



# NASTT's *Trenchless Today*

Educate - Train - Research - Publish



Fall 2015 | Volume 5 | Issue No. 3



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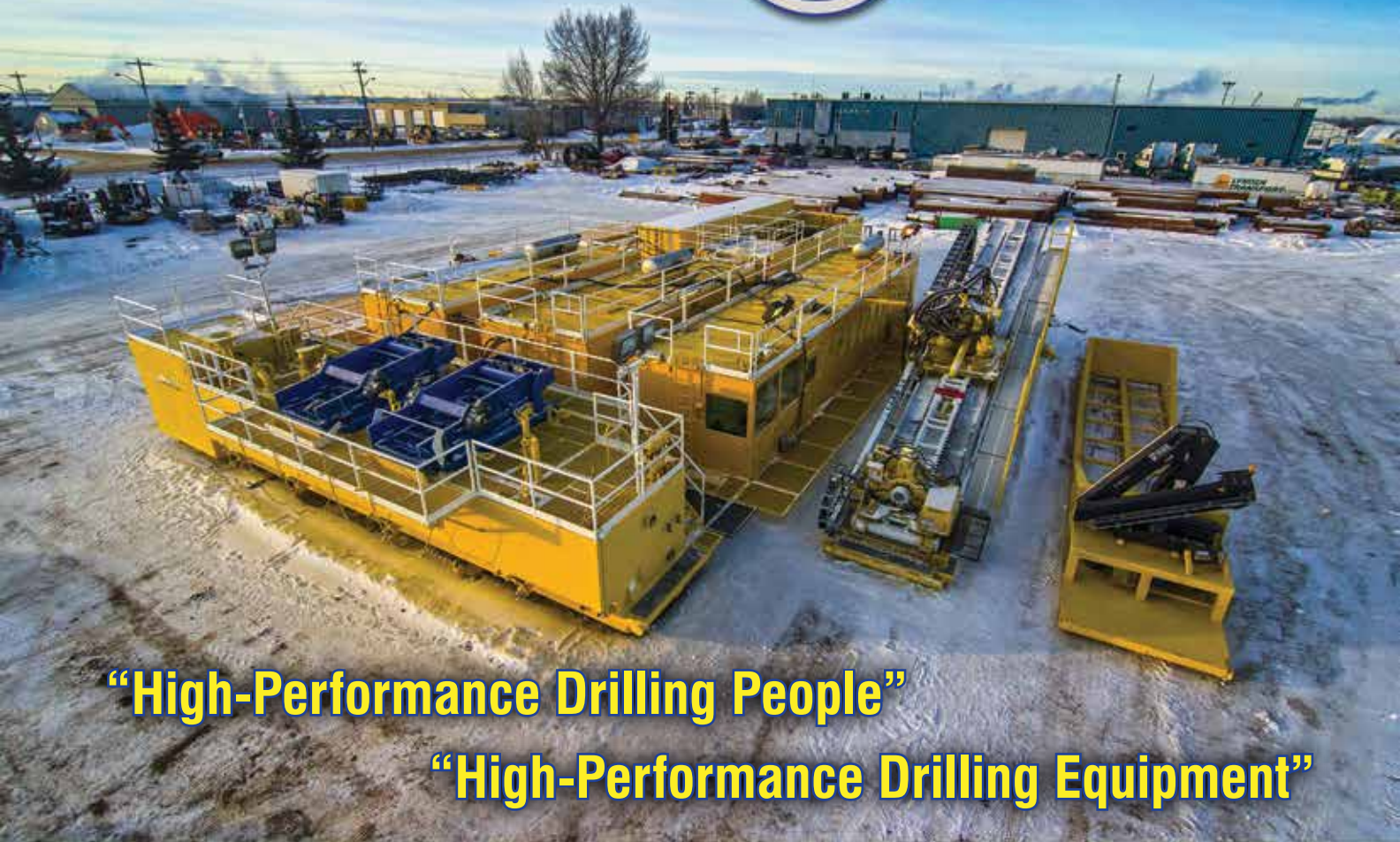
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 NASTT strives to ensure its members have access to valuable industry tools. The annual membership directory aims to provide a resource for members to connect with contractors, manufacturers, professional service providers and municipal representatives who are NASTT members. When planning your next trenchless project, you may need it!

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## Trenchless Technology: A Vital Part of Municipal Growth – Existing Infrastructure Demands It



**N**orth America's buried infrastructure is facing some very real challenges. The need for efficient and reliable underground municipal services continues to expand while much of the existing infrastructure is reaching the end of its lifecycle.

According to AWWA's 2015 State of the Water Industry Report, the single most important issue facing North American municipalities is the renewal and replacement of aging water and wastewater infrastructure. The report states, "These issues continue to be important because many water and wastewater systems built and financed by previous generations are approaching or have exceeded their useful lives. Because of past budgeting approaches that may have included inadequate revenues to fully cover costs, some municipal utilities have deferred necessary maintenance and replacement. Even systems that have acted as good stewards by planning for the renewal or replacement of their assets can sometimes find it difficult to secure reasonable funding for capital projects and/or to win public support for these necessary efforts."

These statements reference the services for the 317 million people in the United States and an additional 35 million people in Canada. For the most part, our infrastructure works and most of it works very well indeed. The real threat though is keeping up with replacement needs especially in economically challenging times. Those of us in the trenchless industry know that there is a way we can rehabilitate existing systems and install new systems that is economically feasible as well as environ-

mentally sensitive and socially responsible.

Let's start with potable water distribution. Recently, the America Society for Civil Engineers gave America's water distribution system an overall grade of "D." Not a great mark! That's partly based on 240,000 water main breaks per year in the United States and another 37,000 in Canada. That's taxpayer money spent reactively, not proactively. These are unplanned events often in inclement weather, in densely populated areas and of course, there is never a convenient time. Some water mains are more than 100 years old and many are antiquated cast iron pipes with lead joints and lead services. Then there is the 1970s vintage thin wall ductile iron piping with problematic mechanical joints – this aging pipe is often referred to as a time bomb!

Turning to storm and sanitary sewers, the wastewater sector has been an area of intense focus for the U.S. EPA and Canadian authorities over the last two decades, with aggressive mandates for eliminating sanitary sewer overflows. Public pressure is also mounting in both countries.

To sum up the challenges, municipalities and public utilities are facing increasing public and environmental expectations, increasing regulatory expectations, complex risk management issues, vast aging infrastructure and diminishing financial resources. The members of NASTT believe that trenchless technology is one part of a very complex equation and it can play a key role in maintaining North America's infrastructure. Right now, trenchless technology is working in every major utility sector in North America, especially the gas industry. Trenchless has grown from an

alternative or niche technology to the preferred method in many cases.

More so than ever, there is hard research, science and engineering behind trenchless technology. This is a major reason why the industry as a whole continues to grow and expand. It also means that tools become better, installation methods become more effective and, as a result, those owners who utilize trenchless become more efficient. In many cases trenchless technology can be a faster option, and in cases where it is not, it can be a preferred option often because of the low impact of the construction. Trenchless methods often require smaller crews as equipment is sized for the specific task at hand.

Many municipalities and public utilities have taken the steps to develop in-house trenchless pipeline replacement or installation programs. The City of Edmonton is an outstanding example of a successful in-house program. Others choose to contract the work on a project by project basis that is adaptable and scalable to meet a community's needs. What this translates to is increasing industry support and investment for more innovative methods including exciting advancements in robotics.

NASTT is proud to promote this cutting edge technology that is so vital for our future. Our goal is to continue to support and train trenchless professionals in as many ways as possible. Sustainable infrastructure is our goal and the future looks very bright!



Mike Willmets  
NASTT Executive Director



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## 2015 has been

another groundbreaking year for NASTT and the trenchless industry. The year is not over but we've already accomplished so much.

We are well into the second year of our three-year Strategic Plan, a plan that our membership helped mold. It started with a member survey to determine the important issues on which the Board of Directors should focus. These issues were prioritized based on member input and we are striving to create and implement endeavors and initiatives that meet these needs, grow the industry and continuously improve our Society.

One of our top initiatives is to continue to increase our member value. NASTT is *your* Society, and it is important to us that we meet your needs. We've worked to continuously improve NASTT's No-Dig Show by providing a unique and enriching experience each year. NASTT's 2015 No-Dig Show included a newly developed Gas Industry Day with a technical track dedicated to gas-specific presentations and a new half-day course dedicated to the industry entitled, "Gas Good Practices Course." Attendees who participated in the Gas Industry Day were also able to experience our sold out exhibit hall to learn about products and services for the trenchless industry and enjoy a networking luncheon.

For the first time, we presented an Innovative Product Pavilion. This pavilion is an extension of our Abbott Innovative Product Award, which was developed to annually recognize two companies for advancing the trenchless industry with state-of-the-art products. Honors are awarded in both new installation and rehabilitation methods. The Innovative Product Pavilion allowed viewing of all award submissions during the entire course of NASTT's 2015 No-Dig Show so they could be showcased and celebrated publicly.

Another objective within the framework of increasing our member value is

# NASTT's Strategic Plan

*A Plan of Action for the Future*



to refresh NASTT's educational offerings and deliver programs with a progressive curriculum. Among these offerings, we are very proud to announce the publication of two new quality books this year: "NASTT's CIPP Good Practices Guidelines" and "NASTT's Laterals Good Practices Guidelines." Both books are available to order online at [nastt.org/bookstore](http://nastt.org/bookstore). We are also very proud to announce that we are in the planning stages to publish the fourth edition of "NASTT's HDD Good Practices Guidelines."

