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Trenchless Today
Educate - Train - Research - Publish



Summer 2013 | Volume 3 | Issue No. 2



NASTT'S 2013 NO-DIG SHOW STRIKES GOLD IN SACRAMENTO





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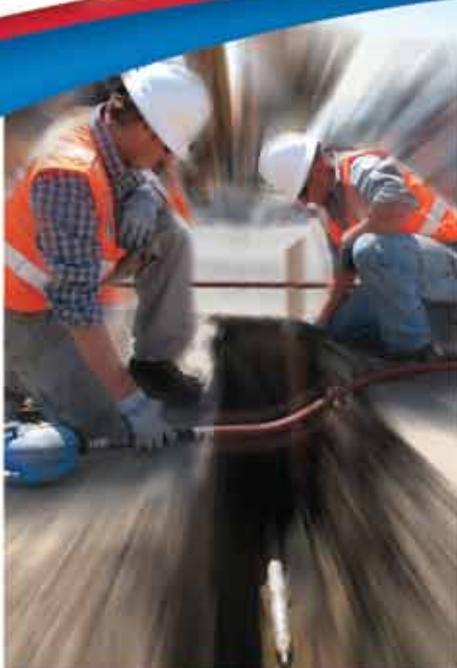
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For this month's issue of *NTT*, we sat down with Dr. Alan Atalah, professor at Bowling Green State University, to talk to him about the school's construction management program, some of the trenchless technology courses he is teaching and how his students feel about the growth of the trenchless industry.

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- 16 **NASTT's 2013 No-Dig Show Recap**
Compiled by *NTT* Staff
NASTT's No-Dig Show continues to exceed expectations and truly remains the largest and most informative trenchless construction conference in North America. In this issue, we'll take a look back at all the events and happenings of this year's show in Sacramento, Calif., specifically examining some of the main themes of the show and what it means to attendees.

- 33 **Congratulations, Larry Kiest!** Compiled by *NTT* Staff
NASTT would like to take a moment to congratulate Larry Kiest on his selection as the 2013 *Trenchless Technology* Person of the Year. Let's take a quick look back at Larry's career and achievements in the industry.

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MESSAGE FROM THE EXECUTIVE DIRECTOR



NASTT GOES WEST: SACRAMENTO SUNSHINE



For five extraordinary days, the trenchless technology community gathered in California's vibrant capital of Sacramento for NASTT's 2013 No-Dig Show. From March 3-7, more than 1,600 attendees took in the sights and sounds while witnessing the innovative technologies from the best the trenchless technology industry has to offer.

Our summer issue of *NASTT's Trenchless Today* will provide you with an inside look at our 22nd annual event, including some memorable images showcasing our unequalled technical paper sessions, the record setting exhibit hall and premier networking events that mix entertainment with a truly trenchless message.

Each year, the NASTT No-Dig Show produces many special moments that remain in our thoughts long after we return home. The 2013 Hall of Fame induction ceremonies held at NASTT's Gala Awards Dinner is one of those very special moments. The Hall of Fame is where the most praiseworthy trenchless industry pioneers are acknowledged to honor and preserve their outstanding contributions and accomplishments.

Heartfelt congratulations and admiration to the 2013 Hall of Fame Class: Insituform founder, the late Eric Wood, Ditch Witch founder Edward Malzahn and Bennett Trenchless founder Dr. David Bennett. Each of these gentlemen's contributions cannot be overstated. NASTT is extremely honored that Edward Malzahn came to Sacramento. At 91, Ed remains an active leader of Ditch Witch, the company he brought to the forefront of the trenchless industry. What an inspiring moment to see him stand before everyone and speak from his heart. The NASTT Hall of Fame induction ceremony has become an event not to be missed.

While honoring our past, NASTT also celebrates its future. Since 2010, the Trent Ralston Award for Young Trenchless Achievement has recognized young individuals who have demonstrated excellence in the early stages of their careers and who have made a valuable contribution to the trenchless technology industry. This year's recipients are: Dr.

John Matthews, a principle research scientist at Battelle Memorial Institute, and Ashley Rammeloo, a progressive operations engineer with the City of London, Ontario, Canada. The future of our industry is in excellent hands with leaders such as John and Ashley. Well deserved!

NASTT also rewards excellence in innovation and technical knowledge. The Joseph L. Abbott Jr. Innovative Product Awards were presented to companies whose latest technology is making a difference in the trenchless field. HammerHead Trenchless Equipment was awarded the New Installation Award for its 34-in. pneumatic pipe ramming hammer – considered to be the world's largest. Electro Scan received the Rehabilitation Award for its ES-620 for sewer systems, which tests and certifies newly relined and rehabilitated mains and laterals as leak free. Outstanding Paper Awards were also presented to Michael Gipsov for QA/QC Procedures for Structural Rehabilitation of PCCP with CFRP Composites; Craig Vandaele with Michels Canada; and Adrian Hansen of Golder Associates for the Vancouver City General Transmission Project HDD. Congratulations to everyone for advancing our industry.

In closing, I want to once again thank our loyal event sponsors whose generosity never ceases to amaze me. Their support, together with the hard work of our Program Committee volunteers led by Dr. Kim Staheli, is the magic that makes our NASTT No-Dig Show possible. I hope you enjoy this issue of *NASTT's Trenchless Today*. Feedback is always welcomed and involvement is invited.

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CHAIR MESSAGE

NO-DIG 2013: THAT'S A WRAP!



NASTT's 2013 No-Dig Show once again proved to be a spectacular blend of technological innovation, education and networking. Sacramento was an excellent host city for our industry's premier event by offering great hospitality, warmth and a gorgeous location for the trenchless community to meet.

This was my first No-Dig Show as NASTT Chair and I could not be more in awe of the amount teamwork, tireless effort and genuine enthusiasm all the volunteers and committee members have for this event. I want to express my thanks and gratitude to NASTT's 2013 No-Dig Program Committee for a fantastic event. Special thanks and appreciation goes to Program Committee Chair Kim Staheli and Vice Chair Kevin Nagle, who did an incredible job. I also want to recognize the efforts of the volunteer members of the Program Committee, as well as all of those who gave their time and energy in making NASTT's 2013 No-Dig Show such an impactful and superb conference — none of it happens without your passion for this trenchless event.



NASTT's 2013 No-Dig Show attracted more than 1,600 attendees from all corners of North America and the globe — this conference continues to be the trenchless event of the year. Attendance at all of our scheduled events from the Kickoff Breakfast to the Technical Program to the Closing Luncheon was terrific. The enthusiasm of the exhibit hall floor, which featured more than 130 exhibiting companies, was also outstanding.

Our Technical Program continues to amaze me and impress our attendees. Already the gold standard for other industry conferences, the No-Dig Show Technical Program continues to surpass already-high expectations in terms of paper quality, presenter expertise and attendance. This year, we had 155 technical papers covering the full gamut of trenchless technologies. Hats off to NASTT's 2013 No-Dig Show Program Committee for once again outdoing itself in selecting the papers and topics for this year's program.

I am happy to report that NASTT was able to share the trenchless experience with more municipal owners this year through NASTT's 2013 No-Dig Show Municipal & Public Utility Scholarship Program. This program allowed NASTT to provide accommodations and full conference entry to 85 North American municipal and public utility owners who otherwise would not have been able to attend. We look forward to growing this program to give municipal and public utility owners the opportunity to learn how trenchless technology can benefit their communities.

Our networking events are always a fun aspect of the show. NASTT's 12th annual Educational Fund Auction mixes a relaxed social setting with a fun and fast-paced auction to raise money for NASTT educational activities. What a blast seeing everyone decked out in their 1960s tie-dye, peace signs, long hair and bell bottom jeans, all for an important cause. The auction

raised more than \$85,000 for our educational activities. Many thanks to those who spearheaded this popular event, most notably Jim Rankin and Brian Avon, as well as those who bid on all the great items.

NASTT's No-Dig Show allows us to honor those who have contributed to the growth of the trenchless technology industry in terms of innovation and leadership.

I want to congratulate this year's class to be inducted into NASTT's Hall of Fame, which is undoubtedly the highlight of NASTT's 2013 No-Dig Show. The inductees were Insituform founder, the late Eric Wood, Ditch Witch founder Edward Malzahn and trenchless engineer Dr. David Bennett. These are three men whose contributions to the trenchless industry were truly pioneering and paramount to the success of our industry.

Richard Thomasson was presented with NASTT's Chairman's Award for Lifetime Service. I cannot think of a more deserving recipient for this award. Richard is a founding member of NASTT and also served as our first chairman, laying the groundwork for our organization. His leadership during NASTT's early years and his enthusiasm and dedication to the trenchless industry makes me proud to be a member of the organization he helped to establish.

That's a wrap on NASTT's 2013 No-Dig Show. Plans for the 2014 event are under way and I can't wait to see what the 2014 No-Dig Program Committee, led by Program Chair Kevin Nagle, has in store for the best trenchless conference on the calendar. In 2014, NASTT heads to Orlando, Fla., and the Gaylord Palms Hotel and Convention Center, April 13-17. We welcome you to lend a hand in the planning. Visit nastt.org for more information on how you can get involved.

Derek Potvin
NASTT Chair

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NEW EDUCATION EVENTS GAIN INSTANT POPULARITY AT NO-DIG 2013



It's no secret the main mission of NASTT is to educate the construction industry on the benefits of trenchless technology. There are so many reasons to use trenchless methods, and presenters at NASTT's 2013 No-Dig Show promoted hundreds of those reasons in Sacramento this past March.

Let's start off by talking about the 155 technical papers that were presented at the show. These papers covered all types of trenchless topics including horizontal directional drilling, water rehabilitation,

condition assessment, CIPP, microtunneling, auger boring, laterals, I/I, sliplining and pipe ramming. The authors and program committee — especially those program committee members who were also session leaders — did a great job putting the technical paper sessions together.

The technical papers were also arranged by region this year to create the "Trenchless in the City" tracks. This allowed local and regional attendees to sit in on an entire session about the successes and challenges faced in their area. The "Trenchless in the City" tracks received an enormous amount of positive feedback, so we hope to recreate this regional focus in next year's technical paper program.

Another new education element at NASTT's 2013 No-Dig Show was the "Legends of HDD: From an Idea to an Industry" session. This roundtable of trenchless professionals was kicked-off with a presentation from Martin Cherrington from Cherrington Corp., highlighting the early days of HDD's evolution. It was a real treat to listen to stories from Martin and the rest of the panel, which included Ron Halderman, Mears; Dick Melsheimer, Melfred Borzall; Bill Riel, Barbco; Lon Briscoe, Direct Horizontal; and Tom Tibor, Baroid. We really appreciate these HDD icons volunteering their time to make this session such a success.

None of this would have been possible without our Program Chair Kim Staheli. Kim spent countless hours making NASTT's 2013 No-Dig Show a success. I truly admire Kim for her leadership, sense of humor, work ethic, fun spirit, creativity and above all, her dedication to this industry. Thank you Kim — you are awesome!

As we wrap up this year's conference, we're jumping right into preparations for next year. Our big focus right now is the call for abstracts for NASTT's 2014 No-Dig Show. Make sure you submit your abstract by June 30 at www.nastt.org/abstractsubmission and spread the word about this opportunity to your colleagues.

As always, we're looking for volunteers to join the Program Committee to review the abstracts for NASTT's No-Dig Shows. This is a great way to network with people in the trenchless industry. Our first meeting will be July 20 in Orlando, Fla. If you are interested in joining the committee, feel free to contact me at mhill@nastt.org for more information. We'd love to have you join the team!

