing a lot of the clear water in our sanitary system. And that's the goal of the whole program."

Bursting a lateral

In the past two years, M& E Construction, a contractor from Kaukauna, Wisconsin, has pipe bursted approximately 500 laterals, says company owner Jay Midbon. "We've pipe-bursted laterals for the town of Menasha, Village of Little Chute, Kimberly and Kaukauna," he says. "We've done some laterals in Oshkosh and Neenah, and up to Green Bay and Appleton."

Midbon says the process typically starts with digging a small hole in a homeowner's basement. Then the contractor excavates a pit in the street at the junction of the lateral with the main. That pit is about 6 feet square by 8 to 12 feet deep. The crew sets the pipe bursting machine, a HammerHead PortaBurst® PB 30, into the pit. From the outdoor pit, the contractor inserts a cable and pushes it through the old pipe into the house. At the hole in the

basement, a worker attaches the pipe bursting head to the cable. The head has a slitter to cut the old pipe, and an expander fits closely behind the slitter to burst the pipe.

Once the bursting head is fitted into the hole in the basement, a worker activates the machine in the outdoor pit. The PortaBurst PB 30 pulls the bursting head and a length of four-inch- or six-inch-diameter HDPE pipe back through the old pipe. Midbon says he typically is bursting either four-inch cast iron pipe or six-inch clay pipe. Usually the contractor powers the PortaBurst with hydraulics from his skid steer loader or an excavator. (Alternatively, a contractor can use a gasoline-over-hydraulic power pack that HammerHead offers.)

Midbon says he has used a HammerHead PB 30 to burst hundreds of laterals with no problem. "We've had real good luck with it so far," he says. "We pulled all 500 of those laterals with that machine and we haven't had any issues over the past three years, so it's been real good for us."

From start to finish it takes about four hours to excavate the two pits, burst the pipe and restore the site. Most of the work is in the preparation; the bursting itself takes a matter of 10 to 15 minutes for a 50-foot lateral. "With a crew of four guys, we can average three laterals a day," says Midbon. "And that's with one pipe-bursting machine."

"We have also worked with contractors who dig the mainline, and then we follow them," says Midbon. "That way we don't have to dig a pit in the street. We open up the basement and as the contractor comes through, we drop our trench box in behind and then we pull the pipe. We just follow the mainline contractor down the road. With a set-up like that we can do four laterals in a day."

HammerHead, an Earth Tool Company of Oconomowoc, Wisconsin, manufactures a full line of pipe bursting, pipe ramming/HDD Assist, pneumatic boring equipment and HDD tooling and accessories. More information about HammerHead products can be found at www.hammerheadtrenchless.com.

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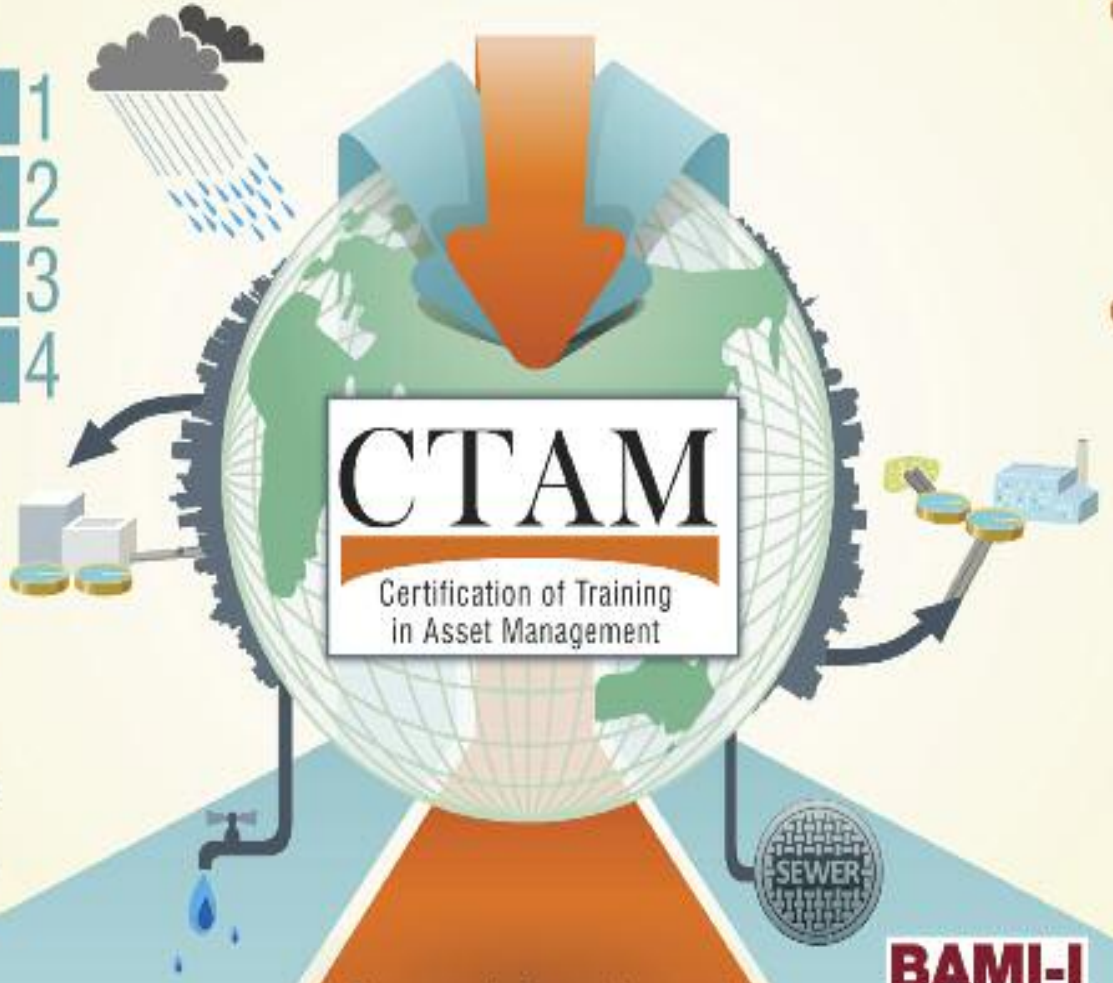

