NASTT's
TrenchlessToday
Educate - Train - Research - Publish

Summer 2014 | Volume 4 | Issue No. 2

A Magical Milestone

Conference Organizers' Sorcery Helps NASTT's 2014 No-Dig Show Rank Among the Best Ever

THE OFFICIAL MAGAZINE OF THE NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY

www.nastt.org www.nodigshow.com

Any geometry – along any axis – in any environment. **PipeArmor**

Stop Leakage, Corrosion of Aged Pipe Systems and Restore Design Life

Stop losses from any diameter drinking, irrigation or raw water pipeline system without excavation: PipeArmor™ structural rehabilitative linings are unmatched in lifespan, economic advantage, installation flexibility and environmental impact.

Installation Benefits

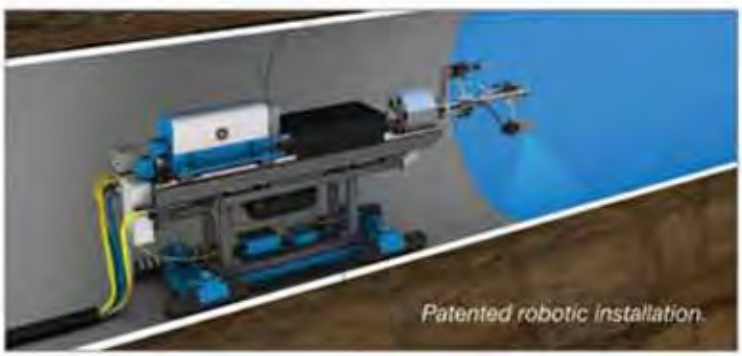
- Umbilical controlled
- 4" to >174" diameters
- Any directional axis
- Bend radius up to 90°
- Self-contained rigs
- Any topography
- Man way to man way lining process
- Turnover to service in as little as one hour

PipeArmor Attributes

- Structural liner
- Seal over perforations and cracks
- Arrest further wall corrosion
- Contains high pressure/ supports external loading
- Entirely monolithic
- Autocatalytic
- CLTE in sync with pipe
- 75-year design life
- 15 year material warranty

Small diameter.

Large diameter.



Patented robotic installation.

Quest inspar

Pipeline Life Extension Specialists

QuestInspar.com

Water Supply • Power • Energy • Mining • More

SUMMER 2014 | VOLUME 4 | ISSUE NO. 2

NASTT's Trenchless Today
Educate - Train - Research - Publish

SUMMER 2014 EDITION

FEATURES

DEPARTMENTS

COLUMNS

EXECUTIVE DIRECTOR MESSAGE

No-Dig Shines in the SUNSHINE STATE

Michael Willmets - NASTT Executive Director

It's been a wonderful year for NASTT and the trenchless industry so far in 2014. We have experienced many successes with the highlight being NASTT's 2014 No-Dig Show in Orlando, Fla. The Gaylord Palms was a beautiful setting that allowed attendees to navigate easily between the hotel and the many educational and networking events of the week, held in the adjoining convention center. We experienced record-breaking attendance, with more than 1,800 enthusiastic professionals taking part in North America's largest trenchless conference.

One of the most popular networking events at NASTT's No-Dig Show is the Gala Awards Dinner. The Gala features fabulous food and excellent entertainment, but the most important part is the opportunity we are given to recognize the trenchless champions within our organization.

Growing the trenchless industry and preparing for the future is a key goal of NASTT. With the Trent Ralston Award for Young Trenchless Achievement, we are given the opportunity to recognize up and coming leaders of the industry. This year, two fine young professionals were chosen who truly embody the spirit of NASTT and a commitment to the industry. Abhinav Huli, senior trenchless technology engineer at Haley & Aldrich, and Laura Wetter, engineering geologist at Stahell Trenchless Consultants, were recognized with this special award. With members like these two, the future of the industry is definitely in good hands.

Of course, the industry would not be where it is today without the pioneers who drove the direction of trenchless technology. With NASTT's Hall of Fame, we are able to honor those who have dedicated their careers to the advancement of trenchless. The 2014 Hall of Fame inductees are Robert Attholder, Joseph Loiacono and Dr. Raymond Sterling. Bob Attholder is the founder of Attholder, Inc., the first mid-America licensee of the Insituform process, and the current vice president of SAK Construction. Joseph Loiacono has been involved in the water industry for more than 40 years and at the end of 2013, he retired from his position as director of business development for Aqua-Pipe. Joe is the first Canadian Hall of Fame inductee. Dr. Ray Sterling is a Professor Emeritus at Louisiana Tech University where he has also served as director of the Trenchless Technology Center. It was my great privilege to recognize these three Hall of Fame inductees at the 2014 Gala Awards Dinner. Thank you for your innovation and lifetime of dedication!

The trenchless industry is constantly growing and evolving and we recognize advancements through the Joseph L. Abbott Jr. Innovative Product Awards. Annually, two companies with state-of-the-art products are chosen as recipients of this honor. This year, the Innovative Product Awards were presented to GAME Trenchless Consultants for their JD7 PipeScan+ and Warren Environmental, Inc., for their Pressure Infusion Lining System. We expect these products to advance infrastructure management in many important ways.

As successful as NASTT's 2014 No-Dig Show was, there is no time to rest on our laurels. We have already begun planning to bring you another fantastic event next year as NASTT's 2015 No-Dig Show heads to the Colorado Convention Center in Denver, Colo. I hope you will join us in the Mile High City as we celebrate 25 years of NASTT!

Vermeer

EQUIPPED TO
DO MORE.

EQUIPPEDTODOMORE.com

CHAIR MESSAGE

Derek Potvin
NASTT Chair

NO-DIG 2014: RAISING THE BAR

NASTT's 2014 No-Dig Show was hugely successful and I was thrilled for the opportunity to serve in my second year as the NASTT Chair at the conference. The show's success is centered on our volunteers that pour their hearts into making NASTT's annual No-Dig Show the premier trenchless technology conference in North America. Our volunteers include the Board of Directors, Program Committee Members, Session Leaders, Moderators and Student Members. They work hard all year and onsite to ensure a valuable, educational and entertaining conference for everyone in attendance.

Coordinating and supporting our large cast of volunteers is the NASTT staff, Mike Willmets, Michelle Hill and Jenna Hale. These individuals truly go above and beyond the call of duty to ensure that the members of NASTT have the best experience possible. Thank you for your hard work!

The Gaylord Palms Hotel and Convention Center in Orlando, Fla., proved to be a fantastic location for NASTT's 2014 No-Dig Show. The site was beautiful and conducive to networking and learning during the many conference events held around the property. This year we had record-breaking attendance for our North American No-Dig Show with more than 1,800 attendees onsite over the course of five days for pre- and post-courses, meetings, networking events, technical paper sessions and exhibit hall hours.

The conference featured 160 non-commercial, technical paper sessions on various trenchless topics along with a CIPP Forum, which was a unique panel discussion of industry experts that focused on the history of CIPP, CIPP technologies available today, industry standards and cost value benefits. The Forum was lively and informative. There was truly something for everyone in the trenchless industry to learn in this year's technical sessions.

We were once again able to offer scholarships through NASTT's No-Dig Show Municipal & Public Utility Scholarship Award. More than 125 municipal and utility employees from all over North America were awarded full conference registration, while 100 of them were also offered hotel accommodations at the Gaylord Palms. This scholarship award was created to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to economic challenges. With this scholarship program, recipients are able to attend technical sessions and visit the exhibit hall to learn about the latest in trenchless products and services and network with nearly 2,000 other trenchless professionals. This program is a benefit not only to the recipients, but to the contractors, consultants, engineering firms and vendors that are able to meet with them to discuss future projects.

I hope you were able to join us for the 13th annual Educational Fund Auction and Reception where this year's theme was Pirates of the Caribbean. A very popular activity in conjunction with the auction is the Vacation Raffle generously sponsored by Vermeer. This year's raffle winner received a $5,000 Dream Vacation to the Caribbean. This year's auction set a new record, raising about $128,000 for NASTT's education initiatives. I'd like to take this opportunity to recognize this year's Auction Chair, Brian Avon of Golder Associates, Inc., and Vice Chair, Cindy Preuss of HydroScience for their hard work, along with the rest of the Auction Committee. These funds enable us to sponsor students' attendance at NASTT's No-Dig Shows, award scholarships, publish trenchless resources and provide targeted training courses to the membership at-large. Thank you for your generosity!

Each year we recognize the recipient of the NASTT Chair's Award for Lifetime Service. The recipient of this award is an individual that has provided both NASTT and the industry with meritorious service during the period of their career. This year, I was honored to present this award to Chris Brahler of TT Technologies. Chris has been active in the underground construction industry for 30 years. He has been a big supporter of NASTT and the No-Dig Show, serving on the Board of Directors and as its Chair for two years, as well as serving on the Program Committee for many, many years. Chris is extremely deserving of NASTT's Chair's Award for Lifetime Service as he truly embodies everything the award is about. Thank you for your years of service, Chris!

As we look forward to the rest of an exciting year here at NASTT, we have already begun planning for next year's show. We'll be heading to the Colorado Convention Center in Denver, March 15-19, 2015. I hope you'll make plans to join us for our Silver Anniversary as we celebrate 25 years of NASTT!

TOUGH. TRUSTED. TRENCHLESS.

STATIC PIPE BURSTING

FROM 38 TO 175 TON MACHINES

PNEUMATIC PIPE BURSTING

SYSTEMS FOR BURSTING PIPE UP TO 36"

PIPE RAMMING/HDD ASSIST

INSTALL STEEL CASINGS, RESCUE STUCK HDD BORES AND MORE!

LATERAL PIPE BURSTING

REPLACE 4 & 6" LATERALS

HYDROGUIDE® WINCHES

FOR BURSTING AND LINING APPLICATIONS

HammerHead, a leader in unique answers for underground utility installation and replacement since 1989. Genuine HammerHead Trenchless equipment is available only at your authorized dealer.

HAMMERHEAD® TRENCHLESS EQUIPMENT

FIND YOUR LOCAL DEALER AT HAMMERHEADTRENCHLESS.COM OR CALL +1 262.567.8833.

MOLING | RAMMING | BURSTING | HDD ASSIST | WINCHES | LINING

EDUCATION UPDATE

COME TOGETHER

Michelle Hill
NASTT Communications & Training Manager

Our trenchless professionals may not have hair down to their knees, but they sure can come together and talk trenchless.

NASTT is pleased to host three different panel discussions in 2014. In January, we brought together a star-studded panel of experts to discuss trenchless trends in the gas industry at UCT in Houston, Texas. Our members discussed the current state-of-the-art advantages and latest trends of trenchless technology for pressure piping while covering design, planning, construction, materials, equipment, inspection and maintenance. We'd like to thank George Ragula, distribution technology manager, Public Service Electric & Gas; Rob Kodadek, senior project manager, ULC Robotics; Collins Orton, product specialist and California regional sales manager, TT Technologies; Dennis J. Doherty, P.E., national practice leader of trenchless technologies, Haley & Aldrich; and Dennis Walsh, senior project manager, Woodard & Curran for their expertise and volunteer efforts.

Our second panel of trenchless rockers performed in April at NASTT's 2014 No-Dig Show. Experts in the cured-in-place pipe field came together to form the CIPP Forum as one of the 160 sessions at the Orlando conference. This unique track reviewed the history of CIPP, the technologies available today, industry standards and the cost-value benefits. Thank you Ian Doherty, president, Trenchless Design Engineering Ltd.; Ed Kampbell, president, Rehabilitation Resource Solutions; Gerry Muenchmeyer, principal, Muenchmeyer Associates LLC; Lynn Osborn, vice president of engineering technology, Insituform Technologies Inc.; Kaleel Rahaim, business manager, Interplastic Corp.; John Schroeder, conveyance market leader, CDM Smith; and Jim Shelton, program director, Malcolm Pirnie/Arcadis for participating in this unique educational event. I would also like to offer a special thank you to Larry Kiest Jr., president, LMK Technologies for creating and moderating the panel.

Finally, we are working on our third panel of the year which will be on Tuesday, Aug. 19 from 2 p.m. to 3:30 p.m. in conjunction with AWPA's Congress in Toronto, Ontario. Kamran Sarrami, senior engineer at Toronto Water; Frank A. Badinski, asset inspection coordinator, The Regional Municipality of York; and Kevin Bainbridge, practice leader – infrastructure management, Robinson Consultants Inc. will form the "Trenchless in Toronto" session. They will discuss the use of various trenchless technologies involving projects in the greater Toronto metropolitan area and cover trenchless case studies, challenges, lessons learned, advantages and benefits using trenchless technology from a user and owner perspective. If you are planning on attending APWA's Congress, make sure to sit in on this session.

That's right. Our volunteers are good lookin' and contrary to what the Beatles say, they aren't hard to see. You can always find fine volunteers like this on our website at *nastt.org*.

Pipe Bursting SUCCESS Starts Here!

TT Technologies has been the worldwide leader in pipe bursting equipment since the 1980s.