Michelle Hill
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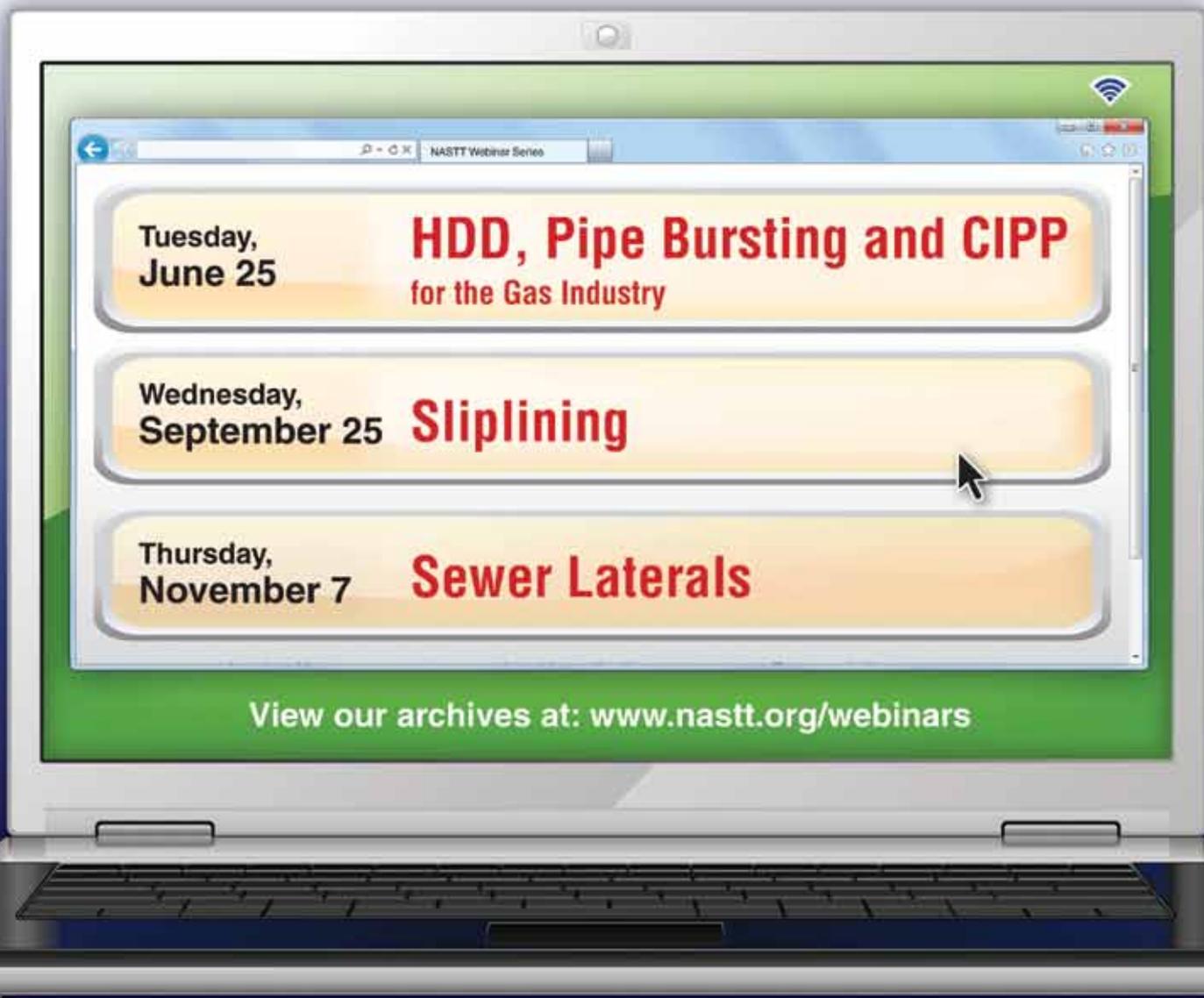
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DR. ALAN ATALAH OF BOWLING GREEN STATE UNIVERSITY EXPLAINS HIS PASSION FOR EDUCATING THE NEXT GENERATION OF TRENCHLESS PROFESSIONALS



NASTT's Trenchless Today (NTT): How did you first get involved with trenchless technology?

Alan Atalah: I got involved with trenchless technology for the first time back in 1986 when I was preparing the submittals for 18 pipe jacking crossings as part of a 37-mile sewer project in Cairo, Egypt. Shortly after

that, I worked on a 3.7-mile tunneling project. I finished my master's and Ph.D. degrees with Louisiana Tech University, where I studied and researched pipe jacking and pipe bursting. After that, I worked as project manager on a microtunneling project in Waikiki, Hawaii.

NTT: How did you get involved with NASTT and the Bowling Green State University student chapter?

Atalah: I got involved with NASTT first as a speaker at the 1994 No-Dig conference. I represented TTC at the No-Dig conference for four years and assisted NASTT in organizing the student activities during the No-Dig conference from 2003 to 2010. I also served as a board member of NASTT for six years. In 2000, I started working for Bowling Green State University and established the BGSU Trenchless Technology Student Chapter, and we have been going strong since then.

NTT: Tell us about the types of courses you teach.

Atalah: I teach several construction management classes at BGSU: trenchless technology construction, engineering economics, construction scheduling, construction estimating, construction contracts and dispute resolutions, and construction equipment management.

NTT: What is most enjoyable about working with your student chapter?

Atalah: The energy flow from the students; the interest

and passion of the students when they see and learn about trenchless technology. Finally, when I visit one of my students a few years after graduation and they are able to successfully run multi-million dollar projects.

NTT: How have the students changed throughout your years of teaching?

Atalah: They are now more digital technology savvy with different communication means than before: cell phones, tablets, etc. The students can now watch YouTube videos of other trenchless technologies with ease. They can Google issues and questions and get answers.

NTT: Have you seen an increase in students interested in working in the trenchless field?

Atalah: Definitely. As trenchless technology becomes more mainstream, the students learn about it and get more interested in it.

NTT: Why are students an important part of NASTT?

Atalah: They are the future of the industry. They will carry the torch of innovation and creativity after we retire. They are the project owners that will employ trenchless technology because they learned about it and are comfortable with it. They are also the future taxpayers at large who will refuse to have the road blocked or lanes closed because of utility work, knowing that there are cost effective alternatives to these inconveniences.

NTT: What kind of future do you see for young trenchless engineers?

Atalah: My students graduate at the average age of 22 years and I suspect that they will work until age 72. This means that they will work for 50 years in a field that keeps on evolving. The trenchless industry depends heavily on innovations and creativity, and these students are excited to be a part of this innovation and creativity.



THANK YOU FROM NASTT

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This year's auction raised over \$85,000 in funds! That brings our grand total since 2002 to over \$600,000. 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:

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By Andrew Farr

If you haven't already figured it out, we're covering everything No-Dig in this issue of *NASTT's Trenchless Today*. And while we reflect on this year's No-Dig Show in Sacramento, we are examining some of the main themes to come out of the largest trenchless construction conference in North America over the years. Among those, perhaps none are more important than the continued education of the trenchless industry. For this issue's "In the Trenches" section, we take a look at three industry professionals who have all been actively involved in both helping to educate the industry, and have also benefited from the education they've received.



Joseph Loiacono
Aqua-Pipe

This year, Joe Loiacono will conclude a very accomplished career in the trenchless water rehab market that includes a long list of achievements and advocacy for infrastructure rehabilitation.

Throughout his career, Loiacono has been actively involved in municipal underground infrastructure systems and has acquired a solid experience in design, marketing and management with both suppliers and contractors. Over the last 25 years, he has

also been involved in the management and rehabilitation of municipal and industrial infrastructures, particularly with trenchless technologies.

After receiving his civil engineering degree from McGill University in 1974, Loiacono began working for a ductile iron and concrete pressure pipe manufacturer. His first introduction to the trenchless industry was in 1989 the year the company began looking into trenchless work and new technologies, when Loiacono attended his first No-Dig Show in London, England.

Soon after, Loiacono began working as the director for Underground Infrastructures at the Center for Expertise and Research for Infrastructure in Urban Areas (CERIU) based in Montreal — a position he held for 11 years.

There, Loiacono further enhanced his knowledge of new trenchless technologies.

"CERIU served as the roundtable for all the players in the field to come and sit at," he said. "We had everyone sitting at the table, from academia and research centers, to different associations, contractors, consultants, as well as municipal, provincial and federal governments. If there was a problem in the industry, we would sit together and solve it.

"During my work at the research center, we were instrumental in lobbying the government at all levels in Canada to work on infrastructure rehabilitation as a whole — not only water and sewer, but also roads, bridges, tunnels and other utilities," he said. "So I'm rather proud of my involvement in those times."

From 1996 to 2002, Loiacono served on the Board of Directors for NASTT. During that time, he founded the Great Lakes & St. Lawrence Chapter (now GLSLA) of NASTT along with some of his regional colleagues from Quebec and Ontario, and also served as chapter chair.

"The trenchless industry at that point was pretty much on the sewer side," he said. "Everything was yet to come on the water side as far as I was concerned. We worked pretty hard to get that going and I think the industry is growing year after year. There is just too much pipe replacement to be done in too little time with minimal

resources for water utilities not to consider using trenchless technologies for water main renewal.

"If someone wants to see what's being done with new technologies on the trenchless side of the business, NASTT is the place to be," he said. "There's no other organization at the national level that provides those types of services, and I'll be there as long as they want me."

Loiacono later joined the ranks of Sanexen Environmental Services Inc., to promote the use of the Aqua-Pipe technology in North America. He has published numerous technical papers on trenchless construction and has participated as a speaker or as a moderator at various workshops and technical conferences in North America and Europe. Loiacono is a current member of AWWA, WEF, NASTT, ASCE and CERIU. He also sits on the AWWA rehab standards committee #257 and is the chair of the CIPP standards subcommittee.

At the end of the year, Joe Loiacono will be retiring from Aqua-Pipe after 39 years in the industry.

"For people who know me, if I wasn't directly involved with Aqua-Pipe, I'd still be promoting water main rehab, or rehabilitation in general," he said. "Infrastructure rehab, more specifically water main rehab, has been a very particular objective for me for the past 25 years, and will interest me for many years to come."

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Ashley Rammeloo
City of London, Ontario

Ashley Rammeloo first became interested in engineering while she was in high school. She said she always enjoyed building things and solving problems, and so, naturally, engineering became a good fit.

It wasn't until later in university, however, that she took her first municipal engineering class.

"When I was in school, I always expected to go more towards the buildings and bridges side of the field, and I happened to take a municipal engineering course in my fourth year because it seemed like it would have a lot of useful, real world information in it, rather than more theoretical things. I thought it would widen what I might be interested in going into, and it turns out, it really did."

Entering her fourth year at the University of Western Ontario after an internship with a small engineering firm, Rammeloo wanted to try something a little different. At the time, the city had a program for hiring engineers in training straight out of university. After meeting with the city engineer, she became even more interested and decided to pursue it.

"One of the things that appealed [to me] is that with the city, there are so many things going on, I thought I'd really be able to experience a lot of different things, a lot of

different fields and get a feel for what I enjoyed," she said. "Even though now I'm on the municipal and civil side of things, I actually use my structural background quite a bit."

Rammeloo joined the City of London after getting her degree in civil and structural engineering. As the city's sewer operations engineer, she manages specialized, high risk sewer inspection and rehabilitation projects, as well as pilot projects to assess new technologies.

Rammeloo first got involved in NASTT after attending the 2009 international No-Dig show in Toronto. Since then, she has attended the North American show every year and has either presented and/or moderated technical sessions each year.

"I always tell my bosses when we're looking at conferences to go to, that No-Dig is always the most helpful to me," she said. "The technical sessions are great for hearing real life experiences for what's out there. People aren't afraid to say what didn't work on a project, and so you hear a lot of the lessons learned."

