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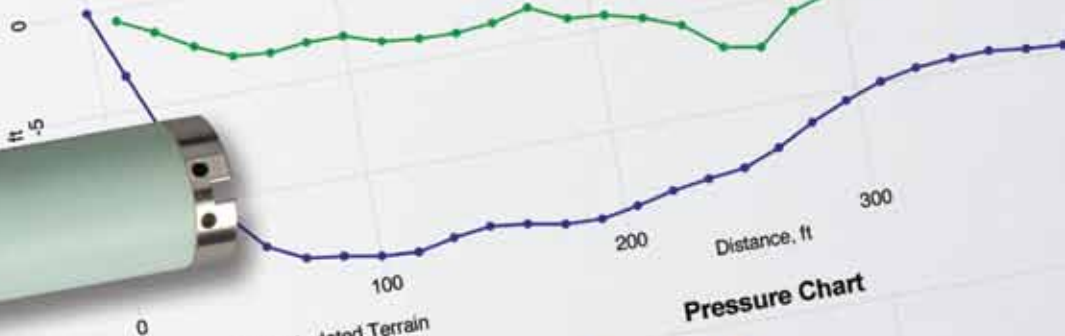
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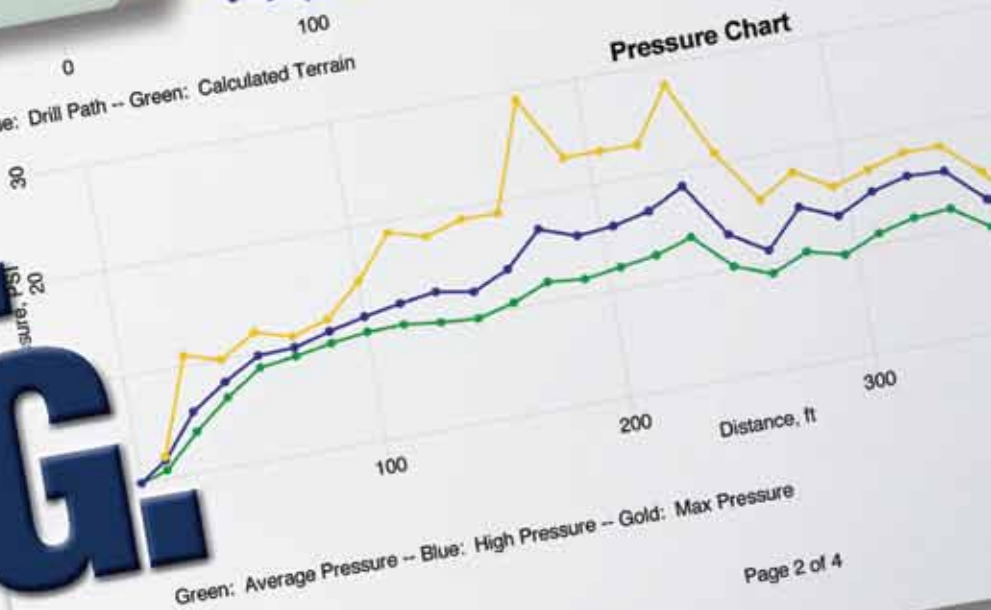
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Drill Data



Profile Chart

Blue: Drill Path -- Green: Calculated Terrain



Pressure Chart

Green: Average Pressure -- Blue: High Pressure -- Gold: Max Pressure

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FEATURES

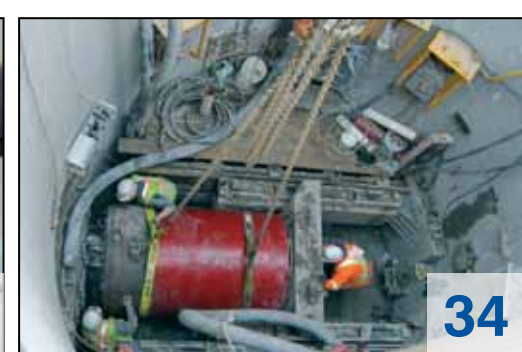
- 12 **Q&A** By Andrew Farr
For this month's issue of *NTT*, we decided to sit down with Jack Burnam, project manager and senior technologist with CH2M HILL, to talk about his career in engineering and his outlook on the trenchless industry.
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NTT highlights three members who have dedicated their careers to NASTT and the trenchless industry. This month, we introduce George Bontus, Michael Davison and Jeff Maier.
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MESSAGE FROM THE EXECUTIVE DIRECTOR



VOLUNTEERS: THE HEART OF NASTT



Why do people join an industry organization? Is it for the networking opportunities that it offers? Or perhaps it's for access to technical knowledge that will strengthen them professionally? Could it be they are looking to give back through mentoring or teaching the next generation? Whatever the case, I strongly believe that NASTT fills all of these needs and so much more.