Whether it's a challenging project or a routine replacement, choose the equipment that has the best track record and most respected technical support in the industry. Choose pipe bursting equipment from TT Technologies.

- **Over 50 years of Service & Support Behind Every Tool**
- **Widest Selection of Pipe Bursting Equipment, Static & Pneumatic**
- **Largest Rental Fleet**

STATIC SYSTEMS

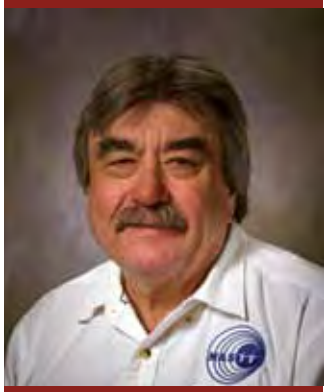
PNEUMATIC SYSTEMS

TT Technologies

Call 1-800-533-2078 www.tttechnologies.com

Pipe Bursting • Pipe Ramming • Horizontal Boring • Directional Drilling • HDD Assist

Q&A



George Ragula

YOU'D BE HARD-PRESSED TO FIND SOMEONE IN THE TRENCHLESS INDUSTRY WHO DOESN'T KNOW GEORGE RAGULA. A LONG-TIME MEMBER AND IMMEDIATE PAST CHAIR, GEORGE IS TRULY ONE TO OFFER A FIRST-HAND PERSPECTIVE ON THE GROWTH OF THE ASSOCIATION AND THE INDUSTRY

NASTT's Trenchless Today (NTT): Going back prior to the start of your career, can you tell us about how you first became interested in the construction industry?

George Ragula: As a young mechanical engineer, I became involved with construction and destruction from a design and planning perspective. I certainly had the destruction piece down pat from my childhood days. I always enjoyed field work and being "hands-on," so the construction industry became a natural progression or destination for me. I also liked the responsibilities associated with making field decisions under pressure due to field changes. Lastly, I learned early on that people working in the construction industry really pull together as a team for a variety of reasons and you can always count on them to stand up to their word on a hand shake.

NTT: When did your involvement in trenchless methods begin?

Ragula: My interest in trenchless perked back in 1987 as a result of some of the ISTT activities happening back then appearing in various publications. Trenchless construction was an unfamiliar catchy phrase, almost like an oxymoron that quickly aroused my curiosity, so I immersed myself in learning more about what it meant and how it could benefit my industry. Eventually, this led to my joining NASTT in 1991…on April Fools' Day as Mike Willmets always likes to remind me! I started out in vacuum technology which was less-dig compared with no-dig, migrated to piercing tools – a very unique application working in the heavily congested streets of NYC and – and then expanded to HDD, CCTV, pipe splitting and liners.

NTT: Briefly, can you summarize your current responsibilities at Public Service Electric & Gas?

Ragula: RDD&D is the simple acronym that summarizes my responsibilities: research, design, development and deployment. I manage, direct, plan, coordinate and implement cutting edge technologies that increase efficiency and effectiveness of operations through my direct involvement with various gas industry R&D activities. My extensive and varied experience in gas distribution engineering, operations, construction and management provides support to our field operations in a wide variety of field disciplines. My activities range from working on the development of new leak detection equipment and its repair, to robotics for inspecting, maintaining and repairing gas facilities – all with the flavor of trenchless in mind.

NTT: Your career has focused on the trenchless aspects of gas distribution unlike some of your NASTT colleagues who are involved more in the water/wastewater sector. Do you see that as a testament to the many applications of trenchless technology?

Ragula: I always say "you get out of it what you put into it" and there is no question that I have reaped the benefits of trenchless construction through my active participation and involvement with NASTT. My NASTT participation has also allowed me to see technologies first-hand in use in other industries that we have eventually modified and adapted for natural gas applications through our R&D process. Interaction with my peers in other sectors has given me tremendous insight into where the gas industry should be headed into the future from a construction and technology perspective. That has allowed me to "walk the talk" in trenchless.

NTT: Tell us about the growth you've seen in the association over the years.

Ragula: At this time and under its current leadership, NASTT is like a well-oiled machine. Membership continues to increase and the technical program is #1 in the world from both a quantity and quality perspective. In my opinion, NASTT membership provides a lot of value and the recent expansion of NASTT staff has led to improved communications, increased use of electronic media, expanded training offerings and the implementation of new ideas – the carbon calculator for example, as part of our continuous improvement journey. We are extremely fortunate to have such energetic and dedicated staff.

NTT: What accomplishments were you most proud of during your time as Chair of NASTT?

Ragula: A major accomplishment was the revamping and updating of the entire financial/accounting/auditing process, including implementing various appropriate checks and balances, under the hard and relentless work performed by Mike Willmets. The expansion of our training programs into webinar offerings was a great success and long overdue. The strategic alliance partnerships we initiated and developed with APWA and AGA were particularly rewarding in an effort to get more owner involvement from other industries to expand our education outreach activities, which has led to many trenchless training opportunities. I'm particularly proud of the successful collaborative effort with the natural gas industry on the development of the carbon calculator and being part of its implementation even today.

NTT: How do you think NASTT's No-Dig Show has grown in advancing its educational outreach?

Ragula: Since we have refreshed, updated and expanded our entire training approach, I'm happy to say training is booming. We've also been very successful in expanding our training programs to the gas industry and municipality sector. Our scholarship program for municipal attendees to help defray costs for attending a No-Dig Show offers a unique way to educate owners who may have never been exposed to trenchless. I always call the owners the center hub of the NASTT wheel, since they are a critical element to our success. I believe our successful and comprehensive involvement with the student community also sets us apart from many other technical organizations. Let's face it – they ARE the future for our great industry, and the sooner we get them involved, the better.

Trenchless CIPP Renewal Technologies

LMK's state-of-the art technologies are installed worldwide through a large network of independent, licensed professional contractors. Contact LMK Technologies today to begin working with the industry leader in wastewater infrastructure renewal.

Main to Lateral Connection

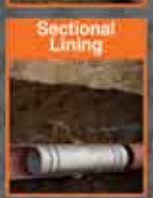
- Exceeds ASTM F2561
- T-Liner®, Shorty™, and Stubby™ One-Piece Connection Lining Systems
- Insignia™ O-Ring and Hydrohat Compression Gaskets

Lateral Lining Through a Cleanout

- 100% Trenchless
- Performance Liner® CIPP Lining

Easy to Install Cleanout System

- VAC-A-TEE® Saddle Kits
- Minimally Invasive Installation



Inverted In-Place Mainline Sectional Repair

- ASTM F2599 Compliant
- Sectional CIPP Lining

CIPP Compression Gasket Sealing Solutions

- Insignia End Seals
- 6 in. - 54 in. Diameters Available

One Size Fits Most CIPP Manhole Rehabilitation

- CIPMH™ Full Depth Lining
- CIPMH Chimney Lining

LMK TECHNOLOGIES

Leading Cured-in-Place
Trenchless Products and Technologies
for over 20 years

Phone: **(815) 433-1275** Email: **info@lmktechnologies.com** Web: **lmktechnologies.com**

12

In the Trenches

By Andrew Farr

For this month's In the Trenches, we decided to add a Canadian flavour to the summer issue as we reached out to Ben Côté and Jamie Hannam – two professionals who are no strangers to NASTT and who have helped advance the trenchless technology market in Canada throughout their careers. Côté, a former Board member, and Hannam, a current one, have each had a front row seat to the growth of NASTT and how the organization's continuing initiatives across all sectors have helped to quench the thirst for knowledge in the trenchless community.

Benoît Côté

Sanexen

Ben Côté has been employed with Sanexen Environmental Services since 1995, but it wasn't until a few years later when he would first explore the world of trenchless as Sanexen began to design a product for water main rehabilitation. Today, Sanaexen's Aqua-Pipe system is recognized industry-wide as a trenchless application for water main rehab, and Côté has been at the forefront of the product's development and the company's success.

Côté earned his M.S. from the University of Sherbrooke, and after joining Sanexen in the mid-1990s, his role was initially in project management. At the time, Sanexen was primarily involved in environmental services. According to Côté, from Sanexen's standpoint, there wasn't a huge understanding of the water rehab market let alone trenchless technology. But on the water side specifically, Sanexen saw the increasing demand for solutions to water main deterioration.

"At the time, we really didn't know anything about the [trenchless] industry at all," he said. "But what we knew was that we had clients who wanted a product that could rehabilitate water mains. There was not much technology out there that you could offer municipalities, engineers and utilities, but they were asking for it."

Throughout the 1990s, as patents on the cured-in-place pipe (CIPP) process for sewer lines expired, CIPP became the pipe relining method of choice for the sewer industy, and experienced phenomenal market success. Côté said this was the time when municipalities were also looking at solutions for rehabilitating water mains as well.

As Côté noted, the Aqua-Pipe system developed by Sanexen was essentially inspired by the CIPP process for sewer rehab, although slightly different. The Aqua-Pipe liner is not a sewer liner, but a woven tube specifically designed for water main applications. But essentially, the concept of pulling a liner inside a pipe and inflating it is similar.

GROUNDBREAKING TRENCHLESS TECHNOLOGY WITHOUT BREAKING GROUND...

SLIPLINING | PIPE BURSTING | DIRECTIONAL DRILLING | OPEN-CUT

FUSIBLE PVC® PIPE
7,000 INSTALLATIONS AND COUNTING...

- Easier trenchless project pull-ins with unparalleled plastic pipe tensile strength and frequent downsizing versus other plastic pipe systems
- Simple re-connections with standard ductile iron fittings
- Over 20 HDD installations exceeding 3,000 feet with a history of record-setting projects, including a 5,365-foot, 24-inch HDD under the Raritan River and a 7,000-foot continuous slipline in Northern California

13135 Danielson St. Suite 201
Poway, CA 92064

www.undergroundsolutions.com
(858) 679-9551

Underground Solutions®

"Because of our environmental background at Sanexen, we had a lot of engineers and designers who were used to developing new and innovative technologies for the environmental field," he said. "So we started working with those designers and engineers to develop, specifically, a product for [the rehabilitation of] drinking water mains. But we sort of got inspired by the CIPP process of putting a liner inside of a pipe and inflating it and using resins."

In 2000, Sanexen performed its first demonstration of Aqua-Pipe. After a couple more years of improving the process, Aqua-Pipe began to gain market acceptance in Canada. In 2002, Côté attended his first No-Dig Show with Aqua-Pipe, which, according to him, opened the door to the full potential of the underground infrastructure market. Since 2004, Sanexen has been slowly introducing its Aqua-Pipe product to the market in the United States.

"The market has grown quite rapidly in Canada, and now, it's starting to show some good promise in the U.S.," Côté said. "But it's been a very difficult trail and it's difficult to convince civil engineers and municipalities to change their ways. When you come to [municipalities] with a new product, they are very conservative. You can tell them how much it's going to cost, but when they don't know the risks, they get nervous. So the market is growing slowly, but it is growing.

"I'm fortunate enough in my job to travel all over the world, and so I do a lot of trenchless shows. No-Dig is probably one of the most complete trenchless shows in the world."

Ben Côté

"I wouldn't say we were the pioneers of water main lining because others had been doing it before us, but I think we were the ones to have the first commercial success with water main lining."

Today, Côté continues to manage the development and growth of the water main rehabilitation branch of Sanexen. He is currently the vice president of the Aqua-Pipe division where he works to market and license the technology in North America. He has comprehensive expertise in water main rehabilitation and NSF certification protocols and is also active within the American Water Works Association.

A member of NASTT since 2001, Côté served on the Board of Directors from 2007 to 2012. Since then, he has continued to be active in the No-Dig Show Program Committee and was instrumental in the creation of NASTT's Carbon Calculator which debuted at the 2014 No-Dig Show in Orlando.

"I'm fortunate enough in my job to travel all over the world and so I do a lot of trenchless shows," he said. "No-Dig is probably one of the most complete trenchless shows in the world. I'm happy to see it grow. What's nice about it, is that the people who are attending the show, are those who want to do trenchless or people who are here to learn more about it. For me, as a vendor of technology, that's great. The technical content of the conference is a very complete program."

NASTT's 2015 No-Dig Show
Call for Abstracts

Submission Deadline: June 30, 2014

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2015 No-Dig Show in Denver, Colorado. The conference will take place at the Denver Convention Center on March 15-19, 2015.

Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically at NASTT's website by June 30, 2014: *nastt.org/abstractsubmission*.

NASTT's 2015 No-Dig Show Program Committee will review abstracts and notify the primary authors of acceptance in August. To ensure meaningful and commercial free technical content, all papers will be peer-reviewed. Final papers will be published in the conference proceedings.