At this year's No-Dig Show in Sacramento, Rammeloo was awarded the Trent Ralston Award for Young Trenchless Achievement and said it was an honor to be recognized. "It was somewhat unexpected to receive it," she said. "I find the trenchless industry to be fairly young and dynamic, and there's so many young people doing a lot of good work. To be selected from all those was pretty exciting."

In 2012, Rammeloo also served as Chair of the 2012 CATT-Trenchless Technology Road Show and currently sits as Vice

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Chair of the Centre for the Advancement of Trenchless Technology (CATT). She remains actively involved with the NASTT and the No-Dig Show, and volunteers her time with the Great Lakes St. Lawrence & Atlantic regional chapter.



Jim Rankin
Vermeer Corp.

Jim Rankin admits, the first time he was introduced to horizontal direction drilling — and looking into bringing HDD equipment into Vermeer’s market in the mid- to late-1980s — he wasn’t all that impressed. But it didn’t

take long to realize not only the benefits of HDD, but also the overall market potential, as Rankin led the team that developed the first drill commercially marketed by Vermeer.

“One of the Vermeer dealers called my boss at that time and said, ‘Vermeer should consider this (HDD) market,’” he recalled. Rankin said he remembers going out to a jobsite in North Carolina to watch a competitor’s machine perform a conduit via directional drilling.

“I remember the length of the bore to this day,” he

said. “It was 136 ft and it took us two days to make this shot. I wasn’t really too impressed at the time, but I got to thinking about it, and I thought about how we didn’t shut traffic down at all, along with some other things. And I’ve been with it since then.”

Today, Rankin has been with the Vermeer Corp. for more than 35 years and has amassed a vast array of knowledge of industrial equipment and trenchless technology applications. For the past 24 years, Rankin’s main focus has been on Vermeer’s horizontal directional drills. Prior to working with HDD equipment, he was involved with the development of Vermeer’s utility products (formerly Rubber Tire) and track equipment.

Jim is a long-time member of NASTT’s No-Dig Show Program Committee and served as the Chair of NASTT’s 2013 No-Dig Show Educational Fund Auction Committee. “I just believe in the industry and the future of the technology,” said Rankin in regards to his involvement in NASTT.

“When NASTT started training people on trenchless technologies and the benefits, that was the big thing, he said. “They started getting the word out that there’s another way to install utilities.”

Rankin has also demonstrated his innovation abilities and technical skills by earning 15 industrial patents.

Him and his wife Jeanette have three daughters, one son and five grandchildren. Jim spends his free time boating and woodworking.

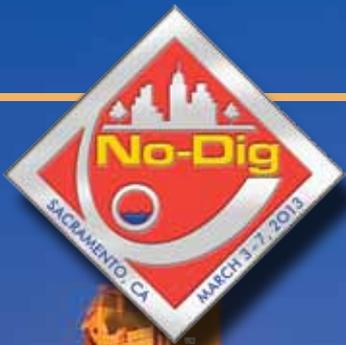
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NASTT'S 2013 NO-DIG SHOW STRIKES GOLD

NASTT's No-Dig Show, the annual conference and exhibition of the North American Society for Trenchless Technology (NASTT), traveled to Sacramento and brought with it more than 1,600 attendees who successfully mixed business, education and the warmth of the West Coast.

For the first time since 2007, the No-Dig Show returned to California, with trenchless professionals converging in the state's capital city March 3-7 for the 22nd annual conference. The all-trenchless event took place at the Sacramento Convention Center and its end-result was true to the show's theme of "The Great Trenchless Gold Rush."

The show was a great tribute to the trenchless industry's past and future as icons of its history and torchbearers for its future are honored. NASTT inducted its second Hall of Fame class: the late Eric Wood, founder of Insituform and the CIPP process; Ed Malzahn, founder of the Ditch Witch brand; and

trenchless engineer Dr. David Bennett, founder of Bennett Trenchless Engineers. The 2013 *Trenchless Technology* Person of the Year was presented to LMK Technologies president Larry Kiest Jr. and all the winners for the 2012 *Trenchless Technology* Projects of the Year were recognized.

The technical paper sessions are one of two main attractions at the No-Dig Show, where detailed, peer-reviewed papers covering a broad range of topics relevant to the industry are presented. This year, there were 155 papers presented covering the gamut of trenchless methods and issues. The other main component of the show is the exhibition hall, in which attendees can see first-hand the latest products that are at the forefront of the utility construction and repair industry. This year, about 150 exhibiting companies occupied the exhibit hall.

IN SACRAMENTO



NASTT'S NO-DIG SHOW PROGRAM COMMITTEE

2013 No-Dig Show Program Chair

*Kimberlie Staheli, Staheli Trenchless Consultants

2013 No-Dig Show Program Vice Chair

*Kevin Nagle, TT Technologies, Inc.

2013 No-Dig Program Committee Members

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 *Cathy Morley RJN Group
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*Mohammad Najafi University of Texas at Arlington/CUIRE
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 *Isabel Tardif Town of Mount Royal
 *Richard Thomasson Malcolm Pirnie
 *Matthew Wallin Bennett Trenchless Engineers
 *Dennis Walsh Woodard & Curran
 *Laura Wetter Staheli Trenchless Consultants

* Indicates Session Leaders

EXHIBITS

EXHIBIT HALL PROVIDES NUMEROUS OPPORTUNITIES FOR ATTENDEES

Each year, NASTT staff works tirelessly to ensure that the No-Dig Show is, and remains, the largest and most informative 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.

But contrary to many other trade shows, NASTT's No-Dig Show offers attendees more than just 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, the 84,000 -sq ft exhibit hall at the Sacramento Convention Center brought in more than 1,600 attendees who actively engaged the 143 exhibiting companies.

If you haven't noticed, NASTT is all about education these days. The association is constantly looking for new and innovative ways to not only promote the use of trenchless technology, but also to educate peers and students on the benefits of trenchless methods. The Student Poster Competition

and CCTV Challenge in the exhibit hall are just a few of the activities that allow No-Dig Show attendees to engage with the talented young students involved in the trenchless field. The students in particular, take great pride in the advantages and opportunities these events provide.

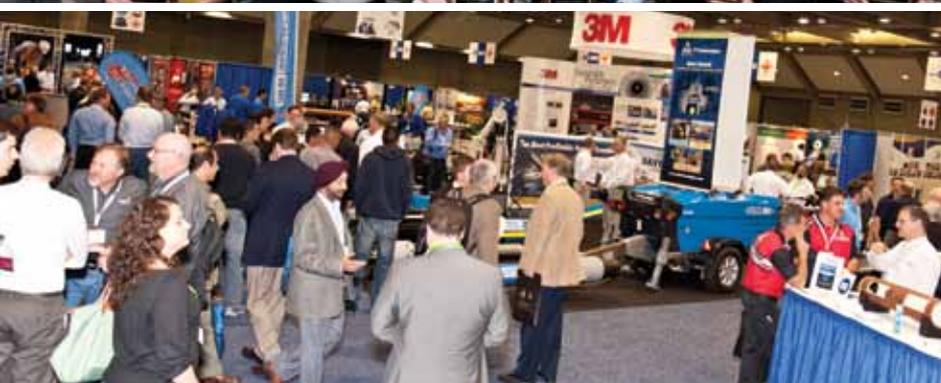
NASTT is also grateful to its sponsors who continue to support the conference and make all the events and activities possible. For the third straight year, NASTT was proud to have two platinum sponsors with Perma-Liner Industries, Inc. and TT Technologies.

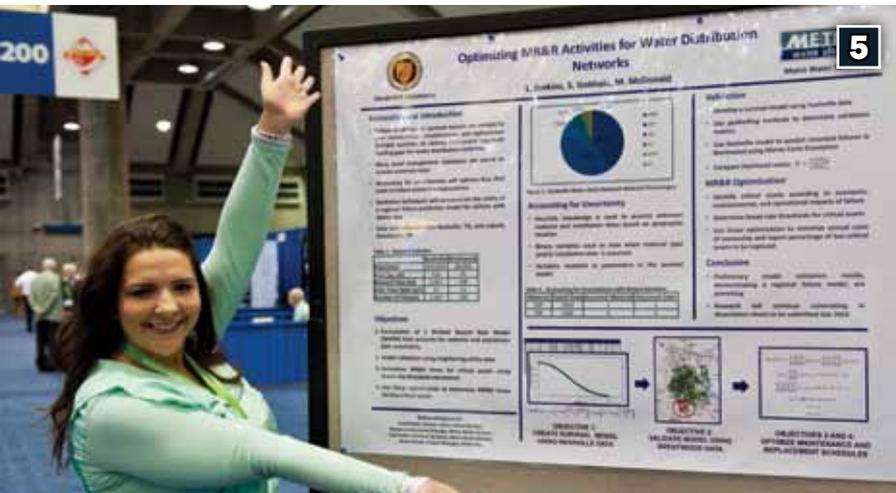


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INNOVATIVE PRODUCT AWARDS

NASTT annually recognizes two companies with state-of-the-art products in either new installation or rehabilitation for their achievements in advancing the trenchless industry — called the Joseph L. Abbott Jr. Innovative Product Awards. This year, HammerHead Trenchless Equipment and Electro Scan were the recipients of this honor.

The award is given in memory of the late Joseph L. Abbott Jr., who was an active member of the society since its inception in 1990. Electro Scan and HammerHead were formally recognized at the Gala Dinner.

HammerHead received the New Installation Award for its 34-in. pneumatic pipe ramming hammer, considered to be the world's largest. HammerHead Trenchless Equipment unveiled its pipe ramming hammer in January 2013. This 34-in. hammer can install casing 48-in. to 180-in. in diameter in drainage culvert and washover applications. It can be used for pipe assist or pipe extraction, guided pilot bore ramming and horizontal directional drilling assist.

Electro Scan received the Rehabilitation Award for its Electro Scan ES-620 for Sewer Mains technology. Using patent pending technology that measures the variation of electrical current inside pipes, electro scanning is now available to independently test and certify newly relined and rehabilitated sewer mains and laterals as leak free. While CCTV inspection is often conducted when a pipe is dry, Electro Scan assesses a pipe's performance under wet conditions. Electro Scan is designed to more accurately find defects in newly relined pipes.

NETWORKING

NASTT GETS CONNECTED

NO-DIG SHOW EVENTS PROVIDE THE ULTIMATE NETWORKING ENVIRONMENT

Some people come to NASTT's No-Dig Show for the education, and other professionals come for the exhibits. However, everyone comes to the conference to network. Networking is the added value of attending the largest trenchless trade show in North America.

NASTT hosts five networking events open to all attendees during the conference. This year the networking began on Sunday, March

3 with our group tour to California wine country. On Monday the conference officially kicked-off with the opening breakfast showcasing a hilarious performance by Dana Daniels. Later that evening, conference goers were able to mingle in a relaxing environment at NASTT's 12th 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.

New to our event this year was the Municipal & Public Utility Scholarship Program. This allowed nearly 100 municipal and public utility employees to be part of the education and networking at NASTT's 2013 No-Dig Show. NASTT was proud to fund this new initiative.



1: The annual Gala Awards Dinner, held this year at the Sacramento Memorial Auditorium, provided attendees with a memorable atmosphere followed by the prestigious awards ceremony and live entertainment.

2: Kim Staheli presents the NASTT Trent Ralston Award for Young Trenchless Achievement to Dr. John Matthews, a principal research scientist at Battelle Memorial Institute, and Ashley Rammeloo, a City of London, Ontario, Canada, sewer operations engineer.

3: Trenchless professionals connect at the Gala Awards Dinner after a busy second day at the No-Dig Show.

4: The evening's entertainment, presented by Circo Magnifico.