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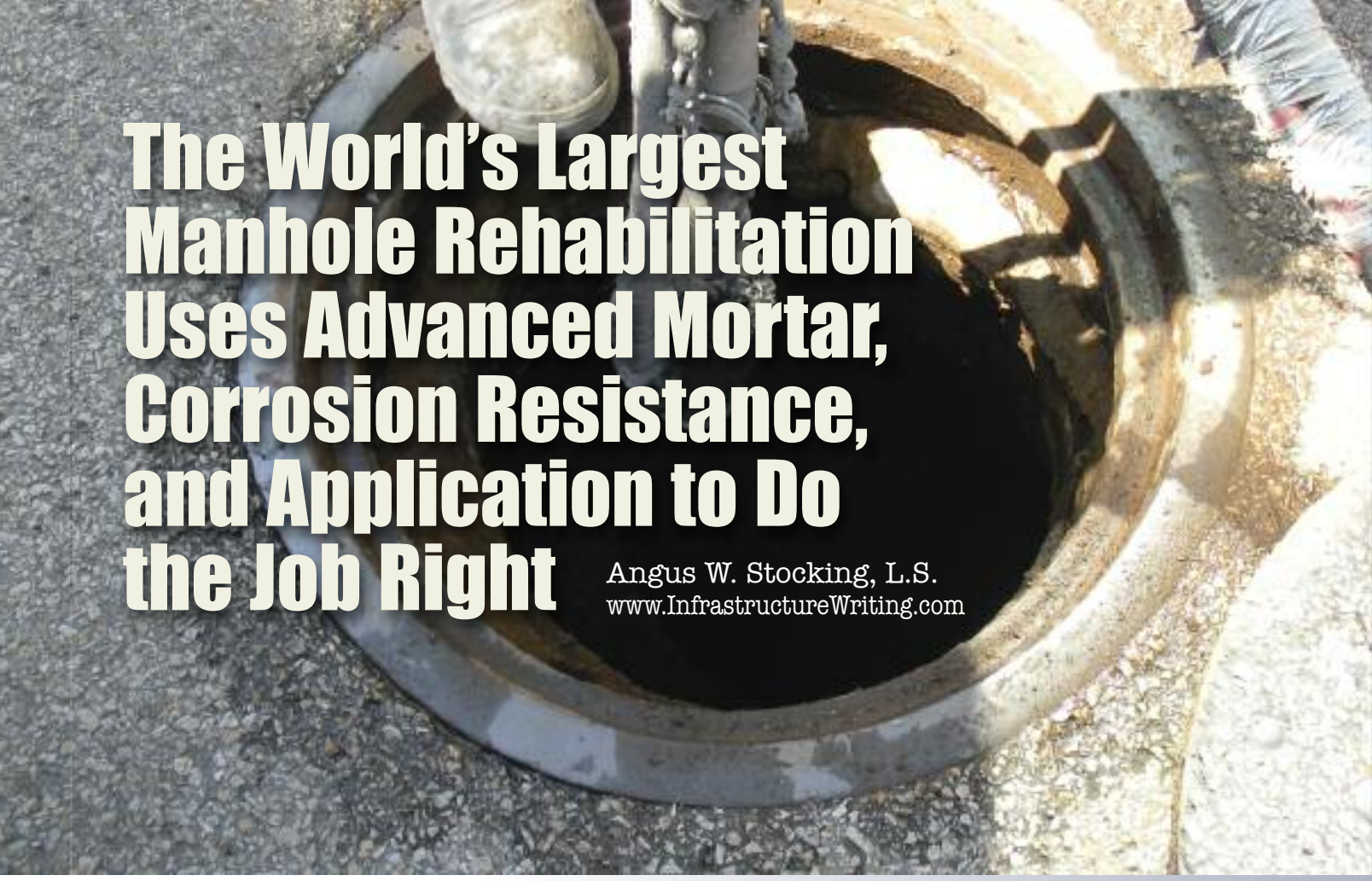