Abstracts from the following subject areas are of interest to the No-Dig Show Program Committee:

Potable Water and Pressure Systems

- Pipeline Inspection, Locating, and Condition Assessment
- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Spray Applied Linings

Wastewater, Storm water, and Non-pressure Systems

- Advanced Pipeline Condition Assessment
- I&I and Leak Detection
- Pipeline and Laterals Rehabilitation

Energy Pipeline Systems

- Pipeline Inspection, Locating, and Condition Assessment
- Aging System Rehabilitation
- New Trenchless Installation
- Standards and Regulations

Trenchless Research and Development

- University and Industry Initiatives
- Education and Training

Industry Issues

- Subsurface Utility Engineering
- Submittal Requirements and Quality Assurance/Quality Control
- Project Budgeting and Prioritization
- Funding for "Green" Technologies
- Selection Criteria for Contractors
- Social Costs and Impacts
- Carbon Footprint Reduction
- Sustainable Construction Practices
- Industry Trends, Issues and Concerns

New Installations

- New Concepts for Trenchless Equipment, Materials and Methods
- Horizontal Directional Drilling (HDD)
- Microtunneling
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)

For more information visit www.nodigshow.com

Questions? Please contact:
Michelle Hill
NASTT Communications & Training Manager
E: mhill@nastt.org
P: 440-638-4676

The 2015 No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at www.nastt.org

Jamie Hannam

Halifax Water

From the beginning of his involvement with NASTT, Jamie Hannam has done quite a bit to bring trenchless technology to Nova Scotia and the Atlantic Canada region both in terms of work being done by the Halifax Regional Water Commission and also from an educational standpoint.

Initially interested in science in high school, Hannam naturally got involved in engineering while at university. He graduated from Acadia University with a bachelor's in 1983, and then from Technical University of Nova Scotia with a bachelor's in engineering in 1985. He obtained his MBA from Dalhousie in 1990 and spent the earlier years of his career in municipal government in both Halifax and Dartmouth working on a variety of engineering tasks.

In 1994, Hannam began working as chief engineer with the Halifax Regional Water Commission, which at the time, had a mandate for water infrastructure in the Halifax area. During this time, Hannam was in charge of capital projects and managing the long-term vision on maintenance of the infrastructure. Hannam described the Halifax region – and much of Atlantic Canada – as being an area which, at the time, had very limited exposure to the trenchless industry, specifically the structural rehab market.

"I think there's a real honest commitment in NASTT to good, unbiased education programs. There's no vendor pushing a particular product, it's just good, honest education being pushed off to a variety of sectors, and that's been a real strength."

Jamie Hannam

"It was within that mandate that we really started doing industry scans on some of the new and innovative ways to construct, renew, rehab and plan for new infrastructure," Hannam said. "I got exposed to the trenchless world specifically through No-Dig and met a lot of contractors and consultants at No-Dig who gave me a range of advice. We started to build some of the trenchless programs into what we do at Halifax Water."

Over the years, some of those trenchless programs have involved large structural rehabilitation projects for water and sewer lines. According to Hannam, the limited structural rehab market in Atlantic Canada was due in part to the fact that the region has a smaller number of large metropolitan areas, and therefore, had not been exposed to certain construction methods that may be more prevalent on large scale infrastructure projects.

"We were reaching out into the Quebec and Ontario markets to try and draw some experience out of those municipalities to try and bring back to Halifax, so we were certainly a little limited at that time," he said.

In 2007, Hannam became the director of engineering and information services for Halifax Water – the position he holds today. Halifax Water is the first regulated water, wastewater and stormwater utility in Canada and also the largest utility in Atlantic Canada, serving 350,000. The utility's system has pipelines that were installed as far back as 1856. For the past 15 years, Halifax has utilized trenchless technologies and

NASTT resources as key components of their system rehabilitation program. Hannam is responsible for water and wastewater infrastructure master planning, asset management and capital project delivery with an annual capital budget of $50 million.

For Hannam, NASTT initially became a tool he used in an attempt to diversify the collective trenchless knowledge of Halifax Water. When he first started getting involved with NASTT and attending the No-Dig Show, he was involved in several discussions which led NASTT to believe that it could benefit from extending the Great Lakes regional chapter to include Atlantic Canada. Hannam was asked to become the Atlantic Canada representative, a role which he graciously accepted thus culminating in the current "Great Lakes, St. Lawrence and Atlantic" regional chapter of NASTT.

As Hannam participated in more No-Dig Shows and became more active in NASTT, he was asked to join the NASTT Board of Directors in an effort to diversify the Board to include more municipal government representation.

"The win-win for Halifax Water was that every time I participated in a Board meeting or a No-Dig, I was able to strengthen a relationship with a consultant or a contractor or an industry rep, and further strengthen Halifax Water's knowledge base within the trenchless industry," he said.

Hannam's term on the Board of Directors will conclude at the end of 2014, but he said there's been a real consistency, not only in the benefit he has experienced from NASTT, but also in the many educational programs and member benefits the organization offers the trenchless community.

"I think there's a real honest commitment in NASTT to good, unbiased education programs," he said. "There's no vendor pushing a particular product, it's just good, honest education being pushed off to a variety of sectors, and that's been a real strength.

"We've also worked hard at being consistent across contractors, consultants and municipalities and not staying focused on one sector of the industry from a participant perspective. We've stayed focused across the border on both a U.S. and Canadian perspective to stay balanced, and we've worked really hard with a lot of leading educational institutions with our university participation. We've really pushed the trenchless experience back much earlier into folks' careers, and we're seeing the ripple effect as those students come into the industry, already knowledgeable and trained. We're really seeing the net benefits of those programs."

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

NASTT's 2014 No-Dig Show

EXHIBITOR, NETWORKING AND EDUCATIONAL EVENTS MAKE 2014 THE BEST-ATTENDED, U.S.-HELD NO-DIG SHOW IN NASTT'S HISTORY

The 2014 NASTT No-Dig Show, the annual conference and exhibition of the North American Society for Trenchless Technology (NASTT), attracted more than 1,800 attendees to Orlando April 13-17 — the most ever attendees for a non-ISTT co-sponsored event. Attendees soaked up the warmth of the Florida sun to successfully mix business, education and social agendas during the course of the conference.

The No-Dig Show set up shop this year at the Gaylord Palms Hotel & Convention Center for the 23rd annual conference and exhibition, with trenchless professionals traveling from all over the globe to take in "The Magic of Trenchless." The show is a fantastic tribute to the industry's past, present and future, bestowing honors for the incredible work trenchless professionals have done over time.

NASTT inducted its third Hall of Fame class: Robert Affholder, founder of Affholder Inc.; trenchless advocate Joseph Loiacono; and professor emeritus Dr. Raymond Sterling. The 2014 *Trenchless Technology* Person of the Year Award was presented to Gerry Muenchmeyer and all of the winners of the 2013 *Trenchless Technology* Projects of the Year were recognized.

"From the opening breakfast through the closing luncheon we had such positive feedback on this year's show," said 2014 Program Committee Chair Kevin Nagle. "Each year we are gaining such wonderful insight from the previous year's show. We are building such a solid foundation on how to make this show what the attendee and exhibitor is looking for in a trenchless show."

There are two main attractions that draw people to NASTT's No-Dig Show. One is the technical paper sessions that provide detailed, peer-reviewed papers covering a broad range of topics relevant to the industry. This year, there were 160 papers presented covering the gamut of trenchless methods and issues. The other main component of NASTT's No-Dig Show is the exhibition hall, in which attendees can see first-hand the latest products that are keeping the industry at the forefront of the utility construction and repair industry. So, what happened at NASTT's 2014 No-Dig Show? Read on to find out!

NASTT's 2014 No-Dig Show Platinum, Gold and Silver Sponsors helped kick off the Show at the ribbon cutting, marking the start of arguably NASTT's best No-Dig Show to date.

NASTT's 2014 No-Dig Show Program Committee

2014 No-Dig Show Program Chair

Kevin Nagle ..... TT Technologies Inc.

2014 No-Dig Show Program Vice Chair

Richard (Bo) Botteicher ..... Underground Solutions Inc.

2014 No-Dig Show Program Committee

Erez Allouche ..... Trenchless Technology Center
Edward Alan Ambler ..... City of Casselberry
Samuel Ariaratnam ..... Arizona State University
Alan Atalah ..... Bowling Green State University
Brian Avon ..... Golder Associates Inc.
Ali Bayat ..... University of Alberta
David Bennett ..... Bennett Trenchless Engineers
Glenn Boyce ..... Jacobs Associates
Dan Buonadonna ..... CH2M HILL
Jack Burnam II ..... CH2M HILL
Craig Camp ..... Hatch Mott MacDonald
Ralph Carpenter ..... American Ductile Iron Pipe
Ben Cote ..... Sanexen Environmental Services Inc.
George Cowan ..... HAKS
Will Craven ..... CDM Smith
David Crowder ..... R.V. Anderson Associates Limited
Mike Davison ..... Sanexen Environmental Services Inc.
Don Del Nero ..... Stantec
Dennis Doherty ..... Haley & Aldrich Inc.
Steven Donovan ..... SHN Consulting Engineers & Geologists Inc.
Jennifer Glynn ..... RMC Water and Environment
Jason Haas ..... Hammerhead
Rick Hanford ..... SHN Consulting Engineers & Geologists Inc.
Keith Hanks ..... City of Los Angeles
Sahar Hasan ..... LMK Technologies
Tony Hranicka ..... Consolidated Edison Co. of New York Inc.
Larry Kiest ..... LMK Technologies
Brenda Kingsmill ..... Region of Halton
David Krywiak ..... Stantec Consulting
Bernie Krzys ..... Benjamin Media Inc.
George Kurz ..... Independent Consultant
Joe Lane ..... SAK Construction LLC
Marc Lehmann ..... CDM Smith
Joseph Loiacono ..... Sanexen/Aqua-Pipe
Jason Lueke ..... Associated Engineering
Gerry Lundquist ..... National Grid
Jeff Maier ..... Summit Water Consulting LLC
John Matthews ..... Battelle Memorial Institute
Dorian Modjeski ..... CARDNO TBE
Cathy Morley ..... RJN Group
Jim Murphy ..... Integrated Pipeline Projects Canada Ltd.
Mohammad Najafi ..... University of Texas at Arlington/CUIRE
Peter Oram ..... AECOM
Collins Orton ..... TT Technologies Inc.
Manley Osbak ..... The Crossing Company
Matt Pease ..... Staheli Trenchless Consultants
Ray Post ..... Michels Corp
Derek Potvin ..... Robinson Consultants Inc.
Cindy Preuss ..... HydroScience Engineers
George Ragula ..... Public Service Electric & Gas Co.
Kaleel Rahaim ..... Interplastic Corporation
Ashley Rammeloo ..... City of London
Jim Rankin ..... Vermeer Corp.
Piero Salvo ..... GENIVAR Inc.
John Schroeder ..... CDM Smith
Chris Schuler ..... Miller Pipeline Corp.
Ariamalar Selvakumar ..... USEPA
James Shelton ..... ARCADIS
Benny Siljenberg ..... Brierley Associates
Sunil Sinha ..... Virginia Tech University
Kimberlie Staheli ..... Staheli Trenchless Consultants
Isabel Tardif ..... Town of Mount Royal
Richard Thomasson ..... Malcolm Pirnie
Matthew Wallin ..... Bennett Trenchless Engineers Inc.
Dennis Walsh ..... Woodard & Curran
Laura Wetter ..... Staheli Trenchless Consultants
Mike Willmets ..... NASTT

EXHIBITS

Exhibits Provide Endless Opportunities for Attendees

For nearly the entire year prior to the conference, NASTT staff works tirelessly to ensure that the No-Dig Show is, and remains, the largest and most engaging trenchless construction conference in North America. One of the main attractions of the No-Dig Show is the exhibition hall, where attendees can see first-hand the latest products keeping trenchless methods at the forefront of the underground construction industry.

In addition to offering attendees an array of booths to navigate, the exhibit hall also allows attendees to engage in valuable networking opportunities with peers, catch up with colleagues and discuss industry projects and practices. This year, 148 exhibiting companies filled the 80,000-sq-ft exhibit hall at the Gaylord Palms Convention Center.

NASTT is also grateful to its sponsors who continue to support the conference and make all the events and activities possible. This year, NASTT was proud to have three platinum sponsors – Perma-Liner Industries, Inc., TT Technologies, and Underground Solutions, Inc.

"I feel that as far as the sponsorship dollars that we put into it, the return on our investment is far beyond what we would normally receive at any other show industry-wise, and the education at No-Dig, industry-wide, it's known as top notch."

— Morgan Trouard, Director of Marketing at Platinum Sponsor, Perma-Liner Industries.

1: Kevin Nagle, NASTT's 2014 No-Dig Show Program Committee Chair, was joined by Dr. Kim Staheli, NASTT Vice Chair, and Derek Potvin, NASTT Chair, at the opening ceremony ribbon cutting to kick off this year's festivities.

2: Perma-Liner Industries performs a demo at its booth in the exhibit hall.

3: TT Technologies displayed a variety of trenchless equipment in its booth.

4: Underground Solutions also displayed various pieces of its fusible PVC pipe in its booth in the exhibit hall.

5: GAME Trenchless Consultants was joined by the selection committee to receive the Innovative Product Award for its JD7 PipeScan+.

6: Warren Environmental, Inc. celebrated its Innovative Product Award nod for its Pressure Infusion Lining System.