5: NASTT Chair Derek Potvin (left) and NASTT Executive Director Mike Willmets (far right) with NASTT's 2013 Hall of Fame inductees Dr. David Bennett and Edward Malzahn.

6: NASTT Chair Derek Potvin (middle left) presents the NASTT leadership awards to (l-r) Benoît Côté, George Ragula and Dr. Alan Atalah.



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NASTT'S HALL OF FAME INDUCTIONS HEADLINE GALA AWARDS DINNER

On Tuesday, March 5, NASTT hosted its annual Gala Awards Dinner, which has become one of the most popular events of the No-Dig Show, as hundreds of attendees gather for awards and entertainment. This year's Gala Awards Dinner, held at Sacramento's Memorial Auditorium, was no exception as the highlight of the night was undoubtedly the induction of NASTT's second Hall of Fame class: the late

Eric Wood, founder of Insituform; Dr. David Bennett, P.E., founder of Bennett Trenchless Engineers; and Ed Malzahn, founder of The Charles Machine Works.

Among some of the other awards at the dinner, founding NASTT member and past chair Richard Thomasson received NASTT's Chair Award for Outstanding Lifetime Service. Dr. John Matthews, a principal research

scientist at Battelle Memorial Institute, along with Ashley Rammeloo, a City of London, Ontario, Canada, sewer operations engineer, both received the NASTT Trent Ralston Award for Young Trenchless Achievement.

The evening's entertainment was presented by Circo Magnifico — an amazing show featuring extraordinary feats of human ability and exhilarating music.

EDUCATION

NASTT SCHOOLS THE INDUSTRY AT NO-DIG

The 12th Annual Educational Fund Auction & Reception was held on March 4 — a popular networking event for attendees after a day of technical sessions and walking the exhibit hall. The auction raises financial support for NASTT's education initiatives which includes targeted training courses and supporting 13 student chapters. Attendees had a great time bidding on

amazing items and raised over \$85,000 this year. Since 2002, the auction has raised more than \$600,000.

NASTT offered four different ways for attendees to participate in the auction this year: a silent auction, the live auction, the 50/50 raffle and the Caribbean vacation raffle. 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, the popular Mortimer the Sewer Rat was up for bid and he will spend the next year traveling with Akkerman.

NASTT also held a "Best Costume" contest at the auction, inviting everyone to revisit the 1960s and the era of Love, Peace and Charity. Lots of tie-dye shirts, peace signs, long hair and beads roamed the auction reception.



LEGENDS OF HDD SCORES BIG

As horizontal directional drilling (HDD) continues to grow in popularity, a one-of-a-kind opportunity was given to attendees to hear from the HDD pioneers and icons on the early days of a fledgling industry that struggled for acceptance.

The "Legends of HDD: From an Idea to an

Industry" drew a strong audience on March 5 to the nearly two-hour session. The panel was led by Martin Cherrington, Cherrington Corp., who kicked off the program with an informative presentation that highlighted the early days of HDD's evolution. The panel also included Lon Brisco, Direct Horizontal;

Ron Halderman, Mears Group; Richard Melsheimer, Melfred Borzall; Bill Riel, Barbo Inc.; and Tom Tibor, Baroid Industrial Drilling Products who then participated in a Q&A discussion about their reflections of the early days and perspective about the industry's evolution.



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1: The “Legends of HDD: From an Idea to an Industry” forum was among the best attended educational seminar at this year’s No-Dig Show.

2: Having some fun with the 1960s-themed costume contest at the 12th Annual Educational Fund Auction and Reception.

3: Brian Avon, Stephen Welling and Jim Rankin draw the winning ticket for the Caribbean Vacation Raffle.

4: Sandra Gelly presents students with NASTT’s CCTV Competition awards.

5: Derek Potvin (right) presents the Michael E. Argent Scholarships to (from left) Carrie Murraray, University of Alberta; Maureen Cassin, Arizona State University; and Lindsay Jenkins, Vanderbilt University.

6: Chris Schill of Rain for Rent presents Rain for Rent’s CP Lake Scholarship to Wesley Parks of Arizona State University.



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THE FUTURE OF THE INDUSTRY

Among the many activities of NASTT’s No-Dig Show, education is undoubtedly important. The conference offered a three-day technical paper schedule along with many pre- and post-conference courses. Students from across North America attended these technical sessions and participated in a number of other student educational events. NASTT is proud to host these students and recognize them for their accomplishments.

This year, the recipients of the Michael E. Argent Scholarship were Maureen Cassin,

Arizona State University; Lindsay Jenkins, Vanderbilt University; and Carrie Murray, University of Alberta. Students who participated in the CCTV Competition were also recognized: First Place – Carrie Murray and Reza Navab, University of Alberta; Second Place – Stephen Welling, Virginia Tech and Carrie Mouck, McGill University; and Third Place – Maureen Cassin and Matt Olson, Arizona State University.

Four student members of NASTT were also awarded \$1,500 scholarships from Rain for Rent. The scholarships were presented as

part of Rain for Rent’s CP Lake Scholarship program, an endowment established in memory of the company’s founder to support and ensure a robust future of engineering, agricultural and construction management studies in the United States.

The four student members awarded the scholarship this year were Agustin Villafana, The University of Texas at Arlington; Blake Travis, Vanderbilt University; Stephen Welling, Virginia Tech; and Wesley Parks, Arizona State University.



The North American Society for Trenchless Technology (NASTT) takes pride in its members. Whether on the engineering, contracting or manufacturing side, NASTT members are involved in countless projects each year that continue to break barriers and drive underground construction forward. In the winter issue of *NASTT's Trenchless Today*, we began our new 'Eye on the Industry' section, devoted to highlighting a handful of these members and some of the recent projects they have been involved in. Here, we present another assortment of members who are involved in notable trenchless projects in North America.

Rain for Rent

Since 1934, Rain for Rent has been setting the standard with industry-leading liquid handling solutions that solve liquid challenges across a broad range of industries and applications. With more than 65 locations in the United States and Canada to provide local support, Rain for Rent delivers proven results and complete solutions through Liquid Ingenuity, an approach that puts expertise and innovation to work with technology, products and integrated services.

Meridian, Mississippi – Dewatering



A \$51 million replacement of a major transportation artery construction project in Virginia required a contractor to provide dewatering and river bypass work. The new bridge would be built in the same location.

Demolition and reconstruction efforts would require dry ground to construct new pilings to support the expanded bridge.

Portadam and Rain for Rent were contracted to work together to provide a four-phase dewatering project, one for each of the center pilings across the quarter-mile wide river. A 10-ft high diversion dam system was chosen along with extra bracing to support the weight of the variable flow rates of the large river. Depending on rain, flow rates could vary between 8,000 CFS up to 62,000 CFS when not flooded. Once in place, portable 4- and 6-in. diesel pumps continuously dewatered the construction area, discharging into a weir tank for solids settling.

Richmond, Virginia – Cofferdam and River Bypass



A pipeline construction project replacing a deteriorating 42-in. pipeline more than 20 ft below the surface of a small river met with trouble as unstable shores prevented directional drilling. Rain also brought constantly changing river levels,

jeopardizing the final phase of pipeline construction. Rain for Rent engineered a gravity-fed flume bypass of the river as an alternate to an all-pump bypassing solution, reducing over-

all bypass costs for the pipeline construction company. Partnering with Portadam, a 10-ft temporary cofferdam was installed to give the pipeline construction company the additional bracing it needed to complete the drilling project. The project manager estimated the implemented system saved them \$500,000 in bypass pumping costs.

Underground Solutions, Inc. Folly Beach, South Carolina – HDD

When South Carolina DOT decided to replace two bridges leading to Folly Beach, officials notified the local utilities that all pipelines and conduits currently suspended from the bridges would need to be placed underground. URS Corp.



designed a 2,800-lf multi-utility HDD crossing which included a 6-in. steel gas main, an 8-in. fusible PVC (FPVC) wastewater force main and three 4-in. FPVC conduit lines. Chandler Construction awarded the HDD subcontract to Environmental Crossings, Inc. who successfully completed the drill and bundled pullback. Underground Solutions, Inc. provided FPVC pipe and fusion services, including de-beading services for the AT&T conduits while South Carolina Electric & Gas supplied the steel gas main pipe. URS coordinated cost sharing agreements among the three utility providers resulting in a very effective and cost efficient trenchless solution for all parties involved.

Hammerhead Trenchless Equipment Ontario, Canada – Pipe Ramming

Hammerhead Trenchless Equipment has unveiled the world's largest pneumatic pipe ramming hammer. The 34-in. hammer can install casing 48 in. to 180 in. in diameter in drainage culvert and washover applications, and can be used for pipe assist or pipe extraction, guided pilot bore ramming and horizontal directional drilling assist. The hammer was recently field-proven in an Ontario, Canada, washover casing job. The hammer successfully installed 185 ft of 72-in. diameter steel casing.

Aqua-Pipe

Framingham, Massachusetts – CIPP

A cured-in-place pipe (CIPP) lining technology was recently presented to officials of the city of Framingham, Mass., by the Aqua-Pipe division of Sanexen Environmental Services. The CIPP technology was used on two recent projects – under a busy Boston commuter railroad crossing in downtown Framingham and along a heavily travelled suburban street,



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NOMINATIONS BEING ACCEPTED FOR NASTT'S HALL of FAME CLASS OF 2014

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 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, 2013.



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NASTT'S EYE ON THE INDUSTRY...

also in Framingham, 1 mile away from the railroad crossing. The Aqua-Pipe CIPP technology is well on its way in cities and towns to becoming the accepted approach to water main rehabilitation. Reduced costs, minimal disruptions and quick start-to-finish times that extend the life of drinking water mains by 50 years or longer, are the primary reasons for its acceptance and increasing popularity.

27-in. ID (686 mm) No-Dig clay pipe through non-displaceable clay and clay stone.

The Eliminator is a new 16-in. (406 mm) diameter boring head designed to work with the standard GBM family of Akkerman tools that has been in service since 2001. Named the Eliminator, the cutter head excavates as the lead tooling in soils that are considered too hard for Akkerman pilot-tube penetration, therefore eliminating the use of pilot-tubes.

City of Edmonton, Akkerman, Inc., Mission Clay Products

Brownsdale, Minnesota – Microtunneling



A manufacturer and customer collaboration between the City of Edmonton and Akkerman this past fall, proved to be mutually advantageous. In fall of 2012, Akkerman put its new GBM system tooling, the Eliminator through the paces of real world testing in Edmonton, Alberta, Canada.

With the Eliminator and the assistance of Akkerman's crew of accomplished technicians, they successfully completed two, 250-ft (76.2 m) drives of

The Robbins Company

San Francisco, California – Tunneling

The Robbins Company is providing the two 6.3-m (20.7-ft) diameter EPBs for the City of San Francisco's newest rail route – the Central Subway. The machines for the Barnard/Impregilo/Healy JV were nicknamed "Mom Chung" and "Big Alma," after local historical figures. The completed Central Subway line will provide service between the China Town and Mission Bay areas.

Project owner San Francisco Municipal Transportation Authority (SFMTA) has set a planned launch date for the first machine in mid-June and for the second machine by the end of August. The Central Subway is part of the SFMTA's Third

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Street Light Rail Transit Project and is scheduled to open to the public in 2018. It is estimated that the new subway will serve about 65,000 passengers daily by 2030.

diameter pipelines on this project and allows increased productivity during the installation process. Insituform will begin work on this project in August 2013 and is anticipated to complete the work within one year.

Insituform Technologies, LLC

St. Louis, Missouri – CIPP



Insituform has been awarded two contracts valued at approximately \$10.4 million from the Metropolitan St. Louis Sewer District (MSD). The contracts are a part of MSD's \$4.7 billion sewer system improvement program.