The World's Largest Manhole Rehabilitation Uses Advanced Mortar, Corrosion Resistance, and Application to Do the Job Right

Angus W. Stocking, L.S.
www.InfrastructureWriting.com

With a population of 2.8 million, Chicago is the third largest city in the United States. Its massive storm-sewer system includes more than a quarter-million manholes and catch basins. Tens of thousands of the manholes are nearly 100 years old, and the bricks or blocks they're made of are held together with small amounts of mortar; most need repair, and many are close to failing. The ongoing effort to save them before they fall apart is currently the world's largest manhole rehabilitation effort, with $60 million budgeted for the initial phases. Chicago began the project in 2006, and is now rehabilitating thousands of manholes annually.

Replace or Rehabilitate?

Given the scale of the Chicago project, choosing the most effective method of repair was obviously of critical importance. The City commissioned a study that found rehabilitation, as opposed to replacement, would be more cost-effective and significantly less disruptive.

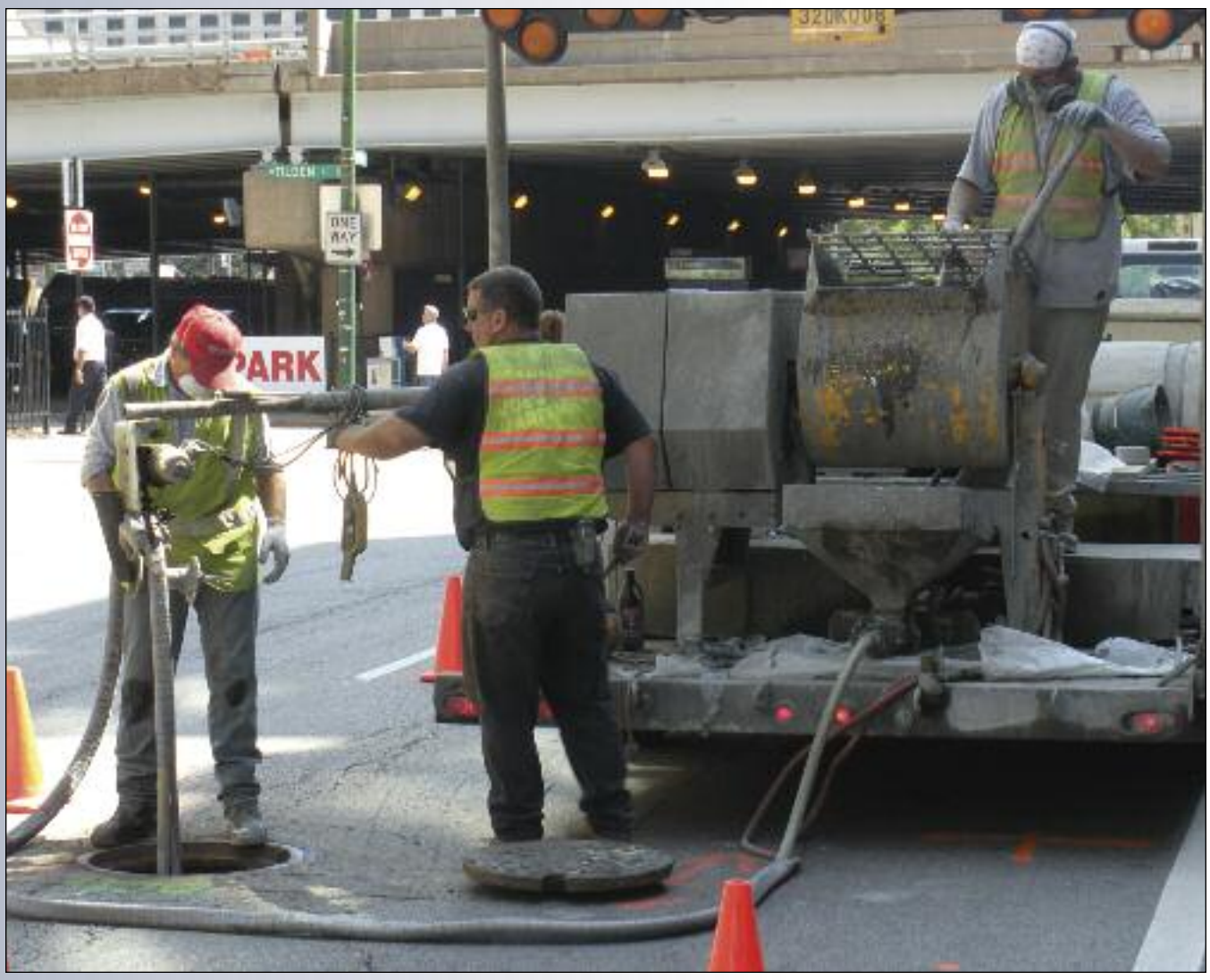
However, much depended on the mortar used to reline manholes and how thickly it could be applied. Factors analyzed included mortar strength, soils, compaction, static and dynamic loading, ground water pressure, diameter and depth, and overall manhole condition. After this detailed analysis, the engineers set three specifications for the mortar:

- minimum of 3,000 psi compressive strength in the first 24 hours after application;
- minimum of 150,000 psi modulus of elasticity in the first 24 hours after application; and
- density of material sufficient to prevent water migration.

Mortar with these qualities is much different than ordinary Portland cement – in fact, a half-inch of such material is about equal to five inches of Portland cement.

To determine the actual thickness needed, engineers evaluated the effect of wheel loads from light and heavy traffic (wheel loads affect mainly the top two feet of the manhole chimney), and hydrostatic loads from external ground pressures. Calculations showed that, for most manhole sizes, a one- to two-inch layer of mortar would be sufficient to strengthen, seal and protect each manhole, giving them approximately the lifespan of a new structure.

A variety of cementitious products were evaluated and Permacast® MS 10,000, made by AP/M Permaform, was selected for all manhole and catch basin relining.



MS 10,000 is an ultra-high-strength mortar based on Portland cement and fortified with micro silica and other densifying agents. Graded quartz sands and fibers are added to improve cohesion and flexural strength.

What About MIC?

Mortar strength was not the only thing to consider when rehabilitating Chicago's manholes. The proposed solution also had to resist microbiologically induced corrosion, or MIC.

Poorly understood when the manholes were originally built, MIC is now known to be a prime cause of concrete deterioration in both stormwater and wastewater systems. Combined with increased temperatures, long retention times, turbulence and anaerobic conditions, organic waste creates hydrogen sulfide gas. This in turn creates a proliferation of thiobacillus, a bacterium that feeds on the sulfur within the gas and then excretes sulfuric acid. And sulfuric acid, of course, attacks the concrete matrix and decomposes it into a crumbly white mass consisting primarily of gypsum.

To further enhance MS 10,000's corrosion resistance, City engineers specified the use of ConmicShield® a liquid admixture made by ConShield Technologies. This material – a water-stabilized silica salt – is a liquid added during the mixing phase that bonds molecularly with cement particles, forming a physical barrier to production of thiobacillus. It is non-toxic to humans and animals, but permanently inhibits single-celled organisms such as thiobacillus.

For additional protection against industrial acids and road salts, the City specified a final layer of epoxy on top of the ConmicShield-enhanced MS 10,000. The epoxy-coated, cement-reinforced manholes represent the state-of-the-art in manhole rehabilitation and are expected to last another hundred years.

Application

Manholes are tight spaces, and brick-and-block walls are very irregular, with sizeable voids and protrusions. Many spray tech-

niques use too much pressure, so material rebounds and doesn't adhere well, and it's hard to coat brick and block thoroughly because spray can't get into or behind irregularities.