"Underground Solutions started sponsoring No-Dig back in 2007 and we love the show because it's the best technical conference in the underground industry. It has a great level of attendees at the municipal utility level and the consulting engineers follow them, so that makes it great for exhibitors because we're getting decision makers."

— Frank Firsching, Executive Vice President at Platinum Sponsor, Underground Solutions, Inc.

"We're big believers in trenchless technology. This is one of the better shows in the industry, it's more focused and this is where the growth is going to come from for the future of our industry. You can just tell there is a desperate need for information. So this is the place to be."

— Chris Brahler, President of Platinum Sponsor, TT Technologies, Inc.

GAME Trenchless Consultants and Warren Environmental Inc. Receive Innovative Product Awards

With the rapid pace of technological innovation across the industry, new products are constantly introduced to the trenchless market. Each year, NASTT recognizes these technological advancements through the Joseph L. Abbott Jr. Innovative Product Awards. Annually, two companies with state-of-the-art products are chosen as recipients of this honor.

This year, the Innovative Product Awards were presented to GAME Trenchless Consultants for its JD7 PipeScan+ and to Warren Environmental, Inc., for its Pressure Infusion Lining System. These products are capable of advancing infrastructure management in many important ways.

The JD7 PipeScan+ from Game Trenchless Consultants is an innovative new tool for condition assessment. A relatively new player in the trenchless market, GAME was formed following an agreement with GENIVAR Inc (now WSP Group) to purchase the Canadian rights to the JD7 Technology. To date, the firm has been involved in live water main condition assessment inspections and trenchless engineering design and support for CIPP projects, both for small and large diameter water main and sewer systems of all ages and materials.

Warren Environmental, Inc. was recognized for its pressure infusion lining system for ductile iron, asbestos, lead jointed clay water and sewer lines, laterals or any distressed pipe product. This patented invention is safe for use in potable water systems and eliminates the need for wet-out facilities, over the road transport of weight restricted materials, refrigeration concerns and the need for steam or boiler trucks.

The Innovative Product Awards are given in memory of the late Joseph L. Abbott Jr., an active member of NASTT since its inception in 1990. Recognized as one of NASTT's seven charter members, he also served on its Board of Directors from 2003 to 2007. Following his years of service, he continued to be involved at a high level. Joe was an exhibitor and supporter of all the NASTT No-Dig Shows and is remembered each year by the entire NASTT family.

NETWORKING

No-Dig Events Provide Essential Networking Opportunities

Every trenchless professional who comes to NASTT's No-Dig Show reaps the networking benefits the conference has to offer. The networking opportunities and events are truly the added value of attending the largest trenchless trade show in North America.

NASTT hosts several networking events open to all attendees during the conference. On Monday, April 14, the conference officially kicked off with the Opening Breakfast featuring awards presentations and a formal acknowledgment of incoming and outgoing NASTT Board Members. The breakfast culminated in an entertaining performance by pickpocket Bob Arno. Later that evening, conference goers were able to mingle in a relaxing environment at NASTT's 13th Annual Educational Fund Auction & Reception. On Tuesday, trenchless professionals gathered at NASTT's premiere event – the No-Dig Show Gala Awards Dinner. The conference concluded on Wednesday with NASTT's No-Dig Show Luncheon & Entertainment.

"The No Dig Show is all about efficiency," said Bo Botteicher, 2014 Program Committee Vice Chair. "Over the course of several days, you can take in the latest design and technical information presented by the leaders of the industry, see the latest trends in trenchless equipment and suppliers and receive non-commercial, cutting edge training from NASTT. It is an extremely efficient format for the best that the trenchless industry has to offer."

1: Attendees took time in between technical paper sessions to make connections with friends and colleagues both new and old.

2: The exhibit hall show floor was a great place for exhibitors and attendees to meet and talk about their trenchless needs and solutions.

3: Attendees filter into the exhibit hall for a day of networking and all things trenchless.

4: Bo Botteicher, No-Dig Show Program Vice Chair, joins his fellow Underground Solutions Inc. co-workers at NASTT's No-Dig Show Gala Awards Dinner.

5: Pickpocket Bob Arno wowed the crowd while using Michael Davison, Jim Rush and Dave Fletcher as his 'targets' during the Kick Off Breakfast.

6: Hundreds of attendees enjoyed a hearty breakfast, awards presentations and entertainment at the annual Kick Off Breakfast.

7: NASTT Board of Directors Chair Derek Potvin and Vice Chair Dr. Kim Staheli presented the Chair's Award for Lifetime Service to Chris Brahler of TT Technologies.

8: NASTT Board Member Frank Firsching awarded the Trent Ralston Award for Young Trenchless Achievement to Abhinav Huli, Haley & Aldrich, and Laura Wetter, Staheli Trenchless Consultants.

9: NASTT Board of Directors Chair Derek Potvin presented a service award to outgoing Board Member Tom Hayes.

NASTT's Hall of Fame: A Trenchless Tradition

While only in its third year at No-Dig, the formal induction of NASTT's new Hall of Fame class has quickly become recognized as a trenchless tradition and celebration of iconic industry pioneers who have dedicated their careers to all things trenchless.

Honored at the dinner as new inductees were: Affholder Inc. founder, Robert Affholder; trenchless advocate Joseph Loiacono; and Professor Emeritus Dr. Raymond Sterling. Robert Affholder is a trenchless industry pioneer who continues to play a leading role as Vice Chairman of SAK Construction after 50-plus years in the industry. Joseph Loiacono has been involved with trenchless technologies since 1989 when he attended his first No-Dig Conference in London. Now as a leader and/or chair of several standard committees at regional and national levels, he continues to promote trenchless technologies in the industry and to students at various Universities. He is the first Canadian to be inducted into NASTT's Hall of Fame. From 1995 to 2009, Dr. Ray Sterling served as the director of Louisiana Tech's Trenchless Technology Center. He is a Past Chair of both ISTT and NASTT and has been the recipient of the Bechtel Pipeline Award from ASCE and the ISTT's Gold Medal.

Among the other awards presented during the Gala Dinner was NASTT's Chair Award for Outstanding Lifetime Service, presented to TT Technologies President and Past Chair, Chris Brahler. "Both the NASTT organization and the No-Dig Show have evolved tremendously," said Brahler. "I'm really a low-profile guy, and really, I feel everyone in this room deserves the award, and I'd like to share it with everybody. It's a tremendous honor be considered, and then to be chosen, there's nothing quite like it."

Abhinav Huli, Haley & Aldrich Inc., and Laura Wetter, Staheli Trenchless Consultants, received the Trent Ralston Award for Young Trenchless Achievement. "These two individuals truly embody the spirit of NASTT and a commitment to the industry," said NASTT Executive Director Mike Willmets. "With members like these two, the future of the industry is definitely in good hands."

The Gala Awards Dinner concluded with a captivating performance by illusionist Drew Thomas, known for his appearance on America's Got Talent.

EDUCATION

NASTT's 13th Annual Auction Raises Money for Educational Fund

The 13th annual Educational Fund Auction and Reception was held on April 14 — a popular networking event for attendees after a full and busy day of technical sessions and walking the exhibit hall. This year's event was a record-setter with more than $128,000 raised.

The auction raised financial support for NASTT's 14 student chapters while attendees have a great time bidding on amazing items. Since 2002, the auction has raised more than $750,000. Ritchie Bros. Auctioneers again served as the official auctioneers for the popular No-Dig event while a silent auction was also held. During the auctions, a wide range of items were donated and bid on, from jewelry and electronics to sporting event tickets and trenchless tools and equipment. Once again, Mortimer the Sewer Rat was up for bid and he will spend the next year traveling with Northeast Remsco Construction, which bid on Mortimer for $7,000!

NASTT also held a Costume Contest at the auction, inviting everyone to done their best pirate wear. There were many interpretations of what makes an awesome pirate, with plenty of Jack Sparrows roaming the reception. Taking first place for the event were Jim Rankin of Vermeer for the men, and Cindy Preuss of HydroScience Engineers for the women. In NASTT's Caribbean Vacation Raffle (announced at the Closing Luncheon), the winner was Greg Penza of ULC Robotics.

CIPP Forum, Paper Tracks Draw Interest

Cured-In-Place Pipe (CIPP) continues to dominate the trenchless rehabilitation market, with more and more municipalities and owners turning to the minimally invasive and cost-effective process to address their underground infrastructure. NASTT's CIPP Forum gathered industry professionals from the engineering, manufacturing and contractor sects to talk about this popular trenchless method.

Taking part in the forum were: moderator and organizer Larry Kiest Jr., LMK Technologies and panelists, Ian Doherty, Trenchless Design Engineering Ltd.; Ed Kampbell, Rehabilitation Resource Solutions; Gerry Muenchmeyer, Muenchmeyer Associates LLC; Lynn Osborn, Insituform Technologies; Kaleel Rahaim, Interplastic Corp.; John Schroeder, CDM Smith; and Jim Shelton, Malcolm Pirnie/Arcadis. Before taking questions from the large audience, the panel gave presentations on the history of CIPP, CIPP technologies available today, industry standards and cost value benefits.

But the CIPP Forum wasn't the only technical session that drew interest from attendees. This year at No-Dig, 160 peer-reviewed papers were presented. With the introduction of these new and informative papers, the best papers from last year were also recognized through NASTT's Outstanding Paper Awards.

The paper, "Design and Construction of an Inclined Frozen Soil HDD Rescue Shaft" by Aaron McCain, Daniel Mageau, Khuram Shah and Mel Olson received the 2013 Outstanding Paper Award for New Installation while the paper, "More Really Old CIPP Liners from Winnipeg, MB, Canada That Have Stood the Test of Time" by Chris Macey, Kas Zurek, Nick Clinch, Armand Delaurier and Ron Sorokowski received the 2013 Outstanding Paper Award for Rehabilitation.

"The No-Dig show is about education, there is no way around it," says Kevin Nagle, NASTT's 2014 No-Dig Show Program Committee Chair. "The show prides itself on its technical presentations, and rightfully so. An extraordinary amount of time is put into coordinating the technical sessions because we know that the attendees crave knowledge. So you have to try and keep the information fresh. A lot of time goes into discussing and looking at the trends of the industry and what we can do to bring this new knowledge to the forefront of the show."

8

1: Student member volunteers from Bowling Green State University displayed items up for bid at the 13th Annual Educational Fund Auction.

2: Auctioneer Butch Graham of Ritchie Bros. used his powers of persuasion to get the audience excited and engaged.

3: Auction Chair Brian Avon and Auction Vice Chair Cindy Preuss led the volunteer auction committee and produced a record breaking auction this year.

4: Bernie Krzys of Benjamin Media checks out over 30 silent auction items up for bid.

5: Mortimer the Sewer Rat brought in a whopping $7,000 from Northeast Remsco Construction!

6: Attendees had their choice of 160 technical sessions covering both rehabilitation and new installation techniques at this year's No-Dig Show.

7: Dozens of auction attendees showcased their Pirates of the Caribbean spirit for the third annual Costume Contest, sponsored by Woodard & Curran.

8: The CIPP Forum was a new event this year which featured an expert panel during the technical tracks.

9: NASTT Board Member Larry Keist and Vice Chair Dr. Kim Staheli presented the 2013 Outstanding Paper Award to Aaron McCain for his paper "Design and Construction of an Inclined Frozen Soil HDD Rescue Shaft."


9

STUDENTS

Students In the Trenches

At NASTT's No-Dig Show, educational activities extend beyond the classroom and into the exhibit hall. The students in particular take great pride in the advantages and opportunities these events provide. The Student Poster Competition and this year's Amazing Trenchless Race in the exhibit hall are just a few of the activities that allow No-Dig Show exhibitors and attendees to engage with the talented young students involved in the trenchless field.

The winners of this year's Student Poster Competition were: Maureen Cassin, Arizona State University – first place; Ashkan Faghih, University of Alberta – second place; and Jane Peter, Queen's University – third place.

The annual Rain for Rent student scholarships were also presented to this year's recipients, Elizabeth Pope Goodwin, Vanderbilt University; Tober Francom, Arizona State University; Michelle Sherman, University of Texas at Arlington; James Hubbard, Clemson University; Seth Bollier, IUPUI.

In addition to these awards and scholarships, NASTT also held a fun new event for students – The Amazing Trenchless Race – designed to encourage student-exhibitor engagement. Participating exhibitors submitted questions and designed events ahead of time for students to answer and complete. The idea was for the students to complete the "race," although due to the various schedules of each student, there was no prize for the first team that completed the scorecard, but prizes were awarded to everyone who successfully completed all exhibitor activities.

1: Program Committee Member and Volunteer Instructor Kaleel Rahaim and NASTT Board Member Joe Lane, present the Student Poster Competition awards to Jane Peter, Ashkan Faghih and Maureen Cassin at the Annual Closing Luncheon.

2: Brian Brandstetter of Rain for Rent awarded the Charles P. Lake Rain for Rent Scholarships to Tober Francom, Michelle Sherman, James Hubbard and Seth Bollier (not pictured: Elizabeth Pope Goodwin).

3: Lameck Onsarigo from Bowling Green State University presents his project on ODOT's Culvert Boring Process during the Student Poster Competition.