The project includes the installation of approximately 47 miles of cured-in-place pipe (CIPP) in small- and medium-diameter sewer pipelines located in mostly residential areas. There is little to no disruption to surrounding areas during the installation of CIPP.

Insituform will install CIPP using standard inversion methods as well as Insituform's proprietary pull-in installation method, iPlus Infusion, which will be used on most small

City of Casselberry

Casselberry, Florida – Pipe Bursting

The City of Casselberry, Fla., contracted with local firms for engineering and construction to replace more than 30 miles of aged asbestos-concrete water mains with HDPE pipe installed using pipe bursting and prechlorination technologies. These technologies virtually eliminate customer water outages and significantly reduce restoration and installation costs.

WANT TO SEE YOUR PROJECT HERE?

Please send a 100-word write-up and high-resolution photos to assistant editor Andrew Farr at afarr@benjaminmedia.com or NASTT Communications and Training Manager Michelle Hill at mhill@nastt.org with the subject line "NASTT Project Updates."

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NASTT CHAPTER NEWS

REGIONAL CHAPTER NEWS

British Columbia

Many of events on the 2013 program for the British Columbia Chapter are now in progress. The agendas for the one day seminars are finalized; topics and speakers have been confirmed. The first two sessions, Kelowna and Burnaby, have had dates chosen and venues booked, and registration is underway. The third session will most likely be in Victoria in the fall. In April, a paper was presented at BCWWA, on a Protocol to Recognize Carbon Credits available through trenchless construction, for cities to offset operations. More papers are to be submitted to other conferences. A one-day workshop is still in the works.

Great Lakes St. Lawrence & Atlantic

The Great Lakes St. Lawrence & Atlantic Chapter was proud to support the 2013 NASTT Municipal & Public Utility Scholarship Program and we would like to congratulate our chapter members who received scholarships, including the City of Hamilton, Halifax Water, City of London, City of Ottawa and Region of York.

We are continuing to expand the number of training

courses offered in 2013. Our first training session, "NASTT Sewer Laterals Rehabilitation Best Practices" was held in Hamilton on Thursday, April 25, 2013 and had more than 24 registered participants. Further training sessions for 2013 are being planned for Halifax this spring and Ottawa in the fall, so stay tuned for details. We encourage our members to contact us should they require specific trenchless technology training and would like to see a training session hosted in their area.

GLSLA will once again be promoting trenchless technology at the ACWWA to be held Sept. 29 – Oct. 1, 2013 in Fredericton, New Brunswick. The conference provides an opportunity to learn about and discuss the water and wastewater industry issues with peers in both a technical and social atmosphere.

For more information on GLSLA, our events and our training sessions, please visit our website at www.glsla.ca.

Mid Atlantic

The Mid Atlantic Chapter had a "Trenchless Technology, SSES and Buried Asset Management" two-day seminar planned for Dec. 19-20, 2012 in Atlantic City, N.J., and it had to be cancelled because of Tropical Storm Sandy. The seminar will be planned for a later date in early 2014.

MASTT held a "Trenchless Technology, SSES and Buried Asset Management" two-day seminar on May 22-23 at the Radisson Plaza Lord Baltimore Hotel in Baltimore, Md. The first day guest presenter was Rudy Chow, P.E., Chief, City of Baltimore, Department of Water and Wastewater. The second day guest presenter was Calvin Farr, Jr., P.E., and Wastewater Collection Group Leader for the Washington Suburban Sanitation Commission (WSSC).

Future MASTT seminars tentatively planned for 2013 include Scranton, Pa., and Newark, N.J. Please go to www.mastt.org/proposed_seminar.html to view the MASTT, MSTT & SESTT 2013 Proposed Seminar schedule. Seminar locations and dates will be updated as the seminar venues and programs are finalized.

Midwest

The Midwest Chapter held a "Trenchless Technology, SSES and Buried Asset Management" seminar at the DoubleTree by Hilton Hotel Detroit Downtown on Sept. 19, 2012. The guest presenter was George Nichols, P.E., of the Contract Management Department of the Oakland County Water Resources Commissioner with the presentation "Oakland County Trenchless Program."

Future MSTT seminars tentatively planned for 2013 include Kansas City, Mo., St. Paul, Minn. and Louisville, Ky. Please visit www.mastt.org/proposed_seminar.html to view the MASTT, MSTT & SESTT 2013 Proposed Seminar schedule. Seminar locations and dates will be updated as the seminar venues and programs are finalized.

Pacific Northwest

The Pacific Northwest Chapter has been busy in the first quarter of 2013. The chapter hosted a very successful

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NASTT CHAPTER NEWS



Trenchless Symposium in late January with 13 exhibitors, a New Installations Good Practices Course taught by Don Del Nero and Kimberlie Staheli, and a day of diverse trenchless topics from speakers around the region. March saw energetic participation in the Sacramento No-Dig Show. The PNW Chapter also sponsored Municipal Scholarships and also donated to the NASTT Education Auction.

We are very excited moving forward in 2013 with a campaign to promote educational outreach in our region. The PNW Chapter Membership Committee, composed of leading trenchless manufacturer representatives, contractors and engineers, is working to spread educational opportunities to every corner of our region. Please visit the chapter website for information about upcoming events throughout the Pacific Northwest, at www.pnwnastt.org.

Northwest

It's shaping up to be another busy year for the Northwest Chapter. Coming off a highly successful year of regional events in 2012, the chapter is planning several additional events for 2013. We have a six-paper trenchless track planned for the Western Canada Water annual conference in Edmonton on Sept. 17-20. This large regional conference offers a great opportunity for the chapter to spread the word of trenchless technology to

water and wastewater professionals from across the Prairie Provinces. This will be the fourth year the chapter has hosted a trenchless track at this conference.

Planning for the 2013 Northwest Trenchless Conference is well under way, under the leadership of conference chair Nadeer Lalji. Mark your calendars for this year's conference, which is scheduled for Nov. 13-14 at the Coast Plaza Hotel in Calgary, Alberta. Last year's conference gathered more than 190 delegates, 25 trade show exhibitors and 18 sponsors, and all indications are that this year's conference will continue the success from recent years. The Call for Abstracts will be issued in spring 2013. Conference, exhibitor and sponsor registrations will open in summer 2013. Please visit the chapter website at www.nastt-nw.com for updates.

The chapter would also like to extend a special thanks to NASTT for undertaking the 2013 No-Dig Show Municipal & Public Utility Scholarship Program. In conjunction with some additional scholarship funding through the chapter, subsidy for the attendance of 10 conference delegates was able to be provided. Feedback from the scholarship recipients was extremely positive and the chapter looks forward to this program continuing in the future to help build NASTT's membership base and increase participation at the annual No-Dig Show.

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NASTT CHAPTER NEWS

Rocky Mountain

The Rocky Mountain Chapter is currently refining goals for 2013. The 2013 annual conference and NASTT Short Course is scheduled to occur the week of Nov. 4, 2013 at the DoubleTree Hotel in Westminster, Colo. The chapter is now accepting presentation topic abstracts for the 2013 fall conference. The RMC Board meets on a monthly basis, typically the second Monday of each month. Meeting and chapter information can be found on the chapter website at www.RMNASTT.org.

Southeast

The Southeast Chapter held a “Trenchless Technology, SSES and Buried Asset Management” two-day seminar at the Greensboro Marriott Hotel Downtown on December 19th & 20th, 2012. The guest presenter was Robbie Bald, P.E., and Engineering Supervisor for the City of Greensboro Water Resource Department with the presentation “Greensboro’s Trenchless Program.”

Future SESTT seminars tentatively planned for 2013 include Savannah, Ga. and Memphis, Tenn. Please visit www.sestt.org/proposed_seminar.html to view the MASTT, MSTT & SESTT 2013 Proposed Seminar schedule. Seminar locations and dates will be updated as the seminar venues and programs are finalized.

Western

The Western Chapter of NASTT has selected the Ala Moana Hotel in Honolulu, Hawaii for its 9th annual Western Regional No-Dig Conference and Exhibition on Oct. 28-29, 2013. Oct. 28 is the technical conference and the Oct. 29 is the educational program. The conference includes a one-day technical program and product exhibit area devoted entirely to trenchless technology, including new installation, rehabilitation and condition assessment. The conference has attracted public officials, engineers, utility company personnel, designers and contractors alike, who are involved with designing, constructing, rehabilitating and managing underground infrastructure.

The Western Chapter is committed to promoting trenchless technology education in the public sector and is therefore offering a significant discount for public employees. More information and registration will be posted on our website in the coming months at www.westt.org.

We are currently accepting articles for our annual magazine Western Regional Trenchless Review. Please send articles to Craig.Camp@HatchMott.com.

At No-Dig 2013 in Sacramento, the chapter held a reception for our WESTT members. The reception was well attended and the WESTT board thanks those of you who attended for making it a success. We wish more people could have made it and we enjoyed meeting the people of WESTT.

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Congrats, Larry!

NASTT would like to formally congratulate LMK Technologies President Larry Kiest Jr. on being named the 2013 *Trenchless Technology* Person of the Year.

Over the course of his career, Larry has reached a great level of success through hard work, perseverance and a passion for the trenchless industry. He started his business — LMK Enterprises, now known as LMK Technologies — from the ground up and is now a leading authority on the rehabilitation of laterals.

A third generation master plumber and operating engineer, working in sewers is in Larry's blood. From the early days of working with his father, Larry's major scope of work included installation and repair of potable water mains and service leads, as well as sewer mains and sewer service laterals. Larry has grown from his early years' garage operations into a five-acre, 40,000-sq ft operating facility in Ottawa, employing more than 80 people. His drive to solve problems and develop innovative technologies has led to 91 issued patents, with an additional 67 pending.

Larry said he was moved by his selection as the 2013 *Trenchless Technology* Person of the Year. "Being the guy who was chosen to be the most likely not to



succeed from the class of 1981 – I have the yearbook to prove it – I found myself just lucky to have a job with my father," he said. "So to be honored with this award is nothing short of taking my breath away and though I have dedicated the greater part of my life to our industry, I have always been surrounded by good people

who believed in me and supported my vision. It is those people who made a lot of what I have done a real success."

To read more on Larry's career and success, check out Sharon Bueno's cover story in the March 2013 issue of *Trenchless Technology* or on the Web at trenchlessonline.com.