To avoid these problems, Benchmark Construction – the winning bidder for all contracts to date – uses the AP/M Permaform SpinCaster. The SpinCaster is a pump connected to a spinning, mortar-emitting nozzle that is winched in and out of manholes by a rig that two men can operate. The nozzle spins alternately clockwise then counter-clockwise, applying half the thickness in each direction. As it is raised and lowered from bench to casting, the MS 10000 mortar sprays evenly and doesn't 'cast shadows' behind raised portions of the rehabilitated surface, such as protruding bricks. Pressure is regulated to eliminate material rebound, but kept firm enough to compact the mortar with centrifugal force and ensure tight adhesion. Bi-directional application also creates a finished product with a smooth surface and eliminates the need for hand trowel work.

Application is straightforward, and requires only a two-man crew – one to mix mortar and tend the pump, and one to operate the winch and spinning nozzle. The SpinCaster quickly applies very thin coats as it is winched up and down. This allows precisely engineered thicknesses of new material and, depending on the condition of the manhole substrate, allows the crew to move quickly and rehabilitate several manhole per day. Since the nozzle is lowered from the surface, and since hand troweling is usually eliminated, technicians are usually able to stay out of hazardous confined sewer spaces. The combination of thorough coverage, speed, and safety made the SpinCaster a winning choice for both Benchmark Construction and the City of Chicago.

Time and corrosion are formidable foes, but Chicago's massive effort is overcoming both. The world's largest manhole rehabilitation project is proving that the right mortar, combined with the right MIC protection agent and the proper application methods, is the most cost-effective method of increasing the life of aging manholes and catch basins.

Angus W. Stocking is a licensed land surveyor, with 17 years' experience in several states, who now writes full-time about construction and infrastructure.

'Spreading the Word'

Chair Says Chapters Are Heart of NASTT

PTR Communications

If you've been to the NASTT No-Dig Shows in the last 15 years, you've probably met Derek Potvin. NASTT's new Chair has been a regular at No-Digs, including the 2013 edition in Sacramento, California.

Potvin, previously Vice-Chair of NASTT, has been an active member for more than 15 years. He's President of Ottawa-based Robinson Consultants Inc. and also Treasurer of NASTT's Great Lakes, St. Lawrence and Atlantic (GLSLA) Chapter. No-Dig Show veterans may recall one or more of the many papers he has authored for the annual event, including one that won an award for Outstanding Paper.

He has seen trenchless technology progress considerably since attending his first No-Dig Show in 1995. "Initially, trenchless was seen as revolutionary and unique," he recently told Trenchless International magazine. "However, it is now viewed as a responsible and progressive approach to infrastructure construction and renewal. In my area, almost all clients are now using trenchless technology in their everyday work programs."

We spoke with him briefly in Sacramento and later exchanged emails to get the new Chair's views on NASTT, its Chapters and the future of trenchless.

First up: What motivates Derek Potvin to stay active within the NASTT organization and the GLSLA Chapter? The first source of motivation he mentioned is "the belief that trenchless technologies benefit society by minimizing disruption to residents and businesses, limiting impact to the natural environment, offering potential cost savings and reducing greenhouse gas emissions." He also mentioned the "overall dedication and volunteer spirit of the organization," and said it is "exciting to be part of an organization that is supporting something we are truly passionate about. The spirit of the organization makes it easy to volunteer time."

"We are pushing forward in educating people about trenchless technology," he added. "Seeing the success and advances over the years is very rewarding and motivating. Now that I am Chair, I am privileged to have the chance to guide something I have been a part of for so long. This too, is very rewarding. "

Asked about his objectives as NASTT Chair, he pointed out that assistance from Regional Chapters is vitally important. Among his key objectives is advancement of NASTT's "exceptional educational lineup," including the Webinar series, Good Practices seminars and Trenchless Technology Short Courses. He wants to see NASTT expand the Trenchless Bookstore and pledges NASTT's support of Chapters by offering local training.

Potvin wants to see awareness of trenchless technology increased by developing relationships with other industries. "We are already committed to providing training to the American Public Works Association, the American Gas Association, the Alberta Water and Wastewater Operators Association, the Atlantic Canada Water and Wastewater Association and the Association of Equipment Manufacturers, and we are currently discussing training opportunities with other associations," he noted.

He also mentioned a desire to further the success of the Municipal and Utility Scholarships and said NASTT encourages

Derek Potvin is Chair of the North American Society for Trenchless Technology.

its members in Regional Chapters to talk to non-member colleagues about the benefits of joining. Having more members will improve NASTT's ability "to reach out to even more municipal and utility owners and an even broader audience," he said.