4: NASTT Volunteer Stephen Welling presents the award for Most Enthusiastic Team to the Amazing Trenchless Race team of Estevan Sanchez and Matthew Lake from our brand new student chapter at Cal Poly Pomona.

5: NASTT Board Members Jason Lueke and Tony Hranika with Carrie Mouck, one of this year's recipients of NASTT's Michael E. Argent Memorial Scholarship Program.

Michael E. Argent Memorial Scholarship Winners

NASTT is pleased to offer its annual student scholarship program established in the memory of Michael E. Argent, who is recognized as one of the industry's true visionaries and a motivating force behind the growth of trenchless technology. In 1990, Michael was one of five people who founded NASTT. Through this scholarship program established in his memory, it is hoped that his contributions to the industry will continue to inspire young trenchless professionals. Be sure to check the NASTT website, nastt.org, for updates and applications for the 2015 scholarship. Congratulations to this year's recipients!

Tober Francom
Arizona State University

Tober Francom is in the process of completing his Ph.D. at Arizona State University in civil engineering, with an emphasis on construction engineering. He has completed his bachelor's in civil engineering and master's in construction engineering at Arizona State University as well. Francom first got interested in the trenchless technology field through discussions and eventually a class with his advisor, Dr. Samuel Anaratnam. "I found this technology to be very interesting and innovative, ultimately reinforcing my decision to study trenchless for my Ph.D.," he said. "I am currently studying how alternative project delivery methods impact trenchless construction performance."

Carrie Mouck
McGill University

Carrie Mouck is in her final semester of her undergrad in Civil Engineering at McGill University. Originally from Toronto, Canada, she moved to Montreal in 2010 to attend McGill. Her interest in both the fields of geotechnical engineering as well as municipal infrastructure led her to discover trenchless technologies. Carrie joined her school's chapter in 2012 and has been an active member ever since. Her summer work experience in the water main rehabilitation industry only encouraged her curiosity in trenchless technologies. Upon graduation in December 2014, she looks forward to pursuing her interests in both water main and sewer rehabilitations as a future career choice.

Reza Navab
University of Alberta

Reza Navab has background in industrial engineering and will obtain his M.Sc. in construction engineering and management from the University of Alberta. His interest in trenchless technology began when he started his engineering internship program with IVIS Inc., a pioneer Alberta-based company that provides CCTV sewer inspection and pipeline rehabilitation services. His master's research focused on productivity analysis of CCTV inspection and work optimization of trenchless construction methods. He also worked with the City of Edmonton to improve the city's sewer mainline physical condition assessment program. He was awarded the prizes of the first choice of people in CSCE Edmonton poster competition 2013 and first place in CCTV inspection of NASTT's 2013 No-Dig Show. He also recently presented a paper on productivity improvement of sewer mains televising at the 2014 No-Dig Show in Orlando, Fla.

Caroleen Wilkes
Vanderbilt University

Caroleen Wilkes' interest in project management and her passion for a project's life cycle, led her to seek knowledge of the construction management process, enrolling in a Master's program at the School of Engineering of Vanderbilt University. There, Caroleen has gained a unique opportunity to strengthen her project management skills and explore the topics of sustainability and innovation. Outside of the classroom, through internships, she has gained new skill sets in facilities management and project management.

Hamed Zamenian
Purdue University

Hamed Zamenian is a Ph.D. student in the School of Civil Engineering at Purdue University. He has been involved professionally in several infrastructure projects including water, wastewater and solid waste management. His research interests include water and wastewater infrastructure assessment and rehabilitation, water-energy efficiency, solid waste management, tunneling construction procurement, construction safety, service-learning in engineering and global issues in engineering and construction.

Municipal Scholarship Winners Honored at Sunday Reception

Before the official start to NASTT's 2014 No-Dig Show, a welcome reception was held for this year's Municipal & Public Utility Scholarship Program recipients. Now in its second year, NASTT's Municipal & Public Utility Scholarship Program allowed municipal and public utility employees to be part of the education and networking at NASTT's 2014 No-Dig Show. The program is meant to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to economic challenges. NASTT was proud to fund this initiative.

"One of the biggest challenges NASTT faces is making sure people have access to the education we provide," says NASTT Chair Derek Potvin. "NASTT's No-Dig Show Municipal & Public Utility Scholarship Program was established to provide a source of funds for North American municipalities, government agencies and utility owners so they could attend NASTT's No-Dig Show."

Selected applicants were awarded conference registrations and accommodations enabling them to take part in the largest trenchless education event of the year. This year, 128 applicants from municipalities and agencies all over North America were awarded full conference registration to NASTT's 2014 No-Dig Show, with 100 professionals also receiving hotel accommodations through the scholarship.

"There's a real need to find new techniques to keep our infrastructure working," said Kas Zurek, design and construction engineer for the City of Winnipeg, Manitoba, a 2014 municipal scholarship recipient. "It's a tremendous opportunity to network with the people in this industry."

"We have old clay pipe in our system that needs to be rehabilitated or replaced," said Eric Schadler, sewer engineering program manager for the City of Vancouver, Wash., another municipal scholarship recipient for 2014. "Asset management is a big part of our [initiatives] and we just wanted to learn more about trenchless [options] and we're looking for new techniques, best practices."

Looking Ahead: No-Dig 2015 Heads to Denver

NASTT's 2015 No-Dig Show will be held March 15-19 at the Colorado Convention Center in Denver. NASTT is already working diligently to ensure next year's show is even better than this year, as we will be celebrating 25 years of NASTT in 2015.

Call for Papers!

NASTT is now accepting abstracts for its 2015 No-Dig Show. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically at NASTT's website, *nastt.org*, by June 30, 2014. NASTT's 2015 No-Dig Show Program Committee will review abstracts and notify the primary authors of acceptance in August. To ensure meaningful and commercial free technical content, all papers will be peer-reviewed. Final papers will be published in the conference proceedings. For more information, visit *www.nastt.org/abstractsubmission*.

NASTT'S EYE ON THE INDUSTRY...

Underground Solutions, Inc.

Hawaii/Guam – HDD, Sliplining, Pipe Bursting, Pilot-Tube, Direct-Bury

Since its introduction in Hawaii in 2006, Fusible PVC pipe has been adopted rapidly by major utility agencies and owners throughout the islands for pipeline projects. Use of the technology has expanded further to include military base projects on Guam.

Fusible PVC pipe from Underground Solutions, Inc., has been installed via horizontal directional drilling (HDD), sliplining, pipe bursting, pilot tube, and direct-bury on the islands of Oahu, Maui, Hawaii, Kauai, and Guam. Utility owners, military engineers and private developers have achieved significant savings while realizing the benefits of a leak-free, fully-restrained, fused PVC pipe system that is easily maintained using standard fittings and tapping procedures. Projects have ranged from 4-in. through 36-in. pipe size diameters, with projects completed on six different military bases.

Fusible PVC pipe is now regularly designed and installed in Hawaii Department of Transportation (HDOT) right-of-ways (airports, harbors, and highways), under major roadways, including H3, Kamehameha Highway and beneath Dillingham Airfield.

Underground Solutions, Inc.

St. Petersburg, Florida – HDD

Located on a beautiful peninsula between the Gulf of Mexico and Tampa Bay, the City of St. Petersburg is the fourth largest city in Florida. The "Sunshine City" is committed to protecting the unique environment of Tampa Bay and the city pioneered wastewater reuse over 40 years ago with the first reclaim water system in the country. To further this legacy, the city recently embarked on a major wastewater pump station and 30-in. pipeline project that would enable the closure of the Albert Whitted Water Reclamation Facility (AWWRF) and transfer the gravity sewage flow to the Southwest Water Reclamation Facility. The city retained multiple consultants to design and bid the project in five parts, four of which dealt with the nearly 7-mile long force main.

George F. Young, Inc. (GFYI) was retained to design the force main section nearest the AWWRF, known as Part D. The alignment traversed historic neighborhoods on the outskirts of downtown and, in one area, crossed a vital four lane road to downtown and a major drainage structure. After studying various options to cross these key areas, a single horizontal directional drill of approximately 1,700 l-f was determined to be the best approach. Bidding contractors decided to use DR21 Fusible PVC pipe in order to provide equivalent flow area and pressure rating.

The project manager noted that the HDD was a very challenging aspect of the project due to limited space and the desire to minimize public disruption. Minimizing borehole size with Fusible PVC was determined to be a major benefit as drilling conditions were more difficult than expected. "UGSI's assistance with pipe layout and fusion was outstanding," noted Craig Kubiniec, project manager of HDD contractor Dallas 1 Corp.

NASTT'S EYE ON THE INDUSTRY...

Insituform Technologies LLC

Irving, Texas – CIPP

The Trinity River Authority of Texas (TRA) is the largest wholesale provider of wastewater treatment services in Texas. The conservation and reclamation district provides water-related services throughout the 18,000-sq mile Trinity River basin to 60 cities and millions of residents.

In April 2012, TRA awarded a contract to rehabilitate more than 17,200 ft of 96-in. sewer pipelines in the City of Irving. This is one of the single largest projects completed to date for cured-in-place-pipe (CIPP) in the world. The project consisted of nine segments of the 96-in. diameter TRA Elm Fork Interceptor (CAC-11) that needed rehabilitation due to concrete degradation from exposure to hydrogen sulfide (H2S). The nine segments averaged approximately 2,000 ft each and were separated into 18 separate installations over the course of the project.

The CIPP portion of the project was designed to meet the criteria of ASTM-1216 in accordance with the depth, diameter and flow requirements of the system. Notice to proceed for the project was issued on May 29, 2012, with a contract completion date of spring 2014. As of June 2013, all nine segments have been completed, almost one full year ahead of the original anticipated completion date. The project was selected as the 2013 Project of the Year runner-up by *Trenchless Technology* magazine.

AP/M Permaform

Birmingham, Alabama – Storm Sewer Rehab

AP/M Permaform was a supplier of lining material on the Alabama DOT HWY 280 Emergency Storm Sewer Repair project that was awarded an honorable mention in the rehab category for the 2013 *Trenchless Technology* Projects of the Year.

This project, passing under eight lanes of State Highway 280 in Birmingham, Ala., involved the emergency rehabilitation of a 500-ft section of 66-in. CMP storm sewer from manhole to manhole, with an average cover of 65 ft. Each 500-ft pass took about 16 hours.

Pure Technologies, Inc.

London, Ontario, Canada – Condition Assessment

Lake Huron Primary Water Supply System (LHPWSS) and Pure Technologies completed a 47-km condition assessment of Lake Huron Pipeline A using advanced non-destructive technologies. The system has about 25 km of non-redundant pipeline, making it very difficult to shut down for inspection and repairs without disrupting water supply to customers. To accommodate operational constraints and continue to provide reliable water supply to its member municipalities, LHPWSS and Pure Technologies used advanced non-destructive free-flowing technologies to inspect the transmission main for leaks, air pockets and structural deterioration while the line remained in service.

The electromagnetic inspection identified 58 pipe sections with electromagnetic anomalies out of approximately 10,000 pipes inspected, a distress rate of 0.6 percent (industry average is 4 percent). This project provides an example of how utilities can manage aging infrastructure while working within a tight capital budget, effectively extending the useful life of the asset. The project was awarded an honorable mention in *Trenchless Technology* magazine's Project of the Year awards.

Region of York; Herrenknecht

Keswick, Ontario, Canada – Microtunneling

Herrenknecht equipment was used in the completion of the Keswick WPCP Effluent Outfall Project that was named runner up in the new installation category for the 2013 *Trenchless Technology* Projects of the Year.

...OUR MEMBERS IN ACTION

To meet the demands of the growing community, the Region of York (Region) wanted to expand the existing Water Pollution Control Plant (WPCP). However, during the expansion, the Region became aware that the existing WPCP outfall could not provide sufficient capacity to accommodate future flows from the expansion. Hatch Mott MacDonald (HMM) was retained by the Region to undertake detailed design and construction administration for a new, 750 mm to 1,200 mm outfall. The new outfall is approximately 1,800 m long, and runs from the WPCP to a point 900 m offshore in Lake Simcoe.

Through collaboration between the owner, design consultant and contactor team, several notable microtunneling firsts were achieved on the project including: the first offshore/underwater reception of a microtunnel drive completed in Canada; the first curved microtunnel drive completed in Canada, and the first compound curve microtunnel drive completed in North America.

The microtunneling work was completed on time, under budget and with no third-party damage claims. All four project drives were completed on line and on grade. In completing this project, the limits of what can be done using microtunneling have been pushed forward significantly, both in Ontario and across North America.

WANT TO SEE YOUR PROJECT HERE?

Please send a 100-word write-up and high-resolution photo to associate editor Andrew Farr at *afarr@benjaminmedia.com* or NASTT Communications and Training Manager Michelle Hill at *mhill@nastt.org* with the subject line "Eye on the Industry."

NASTT CHAPTER NEWS

British Columbia

In February 2014, the British Columbia Chapter held a CIPP training program that attracted nearly 70 attendees. The program was part of the chapter's ongoing training using NASTT-developed courses.