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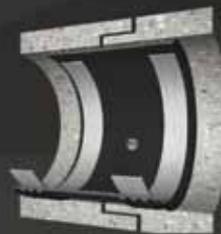
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NASTT REGIONAL CHAPTERS



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
Preston Creelman, Chair
Phone: (604) 591-8274
E-mail: creelmanp@royalbuildingprojects.com
Website: www.nastt-bc.org

Elected Officers
Chair - Preston Creelman
Vice Chair - Gloria Grill
Secretary - vacant
Treasurer - Gurjit Sangha



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
Kevin Bainbridge, Chair
Phone: (905) 304-0080
E-mail: kbainbridge@rcii.com
Website: www.nasttghsl.on.ca

Elected Officers
Chair - Kevin Bainbridge
Vice Chair - Frank Badinski
Secretary - Gerald Bauer
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
Richard Thomasson, Chair
Phone: (703) 842-5621
E-mail: rthomasson@pirmie.com
Website: www.mastt.org

Elected Officers
Chair - Richard Thomasson
Vice Chair - Michael Delzingaro
Secretary - Dennis Walsh
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
Jeff Boschert, Chair
Phone: (314) 229-3789
E-mail: jeffboschert@yahoo.com
Website: www.mstt.org

Elected Officers
Chair - Jeff Boschert
Vice Chair - Larry Kiest, Jr.
Secretary - Randy Fries
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
Dan Willems, Chair
E-mail: dwillems@nastt-nw.com
Website: www.nastt-nw.com

Elected Officers
Chair - Dan Willems
Vice Chair - vacant
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
Erik Waligorski, Chair
Phone: (425) 289-7320
E-mail: ewaligorski@rothhill.com

Elected Officers
Chair - Erik Waligorski
Vice Chair - Chris Price
Secretary - Chris Sivesind
Treasurer - Matt Pease



Rocky Mountain

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

Chapter Contact
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E-mail: al.paquet@ch2m.com
Website: www.rmnnastt.org

Elected Officers
Chair - Al Paquet
Vice Chair - Bo Botteicher
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
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E-mail: jerry@mechanicaljobbers.com
Website: www.sestt.org

Elected Officers
Chair - Jerry Trevino
Vice Chair - Ed Paradis
Secretary - J. Chris Ford
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
Craig Camp, Chair
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Website: www.westt.org

Elected Officers
Chair - Craig Camp
Vice Chair - Cindy Preuss
Secretary - Cory Street
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September 25 **NASTT's Complementary Sliplining Webinar**

October 2 **NASTT's CIPP Short Course**
In conjunction with International Construction and Utility Equipment Exposition (ICUEE)
Louisville, Kentucky

October 28-29 **9th Annual Western Regional No-Dig Conference & Exhibition**
Honolulu, Hawaii

November 6 **4th Annual Rocky Mountain Regional No-Dig Conference and Exhibition**
Westminster, Colorado

November 7 **NASTT's Pipe Bursting Good Practices Course**
Westminster, Colorado

November 7 **NASTT's Complementary Laterals Webinar**

November 13 **NASTT's HDD Good Practices Course**
Calgary, Alberta

November 14 **2013 Northwest Trenchless Conference**
Calgary, Alberta



For More Information and the Latest Course List Visit

www.nastt.org/calendar

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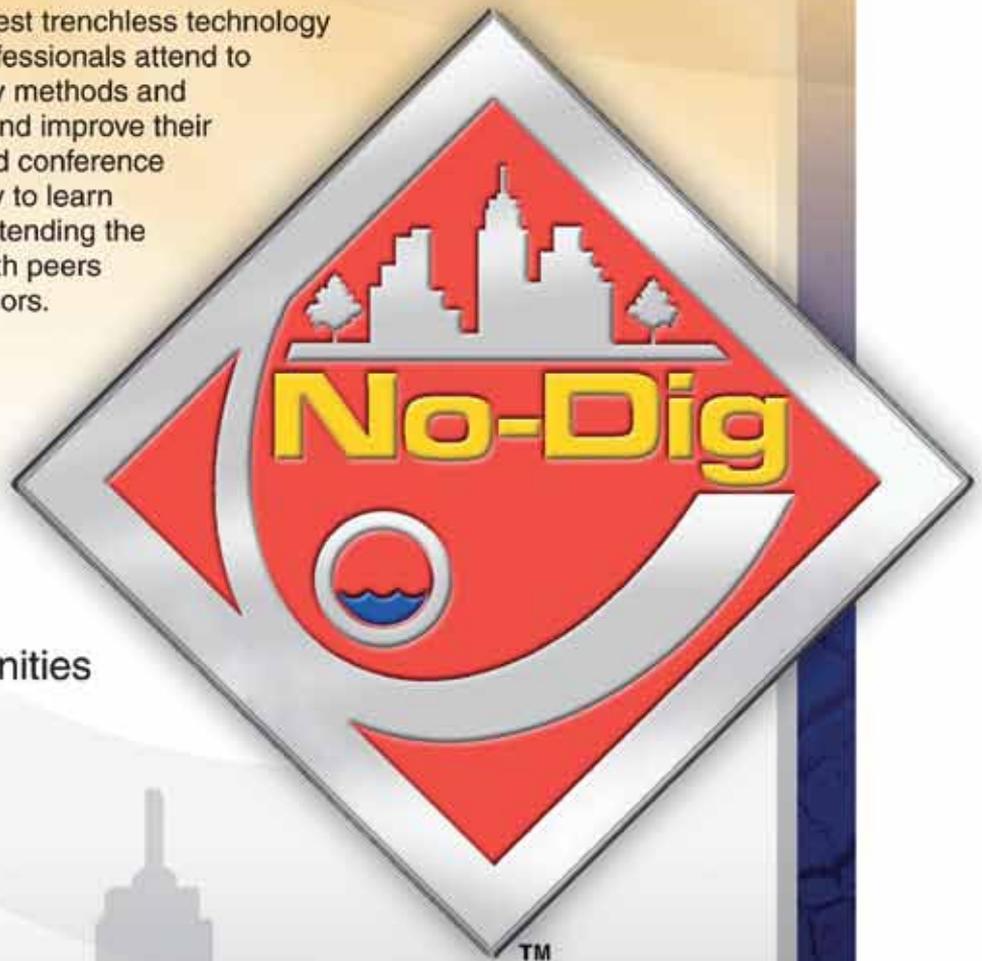


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NASTT's No-Dig Show

NASTT's No-Dig Show is the largest trenchless technology conference in North America. Professionals attend to learn new environmentally friendly methods and techniques that will save money and improve their infrastructure. This trade show and conference provides attendees an opportunity to learn about trenchless technology by attending the technical sessions, networking with peers and meeting with exhibit hall vendors.

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QA/QC Procedures for Structural Rehabilitation of PCCP with CFRP Composites

Michael Gipsov, P.E. – Principal Structural Engineer, Washington Suburban Sanitary Commission (WSSC).

This paper presents the experience of the design and implementation of new Quality Assurance and Quality Control Web-based System for the structural rehabilitation of PCCP with CFRP composites within Washington Suburban Sanitary Commission.

The majority of the Washington Suburban Sanitary Commission (WSSC) large diameter water transmission mains are made of Prestressed Concrete Cylinder Pipes (PCCP). This is common picture for most municipalities nationwide. Many of the transmission mains have been in service for well over fifty years. As these pipes age, the risk of failure increases. One of the standard ways to repair PCCP pipelines is to use Carbon Fiber Reinforced Polymer (CFRP) composites. The installation of the internal CFRP structural liner inside the pipe includes many operations, such as: preparation of the pipe, fiber saturation, etc. Each step of the technological process, if done with deviation from the specification, may compromise the structural integrity of the repair. Because the volume of such repairs is constantly growing, Quality Assurance and Quality Control (QA/QC) procedures for the structural rehabilitation of the PCCP with CFRP composites become more critical. The QA process requires quality control for each operation, designed to ensure that the development process will adequately meet all of the specifications.

With the new PCCP rehabilitation program, Washington Suburban Sanitary Commission has reinforced many miles of main pipelines and recovered more than a hundred pipe sections within the last two years using CFRP. Constantly improving all procedures of the rehabilitation process from the internal inspection and evaluation of the Condition Assessment results, through design of the reinforcement, and ending with installation of the required amount of FRP layers, WSSC Engineering developed a web-based QA/QC system.

The newly implemented Quality Assurance system helps to control the ongoing FRP installation and instantly confirm the compliance of the installed components of the structural system to the approved Specifications. The recording of each stage of the rehabilitation project for every pipe section will help to monitor the pipeline and coordinate future maintenance and repairs.

INTRODUCTION

Prestressed Concrete Cylinder Pipe (PCCP) is the one of the most commonly used pipe materials for

large diameter water transmission mains nationwide. This is common for most large municipalities, and the Washington Suburban Sanitary Commission (WSSC) is no different.

The Washington Suburban Sanitary Commission provides water and wastewater services to approximately 1.8 million customers in Montgomery and Prince George's Counties, Maryland. WSSC owns approximately 5,500 miles of water mains in the 1,000 sq-mile service area; and most of them are distribution mains. Transmission mains range between 16 and 96 in. in diameter, and serve as the major supply of water throughout the service area. The majority of the WSSC large diameter water transmission mains are made of PCCP and many of these mains have been in service for forty five of even fifty years, their aging increases the risk of failure. This is caused by the deterioration of the PCCP's structural elements, mainly corrosion of the pre-stressed wires. The consequences of large diameter main structural failure may be devastating, causing catastrophic property damage and even casualties. When a pipeline of that size breaks, the initial explosive force is immense, and large amounts of pressurized water are released with an initial velocity of up to 90 miles per hour. In addition to the dangers to persons and property posed by the actual break and flooding, the impact on the system and customers is huge, and can disrupt the water service to large portions of the service area for days at a time.



Figure 1 – The result of a 54-in. PCCP failure in January 2011.



The WSSC, like many other municipalities nationwide and overseas, has had the unfortunate experience of such failures. The only way for the Commission to minimize the risk or even avoid possible breakage was to develop an effective Condition Assessment and Pipe Rehabilitation Program, which would be able to monitor, control and repair the inevitable deterioration of the major infrastructure system.

One of the widely accepted and common methods to repair PCCP pipelines is internal reinforcement and relining of the pipe section with Carbon Fiber Reinforced Polymer (CFRP) composites. Using this technique as a part of the new PCCP rehabilitation program, Washington Suburban Sanitary Commission has reinforced many miles of main pipelines and recovered more than a hundred pipe sections within the last two years using CFRP.

established process, specifying each operation, controlling the quality of the procedure and its compliance to the specification. Administrative procedures may vary in different municipalities, but the core process will be similar. Figure 2 shows the flow chart diagram of the Condition Assessment and Pipe Rehabilitation process implemented in Washington Suburban Sanitary Commission since 2010.

The process starts by performing an Internal Inspection and Condition Assessment, scheduled according to a five-year plan of PCCP internal inspection cycles, specific for each pipeline (usually five to seven years). This plan establishes the sequence of PCCP Condition Assessment based on rated vulnerability and accumulated information from the previous inspections. The assessment begins with complex analysis of existing information, including, but not limited to evaluation of “as-built” drawings (plans and profiles), lay schedules, specifications, etc., followed by leak detection and internal inspection of the main. Inspection consists of visual, electromagnetic, sonic/ultrasonic scanning, etc. The results of the internal inspection are analyzed in order to develop recommendations for the rehabilitation of the pipeline, identifying vulnerable pipe sections. The process of prioritizing consists of multiple criteria selection, including the comparison of the amount of the found wire breaks to the safe limit of wire breaks, obtained by modeling of subject pipes using Finite Element Analysis (FEA), character of the damage and position within the pipe section, site location, etc.

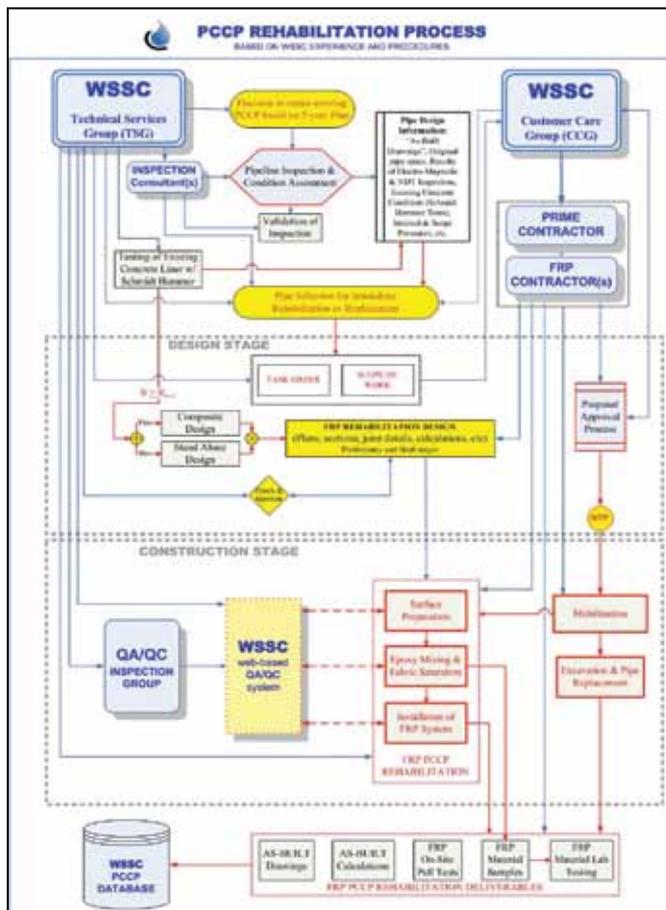


Figure 2 – PCCP rehabilitation process implemented by WSSC Engineering Department.