"NASTT's Carbon Calculator is nearing completion of Phase II, which will offer a web-based user-friendly version of the software," he remarked. "This is a standalone NASTT initiative, and a Phase III training module is being contemplated."

Asked to describe the relationship between NASTT and its Chapters, he emphasized that "Chapters are the driving vehicles of NASTT's mission to provide trenchless technology education and training." The Chapters and NASTT – the organization as a whole – must work together for the key objective of increasing awareness of trenchless technology. Potvin said the Chapters have shown dedication to that objective with their successful work in education and training.

"Chapters' assistance at the grassroots level is vitally important, and it is their enthusiasm and dedication which really makes NASTT a successful organization," Potvin declared. "Chapters encourage peers, colleagues, members and non-members to participate in NASTT, whether it is at Regional Chapter events, with the student chapters, or via a subcommittee."

The Chapters' work is mainly about "spreading the word," he said, and they're "already doing a tremendous job promoting trenchless technology. Many Chapters have a great lineup of seminars and workshops available. Our Chapter functions reach out at the grassroots level to our members and potential members. The future of our industry involves each of us doing our part in educating people about the benefits and capabilities of trenchless technology."

It's important that trenchless technology education and training be accessible, and Chapters help with accessibility by holding local and regional events that people can get to. In a similar vein, Potvin said "NASTT has found that our complimentary Webinars are a great success because the participants have no travelling cost. It allows more members and prospective members to participate in our education initiatives."

NASTT and its chapters are in a partnership to advance understanding and awareness of trenchless technology.

NASTT is always looking to grow the benefits of membership, which in turn enhances benefits for all members. "NASTT is continually updating and improving existing courses, developing new courses, preparing new publications and offering courses in new formats such as webinars," Potvin said. "These education initiatives greatly benefit the joint NASTT and Regional Chapter mission to educate and promote the benefits of trenchless technologies. New initiatives such as the Municipal and Public Utility Scholarship program will allow more Chapter members to attend the annual NASTT No-Dig Show."

NASTT Executive Director Mike Willmets, Communications and Training Manager Michelle Hill and Board members will attend Chapter functions and events to support education initiatives or to discuss what NASTT has to offer its membership, he said.

Potvin said Regional Chapter magazines such as this one are "a place to show new technology and share the successes of trenchless technology. They also promote local and national education seminars, webinars, conferences, etc. They are a great outlet of education and information for the trenchless community and even those interested in learning about trenchless technology. They also allow for the showcasing of regional trenchless projects and local industry champions."

The Chapters those magazines serve are hubs where people "share ideas, network with colleagues and find solutions to trenchless questions," he said. "The great thing about the Chapters is that everyone is so passionate about trenchless technology and is very willing to share their knowledge and inform others about the benefits of the technologies. NASTT really profits from all of the Chapters' contributions."

He underscored the importance of Regional Chapters when he was asked for concluding thoughts in our conversation: "We must thank our Chapters as NASTT's strength evolves from a Chapter-based level, and it is that volunteer spirit that really makes it a successful organization."

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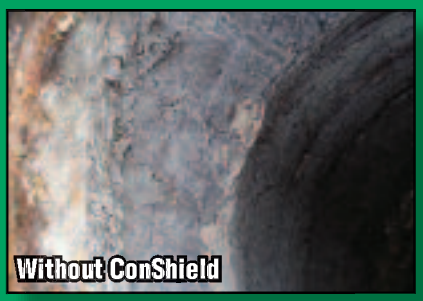

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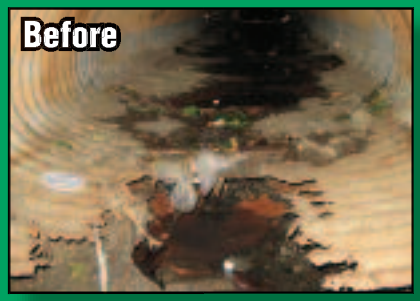

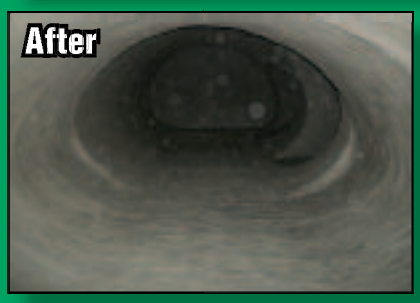

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