TOP: Chris Macey teaches a course in the City of Surrey for the British Columbia Chapter.

BOTTOM: NASTT Executive Director Mike Willmets was also on hand at the Surrey event to introduce a training course.

Three years ago, the chapter ran four courses (pipe bursting, CIPP, HDD and laterals) as a refresher to its target market. Since then, the chapter has been offering one course per year. These courses are intense and only intended for people involved in the specific trenchless areas. For all others, we offer a day-long varied seminar that takes place in different areas across the province. Remember, British Columbia is 367,700 sq-miles while Washington, Oregon and California are 317,000 sq-miles combined, so we have a big area but small population. In order to try and cover the majority of British Columbia, the chapter has taken the show on the road the last four years to three different areas of the province. This year we are presenting on Subsurface Utility Engineering in Okanagan, BC.

We are a few weeks away from submitting our Carbon protocol to the British Columbia government for approval. This will allow local governments in British Columbia to gain carbon offsets from their trenchless programs and offset against their carbon emissions from their day-to-day operations, which local governments have agreed to be neutral on since 2012.

Great Lakes, St. Lawrence & Atlantic

The Great Lakes, St. Lawrence & Atlantic Chapter promoted trenchless technology at the ACWWA last fall in Fredericktown, New Brunswick. The conference provided 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, upcoming events and training sessions, please visit the website at *www.glsla.ca*.

Mid Atlantic

MASTT has seminars tentatively planned in late-June 2014 for Bethesda, Md., and in mid-August 2014 for Pittsburgh, Pa. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any MASTT seminars, please go to www.mastt.org for chapter contact information and to view the proposed seminar schedule, please go to *www.mastt.org/proposed_seminar.html.*

Midwest

The MSTT has a seminar, "Trenchless Technology, SSES and Buried Asset Management," tentatively planned for mid-September 2014 in Louisville, Ky. Seminar locations and dates will be updated as the seminar dates, venues and programs are finalized. To participate in any MSTT seminars, please go to *www.mstt.org* for chapter contact information and to view the proposed seminar schedule, please go to *www.mstt.org/proposed_seminar.html.*

Pacific Northwest

The Pacific Northwest Chapter continues to strive toward its goal of increased educational outreach throughout the region. The PNW Chapter is tapping into the wealth of knowledge held by our diverse membership in order to promote the use of trenchless technology. The recently formed PNW Chapter Membership Committee is diligently working to develop new single-day introductory and education seminars that will be conducted by local members from Alaska to Idaho. The goal is to publicize the breadth of capabilities and advantages made available through

NOMINATIONS
BEING ACCEPTED FOR NASTT'S
HALL of FAME
CLASS OF 2015

NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY

In 2010, the NASTT Board of Directors voted to create a Hall of Fame in order to ensure that the Society's most outstanding and praiseworthy members received due recognition. The intent of NASTT's Hall of Fame is to preserve the outstanding accomplishments of these exceptional individuals and to honor their contributions to the advancement of both the trenchless industry and the Society. Members may be elected from all NASTT membership categories: Manufacturers and Suppliers; Engineers and Consultants; Municipal and Utility Employees; Contractors; and Academia.

Nominee _____

Birth Date _____ Year NASTT Membership Started _____

Nominee or Next-of-Kin Contact Information

Name _____

Business Name (if applicable) _____ Business Phone _____

Business Address _____

Home Address _____

Home Phone _____ Email Address _____

Summary of Outstanding Achievements

Please state in 3-4 sentences the contribution(s) made by this nominee that justifies his/her induction. You may also attach a document to this application if you need more space.

_____

_____

_____

_____

_____

Contact Information for the Principal Nominator

Name _____

Business Phone _____ Email Address _____

Completed applications along with (3) letters of recommendation from NASTT members and biographical information on the nominee should be directed electronically to Michael Willmets, NASTT Executive Director at mwillmets@nastt.org and must be received by no later than July 1, 2014.

NORTH AMERICAN SOCIETY for TRENCHLESS TECHNOLOGY ★ HALL OF FAME ★

www.nastt.org

North American Society for Trenchless Technology
7445 Morgan Rd. • Liverpool, NY 13090 USA
Phone: 315-409-7552

trenchless technology and to provide an introduction to our organization. For information on the chapter and upcoming events, please visit *www.pnwnastt.org*.

Northwest

All great news in the Northwest! The chapter's 2013 Northwest Trenchless Conference in Calgary last November was another triumph, with great attendance and a fantastic technical program. Attendance at the HDD Good Practices course at this event was a whopping 71, which topped the list for paid courses by NASTT in 2013. The conference itself included 13 technical presentations, 23 tradeshow exhibitors and received 170 attendees. Nadeer Lalji, who chaired the conference planning committee for the second time, deserves recognition in all his efforts to pull together this great event. Thanks as well to everyone who assisted on the planning committee!

Congratulations to the City of Edmonton, Michels, and Stantec for being awarded the 2013 Northwest Trenchless Project of the Year for the Big Lake Offsite Sanitary Gravity Portion (WESS W14) Project!

Planning for the 2014 Northwest Trenchless Conference is underway under the leadership of Alan Miller and Greg Tippett. The conference and tradeshow are scheduled for Nov. 13 at the Fantasyland Hotel in Edmonton. The Pipe Bursting Good Practices Short Course will be held on Nov. 14. The planning committee is actively pursuing volunteers for technical presentations. If you're interested in submitting an abstract or learning more about the conference, please visit the Northwest Trenchless Conference page of our website at *www.nastt-nw.com*. Conference registration will open this summer.

Left to right: Northwest Trenchless Project of the Year Award winners for 2013: Albert Kwan (City of Edmonton), Greg Tippett (Stantec), and Craig Vandaelle (Michels), with Chapter Chair Alan Miller.

In other news, on very short notice, Hartley Katz of our board of directors coordinated the Sewer Lateral Good Practices Course in Winnipeg on Feb. 7, 2014. Jason Lueke and Ray Sterling were the course instructors and attendance was good. Thanks to Hartley for his efforts in planning the event, and thanks to all who participated.

The Northwest chapter also extends a special thanks to Jason Lueke for his continued outreach work at the Alberta Water and Wastewater Operator's Association annual conference in Banff, where he conducted free NASTT short courses in March 2013 and 2014. Jason's efforts are a great example of the grassroots spirit of our chapter membership.

With recent turnover of some of our board, we had a significant number of director positions up for election in 2014. The Chapter welcomes new directors Charles Pullan (City of Calgary), Craig Vandaelle (Michels), Ali Bayat (University of Alberta), and Ben Campbell (Neptune Coring) to the Board. These gentlemen are joining veteran directors Alan Miller (Associated Engineering), Hartley Katz (Stantec), Siri Fernando (City of Edmonton) and Keith Moggach (Royal Pipe) on the Board in 2014.

Rocky Mountain

The Rocky Mountain Chapter held its 4th annual regional No-Dig conference in Westminster, Colo., in November 2013. The conference provided a unique and important opportunity to share information, hear from respected trenchless practitioners, visit exhibitor booths and network with trenchless technology professionals actively engaged in trenchless pipeline projects in Colorado, Utah and Wyoming. For more information on upcoming chapter events, please visit *www.rmnastt.org*.

Western

The Western Chapter most recently held its annual Western Regional No-Dig Conference and Exhibition on in October 2013 in Honolulu, Hawaii. More information on the chapter and upcoming events can be found on the website at *www.westt.org*.

NASTT'S TRENCHLESS TODAY Wants To Hear From You!

If you're involved with one of NASTT's nine regional chapters, we want to hear about all your events and activities. Send write-ups to associate editor, Andrew Farr at *afarr@benjaminmedia.com*.

NASTT has a network of nine 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	Elected Officers
David O'Sullivan, Chair	Chair - David O'Sullivan
Phone: (604)-580-0446	Vice Chair - Rod Loewen
E-mail: david@pwtrenchless.com	Secretary - vacant
Website: www.nastt-bc.org	Treasurer - Kieran Field

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	Elected Officers
Kevin Bainbridge, Chair	Chair - Kevin Bainbridge
Phone: (905) 304-0080	Vice Chair - Frank Badinski
E-mail: kbainbridge@rcii.com	Secretary - Gerald Bauer
Website: www.nasttglsl.on.ca	Treasurer - Derek Potvin

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	Elected Officers
Richard Thomasson, Chair	Chair - Richard Thomasson
Phone: (703) 842-5621	Vice Chair - Michael Delzingaro
E-mail: rthomasson@pirnie.com	Secretary - Dennis Walsh
Website: www.mastt.org	Treasurer - Tom Wyatt

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	Elected Officers
Jeff Boschert, Chair	Chair - Jeff Boschert
Phone: (314) 229-3789	Vice Chair - Larry Kiest, Jr.
E-mail: jeffboschert@yahoo.com	Secretary - Randy Fries
Website: www.mstt.org	Treasurer - Bill Shook

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	Elected Officers
Dan Willems, Chair	Chair - Dan Willems
E-mail: dwillems@nastt-nw.com	Vice Chair - vacant
Website: www.nastt-nw.com	Secretary - Mark Brand
	Treasurer - Keith Moggach

Pacific Northwest

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

Chapter Contact	Elected Officers
Christopher Price, Chair	Chair - Christopher Price
Phone: (425)-205-4930	Vice Chair - Chris Sivesind
	Secretary - Matthew Pease
	Treasurer - Richard Hanford

Rocky Mountain

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

Chapter Contact	Elected Officers
Al Paquet, Chair	Chair - Al Paquet
E-mail: al.paquet@ch2m.com	Vice Chair - Bo Botteicher
Website: www.rmnastt.org	Secretary - Andrew Lockman
	Treasurer - Ken Matthews

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	Elected Officers
Jerry Trevino, Chair	Chair - Jerry Trevino
Phone: (877) 462-6465	Vice Chair - Ed Paradis
E-mail: jerry@mechanicaljobbers.com	Secretary - J. Chris Ford
Website www.sestt.org	Treasurer - Kelly Derr

Western

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

Chapter Contact	Elected Officers
Craig Camp, Chair	Chair - Craig Camp
Phone: (619) 858-1595	Vice Chair - Cindy Preuss
E-mail: craig.camp@hatchmott.com	Secretary - Cory Street
Website www.westt.org	Treasurer - Matt Wallin

NORTH AMERICAN SOCIETY *FOR* TRENCHLESS TECHNOLOGY

educate • train • research • publish

NASTT REGIONAL CHAPTERS

REGIONAL ISSUES, INTERNATIONAL SUPPORT

Contact your regional chapter today.

The grassroots of NASTT is a network of nine regional chapters throughout the United States and Canada. Regional chapters network at the local level, share infrastructure challenges and develop new ideas. Regional chapters hold various events throughout the year, and like NASTT, are dedicated to the advancement of trenchless technologies for the benefit of the public and the environment.

With your NASTT membership you are automatically enrolled not only in the national and international organization, but also in your regional chapter. So join today and get to know the "local heroes" that are making their communities better places through the innovative engineering solutions of trenchless technologies.

REGIONAL CHAPTERS

British Columbia
www.nastt-bc.org
British Columbia

Great Lakes, St. Lawrence & Atlantic
www.glsla.ca
Ontario, Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland and Labrador

Mid-Atlantic
www.mastt.org
Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia and District of Columbia

Midwest
www.mstt.org
Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin

Northwest
www.nastt-nw.com
Alberta, Manitoba and Saskatchewan

Pacific Northwest
Alaska, Idaho, Oregon and Washington

Rocky Mountain
www.rmnastt.org
Colorado, Utah and Wyoming

Southeast
www.sestt.org
Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico

Western
www.westt.org
Arizona, California, New Mexico, Nevada and Hawaii

nastt.org

North American Society for Trenchless Technology
7445 Morgan Rd. • Liverpool, NY 13090
Phone: 315-409-7552

NASTT 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.*

Arizona State University
Tempe, Arizona
Advisor: Dr. Samuel T. Ariaratnam
E-mail: samuel.ariaratnam@asu.edu

Bowling Green State University
Bowling Green, Ohio
Advisor: Dr. Alan Atalah
E-mail: aatalah@bgnet.bgsu.edu

California State Polytechnic University, Pomona
Pomona, California
Advisor: Dr. Jinsung Cho
E-mail: jinsungcho@csupomona.edu

Clemson University
Clemson, South Carolina
Advisor: Dr. Kalyan Piratla
E-mail: kpiratl@clemson.edu

Concordia University
Montreal, Quebec
Advisor: Dr. Tarek Zayed
E-mail: zayed@bcee.concordia.ca

Indiana University - Purdue University Indianapolis
Indianapolis, Indiana
Advisor: Dr. Dae-Hyun (Dan) Koo, P.E.
E-mail: dankoo@iupui.edu

Laval University
Quebec City, Quebec
Advisor: Dr. Geneviève Pelletier, ing.
E-mail: Genevieve.Pelletier@gci.ulaval.ca

Trenchless Technology Center/ Louisiana Tech University
Ruston, Louisiana
Advisor: Dr. Erez Allouche
E-mail: allouche@latech.edu

McGill University
Montreal, Quebec
Advisor: Dr. Mohamad A. Meguid
E-mail: mohamed.meguid@mcgill.ca

Queen's University
Kingston, Ontario
Advisor: Dr. Ian D. Moore
E-mail: moore@civil.queensu.ca

CUIRE/University of Texas at Arlington
Arlington, Texas
Advisor: Dr. Mo Najafi
E-mail: najafi@uta.edu

Vanderbilt University
Nashville, Tennessee
Advisor: Dr. Sanjiv Gokhale
E-mail: s.gokhale@vanderbilt.edu

Virginia Tech University
Blacksburg, Virginia
Advisor: Dr. Sunil Sinha
E-mail: ssinha@vt.edu

University of Alberta
Edmonton, Alberta
Advisor: Dr. Alieza Bayat
E-mail: abayat@ualberta.ca

This year's auction raised over $128,000 in funds! That brings our grand total since 2002 to over $750,000. These funds will be directed toward educational and outreach activities offered by NASTT, including student scholarships, educational publications and developing new training courses.