NASTT is working to foster and leverage strategic partnerships to further extend our networking efforts for the benefit of reaching new audiences and advancing trenchless technology. We have participated throughout the year in various trade shows and conferences. Earlier this year we exhibited at the Underground Construction Technology (UCT) conference where we also hosted a trenchless panel discussion on Trenchless Trends for Infrastructure Rehabilitation. As solutions for aging infrastructure continue to trend towards proven trenchless options for rehabilitation, an expert panel moderated by Jeff Maier, director of engineering at C&L Water Solutions, Inc., discussed the economic and social benefits of cured-in-place piping (CIPP), pipe bursting, sliplining and spot repairs.

In May, we exhibited for the first time at the American Gas Association (AGA) conference, and the effort was deemed a huge success. We were able to help spread the trenchless message to the gas industry and found that these utility employees were eager to learn more about trenchless technology, NASTT and the No-Dig Show. Finally, in August we exhibited at the American Public Works Association (APWA) Congress and hosted a forum: Trenchless Trends – A Growing Industry. This forum was led by trenchless expert, Dr. Sam Ariaratnam, a professor in the Ira A. Fulton School of Engineering at Arizona State University and a panel of infrastructure authorities. They discussed the use of various trenchless technologies, recent projects and case studies in a lively panel discussion setting.

These initiatives are just a small sampling of the work we have been doing to implement our Strategic Plan. For more information on the plan, visit [nastt.org/strategicplan](http://nastt.org/strategicplan). I'll keep you updated on our progress in future issues of *NASTT's Trenchless Today* as well. We always welcome your feedback or questions. Please feel free to contact us at [info@nastt.org](mailto:info@nastt.org).



Dr. Kimberlie Staheli  
NASTT Chair

# OUT OF SIGHT, OUT OF MIND

## INFILTRATION IS OUT OF CONTROL

Every city battles groundwater migration in the sewer system. Infiltration attacks the integrity of underground infrastructure resulting in excess flow, reduced capacity, higher maintenance, shorter lifecycle, and greater expense to rate-payer. Unresolved, the cost to rehabilitate or replace increases exponentially.

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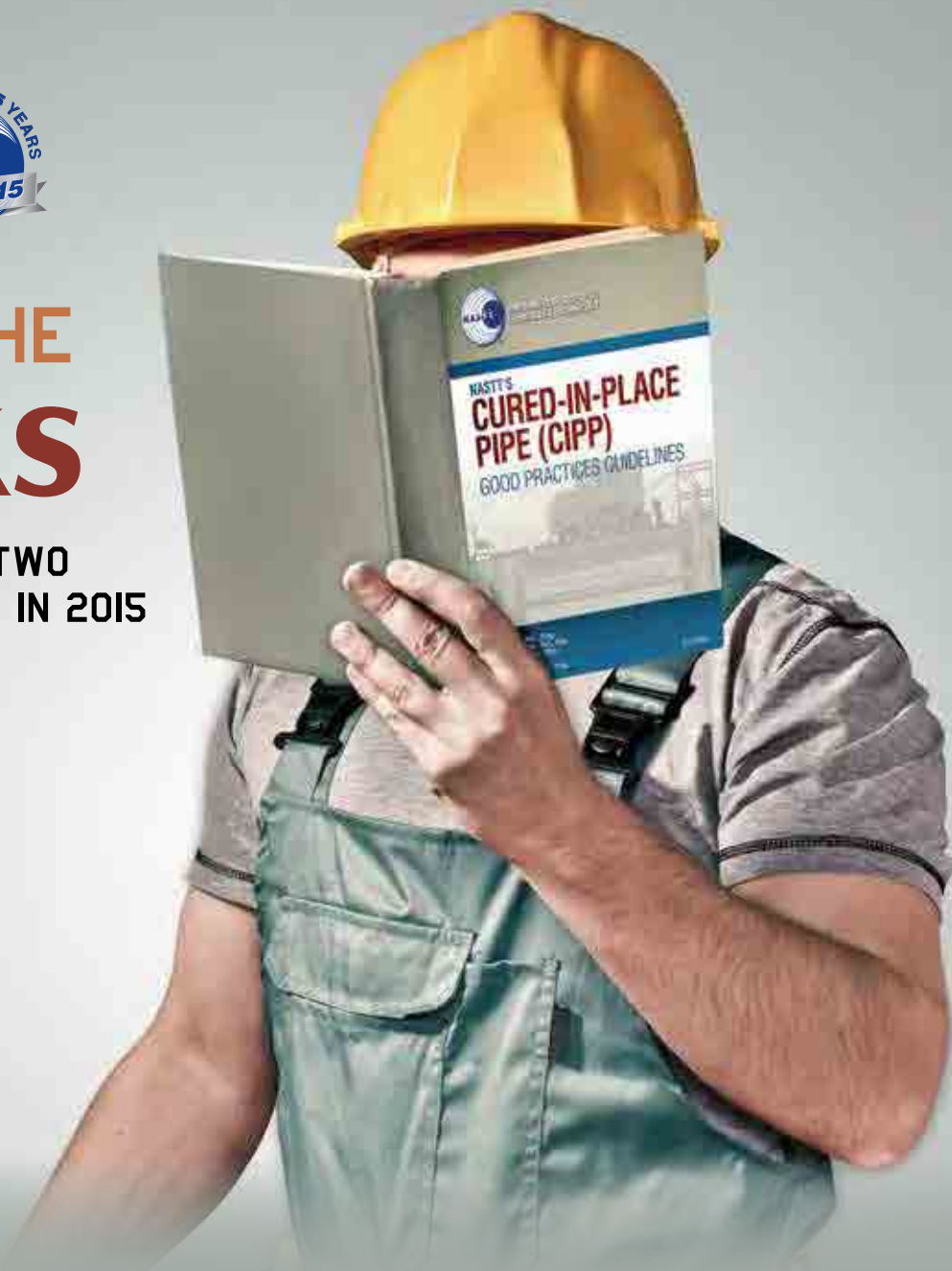
# AVANTI

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# HITTING THE Books

**NASTT LAUNCHES TWO NEW PUBLICATIONS IN 2015**



I'll admit it's been a long time since I've cracked open a text-book – like junior year at Ohio University long – but that might change here very soon.

NASTT is releasing two new text-books which are companion publications for our training courses. Based on the increasing demand for more rehabilitation resources, "NASTT's Laterals Good Practices" and "NASTT's CIPP Good Practices" publications are now available for purchase through our on-line bookstore.

"NASTT's Laterals Good Practices"

publication focuses on rehabilitation and replacement methods along with specifics like locating, inspecting, condition assessment, planning, managing, financing, troubleshooting and remedial action.

When you dive into "NASTT's CIPP Good Practices" publication, you'll learn about everything from methods, applications, testing, design and specifications to construction, installation, inspection and quality control.

The most notable fact about these and all other NASTT educational offerings is that they have been developed

to be non-commercial. Our content is always peer reviewed by volunteer industry professionals to ensure it offers accurate and unbiased information. Countless volunteer hours have been invested into these publications to make sure we are providing the best resources for the trenchless industry.

Go ahead, channel your college days and hit the bookstore. You'll be impressed with all of the innovative ideas you can only find at NASTT.



Michelle Hill  
NASTT Program Director





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## NASTT's Q&A with Jerry D'Hulster



Perma-Liner Industries President Jerry D'Hulster chats with us about the state of trenchless rehab and the growth areas in recent years.

### Going back to early in your career, tell us about how you first got involved in the construction industry.

My initial start in the construction industry was in early 1990s working in the family business. The business was founded in 1969 offering pipe maintenance services to cities throughout the Delaware, Pennsylvania and New Jersey Tri-State area. By the time I became involved, the business had developed into several service divisions and included new pipe installations as well as Polyethylene Slip Lining. The company division I managed worked closely with the Pennsylvania Department of Transportation for supplying Automated Road Repair Equipment and High Pressure Pipe Cleaning Equipment through district contracting. Eventually, this division was consolidated with the pipe maintenance division and thrust me into the pipe inspection and repair industry using state of the art technology offered at that time.

### At what point did you become familiar with trenchless technologies? What attracted you to the industry?

I was first introduced to CIPP during my attendance at the Pumper/Cleaner Show in 1995. The CIPP technology offered during that event was for CIPP sectional repairs. I was impressed with the technology and how it provided a structural repair inside the existing pipe without excavation.

During this time, there were only a few companies offering this type of technology. Having been in the field and exposed to the issues for repairing failing sewer collection pipes, I knew this was a solution the industry would embrace. The installations were completed in hours vs. days with dig and replace methods.

### What have been the biggest growth areas of the sewer rehab market (technology, methods, acceptance, etc.)?

I've seen growth in all areas, but the most growth is probably in the building sewer lateral rehabilitation. The service lines that collect and transfer the sewage from the private building to the municipal sewer collection system is an area within the system that has the least amount of attention. In most cases, there is not a maintenance program in place to clean and inspect the building sewer laterals. The failing pipes are long past their expected lifespan.

Technology has come a long way and will continue to improve with companies spending time to research and develop new equipment, practices and materials. Technology offerings now provide installers of CIPP lateral lining to install through an existing cleanout and steam cure. Building sewer laterals can be rehabilitated in an hour to an hour and a half, complete!

The majority of the building sewer laterals fall under the

state, county or other recognized plumbing codes. Plumbing codes are now providing acceptance to CIPP technology that meet code requirements.

### Equipment and technology has been a huge driver in the trenchless industry. Do you feel that's still the case in the sewer line/lateral rehab market?

Pipeline rehabilitation equipment and technology for installing small diameter CIPP lining is a critical part of the installation success. Building sewer laterals range in size from 2 to 8 in., the most common being 4- and 6-in. diameters. Access, bends, tie-ins and length of pipe to be lined are some of the most common concerns when rehabilitating building sewer laterals using CIPP technology.