Figure 3 – WSSC engineers prepare digital Schmidt Hammer for internal pipe concrete testing.

PRE-CONSTRUCTION OF PIPELINE REHABILITATION PROCESS

The success of a PCCP Rehabilitation Program, effectively working through years without unpleasant deviations, is based on the development of an

Once pipe sections which require rehabilitation have been selected, WSSC Engineering Department prepares the Scope of Work, detailing all necessary



information for the prospective contractor. This document indicates all pipe sections selected for rehabilitation or replacement, mapping locations and stipulating methods of the repairs, and identifying structural specifics of the pipe. Concurrently with the development of the Scope of Work, the WSSC Engineering office conducts concrete testing of the inner core of all pipes to be repaired with CFRP. This task is necessary for future design of the pipe reinforcement. WSSC engineers are using one of the non-destructive on-site testing methods, utilizing a digital Schmidt hammer (Figure 3, p. 39). Median compressive strength results of the concrete sampling are added to the Scope of Work..

PCCP Condition Assessment and further Structural Rehabilitation is designed as a web-based system, which makes the whole process of the Quality Assurance continuous, uninterrupted and more manageable, instantly providing clear and transparent information for the entire team of consultants and WSSC engineers and managers. The web-based system has proved to be perfect for storing of a large amount of design information and making it accessible outside of the WSSC local network. As a result, the WSSC program manager is able to access the project site directly, conducting Quality Assurance and confirming compliance with each procedure.

The WSSC PCCP Rehabilitation Program employs a pool of pre-selected contractors, entering on rotating basis, which saves time and makes the beginning of the project much easier. Each contractor uses pre-approved unit prices; therefore, the initial estimate is simplified as much as possible, stipulating only specific conditions of the project site. The contractor's proposal can be received within a short time after finalizing the Scope of Work.

The approval of the Proposal, followed by Notice-To-Proceed, immediately triggers the design of the structural reinforcement and receiving of all design information. The selection of the working model for each pipe section is based on results of the on-site concrete testing. Lower than the required minimum concrete compressive strength will result in the design of the internal reinforcement as a "stand-alone" system, which may need more layers of the carbon fiber comparing to composite design. The WSSC Engineering office provides all necessary design data, including as-built drawings, pipe specifications, profiles, working pressures, etc. and reviews the conceptual design. Upon acceptance of the preliminary design, the structural engineer of the record submits the final version, which includes calculations and working drawings (plans, details, etc). Needless to say, that the whole design submittal process is set to be web-based which significantly reduces turnaround time and makes results of the design (pipe layouts,

profiles, details, etc.) available for review and comments of the other team players. An important part of QA process is that consultants, involved in the construction inspection and project QA/QC, are able to get familiar with construction documents and the entire game plan in advance, which will let them prepare for the job, identify entry ports, etc.

CONSTRUCTION STAGE OF THE PIPELINE REHABILITATION PROCESS

In this paper, we will not discuss pipe replacement or other than FRP pipe rehabilitation techniques, concentrating on the PCCP repair using CFRP composites for internal pipe reinforcement. The major procedures for this method are listed below. Each procedure is monitored for quality and compliance with WSSC specifications. The installation of the CFRP structural system is usually preceded by the pull-off testing of selected pipe sections (Figure 4). This procedure is necessary in order to confirm the existing condition of the internal concrete core and designed bond between concrete core and CFRP material.



Figure 4 – Pull-off testing of the CFRP material within selected pipe section.

Results of the pull tests are reported to the WSSC Structural Engineer and instantly submitted to the QA records. Failure to meet a minimum bond value may require a change of the original design or even reconsideration of the design concept. The WSSC Structural Engineer initiates a QA/QC record for each repaired pipe section, identifying location and specifics of the rehabilitation. This record will contain all repair information and will be used for the next rounds of condition assessment



in the future. Preparation of the repaired pipe before receiving the CFRP structural system usually involves the following procedures:

- Surface preparation of the internal concrete core (water blasting);
- Drying of the prepared internal core surface;
- Patching and repairing of the damaged concrete liner;
- Joint opening, steel cleaning and preparation of the concrete edges per designed termination detail.

All these procedures are controlled by the inspection team. The inspection consultant closely examines each of the prepared pipes for compliance to specifications and construction drawings. Approvals and working comments are recorded in the QA/QC record. Installation of the CFRP structural system includes several operations:

- Mixing of the epoxy material (Figure 5);
- Saturation of the glass- and carbon fiber mesh with epoxy mix;
- Application of the saturated sheets on the internal surface of the pipe;
- Detailing of the liner termination at the joint (normally) or between joints (for special designs).



Figure 5 – Mixing of the epoxy material.

Each of the FRP installation operations is subject to Quality Control; this includes, but is not limited to, saturation weight ratio testing, production of the FRP sample panels, etc. Results of weight ratio tests, construction notes and comments are also recorded in the QA/QC web-based documents. Sample panels, produced by the contractor per standard WSSC specifications are instantly collected by the inspec-

tor and tested by a certified testing laboratory. Tensile test reports submitted by the laboratory are reviewed by the WSSC structural engineer. In case of unacceptable deviations of the test strength values from the design strength characteristics, the structure may need to be redesigned.

The construction inspector performs a thorough examination of the installed FRP system confirming compliance with design and spotting all installation defects, such as bubbles, unsaturated areas, voids, etc. Each deficiency is recorded in the QC log, specifying longitudinal and circumferential location, size and character of the defect. The contractor, upon disapproval of the installation, will fix all found faults and resubmit the installation report, identifying date and method of the repair.

A final walk-through inspection will confirm completion of the touch-ups and the entire installation and result in the final approval of the work. Upon concluding approval, QA/QC working files will be automatically modified to the final QA/QC form, generating a conclusive comprehensive (one page per pipe) rehabilitation report, which will be kept along with “as-built” drawings and calculations for all future inquiries.

CONCLUSION

The development of the Quality Assurance and Quality Control (QA/QC) System for the rehabilitation of the aging water transition infrastructure within Washington Suburban Sanitary Commission was vitally critical to ensure consistency and compliance of the growing volume of the construction operations. The QA/QC System formalized and simplified a management of the Rehabilitation Program within Washington Suburban Sanitary Commission.

Washington Suburban Sanitary Commission has successfully rehabilitated several major PCCP pipelines within the last two years, minimizing the risk of structural failure and supporting a stable and uninterrupted water supply for more than 1.6 million people. This newly implemented QA/QC System made the rehabilitation process more reliable and secure. Taking into consideration the future cycles of the structural assessment and the planned rehabilitation of these pipelines, acquired records of the previous repairs will make the whole process consistent, continuous and manageable.

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Vancouver City Central Transmission Project – Horizontal Direction Drilling and Supply and Installation of High Density Polyethylene Duct

Craig Vandaele – Michels Canada Co., Nisku, Alberta

Adrian Hansen – Golder Associates Ltd., Vancouver, BC

British Columbia Transmission Corporation (BCTC) and BC Hydro developed the Vancouver City Central Transmission (VCCT) project to improve the reliability of supply to the City of Vancouver. As a part of the overall project, a bundle of ducts needed to be installed beneath False Creek to house high voltage electrical cables within seismically stable ground conditions. Two options were considered for the installation of the ducts: A purpose-made tunnel or HDD. The tunneling method had a number of major issues: the tunnel would have to be significantly larger than the diameter of the duct bundle, thus adding to the construction cost; it would be more environmentally disruptive because of the need to construct entry and exit shafts; the duration of construction was likely to be significantly longer than for the HDD option; and the cable engineer's design required that high voltage cables be installed at a limiting angle of not steeper than 13 degrees to the horizontal to meet seismic performance criteria, which would be difficult to achieve with vertical tunnel shafts.

The HDD method had engineering, cost and schedule advantages over the tunneling option. In addition to being significantly less expensive than the tunneling option, it allowed for entry and exit angles which could be designed to meet the requirements of the cable designers.

The team of BC Hydro, Golder Associates Ltd. (Golder) and Michels Canada Co. (Michels) worked together to design and construct the HDD crossing with a minimum final reamed diameter of 44 in. Within the crossing, the team installed a bundle of seven nominal 10.75-in. conduits and six 4.5-in. HDPE grout pipes. In addition to displacing the drilling mud while placing the thermal grout in the annular space between the borehole walls and the bundle, the project team constructed a transition on either end of the crossing from an HDPE to a PVC duct system that terminated in previously installed cable vaults. Finally, the team constructed some minor electrical works and restored all worksites to their pre-existing conditions.

There were many challenges in the design and construction of this project, not the least of which was construction in a dense urban environment where residents and business owners would experience months of construction noise, traffic and other disruptions. Project work also accommodated provisions for major City of Vancouver events, such as the Vancouver

International Jazz Festival — an event which featured 1800 musicians, 400 concerts and 40 venues, and required unobstructed access to David Lam Park for an entire closing weekend extravaganza.



Figure 1 – The project site in David Lam Park beneath Vancouver's famous skyline.

Technical HDD challenges included: surveying and making use of a proposed exploratory borehole to the fullest extent practical; sinkhole development; inadvertent mud migration to ground surface at two urban parks beneath which the borehole traversed; and counteracting potential twisting of the 13 conduits/pipes of the bundle as it was conveyed through the streets into the borehole.

In addition, once the bundle was installed in the borehole, the operating environment for the transmission cables required a special heat dissipating grout to be used to displace the mud. This required a precise grout mix formula that could not only achieve the desired thermal properties, but would also be dense enough to displace the drilling mud with limited mixing and could still be pumped long distances through staged grout pipes while flowing easily through the extent of the entire 2,788-ft long borehole (Dickes, 2011).

SITE CONDITIONS AND PRE-DESIGN

Golder was retained by BCTC to conduct a geotechnical overview assessment of existing conditions for potential



transmission corridor options for the proposed Mount Pleasant Substation site under consideration for the VCCT project. Several options were considered for connecting the new Mount Pleasant Substation to existing substations. Of the options considered, the most feasible corridor included a direct crossing beneath False Creek.

False Creek is an inlet which separates the high density downtown core of Vancouver from the rest of the city. The geologic sequence along this crossing generally consists of fill materials at ground surface which overlie glacial (till-like) soils north of False Creek (drill entry). The geotechnical investigation carried out along the proposed alignment indicated that, at the entry location of the exploratory bore path, the till-like soil deposit was roughly 180 ft in thickness. The till-like soils were underlain by extremely weak to moderately strong sandstone and siltstone sedimentary bedrock containing occasional coal seams. South of False Creek (drill exit), and including the majority of the crossing length beneath False Creek, geotechnical investigations indicated that the till-like soils were much less extensive, and at drill exit, the sedimentary bedrock directly underlies surficial fill at a depth of about 6 ft.