This fund would not be possible without the generous donations made by the following organizations:

THANK YOU!

Akkerman Inc
American Augers
American Ductile Iron Pipe/
American SpiralWeld Pipe LLC
AOC Resins
Barbco Inc
Baroid Industrial Drilling Products
Benjamin Media Inc
CATT
Digital Control Inc
Ditch Witch
GLSLA Chapter of NASTT
Hamilton Kent
HammerHead Trenchless Equipment
Harris & Associates
Interplastic Corp
LMK Technologies
Mears
Michels Corporation
Midwest Mole Inc
Miller Pipeline
NASTT
Northeast Consulting Inc
Northwest Chapter of NASTT
Pacific Northwest Chapter of NASTT
The Plastics Pipe Institute
PUG - Northern CA Pipe Users Group
PW Trenchless Construction Inc
Rain for Rent
Rick Mauldin
The Robbins Company
Robinson Consultants Inc.
Sea Glass Fine Art
Secure CFO Solutions
SpectraShield Liner Systems
Sprayroq Inc
Staheli Trenchless Consultants
Stantec Consulting Ltd
The Ted Berry Company
TT Technologies
WESTT Chapter of NASTT
Woodard & Curran
Wyo-Ben

NASTT.ORG

North American Society for Trenchless Technology
7442 Morgan Road • Liverpool, New York 13090

NASTT OUTSTANDING TECHNICAL PAPERS

DESIGN AND CONSTRUCTION OF AN INCLINED FROZEN SOIL HDD RESCUE SHAFT

Aaron K. McCain, P.E.,
SoilFreeze, Seattle, Wash.

Daniel W. Mageau, P.E.
SoilFreeze, Seattle, Wash.

Khuram Shah
Southeast Directional Drilling, Casa Grande, Ariz.

Mel Olson, P.E.
Duluth, Minn.

INTRODUCTION

The completed Tulalip Water Pipeline project consisted of the drilling and installation of 7.5 miles of underground steel water transmission pipeline from the City of Everett to the Tulalip Tribes Reservation. The alignment was designed to pass under four rivers, including Ebey Slough, and was a joint effort by the City of Everett and the Tulalip Tribes to extend municipal water supply to previously unserved areas. The entire project was broken into eight segments with Don Kelly Construction (DKC) as the general contractor and Southeast Directional Drilling (SEDD) subcontracted to complete the required horizontal directional drilling (HDD), including the high water Ebey Slough area designated as Segment 5N.

Segment 5N, located just south of Marysville, Wash., (about 40 miles north of Seattle), consisted of a 2,800-ft long HDD profile that roughly paralleled the west side of the Interstate 5 (I-5) as it went under Ebey Slough, and back up again. The Washington State Department of Transportation (WSDOT) required that a 240-ft long, 60-in. diameter steel conductor barrel casing first be installed beneath the I-5 off-ramp for SR529 to protect the off-ramp from construction impact during HDD operations. During the pullback/reaming process the pull head, which connects the product pipe to the drill string, became hung up on the lead edge of the conductor barrel casing such that it could not be pulled inside and then through to complete the installation. The location where the drill string became stuck was directly beneath the off-ramp, approximately 65 ft below the pavement surface.

Early attempts to free the drill string from the ground surface had been nearly exhausted while the exact orientation of the stuck pipe in relation to the conductor barrel casing below ground was difficult to determine. The last remaining option was to excavate down to the lead edge of the conductor barrel casing and expose the product pipe via a rescue shaft. This approach required significant shoring and groundwater control due to the loose alluvial soils and high groundwater. After review and investigation of practical methods, ground freezing was selected as the primary means of pipe rescue. SoilFreeze Inc., a Seattle-based ground freezing contractor, was retained by SEDD to design and create a frozen soil shaft that provided a stable and watertight access to the rescue point at the end of the product pipe. Engineering & Construction Innovations, Inc. (ECI), a subcontracted tunneling contractor, was retained by SEDD to excavate the rescue shaft.

FROZEN SOIL SHORING CONCEPT AND SOIL CONDITIONS

The geometry on this project was controlled by the restrictions created by the proximity to the state controlled roadways and surrounding wetlands. Traffic along I-5 and the off-ramp could not to be impacted in any way and therefore a vertical shaft that extended from the ground surface down to the rescue point was not possible. Instead, SoilFreeze designed an inclined shaft that extended below the off-ramp from the west side of the roadway embankment, perpendicular to the conductor casing to the rescue point. A shaft "bottom" was built to provide groundwater cutoff by extending a freeze wall down from the east side of the exit ramp to intersect the shaft below the rescue point.

The shaft and the bottom cutoff wall were created by installing a series of close-ended 3-in. diameter steel pipes at an approximately 3-ft spacing around the perimeter of the shaft and along the centerline of the cutoff wall. Calcium chloride brine, chilled to approximately -15 to -20 °F was then circulated through the series of pipes to freeze the surrounding soils. The frozen ground around each pipe gradually enlarges and eventually the frozen ground around each pipe overlaps with the frozen ground around the adjacent pipe and a continuous frozen barrier is created. The inclined shaft and bottom cutoff wall resulted in a complex 3-dimensional solution that was made even more difficult by the sloping and non-uniform ground surface and the new waterline that was inclined at 10 degrees from horizontal that could not be hit or damaged in any way during installation of the freeze pipes. Any scratch or damage to the protective coating on the waterline would have had to be repaired, meaning a difficult expansion of the rescue shaft operation.

The soil conditions at the site consisted of silty sand and gravel (embankment fill) overlying loose to medium dense silty sand (alluvial deposits). A layer of silt with organic matter was encountered within the alluvial deposits. Tidally influenced groundwater, with a daily fluctuation on the order of 2 ft, was near the natural ground surface at the base of the embankment.

THERMAL ANALYSIS

A series of thermal analyses were completed for the project using TEMP/W, a 2D computer program developed by Geo-Slope International. The program is used to model thermal changes in the ground, including frost growth around a steel freeze pipe chilled

with calcium chloride brine. The results of the analyses are used to determine optimum spacing for the freeze pipes to create a water-tight and structurally stable shaft and wall within a timeframe that meets the project requirements. In addition the results of the analyses are used to predict the temperature of the frozen soils which governs the strength parameters used in the structural analysis of the rescue shaft.

The input soil parameters consist of thermal properties that are based on published correlations with common characteristics such as dry density and moisture content of the soils. The input temperature data for the freeze pipes in the model is based on convective heat transfer between the soil and the chilled calcium chloride through the steel pipe.

Thermal 2D analyses were completed to evaluate the complex 3D geometry. These include sections through the inclined shaft area and sections through the back wall area. We also completed a number of analyses near the end of the inclined shaft, just beyond the rescue point where the casing and the product pipe intersect. Figure 1 shows a typical TEMP/W result for evaluation of ground freezing for the inclined shaft.

This plot is a cross section near the midpoint of and perpendicular to the inclined rescue shaft and represents the expected extent and temperature of the frozen ground after five weeks of freezing. The blue triangles in the figures represent the location of the freeze pipes and the contours shown represent the ground temperatures in 5°F increments. The dashed blue line represents the limit of the frozen soil (32°F).

The results of the analysis indicated that with a center-to-center spacing of 3 ft between adjacent freeze pipes frozen soil would be continuous around the shaft and provide water cut-off after about 3-4 weeks of freezing. The analyses also indicated that the frozen soil would have sufficient thickness (~4 to 5 ft) and strength after five weeks of freezing to provide a stable shoring system for the excavation of the shaft.

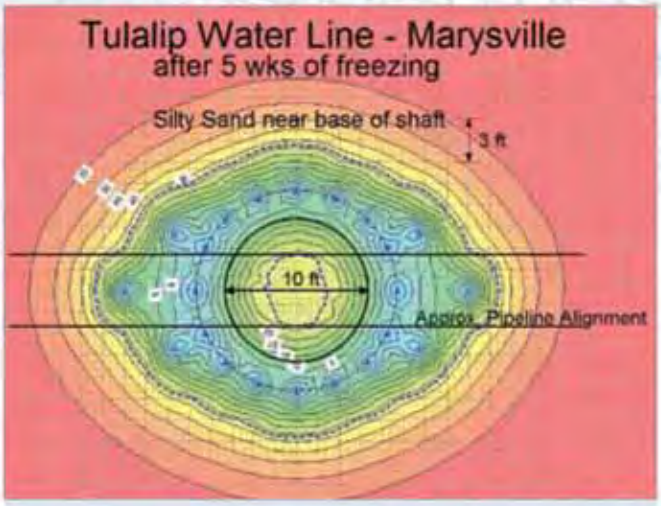


Figure 1: TEMP/W results for the inclined shaft after five weeks of freezing.

STRUCTURAL ANALYSIS

A structural analysis was completed for the rescue shaft based on the locations of the freeze pipes and the thickness and temperature of the frozen soil as determined from the thermal analysis. Finite element modeling was completed using PLAXIS 2D to determine the factor of safety and expected deformation of the frozen soil. As with the thermal analysis, two different 2D analyses were used to evaluate the structural stability of the rescue shaft. The first was an analysis of a horizontal frozen soil shaft (essentially a tunnel) beneath the embankment using a plane-strain model. The second analysis was an evaluation of a vertical frozen soil shaft using an axi-symmetric model that simulates a 3D analysis around a vertical axis.

The horizontal tunnel (first) analysis was completed to evaluate the effect of earth and water pressures on the circular frozen rescue shaft at various depths and in different soil conditions. This analysis also allowed us to calculate the settlement that could occur at the ground surface. The different contours represent total displacement in increments of 0.01 in. (maximum calculated displacement was 0.17 in.). The results from these analyses indicated the frozen soil was very stable with a factor of safety of at least five, and that very little movement (on the order of 1/8 to 1/4 in.) of the shaft was expected. In addition, the settlement at the ground surface was calculated to be less than 1/4 in. and the zone of influence would extend horizontally from the pipe a distance equal to one-half the depth.

The second PLAXIS analysis is for a vertical shaft and assumes that the input geometry is uniform around the central axis of the model. The different contours represent total displacement in increments of 0.02 in. (maximum calculated displacement was 0.33 in.). The depths used in the model are representative of the actual vertical change of pressures on the shaft and not the total angle length of the shaft. This was done in order to model accurate lateral earth and water pressures.

In addition, a horizontal load was applied to the shaft equal to the component of the vertical effective stress that is oriented normal to the inclined shaft. The axi-symmetric results also indicated that the shaft had a factor of safety of at least five and the maximum deflection of the shaft would be less than 1/2 in. located in the layer of silt with organic content. At other locations the deflection of the frozen soil would be negligible. Settlement of the ground surface was also calculated to be less than 1/4 in.

FREEZE SYSTEM INSTALLATION

The project experienced a considerable delay due primarily to the review process of the design of the rescue shaft and obtaining the regulatory permits for working adjacent to and partially in a tidally influenced wetland. SEDD was required to protect the existing ground surface at the base of the roadway embankment. This was accomplished by covering the existing wetland vegetation with a non-woven filter fabric and large wooden crane mats that served as a working platform. A "berm" was created at the south end of the work area using concrete ecology blocks and plastic to protect the existing wetland to the south.

The final design of the rescue shaft consisted of two separate systems due to the I-5 off-ramp located between the east and west systems. Each system included a separate chiller, generator, pump, and manifold system. The west system consisted of the access shaft and initially included 22 freeze pipes installed at 45 degrees into the side of the roadway embankment. These pipes generally extended beyond the rescue point to a depth of 75 to 80 ft below the ground surface except in the vicinity of the conductor casing and the product pipe. The east system consisted of the shaft bottom and initially included 13 freeze pipes installed at 60 degrees (from horizontal) to a depth of 80 ft below the ground surface.