Over the last 10 years, CIPP lateral lining has seen a lot of new technology. This technology has led to more contractors entering the market and an increase in CIPP technology used for rehabilitating building sewer laterals. As the market continues to grow, you will see advancements in the technology offerings.

### To what do you attribute Perma-Liner's continued success and growth in the industry? What have been the challenges?

Perma-Liner Industries (PLI) focused first on designing a quality system that is user friendly. PLI's marketing approach was a little different style than what was offered by competitors at the time. We realized the products and systems offered needed more than publication advertising. In the early days, lateral CIPP rehabilitation was unknown. There were many obstacles to overcome. Contractors were skeptical and plumbing inspectors didn't have an approval method.

PLI began working with NSF and other plumbing code officials to implement an approval process for materials, installation and inspection of CIPP lateral lining rehabilitation. These same testing and approval procedures are still used in current plumbing code and certification approvals.

### Tell us about how you first got involved in NASTT.

I first became involved with NASTT in 1999 as Perma-Liner was at its inception. I saw the value in what the organization was doing to bring the engineers and municipal sectors together. NASTT brought additional support to the PLI brand, even in the early days.

### How have NASTT and the No-Dig Show evolved during your time in the industry?

Perma-Liner has been exhibiting at NASTT's No-Dig Show since 1999 and has experienced the growth of the exhibition first-hand. In recent years, we've noticed the attendee base has expanded into different segments of the industry, which we have found to be very promising. The participation within the student community is impressive and we look forward to welcoming these young minds to our developing industry as they are the future.

### What do you see for the future of Perma-Liner?

Perma-Liner is established as the leading CIPP manufacturer and supplier for small diameter pipeline rehabilitation. Our foundation is strong with a team that is not only ready to react, but is proactive on a daily basis to improve on the Perma-Liner brands. Our business continues to grow in North America and has been our primary focus. The global pipe issues are alarming, and as each year passes, the amount of failing pipes increases. Pipes are failing faster than they can be rehabilitated. PLI is evaluating the international market for what we can provide as local solutions. PLI's distribution network outside the United States works with local installers.



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## In the Trenches

By Andrew Farr

**T**he construction industry is expansive. Sometimes we forget, but trenchless technology is just one very small part of it. In fact, some never even set out to be a part of this industry, but at some point early in their careers, something piqued their interest in the construction field that put them on the path to trenchless. For the three professionals featured in this month's "In the Trenches," it was all about finding their footing in the industry. Now, the three have a passion for construction work and have brought their expertise to our niche industry and are driving the work forward through their various commitments to advance the industry.

### Joe Lane HEBNA Corp.



Joe Lane says he got into the trenchless industry not so much by choice as by need. But now, as president and general manager of the international construction company HEBNA Corp., Lane admits it was the hands-on work in the field that really drew him to the industry when he was in college.

While studying biology at the University of Northern Colorado, Lane got a job working for pioneering pipe rehab company, Insituform, where he started out working in the field. Lane says he enjoyed the work even though it was different from his focus in school.

"When I got out of college, I found out you can't pay back your student loans on what a biology major makes," he jokes.

Working for Insituform was Lane's first introduction to trenchless technology, and he was intrigued. "I thought it was a fascinating industry," he says. "To me, it was fantastic technology and I wanted to stay in the industry if there were opportunities to move up in the company." When a sales

position opened up, Lane jumped at the opportunity to take the next step in his career.

He continued working for Insituform for the next 18 years in progressively increasing roles of responsibility in sales, business development, training, operations and executive management.

"For me, I really enjoyed the interaction with clients, but I also understood the business from an operations perspective really well," he says. "So for me, the biggest tool I had was to bring customers on to other customers' jobsites, show them how effective the technology was and show them how it could work for them."

After his time with Insituform, Lane joined SAK Construction, which was experiencing phenomenal growth due to the leadership of industry veterans like Jerry Shaw, Tom Kalishman and now NASTT Hall of Famer Bob Afholder. Lane became the head of SAK's energy division, a market in which he began to see huge potential for in the trenchless industry.

Through his work with SAK, Lane developed a working relationship with company executives at HEBNA Corp., a company specializing in the protection of new and existing pipelines from internal corrosion and abrasion through the fabrication and installation of HDPE pipe liners. Lane was intrigued by what the company was doing in the energy market and eventually made the decision to join.

Today, Lane leads HEBNA Corp., which he says is a company that represents an aspect of the trenchless industry that has not yet reached its potential.

"The energy services market is different than the municipal market," he says. "With NASTT, we're trying to pull in more energy people. I think there's tremendous potential within the energy industries for trenchless technologies."

In addition to his degree in biology, Lane is also a graduate of the University of Michigan's School of Business Management and the Leadership Program of the Rockies. On the

local level, he got involved with the Rocky Mountain Chapter of NASTT earlier in his career after leaving Insituform, which was his introduction to the association. Shortly after, he got involved at the national level with NASTT's No-Dig Show Program Committee and now serves on the national Board of Directors. He also still serves as a Board Member for the Rocky Mountain Chapter. Lane is also a regular speaker and instructor at numerous industry and educational associations and takes pride in working to advance the knowledge and use of trenchless technologies.

Many industry professionals regard the quality of NASTT's No-Dig Show technical papers as a prime example of the development of NASTT's educational initiatives. Lane says it's the quality of the people.

"I've been thoroughly impressed with the level of talent and knowledge within NASTT and the willingness to share that with so many people," he

says. "You know, with some [associations], people join the group for personal reasons for self-advancement or advancement within their company, but overwhelmingly, almost everybody I've talked to is in this for the betterment of the industry.

"They all realize the big picture. It's all about educating the public and growing the market for everybody, and let's ensure we've got good quality projects out there."

**John Schroeder  
CDM Smith**



For some, determining what path your career takes is easy once you find the right fit. But that path can also be determined when you realize what you don't want to do. That was the case for John Schroeder, who found a happy medium in consulting engineering early in his career.

Schroeder was doing a co-op at the Ohio Department of Transportation (ODOT) in the traffic engineering and road construction division, working as a surveyor. Although the work involved interesting projects, he says he didn't particularly enjoy the work schedule and being out in the field for long periods of time. He also knew he didn't want to be in a position where he would be in the office constantly. Instead, Schroeder says he took an interest in design engineering where his time could be spent seeing projects develop from design through construction.

"Once I started getting more knowledgeable about what exactly civil engineers do, especially with water, wastewater and stormwater types of projects, I guess I was kind of hooked on that," he says.

That work led him to getting a position with consultant CDM Smith (then CDM) in its Columbus, Ohio office, where he says he developed a passion

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for watching projects get built and making a difference with roads, bridges, pipes, safety and fixing infrastructure that society takes for granted.

After working for CDM for several years focusing on underground pipelines, Schroeder was asked to interview for a marketing engineering position at contractor CSR Pipelines (now Reynolds). After a short time working at CSR, where he was involved in research and development, design work on CIPP projects and bidding jobs, Schroeder realized he'd rather be back working as a consultant rather than working as a contractor. He returned to CDM Smith, where he has worked ever since, now a vice president and the firm's national practice leader for trenchless technology. His primary focus is assessing and revitalizing aging infrastructure.

"I am perplexed how our society takes for granted that they turn on the faucet and water comes out," he says. "They shower, wash clothes and flush the toilet and never think about all the work that goes into delivering, transporting and treating this water. If this system breaks down, there is complete panic and desperation and it's like living in the 18th century or a third world country. I think society appreciates us but not until they are reminded with a pipe failure or system failure, overflow or flood."

In terms of industry evolution, Schroeder says he's impressed by the technological development across the trenchless industry, and that owners and engineers must continue to try new things that will allow the innovation to result in project efficiency.

"Everything is evolving – the creativity, innovation, capitalism, necessity," he says. "Technologies are all evolving to create new products and make updating our infrastructure better, cheaper and more dependable. I think most owners look to consultants and suppliers to give them sound advice but want it to be proven. So there always has to be engineers and owners willing to be the first to try something new and then prove to others that is better than what we have done before."

Schroeder says his involvement in NASTT and the No-Dig Show have helped advance his understand of how the industry works.

"A key aspect to this industry is the collaboration between companies and people," he says. "NASTT and the No-Dig Show provides this centroid for all these people, ideas, products, contractors and engineers to solve problems. When you get a room full of intelligent, innovative suppliers, owners and engineers together, great things happen and will continue to happen and push this industry beyond our imagination."

### Chris Schuler Miller Pipeline



In 1984, Chris Schuler was looking for a summer job. Instead, he found a career.

The job was with Miller Pipeline, and Schuler started working as a laborer while he was studying economics and business at Indiana

University. "I was having a whole lot of fun there and not doing as much studying as I probably needed to," he jokes. "It quickly became a full-time career."

Initially, Schuler worked on a lot of gas main and service line replacement projects and gas main leak detection. During this time, he worked his way up from a laborer to an operator, and then to a foreman and superintendent.

In 1998 Schuler stepped into the role of superintendent over Miller's Kansas City and Indianapolis service territories until 2005 when he was promoted to project manager. Around this time, Schuler also went back to school, graduating from the University of Missouri with a B.A. in commercial economics in 2001.

In 2009 Schuler assumed his current role as general manager of the Municipal Services Division, shifting from the gas side to overseeing Miller Pipeline's water/wastewater trenchless rehabilitation operations. Throughout his time in this role, Schuler says he has seen the growth in acceptance of trenchless methods.

"I think owners have become more educated over the years," he says. "Personally, while there still is a low bid mentality, I'm seeing that some municipal markets are starting to recognize the need to have quality as well, and not just low bid."