The selection of a drill exit site was a much more difficult task because there was a strong preference to locate HDD activities as far as possible from local residences and businesses. Locating the drill exit point within Charleson Park was strongly considered; however, geotechnical investigations revealed that Charleson Park was underlain by an extensive thickness of loose, seismically unstable and potentially contaminated soils. Several locations were analyzed, but eventually it was clear that the bore path would have to traverse an approximate distance of roughly 165 to 195 ft through these loose soils.

HDD EXPLORATORY BOREHOLE

The one potential major risk with the HDD method was the significant length of the bore path through the till-like soils on the north side of False Creek. However, given the potential for significant cost and schedule savings, as well as some design benefits, it was decided to investigate (and potentially mitigate) the risks by carrying out an exploratory HDD drilling program. The ultimate goal of the exploratory HDD drilling was to reduce the ground condition risk to the project by confirming construction feasibility of the complete crossing.

The exploratory HDD drilling program was designed to advance through the surficial fill and till-like soils on the north side of False Creek and 115 ft into the sedimentary bedrock formation to confirm that drilling through the till-like soil was complete. The exploratory program, however, did not allow for the pilot bore to daylight at the drill exit. The second stage to extend the bore path across False Creek would only be carried out if the exploratory drilling and reaming of the hole to 42 in. was successful. It was considered important to ream

the till-like soils to a size close to the size required to install the 34-in.

cable bundle because a successful pilot hole would not guarantee successful reaming in a setting where random large cobbles and boulders could be present.

Directional Mining and Drilling (DMD) was awarded the exploratory HDD drilling contract. Forward reaming to enlarge the pilot bore to 42 in. in diameter was carried out in a total of three stages. The contractor was able to complete construction of the borehole to the required diameter and to the design grade along the design bore path for a total distance of 837 ft (722 ft through till-like soils and 115 ft into sedimentary bedrock) within a three month schedule. While difficult reaming conditions were sometimes experienced – notably through cobble zones – no boulder obstructions or other “show-stopper” ground conditions were encountered.

DESIGN

The design process was difficult due to the unique requirements of the job. In addition to designing a suitable bore path, selecting the proper pipe that could not only handle the stress of installation but also meet the thermal heat dissipation requirements established by BC Hydro was challenging.

In consultation with BC Hydro, Geotherm Inc. (a testing company), and Constellation Group LLC, Golder designed an uncased borehole, which would receive installation of seven nominal 10.75-in. OD HDPE pipes, banded in conjunction with up to 12 nominal 4.5-in. OD HDPE staged grout pipes (i.e. up to six bundled grout pipes entering the borehole at each of the entry and exit ends of the borehole, and terminating at varying distances along the length of the bore path). Banding was specified to consist of non-magnetic bands (stainless steel or equivalent) strapped at a minimum of 5 ft apart along the product bundle. Instrumentation to measure temperature and pressure at key locations along the installed length of the product bundle was also included to provide real-time information during the installation of the thermal grout. This allowed for assessment of risk to damage of the product bundle due to heat of hydration of the thermal grout and pressurization during the grout placement process.

Mechanical separation (use of fabricated spacers) of each individual duct would promote increased displacement of the drilling fluid with thermal grout; however, increasing the overall diameter of the product bundle through oversizing the borehole would increase risk and cost, so that option was avoided. Additionally, the installation of mechanical spacers would have required increased assembly time during pullback. Because the borehole was ultimately required to be uncased, the prolonged pullback time would have increased the risk of borehole collapse. While several spacer designs were provided by Underground Devices and several more were conceptualized by Golder, separation of the ducts

of the product bundle was ultimately provided by the retention of the outer beads formed during the HDPE butt fusion process.

CONTRACT BID, AWARD AND PRECONSTRUCTION

Michels responded to the request for proposal (RFP) on Oct. 14, 2010, and was awarded the project with notice to proceed issued by BC Hydro on Dec. 16, 2010. Michels ultimately adopted and improved on primary design elements to facilitate the project's successful completion.

During the bidding process, one of the largest issues was the availability of silica flour and potential ready-mix suppliers with the ability to batch and supply thermal grout for grouting operations. The sheer volume of grout required to perform the grouting as laid out in the RFP documents was both difficult and costly. The main difficulty was the ability to store all of the silica flour in Vancouver prior to the grouting activities taking place. In order to assist with this process, Michels acquired Guy Dickes as a subcontractor to assist with the planning and implementation of the thermal grouting of the HDD annulus.

PILOT HOLE

Prior to beginning the drilling, Michels needed to clean debris from the existing 60-in. steel casing left by the previous contractor, survey it for alignment, and verify the entry angle of the pilot hole. Michels used its downhole tracking system to survey the 60-inch casing and found that it was not at the angle shown on the Contract Drawings. As a result of the changed casing angle, Michels revised the proposed bore path to reflect the change to the entry angle. The Contract did specify the likelihood of Michels running into debris left behind from the previous contract (centralizer casing arms) but fortunately Michels did not encounter those obstructions. The pilot hole was completed on April 18.

REAMING AND SWABBING

Michels Canada used a 12.25-in. mud motor to drill the pilot hole and then used a 30-inch reamer to upsize the hole from 12.25 in. to 30 in. The first reaming pass was successfully completed in nine calendar days. From there, Michels installed a 44-in. reamer to upsize the hole from 30 in. to 44 in. The second reaming pass was completed in 12 calendar days. Finally, a 44-in. barrel reamer was used to swab the hole free of cutting and to clean the hole prior to pullback of the product test bundle. A total of three swab passes were completed prior to pullback.

FABRICATION & MOVING OF THE HDPE DUCT BUNDLE

The fabrication of the HDPE product bundle was running concurrently with drilling operations. The staging area for the fabrication of the HDPE product

bundle took place along the Heritage Railway corridor in Vancouver. This railway was approximately four blocks from the exit location of the directional drill, and Michels set up two fusing machines to fuse together the 10-in. DR 9 lines. A total of seven 10-in. lines were fused together, and each was approximately 2,950 ft in length.



Figure 2 – Reaming and swabbing operations were completed without any serious complications.

One of the most difficult and challenging aspects of this project was moving the seven 10-in. HDPE lines from the fusing area along the railway corridor to their temporary staging area along 8th Avenue. Michels was tasked with setting up traffic control to close and reroute motorists and the public in an area spanning 16 x 8 city blocks in the Fairview Slopes neighborhood on the south side of False Creek for a period of approximately five days.

PULL BACK OF TEST BUNDLE AND PRODUCT BUNDLE

Prior to pulling the HDPE product bundle, a test bundle was pulled through the bore hole to ensure that the hole was open and that the product bundle could be pulled through successfully. Michels erected a 65-ft long full-scale test bundle to perform this task. Prior to the pull back of the test bundle, Michels assembled a swab ball and welded straps at the connection between swivel and the ball. The test bundle was moved from Michels' staging yard to the exit site and prepped for the test pull. Once the pull began, Michels pumped drill mud to the ball reamer so the pipe wouldn't be dragging down a dry hole due to the elevation change at the entry side. The test pull was completed in one day without any disruption or major damage noted to the test bundle. Once the test bundle was removed from the hole at the entry side, Michels began chasing drill pipe back through the hole to keep the hole open.



With the passing of the test bundle, the bore hole was ready to start the pull back. With the product bundle now resting along 8th Ave., Michels then attached five grout lines of varying lengths to the front and five additional redundant grout lines to the back of the 10-in. HDPE product bundle. These lines were laid out along 8th Ave. and fused together while preparations for the pullback took place. The HDPE test bundle was fused to the product bundle and added grout lines. At this point, the product bundle was ready to be pulled across False Creek.

HDD bore hole. Field testing of TR values showed an overall average TR of 0.75, significantly better than originally specified. Proper engineering, planning before construction and execution of the established procedures during the construction made the grouting a tremendous success.

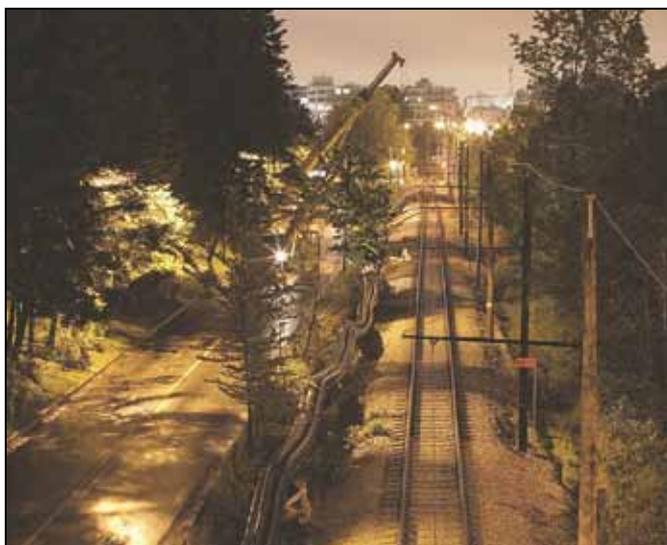


Figure 3 – A photo of the Heritage Railway corridor during the HDPE pipe move process.



Figure 4 – The exit side, with residents only feet away from the product pullback.

The pullback started in the early-morning hours of May 29 and was completed on the morning of May 31. The pullback forces encountered during the pullback were very low: Although Michels had an Atlas 840 Drill Rig with the capability of pulling 840,000 lbs., the highest forces encountered were in the 130,000-lb range.

OPEN CUT – TRANSITIONS HDPE TO PVC

Upon completion of the HDPE product bundle beneath False Creek, the contract documents called for the HDPE product bundle to transition to PVC pipe prior to entering electrical manholes on each side of the project. This was done with standard open-cut construction practices and the use of engineered shoring systems. After the transitions were completed and the HDPE/PVC lines cleaned, the project was complete and ready for installation of the power cables.

THERMAL GROUTING

Once the product bundle was pulled into place, the Contract specified that the 44-in. bore hole was to be filled with a low thermal resistivity grout. Never before has a thermal grouting project of this magnitude been undertaken within an uncased borehole. The thermal grouting of this project is covered in length in a paper published by Guy Dicks, Sudhakar Cherukupalli and Craig Vandaele and presented at the 2011 NASTT No-Dig Show.

PUBLIC IMPACTS & PUBLIC OUTREACH

BC Hydro had an extensive public outreach program that began to inform the general public and residents of the affected areas well before construction commenced. Ongoing and frequent public notifications were sent out to the residents of the areas via email, handouts and multimedia. Additionally, community meetings to inform the residents of the latest developments and get their feedback took place every few months and included the owner, engineer and contractor. These meetings proved very valuable, as they developed a great deal of trust between the local residents and the project team.

On day One of grouting, nearly 160 cubic meters of grout was pumped. On days three, four and five, 89, 107, and 71 cubic meters were pumped. A requirement of 90 percent drill mud replacement from within the bore hole was needed to be confirmed for the grouting to be deemed successful. Calculated grout volumes and theoretical bore dimensions proved nearly 92 percent replacement of drilling fluid from within the

This paper was edited for style and space in *NASTT's Trenchless Today*. To view the full version of Paper C-1-02, please visit nastt.org.

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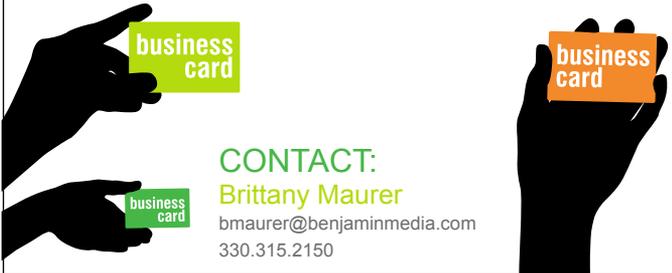


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In conjunction with APWA's International Public Works Congress & Exposition
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Contact Info:
 Michelle Hill
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 Web: www.apwa.net/Congress

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