Installation of the freeze pipes began in April 2012 by DBM Contractors, Inc, a subcontracted drilling company. Drilling began first for the pipes that made up the shaft bottom. It was critical that these pipes extended to the full depth to ensure that the bottom of the shaft would be completely frozen. Figure 2 shows typical drilling for the shaft bottom. After the pipes for the shaft bottom were installed, the drilling process relocated to the west side to install the pipes for the rescue shaft. The freeze pipes were installed by visually aligning the drill rig with surveyed control points, setting the drill string at the correct angle and drilling a cased hole, flushing with water, to the design depth. Upon completion of the hole the entire 3-in. diameter steel freeze pipe was immediately placed inside the casing. The freeze pipe had previously been welded in sections to the design length with a cap welded onto the base. The pipe was pressure tested with air to confirm that there would be no brine leaks. Once the pipe had been installed the annular space around the pipe was filled with lean grout, which was pumped through the casing as the casing was removed.

Figure 2: Drilling and freeze pipe installation for the shaft bottom (looking south). I-5 is to the left and the off-ramp is located to the right.

One of the chief concerns during installation was verification of the freeze pipe location and alignment. On the east side, verification of the freeze pipe location was accomplished using a down-hole survey probe. However, the pipes on the west side were at too flat an angle for this probe and a different methodology was required. SoilFreeze engineers created a small trolley equipped with a mini surveying prism (peanut) that fit into the empty 3-in. freeze pipe. The trolley was then lowered down the pipe and successfully surveyed using a conventional total station instrument.

Most of the freeze pipes were installed within 18 in. of the design alignment. However a few pipes were significantly out of tolerance. The results of the survey allowed us to review the actual installed locations and adjust the design to ensure that the frozen soil shaft would be created as planned. As a result, four additional pipes were added in locations where the installed pipe spacing was excessive.

Instrumentation of the site consisted of three temperature pipes and a series of settlement monitoring points on the ground surface and inside the excavated shaft. The temperature pipes were installed using the same 3-in. diameter pipes and drilling techniques as the freeze pipes. They were installed within the area of anticipated freezing, a few feet from the nearest freeze pipes.

Thermocouple (T-type) temperature strings were installed in each of the temperature pipes with temperature nodes at 5-ft intervals to monitor the ground temperatures and the growth of the frozen soil. Settlement monitoring points had been established on the ground surface during the HDD phase of the project and these were monitored throughout the rescue process. Survey points were also established within the rescue shaft during excavation in order to monitor deflection of the shaft.

FREEZING PERFORMANCE

The frozen soil stabilization worked very well. The progress of freezing was monitored using the temperature strings and the thermal model was calibrated based on the actual measured temperature of the chilled brine (input to the model) and the measured temperature of the ground (output from the model). With a relatively well calibrated model, we were able to evaluate the growth of the frozen ground from the output of the model. Freezing took about five weeks to complete.

The excavation in the 60-in. casing was completed by SEDD after freezing was sufficient to cutoff groundwater. It consisted of pumping out the water and cleaning out the material that had settled in the casing after drilling operations had ceased. The excavation was completed initially using high pressure water and a vactor truck. Frozen soils were encountered approximately 6 ft from the end of the conductor casing. The frozen soil down near the rescue point allowed the excavation to extend a few feet past the end of the conductor casing well before the inclined rescue shaft had advanced to the same point. This allowed SEDD to determine the location and orientation of the product pipe and make early measurements and preparations for the repair process. It was confirmed that the pull head had become wedged against the lower portion of the conductor casing. After observing the location of the pull head, excavation from the conductor casing was stopped. It was determined that it would not be safe to open a cavity around the rescue point while the inclined rescue shaft was being excavated.

The excavation for the inclined rescue shaft was completed by ECI. The excavation was begun by constructing a concrete portal with 8-ft diameter (ID) steel liner plates that were surveyed into place to establish the correct alignment. The contractor elected to use

Congratulations

to the following award recipients honored at NASTT's 2014 No-Dig Show!

NASTT Hall of Fame Award
Bob Affholder
Joseph Loiacono
Dr. Raymond Sterling

Chair's Award for Lifetime Service
Chris Brahler, TT Technologies Inc.

Joseph L. Abbott, Jr. Innovative Product Awards
GAME Trenchless Consultants
Warren Environmental Inc.

2013 Outstanding Paper Award
"Design and Construction of an Inclined Frozen Soil HDD Rescue Shaft" by Aaron McCain; Daniel Mageau; Khuram Shah and Mel Olson

"More Really Old CIPP Liners from Winnipeg, MB, Canada That Have Stood the Test of Time" by Chris Macey; Kas Zurek; Nick Clinch; Armand Delaurier and Ron Sorokowski

Trent Ralston Award for Young Trenchless Achievement
Abhinav Huli, Haley & Aldrich Inc
Laura Wetter, Staheli Trenchless Consultants

Michael E. Argent Memorial Scholarship
Hamed Zamenian, IUPUI
Reza Navab, University of Alberta
Tober Francom, Arizona State University
Caroleen Wilkes, Vanderbilt University
Carrie Mouck, McGill University

Student Chapter Presentation
1st Place - Arizona State University
2nd Place - Queens University
3rd Place - Clemson University

Student Poster Competition
1st Place - Maureen Cassin, Arizona State University
2nd Place - Ashkan Faghih, University of Alberta
3rd Place - Jane Peter, Queen's University

Figure 3: Initial cavity around the product pipe (green) and casing prior to removal of the pull head and installation of the insulated tarps. Note the frost development on the back and upper face of the cavity.

the steel liner plates to aid in entering and exiting the steep shaft, to protect the frozen soil from thermal erosion as work progressed down the shaft, and to help maintain the alignment of the shaft. Ground support and groundwater cutoff, however, was provided entirely by the frozen soil shoring. Excavation was completed using primarily high pressure water wands and pneumatic chipping guns. The frozen soils remained stable during the entire excavation and no signs of seepage were observed. Ventilation air ducting was installed concurrent with excavation utilizing PVC pipe and maintained within approximately 10 ft of the active face. As the excavation progressed monitoring points were established on the interior of the shaft to observe any deflections. The measurements never indicated more than 1/8-in. of deflection, even as the excavation extended through the frozen layer of silt with organics in the deeper sections of the shaft.

No water seepage from outside the frozen soil shoring was observed during the excavation of the rescue shaft. A small trickle of water from condensation flowed down the shaft, but this was not an issue. The condensation froze near the base of the shaft and the ice layer had to be occasionally chipped out and removed by workers.

The end of the conductor casing and the product pipe were encountered almost exactly in the middle of the excavation (see Figure 3). The product pipe was exposed and the shaft was expanded to a cavity that was roughly 12 ft wide, 10 ft deep and 9 ft high. Originally the cavity was not much wider than the 8-ft wide shaft, however there was not sufficient room to make the repairs on the pipeline. After observing the extent of the frosted area on the inside face of the conductor casing and reviewing temperature data and the calibrated thermal model, we concluded that there was sufficient thickness of frozen ground to expand the cavity. The cavity was expanded and approximately 18 in. of the conductor casing was removed to allow for the repairs to be made. Insulated tarps were nailed directly onto the frozen soil to protect against thermal erosion. The frozen cavity remained open with no water seepage or wall movement for approximately two to three weeks while the product pipe was repaired and completed.

The repair process required inserting a 240-ft long, 36-in. diameter product pipe extension down the conductor casing and connecting the stuck portion and extension through a series of welded butt straps. After the welding was completed, a protective coating was required for the offset fittings on the interior and exterior faces. The surface of the offset fittings was prepared for coating by sandblasting, however the high humidity and cold temperatures at the rescue point resulted in frequent rust blooms. To combat these issues a dehumidifier was placed in the cavity and electric heaters were used to warm the pipe to 45°F. The protective coating consisted of a roller applied epoxy coating, which was successfully placed on the pipe. Through all of the heat-generating repair activities the frozen soils remained frozen with a typical temperature of 20°F to 25°F on the face of the cavity and much colder towards the center of the frozen soil. A photo of the completed 36-in. product pipe inside the frozen chamber is shown in Figure 4.

After the pipeline was successfully repaired and coated, the frozen cavity was eventually filled with a combination of pea gravel and low-strength flowable cement-based material. The portal wall was backfilled to match the surrounding road embankment with native material and vegetation re-established.

Figure 4: The completed 36-in. diameter product pipe inside the frozen soil cavity.

CONCLUSION

The frozen soil rescue shaft performed exceptionally well and allowed the completion of the water transmission line for the Tulalip Nation of Tribes. The frozen soil system provided significant advantages for this difficult excavation. The complex geometry of an inclined frozen soil shaft and an inclined bottom cutoff wall was successfully installed with no impacts to the adjacent Interstate or the partially installed product pipe. Excellent survey control, as-built plans, ground temperature data, and a calibrated thermal model allowed ongoing evaluation of the frozen soil shoring system in a complex environment which provided flexibility to expand the frozen cavity when additional space was required during the repair activities. The frozen soil rescue shaft was shown to be a safe and stable means of providing a dry excavation below tidally influenced groundwater.

This paper was edited for style and space for *NASTT's Trenchless Today*. To view the full version of paper TA-T2-04, please visit *nastt.org/technicalpapers*.

CALENDAR

July

8
NASTT's Complimentary Carbon Calculator Webinar
Contact Info:
Vicki Losh
Phone: (330) 467-7588
Email: *vlosh@benjaminmedia.com*
Web: *www.nastt.org/webinars*

August

19
Trenchless in Toronto
In conjunction with APWA's International Public Works Congress & Exposition
Metro Toronto Convention Centre
Toronto, Ontario
Contact Info:
Michelle Hill
Email: *mhill@nastt.org*
Web: *www.apwa.net/Congress*

September

10
NASTT's Complimentary CIPP Webinar
Contact Info:
Vicki Losh
Phone: (330) 467-7588
Email: *vlosh@benjaminmedia.com*
Web: *www.nastt.org/webinars*

October

6-7
10th Annual Western Regional No-Dig Conference & Exhibition
Location TBA
Albuquerque, New Mexico
Contact Info:
Craig Camp
Email: *Craig.Camp@HatchMott.com*
Web: *www.westt.org*

November

6
NASTT's Complimentary Condition Assessment Webinar
Contact Info:
Vicki Losh
Phone: (330) 467-7588
Email: *vlosh@benjaminmedia.com*
Web: *www.nastt.org/webinars*

13
2014 Northwest Trenchless Conference
Fantasyland Hotel
Edmonton, Alberta
Contact Info:
Alan Miller
Email: *millera@ae.ca*
Web: *www.nastt-nw.com*

September

NASTT Member Directory Coming Soon!

This fall, feature your company logo with your member listing in the September issue of NASTT's Trenchless Today!

YOUR COMPANY HERE
Your Name
1234 Some St.
City, STATE 00000 USA
111-222-4444
www.yourwebaddress.com

Contact Brittany Maurer to reserve your logo placement today!

bmaurer@benjaminmedia.com
440-315-2150

Future NASTT's No-Dig Shows

March 15-19, 2015
NASTT's 2015 No-Dig Show
Colorado Convention Center
Denver, Colorado

March 20-24, 2016
NASTT's 2016 No-Dig Show
Gaylord Texan
Dallas, Texas

April 9-13, 2017
NASTT's 2017 No-Dig Show
Gaylord National
Washington, D.C.

ADVERTISERS INDEX


educate • train • research • publish
NORTH AMERICAN SOCIETY FOR TRENCHLESS TECHNOLOGY
A PIPELINE OF TRENCHLESS RESOURCES
EDUCATE
• NASTT's No-Dig Show - Exhibits, Technical Program and Networking
• Free Trenchless Webinar Series
PUBLISH
• Introduction to Trenchless Technology Rehabilitation Manual
• Introduction to Trenchless Technology New Installations Manual
• Horizontal Directional Drilling (HDD) Good Practices Guidelines Manual
• Pipe Bursting Good Practices Guidelines Manual
• Laterals Good Practices Guidelines Manual
RESEARCH
• NASTT's Carbon Calculator
• Industry Partnerships
• World's Largest Online Trenchless Library
• Scholarships
TRAIN
• Cured-in-Place Pipe (CIPP)
• Horizontal Directional Drilling (HDD)
• Introduction to Trenchless Technology Short Course
• Laterals
• New Installation Methods
• Pipe Bursting
nastt.org
North American Society for Trenchless Technology
7445 Morgan Rd. • Liverpool, NY 13090
Phone: 315-409-7552

LEADING THE WORLD OF CIPP IS IN OUR FIBER.

Everything we do at Applied Felts — from maintaining full control of our raw materials to helping ensure each and every felt liner we make is successfully installed — makes us the global leader in supplying the world's finest CIPP liners. It's who we are because Applied Felts was there from the beginning, helping take the first innovative steps to invent the CIPP process more than 40 years ago. Now we are taking the next big leap by introducing our latest innovation, AquaCure RP®. This breakthrough liner combines the benefits and performance of fiberglass reinforcement with our existing, best-in-class felt liner design and construction. Our exclusive technology fully integrates and blends state-of-the-art strength with millions of feet of proven results to provide the strongest, most robust liner on the market today. AquaCure RP is just one more reason customers from Singapore to San Francisco depend on us year after year. They know what we're made of.

APPLIED FELTS

YOUR SUCCESS IS OUR SUCCESS

appliedfelts.com
US: 276.656.1904
UK: 44.1924.200535