Schuler adds that technology, and in particular the manufacturers, are vital in driving the advancement of the industry. He says people outside the trenchless market may not even realize the kind of technology that's involved.

"I think that the material providers continue to be innovative," he says. "From a tooling standpoint – cutters, cameras, liners – innovation doesn't seem to stop. I think water main rehab lags behind right now but there are a lot of really smart people in the industry and I think it will get figured out."

Schuler started attending NASTT's No-Dig Show in 2009 before there was much of a gas focus, but says it's the ability of NASTT to continue branching out and educating all the markets trenchless touches that contributes to greater industry acceptance.

"I like to say that every day, the whole [trenchless] industry is making the world a better place to live in," he says. "There are people always striving to make it better. I probably field about 75 calls a month from people calling looking for some solution. And while I may not be able to provide it, I'd like to think I can steer them to someone who can. I think there are a lot of people in our industry who are that way. That's pretty fulfilling."

Currently, Schuler is the Miller Pipeline Representative for Indiana Chapter of NUCA. He is also a member of NASTT's No-Dig Show Program Committee and vice president of Board of Directors for the Midwest Society of Trenchless Technology (MSTT).

**Andrew Farr is the associate editor of NASTT's Trenchless Today.**

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# NASTT's 2015 Membership Directory

NASTT's vision is to be the premier resource for knowledge and education in trenchless technology. We are constantly working towards this vision using our core values which include integrity, excellence, objectivity, transparency, inclusiveness and passion.

We strive to ensure that NASTT members have access to valuable industry tools. Our members receive industry news through a variety of print and digital platforms. Members also receive discounts on publications, conferences and training, along with complimentary technical papers and webinars.

Our goal for producing this directory is to provide a resource for you to connect with contractors, manufacturers, professional service providers and municipal representatives who are NASTT members. Make sure to keep it close by, as it will prove to be a great resource when planning your next trenchless project. If you are out and about, visit [nastt.org](http://nastt.org) to access real-time directory information day or night.

This directory is accurate as of July 2, so if your information has changed please contact NASTT's Membership Coordinator, Molly Margosian, at [mmargosian@nastt.org](mailto:mmargosian@nastt.org). You can also log on to [nastt.org/directory](http://nastt.org/directory) to update your information.





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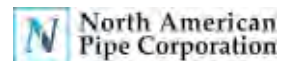
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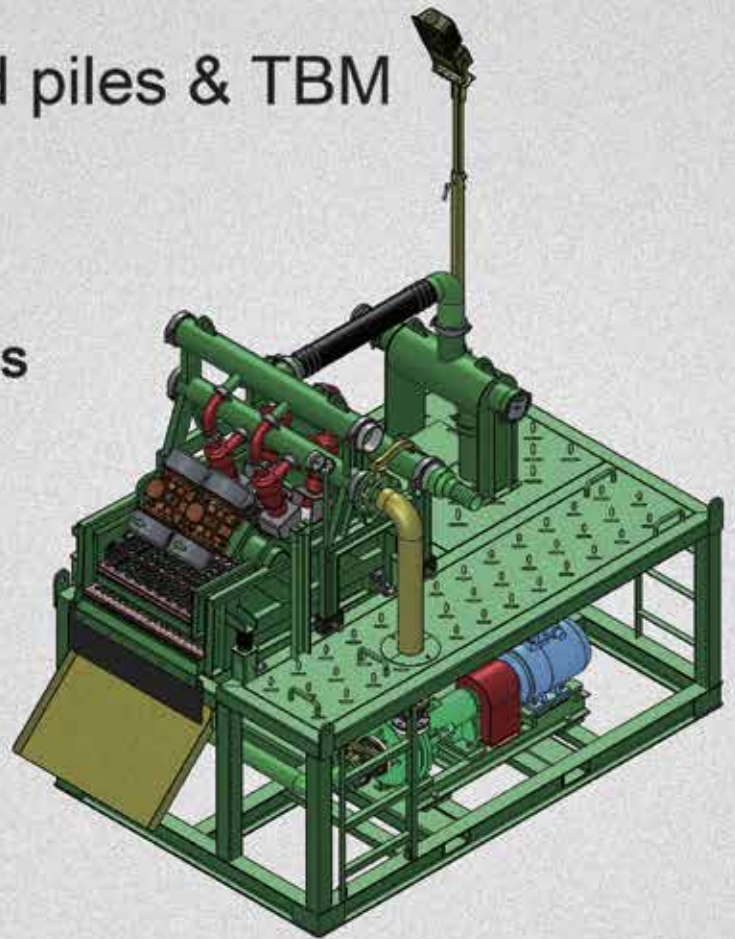
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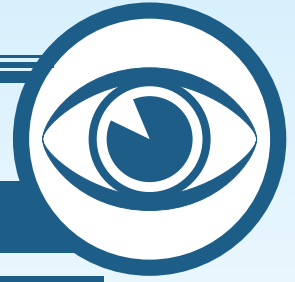
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# NASTT'S EYE ON THE INDUSTRY

## OUR MEMBERS IN ACTION

### Hobas Pipe USA

#### Kaneohe-Kailua Wastewater Conveyance Tunnel

Honolulu, Hawaii

Hobas Pipe USA is supplying CCFRPM pipe to the City and County of Honolulu for the Kaneohe-Kailua Wastewater Conveyance Tunnel project. This gravity sewer tunnel will convey wastewater flows from Kaneohe to Kailua while providing wastewater storage to help prevent overflows, especially during heavy rainfall events. More than 90 percent of the Kaneohe-to-Kailua tunnel will be deeper than 100 ft.

For the project, 16,000 ft of 120-in. and approximately 2,000 ft of 30- to 96-in. pipe is being manufactured in Houston and transported by cargo ship to Honolulu. The first shipment included 4,000 ft of the 120-in. pipe. It was loaded onto the 692-ft MV Marjorie C in Galveston, Texas, for the ships' maiden voyage. The \$200 million project is expected to be completed by June 2018.

Hobas manufactures pipe in sizes from 18 in. to 126 in. in pressure and non-pressure classes.



### ULC Robotics

#### George Street Gas Main Inspection

Edinburgh, Scotland

ULC Robotics has deployed its Cast Iron Joint Sealing Robot (CISBOT) for the first time in Scotland on iconic George Street in Edinburgh. Similar to Fifth Avenue in New York City, the visitors and high-end shop owners along George Street are not likely to notice CISBOT because the robot is virtually invisible.

In conjunction with UK gas distribution network SGN, CISBOT will carry

out advanced maintenance in more than 1,965 ft of gas pipe that delivers gas to businesses and residents in one of the city's most high profile and central locations. Unlike traditional methods of rehabilitating or replacing cast iron gas mains, ULC's CISBOT robot enters the live, large diameter cast iron gas mains through small excavation and the robot's advanced technology enables it to repair joints while minimizing disruption to the public.

By using ULC's CISBOT robotic technology on George Street, the non-intrusive work performed on live gas mains means that many businesses along the busy section of the street benefit because their gas services remain intact and online during the procedure. Furthermore, the work done with CISBOT reduces the risk for gas leaks and because there are no large-scale excavations, greenhouse gas emissions are greatly reduced.

"Gas utilities in the United States and in the UK are dedicated to making pipeline safety and reliability a paramount priority," said Gregory Penza, president, ULC Robotics. "CISBOT technology helps gas utilities, such as SGN, maintain the safety and reliability of large diameter cast iron gas mains by renewing the joints, where gas is most likely to escape."

In addition to the George Street project, ULC Robotics performs year-round operations for SGN and now has two CISBOT systems dedicated to the gas utility's field operations.



### Nix Construction; McLaughlin Boring Systems

#### South Valley Sewer District Auger Boring

Salt Lake City, Utah

The South Valley Sewer District, which provides public sanitary sewer

service in the Salt Lake City area, recently performed an auger boring project that called for approximately 2,300 ft of 18-in. SDR 35 PVC sewer pipe to be installed under a divided freeway. The PVC pipe was to be housed in 509 ft of 30-in. steel casing, which Claude H. Nix Construction (Nix Construction) was subcontracted to install.



Nix Construction planned for two bores, one in each direction under the road. The design slope for the sewer line was 0.3 percent. Auger boring is a popular method for jobs like this, where precision with the line and grade are critical. It's also a good approach when product needs to be installed under a road or railroad because there is minimal road upheaval and soil subsidence.

It turns out the Nix Construction crew hit what they described as a massive amount of rock. Once they got boring again, 6- to 8-in. chunks of cobble were coming out of the discharge on the auger boring machine. To get through it, Nix rented an On Target steering system from McLaughlin Boring Systems. With it, the steering head can be kept on the proper cutting path with hydraulic actuated flaps that open and close, allowing for lateral movement. The On Target system's active cutter head was what helped Nix Construction the most.

The cutter head fits on the lead end of the casing and is the same diameter as the pipe being installed. That allows for the ability to swallow larger stones and ingest material through the throat of the steering head, which is augered back to the bore pit. In comparison, with the pilot tube system the company typically uses, soil is displaced using thrust force on the drill string relying on material to be compacted to the sides of the head.

A positive experience with the On Target system several years before left Nix confident it'd work on this job, allowing him to kick the "expect the unexpected" maxim for that part of the bore.

## AOC

### Mexico-Tuxpan Highway Steam-Cured CIPP Puebla, Mexico

In early 2015, a culvert under the surface of the Mexico-Tuxpan Highway near Puebla, Mexico, was nearing collapse. Corrosion from frequent storms led to exposed steel and falling pieces, which posed a risk to the 10,500 vehicles that travel on the highway daily. The federal organization that oversees transportation, the Caminos y Puentes Federales de Ingresos Servicios Conexos (CAPUFE), turned to Tubepol for an immediate solution.

Tubepol, a CIPP provider based in Mexico City, designed a trenchless solution using AOC's Vipel resin to rehabilitate the pipe. Open-cut replacement wasn't an option for this project because it would disrupt traffic on the busy 310-km stretch of highway between Mexico City and the Tuxpan harbor on the Gulf of Mexico.



CIPP was ideal. The seamless pipe-within-a-pipe system relied on quality materials, including Vipel L704-AAP, an isophthalic-based resin that provides the corrosion resistance, durability and toughness required for CIPP applications.

Tubepol and AOC worked hand-in-hand on the CIPP project, the first of its kind in Mexico. "The process was not simple," says Adrian Cordero, an engineer and head representative of Tubepol. "It took us weeks to plan the perfect and fastest execution without compromising the security of the highway."

Designing the CIPP lining presented one of the primary challenges. "We needed a functional tube capable of handling ground loads and settles," says Engineer Jorge Pérez-Gavilán, Tubepol's field foreman. The design team opted for a 25mm liner.

Because of the ground's pronounced 12.4° slope, Tubepol opted to install the liner cure using compressed air and cure it with steam. Using hot water as the cur-

ing mechanism would have been nearly impossible as it would have required a large volume of water, which would have created excessive pressure on the nose of the inverting liner. Steam curing also provided an enormous time advantage: It took only three hours to cure the liner.

Tough conditions prevailed during the installation, including fog, rain and even a flood. But thanks to its excellent wet-out and cure properties, the Vipel resin behaved as expected. The liner was cured and a temperature of 212° F/100°C resulting in new pipe with improved structural and hydraulic performance. The success of this project has gained visibility for Tubepol and spread the word throughout Mexico about the benefits of no-dig rehabilitation technologies, such as CIPP.

## Akkerman Inc.

### Martha Lake Gateway Sewer and Water Improvement Project Seattle, Washington

Akkerman equipment was used on an installation of 540 lf of steel casing to house new gravity water and sewer lines under an active 10-lane interstate in Lynwood, Washington in August 2014.

The I-5/164th Martha Lake Gateway Sewer and Water Improvement project for the Alderwood Water and Wastewater District (AWWD) included the installation of 4,300 lf of open-cut 8- to 14-in. sanitary sewer; 1,900 lf of open cut 6- to 8-in. ductile iron water main along with connections; dewatering, erosion control and site restoration. TITAN Earthwork LLC of Sumner, Washington, was AWWD's general contractor on this project. Trenchless subcontractor Northwest Boring Co. Inc. of Woodinville, Wash., pipe jacked 540 lf of 66-in. steel casing under I-5 with an open-face, man-entry TBM system and 202 lf of 42-in. auger bored steel casing under 164th Street SW. Total project costs were \$5 million, which included the two trenchless runs tallying \$650,000.



Northwest Boring used an all-in-one Akkerman TBM 540, a 5000 Series Pump Unit to power the TBM and jack the casing, a 524 haul unit for muck removal, and a laser stand for guidance from its

fleet of equipment. The TBM was outfitted with an open cutter-face, dressed with bullet teeth in order to contend with the anticipated glacial geology and potential obstructions, which included wood and/or large boulders.

When Northwest Boring completed the 66-in. crossing at the end of June 2014, TITAN crews assumed the installation of the 30-in. ID water and 20-in. sewer pipeline. Northwest Boring then moved to 164th street to complete the 202-ft, 42-in. steel casing installation across six-lanes of traffic with an auger bore machine, which concluded their portion of the work.

## SAERTEX multiCom LP

### Whiteface Mountain Veterans Memorial Highway Culvert Relining Wilmington, New York

Glass-fiber reinforced UV-cure liners from SAERTEX multiCom LP were used in culvert relining on a project for the Whiteface Mountain Veterans Memorial Highway in Wilmington, N.Y. In 2014, a contract was awarded for highway restoration that involved the repair of many of the highway's historic elements and the renewal of culverts that traversed under the roadway.

Precision Industrial Maintenance Inc. (PIM) of Schenectady, N.Y., was the trenchless subcontractor hired to rehabilitate the culverts. There are 70 culverts along the eight-mile route, 52 of which required rehabilitation. The contractor elected to use the ultraviolet (UV) curing method – a first for New York DOT.



PIM specializes in the UV-cure method and it was part of the bid package submitted by the contractor Rifenburg. The UV method also worked well in the larger diameters (ranging from 21 to 36 in. in diameter) of the storm culverts along Whiteface Mountain.

The majority of the culverts were 21- and 24-in. diameter, with some 30- and 36-in. runs as well. The typical lengths of installations were 60 to 120 ft in length. PIM began its relining work in June 2014 and was finished in August, working five days per week.



# NASTT CHAPTER NEWS

## British Columbia



Trenchless technologies are still strong as ever in beautiful British Columbia. Our chapter has been continuing its efforts to advance the science and practice of trenchless technology for the public benefit.

This year, the BC Chapter is focusing its efforts on the much anticipated Trenchless Technology Road Show which is coming to British Columbia, Nov. 17-19, 2015. This Road Show is a result of a joint collaboration between the Centre for Advancement of Trenchless Technologies (CATT), Benjamin Media Inc. and NASTT-BC. It will consist of one day of courses (attendees can choose from Trenchless Technologies 101, Advances in Water and Wastewater Infrastructure Asset Management, or Culvert Assessment & Rehabilitation) followed by two days of technical presentations on topics ranging from inspection tools and SUE to tunneling and microtunneling. The Road Show will also include an exhibition hall filled with the latest and greatest from the trenchless technology world, offering great networking opportunities with industry peers. You can find more info at [trenchlessroadshow.ca](http://trenchlessroadshow.ca).

## Great Lakes, St. Lawrence & Atlantic



The GLSLA board of directors and member volunteers are continuing to work to provide value to our members through training, publications and our website. We have a number of activities currently ongoing. In coordination with NASTT, GLSLA will be hosting a two-day trenchless conference and training session Oct. 15-16 at the

Hilton Niagara Falls.

The conference will feature a day of trenchless presentations in four tracks including water main rehabilitation, sewer rehabilitation, condition assessment and new installation. The first day will also include an exhibit hall and networking opportunities. The second day will feature NASTT's CIPP Good Practices Course and Lateral Good Practices Course. For more information on registration, booth space or sponsorship, please visit our website, [glsla.ca/education-training](http://glsla.ca/education-training).

GLSLA's annual magazine is scheduled for release in October 2015. Advertising space is available, so please visit our website for information if you are interested in placing a company advertisement in the magazine. We are also looking for interesting project articles, so if you have been involved in a trenchless project, please consider writing an article about your project so others can benefit from your experience.

GLSLA will once again be promoting trenchless technology at the ACWWA to be held Oct. 5-7 in St. John's, Newfoundland. The conference will provide an opportunity to learn about and discuss water and wastewater industry issues with peers in both a technical and social atmosphere.

For more information on GLSLA, our events, and our training sessions, please visit our website at [glsla.ca](http://glsla.ca).

## Mid Atlantic



The Mid Atlantic Society (MASTT) hosted a very successful "Trenchless Technology, SSES and Buried Asset Management" seminar in Mt. Laurel, N.J. on June 24-25 at The Hotel ML at CoCo Key Water Resort. The guest presenter was Jeff

Twardzik, engineering supervisor for the Philadelphia Water Department (Water & Sewer) with his presentation, "Philadelphia's Trenchless Program." Thank you, Mr. Twardzik, for presenting and participating for the entire two-day seminar.

MASTT is planning a "Trenchless Technology, SSES and Buried Asset Management" seminar in Virginia Beach, Va., on Oct. 21-22. Please plan to support and attend the seminars to enjoy the networking and learning.

Please go to [mastt.org](http://mastt.org) to view MASTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, MASTT Executive Director, at [leonard@engconco.com](mailto:leonard@engconco.com) for more information.

MASTT published its inaugural annual issue of the *Mid Atlantic Journal of Trenchless Technology 2015* in June. The journal had numerous excellent Mid Atlantic project articles, messages and advertisements. Thanks to everyone who participated with support of the journal. The journal will be available online at [mastt.org](http://mastt.org).

## Midwest



The Midwest Chapter (MSTT) plans to have a "Trenchless Technology, SSES and Buried Asset Management" seminar in Indianapolis, Sept. 16-17. There will be networking and learning opportunities at the seminar, so please plan to support and attend the seminar if possible.

MSTT is currently organizing the third issue of the annual *Midwest Journal of Trenchless Technology* to be published and distributed in Sep-



tember 2015. The journal will have numerous Midwest project articles, messages and advertisements. After the mail out, the journal will be available online at [mstt.org](http://mstt.org). To participate in the magazine, please call Andrew Pattison at (204)-275-6946.

Please go to [mstt.org](http://mstt.org) to view MSTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, MSTT Executive Director, at [leonard@engconco.com](mailto:leonard@engconco.com) for more information.

## Pacific Northwest



Please visit the website, [pnwnastt.org](http://pnwnastt.org), for updates and current information about the Pacific Northwest Chapter of NASTT. A primary goal for the PNW Chapter in 2015 is additional training opportunities throughout the Pacific Northwest, and the PNW Chapter is in the process of scheduling lunch and learns in 2016.

## Northwest



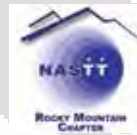
Hello from the Northwest Chapter! Technical lunches continued in February and March in both Edmonton and Calgary with good attendance. The Edmonton Branch then held a joint dinner presentation with the Canadian Society of Civil Engineers (CSCE) in April, which was a successful event. Calgary hosted a summertime technical lunch in June. We plan to take a break over the summer with technical lunches scheduled to continue again in September.

As a reminder, we will be hosting our 19th annual Northwest Trenchless Conference this year. This year's conference is being held in at the Coast Plaza Hotel in Calgary on Nov. 18-19. New Installation and Rehabilitation NASTT Short Courses will be held on Nov. 18 with the symposium and tradeshow on No. 19. This year,

a total of \$5,000 in municipal scholarships to attend the conference will be available. Please check our website at [www.nastt-nw.com](http://www.nastt-nw.com) for further information on this event and application for the scholarships.

We look forward to seeing as many as possible at our upcoming fall events and thank you to everyone for your continued support!

## Rocky Mountain



The Rocky Mountain Chapter of NASTT (RMNASTT) was pleased to sponsor a lateral lining field demonstration event in conjunction with the City of Boulder, Colo., on April 24. The event featured a classroom educational session that provided an overview of the lateral rehabilitation technologies available, followed by a field demonstration. Attendees learned about some of the latest developments in trenchless rehabilitation methods used to eliminate infiltration, root problems and correct deficiencies commonly found at sewer main lateral connections. The field portion of the lateral lining demonstration was sponsored by the RMNASTT, LMK Technologies, C&L Water Solutions and the City of Boulder.

Looking ahead, the RMNASTT Chapter is busy preparing for its annual regional conference at the Inverness Hotel and Convention Center located in the Denver Tech Center (south Denver), scheduled for Nov. 4-5. The conference will feature a full day of regional trenchless paper presentations, an exhibit hall and networking opportunities on Nov. 4. Exhibitor and sponsorship opportunities are available! Thursday, Nov. 5 will include a NASTT promulgated Short Course. The conference dates will also coincide with the yearly release of the *Rocky Mountain Trenchless Journal*, which will complement the conference content as well as showcase local trenchless technology organizations and service providers.

For more information about RMNASTT, upcoming events, exhibitor/

sponsorship opportunities and how to get involved, please visit [rmnastt.org](http://rmnastt.org), or contact Bo Botteicher at [bbotteicher@ugsi.us](mailto:bbotteicher@ugsi.us).

## Southeast



The Southeast Chapter (SESTT) plans to conduct a "Trenchless Technology, SSES and Buried Asset Management" seminar in Shreveport, La., on Dec. 2-3. Please plan to attend and support these seminars if possible.

Please go to [sestt.org](http://sestt.org) to view SESTT's 2015 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any of the seminars, please contact Leonard Ingram, SESTT Executive Director at [leonard@engconco.com](mailto:leonard@engconco.com) for more information.

In December 2015, SESTT plans to publish and distribute the annual issue of the *Southeast Journal of Trenchless Technology*. This will be the second issue and the Journal will have numerous Southeast project articles, messages and advertisements. After the mail out, the journal will be available online at [sestt.org](http://sestt.org).

## South Central



Help shape the future of trenchless in Texas and the South Central United States! NASTT is excited to announce the newly created South Central Regional Chapter. If you would like to get involved and volunteer to lead the charge in this new region, contact us at [info@nastt.org](mailto:info@nastt.org).

## Western



The Western Chapter of NASTT promotes the NASTT mission within the western region of Arizona, California, Hawaii, Nevada and New Mexico. More information on the chapter and upcoming events can be found on the website at [westt.org](http://westt.org).

# NASTT REGIONAL CHAPTERS

# N

ASTT has a network of 10 regional chapters throughout the United States and Canada. With a single NASTT membership, you're automatically enrolled in the national organization, the international organization (ISTT) and also in your regional chapter. Regional chapters offer valuable educational and networking opportunities in your local area. Share your ideas, network with colleagues and find solutions to your everyday challenges.



## British Columbia

The British Columbia (NASTT-BC) Chapter was established in 2005 by members in the province of British Columbia, Canada.

### Chapter Contact

Kieran Field, Chair  
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Website: [nastt-bc.org](http://nastt-bc.org)

### Elected Officers

Chair - Kieran Field  
Vice Chair - Rod Loewen  
Secretary - vacant  
Treasurer - Preston Creelman



## Pacific Northwest

The Pacific Northwest Chapter was established in 2009 by members in the states of Alaska, Idaho, Oregon and Washington.

### Chapter Contact

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Phone: (507) 567-2261 x155  
E-mail: [csivesind@akkerman.com](mailto:csivesind@akkerman.com)  
Website: [pnwnastt.org](http://pnwnastt.org)

### Elected Officers

Chair - Chris Sivesind  
Vice Chair - Brendan O'Sullivan  
Secretary - Brandon Simonds  
Treasurer - Matt Pease



## Great Lakes, St. Lawrence & Atlantic

The Great Lakes, St. Lawrence & Atlantic (GLSLA) Chapter was established in 1995 and represents the Eastern Canadian perspective of the trenchless technology marketplace. GLSLA members are from Ontario, Quebec and the four Atlantic provinces.

### Chapter Contact

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Website: [nasttglsl.on.ca](http://nasttglsl.on.ca)

### Elected Officers

Chair - Kevin Bainbridge  
Vice Chair - Anna Polito  
Secretary - Gerald Bauer  
Treasurer - Derek Potvin



## Rocky Mountain

The Rocky Mountain Chapter was established in 2009 by members in the states of Colorado, Utah and Wyoming.

### Chapter Contact

Bo Botteicher, Chair  
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Website: [rmnastt.org](http://rmnastt.org)

### Elected Officers

Chair - Bo Botteicher  
Vice Chair - Ken Matthews  
Secretary - Chris Larson  
Treasurer - Joe Lane



## Mid Atlantic

The Mid Atlantic (MASTT) Chapter was established in 2004 by members from the states of Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia and the District of Columbia.

### Chapter Contact

Richard Thomasson, Chair  
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Website: [mastt.org](http://mastt.org)

### Elected Officers

Chair - Richard Thomasson  
Vice Chair - Michael Delzinger  
Secretary - Dennis Walsh  
Treasurer - Tom Wyatt



## South Central

The South Central Chapter was established in 2015 to serve the members of NASTT from Texas and the south central area of the United States.

### Chapter Contact

Molly Margosian  
Phone: 216-570-8711  
E-mail: [mmargosian@nastt.org](mailto:mmargosian@nastt.org)

### Elected Officers

If you are interested in becoming an officer, contact Molly Margosian at [mmargosian@nastt.org](mailto:mmargosian@nastt.org)



## Midwest

The Midwest (MSTT) Chapter was established in 1998 to promote trenchless technology education and development for public benefit in Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin.

### Chapter Contact

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Website: [mstt.org](http://mstt.org)

### Elected Officers

Chair - Jeff Boschert  
Vice Chair - Larry Kiest, Jr.  
Secretary - Randy Fries  
Treasurer - Bill Shook



## Southeast

The Southeast (SESTT) Chapter was established in 2001 to serve the members of NASTT from Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico.

### Chapter Contact

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Website: [sestt.org](http://sestt.org)

### Elected Officers

Chair - Jerry Trevino  
Vice Chair - Ed Paradis  
Secretary - J. Chris Ford  
Treasurer - Kelly Derr



## Northwest

The Northwest Chapter was established in 1988 by members in the Canadian provinces of Alberta and British Columbia, Canada, and in Washington state. In 2009, the Chapter adjusted the geographic area to include the members in the provinces of Manitoba and Saskatchewan, Canada.

### Chapter Contact

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Website: [nastt-nw.com](http://nastt-nw.com)

### Elected Officers

Chair - Alan Miller  
Vice Chair - vacant  
Secretary - Ben Campbell  
Treasurer - Keith Moggach



## Western

The Western (WESTT) Chapter was established in 2003 by members from the states of Arizona, California, New Mexico, Nevada and Hawaii.

### Chapter Contact

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Website: [westt.org](http://westt.org)

### Elected Officers

Chair - Craig Camp  
Vice Chair - Cindy Preuss  
Secretary - Cory Street  
Treasurer - Matt Wallin



# NASTT'S 2016 NO-DIG SHOW MUNICIPAL & PUBLIC UTILITY SCHOLARSHIP PROGRAM

NASTT's 2016 No-Dig Show Municipal & Public Utility Scholarship Award has been established to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to restricted budgets.

Selected applicants will be awarded complimentary **full conference registration** to NASTT's 2016 No-Dig Show in Dallas, Texas, March 20-24. One day conference registrations will also be available. Registration includes full access to all exhibits and technical paper sessions... all you have to do is get yourself to the conference! Selected applicants will also be eligible to receive overnight accommodations. Selection based on responses to the application as well as need.

Apply today!  
Application deadline is **October 30, 2015**.



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**N**ASTT Student chapters are involved in a number of activities throughout the academic year including field trips, seminars and fundraisers. Members of student chapters also attend and participate in NASTT's No-Dig Show where they present trenchless research posters, participate in competitions and provide event support monitoring the technical paper sessions. There are many benefits for students who belong to a NASTT student chapter – scholarships, networking opportunities, education and career opportunities to name a few. To learn more about NASTT's student chapters, visit [www.nastt.org/student\\_chapters](http://www.nastt.org/student_chapters).



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# Microtunneling Overcomes Design and Construction Challenges to Accomplish Three Notable Firsts

Marc Gelinas

Hatch Mott MacDonald, Burlington, Ontario

Shu He

Regional Municipality of York, Newmarket, Ontario

John Grennan

Ward and Burke Microtunneling, Mississauga, Ontario

Armenio Martins

McNally Construction Inc., Hamilton, Ontario

The community of Keswick lies on the shore of Lake Simcoe and is a rapidly growing part of the Town of Georgina on the outskirts of the Greater Toronto Area (GTA) in Ontario, Canada. Keswick was once a rural community, but is now a bustling commuter hub due to growth in the GTA and an extension of the 404 Highway.

The Regional Municipality of York (York Region) has been expanding the existing Keswick Water Pollution Control Plant (WPCP) to meet the demands of the growing community. The Keswick WPCP effluent outfall expansion project (referred to hereafter as the 'outfall expansion' or 'project') was initiated as part of the overall WPCP expansion effort. The outfall expansion involved the twinning of the existing effluent outfall, providing sufficient capacity to accommodate flows from the current and future WPCP expansions, while also providing greater operational flexibility and improving access for future maintenance and inspection.

The outfall expansion consists of approximately 5,900 ft (1,800 metres) of new, 30 in. (750mm) to 48 in. (1,200mm) pipeline, including a new telescoping diffuser array at the in-lake terminus. As detailed in Figure 1, the alignment for the effluent outfall starts from the discharge of the UV chamber at the Keswick WPCP and extends approximately 2,950 ft (900 metres) offshore in the Cook's Bay area of Lake Simcoe. Along its 2,950-ft (900 metre) onshore alignment, the effluent outfall traverses regulated wetlands, arterial roadways containing both ambulance and fire stations, a busy "five corner" intersection containing numerous existing utilities, a quiet residential subdivision with mature trees and narrow roadways, a City park and a regulated shoreline/floodplain. Once offshore, Lake Simcoe is subject to stringent environmental regulations intended to maintain the lake as a valuable ecological and recreational resource.



Figure 1 – Keswick WPCP Effluent Outfall Expansion Project Alignment.

The project was completed using a combination of three construction methods. Open-cut trenching was used within and adjacent to the WPCP property. Along the public right-of-way and for the onshore to offshore transition, microtunneling was used. Once offshore, marine dredging was the selected construction method. While all of these construction methods had unique benefits and challenges, this paper will focus solely on the portions of the project completed by microtunneling.

## DESIGN CHALLENGES

Hatch Mott MacDonald (HMM) was retained by York Region to undertake detailed design, contract administration and site inspection services for the outfall expansion project. During the preliminary design phase, HMM identified several project challenges, including poor subsurface conditions, existing utilities, the need to maintain the effluent outfall alignment within the existing right-of-way, maintaining traffic flows, environmental concerns, and potential for construction related damage.

In order to address these and other identified project challenges, HMM evaluated several alignment alternatives and construction methods with regards to cost, schedule, community, and environmental impacts. Evaluated construction methods included open-cut trenching with continuous solid-sheet shoring, horizontal directional drilling and microtunneling. Of these methods, microtunneling was considered to provide the lowest risk for schedule, community and environmental impacts.

Microtunneling was subsequently recommended as the primary onshore construction method despite having the highest anticipated construction costs. This recommendation was significant as until that point, the history of microtunneling in Ontario had been limited to approximately only 10 projects. Most of those projects had occurred in the 1990s and had met with limited success.

In the following sections, several of the key project challenges will be discussed, and details regarding how they were addressed in the design will be provided.

## Subsurface Conditions

Geotechnical conditions along the effluent outfall alignment consist of very soft/very loose (i.e., SPT N = 0), highly sensitive silts, clays and sands, along with local areas of glacial tills with cobbles and boulders. The groundwater table is at or near the ground surface along the entire alignment. The combination of very soft/very loose soils and a high groundwater table indicated that unstable (i.e., flowing) ground behavior would be predominant.

In general, microtunneling is ideally suited to installations below the groundwater table and in flowing ground. However, the presence of very soft/very loose soils was considered problematic for microtunnel stability due to the risk of machine sinking and/or inability to make steering corrections. Initial calculations revealed that depending on the make and configuration of microtunnel boring machine (MTBM) selected by the contractor, settlement and ability to steer could be significant risks.

These risks were mitigated by requiring the contractor to

configure the MTBM to its lightest configuration and to install a minimum length of trailing cans to aid in the distribution of MTBM weight. Provisional measures for intermittent ground improvement (jet grouting) and for emergency retrieval/intervention excavations were also included in the contract to provide an additional safeguard.

### Existing Utilities

The main trunk sanitary sewer serving the community of Keswick and the Town of Georgina crossed the project alignment within one of the area's busiest intersections. Of particular concern was the fact that review of record drawings indicated that the trunk sanitary sewer had been constructed using solid-sheet shoring that extended over 36 ft (11 metres) below grade and had been abandoned in place. The presence of these sheet piles posed a significant obstacle to construction, and their location within the intersection meant that excavation and removal of the sheets or locating a shaft at the crossing location would not be desirable. Only one crossing location could be identified where abandoned shoring was not present. At that location, the new outfall needed to cross underneath the existing sewer with a vertical separation of less than 18 inches (0.45 metres) to maintain hydraulics.

For the trunk sewer undercrossing, the limits of existing sheet pile shoring (including the absence of sheet piles at the crossing location) was verified during the design phase by geophysical surveys as well as by direct probing using horizontal directional drilling. The risk of settlement and/or disruption of the trunk sewer was mitigated by a combination of measures, including requirements for:

1. Advance jet-grout support of the trunk sewer;
2. Bypass pumping of flows in the sewer during jet grouting and tunneling operations;
3. Monitoring of the sewer via tell-tales mounted on the sewer crown;
4. Having a cured-in-place liner stocked and available for installation should damage occur; and
5. Requiring pre- and post-construction CCTV inspections of the sewer.

### Staying Inside the Right of Way

The outfall expansion project was pre-approved under an existing environmental assessment completed for the WPCP. However, in order to maintain this pre-approved status, no additional property could be obtained. This meant that the new effluent outfall would need to remain entirely within the existing public right-of-way.

This requirement was particularly constraining around the middle portion of the onshore alignment, where a prominent 'kink' can be seen in the alignment. The 'kink' was required in order to 1) avoid the existing steel sheet piles described in Section 3.2 above, and 2) to maintain the alignment within the right-of-way, as illustrated in Figure 2. Because the new outfall is below the lake level at this point in the alignment and is therefore always submerged, the incorporation of such a severe (less than 90 degree) bend at Manhole 6B could be accommodated without significant impacts to hydraulic performance. Between Manholes 6B and 7B, the plan separation between the springline of the new outfall pipeline and the property line was approximately 20 in. (0.5 metres).

Early on in the design process, it was determined that there was very little appetite from any of the project stakeholders for construction operations that would lead to detours or significant impacts to traffic. The community of Keswick had just undergone several significant road works projects, which left residents with very little patience for construction.

To reduce the impacts of microtunnel construction, shaft

sites were strategically chosen where they would have the lowest impact on traffic. As a result, Keswick's "5 Corner" intersection was able to remain open in all directions throughout construction. Most importantly, the operations of fire and ambulance stations along the alignment were not impacted during construction.



Figure 2 – Project alignment near manholes 6B and 7B. Traffic Management

### Environmental Concerns

Completing the transition between the onshore and offshore portions of the outfall was identified as a significant challenge. Traditionally, such transitions are completed by constructing a cofferdam, resulting in significant impacts to sensitive near shore aquatic environments. Permitting of works that would result in disturbance to the natural shoreline of Lake Simcoe were known to be very difficult to obtain, and were thought to likely contain onerous conditions of approval.

In order to minimize impacts to the near shore environment and to assist in obtaining regulatory approval, the transition between the onshore and offshore portions of the outfall was designed for completion by microtunneling. The design called for the MTBM to be launched from an onshore shaft, and received underwater, in a dredged trench approximately 360 ft (110 metres) offshore.

### Construction-Related Damage

The project alignment traversed a quiet, residential neighborhood with narrow roadways and numerous mature trees. The identified unstable ground conditions would result in significant risk for third-party damage claims during construction. Many homes were of older construction, and considered highly susceptible to damage. The use of minimally-invasive microtunneling and the specification of sealed (water-tight) shaft construction provided a significant risk reduction in this regard as compared to traditional open-cut trenching with solid-sheet shoring and dewatering.

Additionally, because the product pipe is directly jacked in place using microtunneling, and because microtunneling utilizes slurry pressure to counterbalance earth and groundwater pressures, the risk of inadvertent over-excavation and associated settlements was reduced as compared to other, more invasive and/or non-pressure balancing tunneling and trenchless methods.

In order to monitor the performance of the microtunnel, the specifications required a series of both in-ground and surface monitoring points to be established and monitored along the alignment. In-ground points were located near shaft portals, while surface points were arranged along the length of the alignment in arrays of three: one point on the centerline of the tunnel, and one point laterally offset to each side of the centerline.

**CONSTRUCTION CHALLENGES**

Due to the design challenges outlined above, obtaining an experienced, technically competent contracting team to complete construction of the project was of prime importance. As a result, York Region completed a prequalification process, in which contracting teams consisting of a general contractor, a microtunnel subcontractor and a marine subcontractor were evaluated on a number of criteria including financial strength and stability, safety, corporate experience and proposed project staff experience. Of the nine teams that submitted qualifications, only three teams met the prequalification criteria and were qualified to submit bids.

The project was awarded to McNally Construction Inc. (McNally) who acted as both the general contractor and marine subcontractor. Ward and Burke Microtunneling (Ward and Burke) was the microtunneling subcontractor. Construction of the \$21 million (\$CDN) project commenced in December 2012.

**Elimination of Shafts and Incorporation of Curves**

The initial design of the onshore portion of the outfall provided for a 30 in. (750mm) diameter outfall pipeline, mirroring the design of the existing effluent outfall. In order to limit drive lengths and thereby maintain jacking forces below the allowable capacity of the reinforced concrete jacking pipe, the initial design called for six tunnel shafts. The tunnel drives between all of the shafts were designed as straight drives.

Following award, the contractor proposed to eliminate two of the six shafts from the design. However, in order to accommodate this change, the diameter of the outfall had to be upsized from 30 in. (750 mm) to 48 in. (1,200 mm), as Ward and Burke wanted to utilize a Herrenknecht AVN 1200 MTBM. Four key reasons Ward and Burke cited for wanting to increase the pipe diameter/use a larger MTBM were:

1. The increased performance characteristics of the larger diameter MTBM which made it more appropriate for the longer-distance drives resulting from elimination of the shafts;
2. The increased ease of access inside the tunnel for items such as emergency maintenance and installation and removal of intermediate jacking stations;
3. The availability of 48-in. reinforced concrete jacking pipe from local suppliers; and
4. The increased ability of the MTBM to break down granite cobbles and boulders that are prevalent in the area.

From the designer’s viewpoint, the use of a larger diameter machine was also advantageous as the larger (48 in.) MTBM was more neutrally buoyant than the smaller (30 in.) MTBM, and therefore was thought to reduce the risk of MTBM settlement/inability to steer.



Figure 3 – Project Tunnel Drives.

In eliminating two of the six shafts from the design, the number of tunnel drives was reduced from six to four, as shown in Figure 3. However, two of the four resulting drives would need to be curved. For the first curved drive (between MH7B and MH8B), the required curve would be a plan curve only. For the second curved drive (between MH6B and MH4B), the required curve would be a simultaneous plan and profile curve, or “spatial” curve. Details for both curved drives are provided in Figure 3.

In both cases, the incorporations of curves into the drives would result in notable first achievements. The plan curve drive was the first curved microtunneling drive completed in Canada. The spatial curve drive was the first spatial curve drive completed in North America. The Design and Contractor teams, along with York Region, worked together to evaluate the technical risks and benefits of these changes. Key factors that were taken into account when evaluating the changes included:

- The radius of the curves being proposed and the ability of the MTBM to complete such curves given the poor ground conditions;
- The radius of the curves being proposed and their effects on pipe loading and joint integrity, as well as;
- The experience of the microtunneling subcontractor, Ward and Burke.

As regards experience, Ward and Burke had completed curved drives in the past for European installations, and owned the specialized guidance equipment necessary for long distance curved drives (VMT SLS LT system). In addition, Ward and Burke’s proposed MTBM operators and survey specialist all had curved drive experience.

In order to mitigate this concern, it was agreed to complete the plan curve drive first. On successful completion of the plan curve drive, it was considered that Ward and Burke had sufficiently demonstrated their ability to jack curves in the project ground conditions and approval was given to proceed to the spatial curve drive.

Once it was decided to adopt the changes, the Owner, Designer and Contractor teams further collaborated to make the modifications necessary to implement them. Key among those changes were modifications to several existing permits and approvals. Adopting the changes resulted in over \$1 million in cost savings. This cost savings was shared equally between York Region and the contractor team.

**Shaft Design and MTBM Cutter Configuration**

To overcome the construction challenges associated with constructing launch and reception microtunneling shafts in close proximity to exiting utilities and structures, Ward and Burke elected to use cast in place concrete caisson shafts using their proprietary formwork. A circular wall of concrete, 8-ft high, was first cast at ground level. A steel cutting shoe was cast into the base of this wall to cut the ground cleanly as the shaft advanced. The caisson was sunk by excavation through the use of a hydraulic clam shell on an excavator. The shaft walls were extended as the shaft progressed into the ground until the required subgrade level was obtained.

Finally, a tremie base plug was cast developing a sealed shaft for microtunnel construction and thereby meeting the contract specifications. Using this shaft system, a non-reinforced soft concrete section (eye) was cast into the shaft walls at all MTBM launch and retrieval locations. The technique allowed the MTBM to core through the walls as it exited and entered each shaft location and therefore, never exposed the personnel or equipment inside the shaft to the potentially flowing external ground conditions. Through the use of the concrete soft eye



and low disturbance shaft system, no damage to nearby services or structures occurred and the MTBM successfully launched and received into each shaft on line and grade without the requirement for external dewatering or ground improvement.

During the construction of the reception shaft for the spatial curve drive, the ground conditions changed from extremely soft silts and clays to coarse ground conditions containing gravel, cobbles, and boulders. On evaluation of these ground conditions on site it became apparent that the soft ground cutting head configuration required on all other microtunnel sections would have difficulty dealing with this type of material. As a result of these conditions, there would be a transition from soft clay and silt into coarse gravels, cobbles, and boulders on the spatial curved drive.

The contractor proposed to use a mixed ground cutting wheel to overcome the ground conditions anticipated near the end of the tunnel. However, the mixed ground cutting head was heavier than the soft ground cutting head used in previous sections on the project and it posed a risk of the MTBM sinking in the softer material at the start of the tunnel. After review of the shaft records at the launch location and a risk mitigation exercise by all parties involved in the project, it was agreed that the cutting head would change to a mixed ground type for the spatial curved drive only.

As a result of the collaborative efforts between parties and monitoring of ground conditions as the project progressed, both of the curved microtunnel drives were completed successfully, and within specified line and grade tolerances (+/- 2in/50mm for line and +/- 1in/25mm for grade).

### Underwater Reception

As detailed earlier, the transition between the onshore and offshore portions of the outfall was designed for completion by microtunneling. The design called for the MTBM to be launched from an onshore shaft, and received underwater, in a dredged trench approximately 360 ft (110 metres) offshore.

The method by which the MTBM was removed was left largely to the contractor. However, the Contractor was required to prepare a detailed work plan for the underwater reception, for review by the design team.



Figure 4 – MTBM being retrieved from the dredged trench.

For the offshore drive, Ward and Burke elected to remove the hydraulic power pack from the MTBM, supplying power solely from the shore. Following completion of the offshore drive, Ward and Burke crews removed all of the supply lines and plugged all of the lubrication ports. McNally construction then installed an engineered mechanical bulkhead inside the pipe, just inside the offshore launch shaft. The bulkhead had ports fitted into it, which allowed the length of installed pipe to be flooded and drained as needed.

With the bulkhead in place, McNally Construction crews excavated down to the MTBM, using both a hydraulic excavator and a suction dredge. Once the MTBM was exposed in the trench, the pipe was flooded through the mechanical bulkhead at the offshore launch shaft, equalizing pressure to the lake. With pressure equalized, the MTBM was safely removed by divers, with the assistance of the main dredge crane as shown in Figure 4.

### LESSONS LEARNED

The project has proven to be a tremendous success. The project was completed on time, and within budget. Additionally, there were no third-party claims for microtunnel construction-related damages.

The project demonstrates how the use of innovative technologies such as microtunneling can significantly reduce the impact of construction. The project also demonstrates how a collaborative effort between the Owner, Designer and Contractor team can lead to ground-breaking advances.

Lessons learned on this project include, but are certainly not limited to the following:

- Be open to change, and encourage collaboration in reviewing and implementing change. In the case of the Keswick Outfall, the decision to incorporate curved drives, most notably the spatial curve, was one that was made collaboratively. Open communication was maintained between the Owner, Design and Contractor teams, both during the review of the change, the modifications to contract documents and permits, and execution of the change.
- Maintain some specification flexibility for unique or high-risk elements of the design. This was most relevant as regards the underwater reception. The Design team had a firm understanding of what would need to be done to complete the underwater reception, however, because none of these had been done in Canada (and only a limited number in North America) a decision was made to not be overly-prescriptive in its specification. Critical elements were specified, but other elements were left to the Contractor's discretion.
- A good Contractor can make all the difference. For projects with challenging or unique requirements, prequalification can be a useful tool to assist the Owner in ensuring only financially stable and technically competent contractors are bidding on the work. In the case of the Keswick Outfall, the experience and technical capabilities of the McNally Construction and Ward and Burke Microtunneling teams was invaluable.

This paper was edited for style and space for publication in *NASTT's Trenchless Today*. To view the full version of Paper MM-T5-05, please visit [nastt.org/technicalpapers](http://nastt.org/technicalpapers).



# CALENDAR

## September

1  
**NASTT Forum: Trenchless Trends – A Growing Industry**

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2:00-3:30 PM  
Phoenix, Arizona

23  
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28-30  
**International No-Dig 2015**  
Istanbul Conference and Exhibition  
Hosted by ISTT & TSITT  
Istanbul, Turkey

30  
**NASTT's Pipe Bursting Short Course**

In conjunction with ICUEE  
9:00-11:00 AM  
Louisville, Kentucky

## October

15  
**GLSLA Trenchless Conference**

8:00 AM-5:00 PM  
Niagara Falls, Ontario

16  
**NASTT's Laterals Good Practices Course**

Hosted by NASTT's GLSLA Chapter  
8:00 AM-5:00 PM  
Niagara Falls, Ontario

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**NASTT's CIPP Good Practices Course**

Hosted by NASTT's GLSLA Chapter  
8:00 AM-5:00 PM  
Niagara Falls, Ontario

26  
**11th Annual Western Regional No-Dig Conference & Exhibition**

8:00 AM-5:00 PM  
San Diego, California

27  
**NASTT's CIPP Good Practices Course**

Hosted by NASTT's WESTT Chapter  
8:00 AM-5:00 PM  
San Diego, California

## November

4  
**Rocky Mountain Chapter 5th Annual Regional No-Dig Conference**

8:00 AM-5:00 PM  
Denver, Colorado

5  
**NASTT's Introduction to New Installation and Rehabilitation Good Practices Course**

Hosted by NASTT's Rocky Mountain Chapter  
8:00 AM-5:00 PM  
Denver, Colorado

10  
**NASTT's Complimentary Pipe Ramming Webinar**

2:00-3:30 PM  
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18  
**NASTT's Introduction to New Installation and Rehabilitation Good Practices Course**

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7:30 AM-4:30 PM  
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19  
**Northwest Trenchless Conference**

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