More than 70 trenchless industry volunteers make up NASTT's 2014 No-Dig Show Program Committee. Photo courtesy of David Crowder.

NASTT's mission to advance the benefits and awareness of trenchless technology is presented through educational training programs, conference and exhibit events, research initiatives, Good Practices publications, scholarship awards and an unequalled online technical library. All this is happening in a time of rapidly increasing worldwide acceptance of trenchless technology that creates opportunities for our North American membership as industry leaders and suppliers to an ever-growing market at home and abroad.

As technology continues to evolve at a boundless pace, NASTT can be your resource for progress and change in the buried infrastructure industry. The value of an NASTT membership has never been higher, especially in this era of challenging economic times and escalating environmental responsibilities — perfect timing too, as there is no doubt shrinking budgets make it rather difficult for municipalities and utilities that “have no green to be green.”

So what makes NASTT stand above other associations? Undoubtedly, it is the high-quality corps of many volunteers who promote the trenchless message through our educational pro-

grams, the NASTT No-Dig Show Program Committee and the nine regional chapters. Without volunteerism, none of this would exist.

NASTT is unbelievably fortunate to have a membership that is dedicated to promoting this industry at all levels — regional, national and international. I want to take this opportunity to commend and say thank you to all our creative, resourceful and committed members, and especially to those who energetically volunteer their valuable time. Whether you are a Good Practices course instructor, a Board Member, a Program Committee member or regional chapter leader, you are an NASTT trenchless champion!

The enthusiastic commitment that NASTT members make in volunteering their time and energy never ceases to amaze me. They continually ask, “What can I do to help?” That's a question I never tire of answering. If you want to invest in the future of the trenchless industry, and you're wondering what you can do, please let us know. I'm quite sure you won't regret it.

Mike Willmets
NASTT Executive Director

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CHAIR MESSAGE

TRENCHLESS FOR TOMORROW

NASTT PREPARES FOR ITS STRATEGIC PLAN INITIATIVE



Looking back on the last few years, it's incredible to see how NASTT has grown. We have worked hard together as a team to expand our training program, grow our online educational library and support a variety of research efforts. While we're confident this growth will continue, we need to have a plan.

I am proud to announce that this fall, NASTT will launch a strategic planning initiative to build on our current organizational goals. The primary objective of this initiative is to develop a consolidated long-range strategic plan that outlines NASTT's vision, direction and priorities. Consultants from Deloitte have been engaged to assist us in developing our strategic plan, as they have with many other not-for-profit societies like NASTT.



NASTT STAKEHOLDERS

In order to ensure that we develop a robust plan, Deloitte representatives will be soliciting input from a number of NASTT stakeholders. The objectives of these interviews are: to gain a better understanding of NASTT's current strengths and potential areas for improvement; to understand the changing environment and its implications for NASTT; to identify perspectives on opportunities, challenges and potential future priorities for NASTT; and to begin to identify what it will take to achieve a desired future state. These interviews with the stakeholders will give NASTT a clear picture of how our active members feel about our past activities and what they would like to see from us in the future.

INDUSTRY REPRESENTATIVES

Along with interviewing active members of our society, we also want to hear from those not currently involved with NASTT and those that could be more involved. It's important for us to learn as an organization what we can do to get more people active with NASTT. We will interview the industry representatives and discuss NASTT member products and services, management processes, our volunteers and staff, and other topics such as membership growth and retention. We believe knowing more about our industry will allow us to develop tools that will encourage more people to get involved.

ALL MEMBERS HAVE A VOICE

The most exciting piece of this strategic plan initiative is that every member has a voice in the direction we take. That's right — every member was invited to take an online survey about NASTT. Your participation in this effort is extremely important. The more feedback we get, the more we can do to make NASTT a great resource for municipalities, utilities, engineers, consultants, suppliers, contractors and academics.

THE PLAN

Once all of the information from the interviews and surveys are pulled together, the Strategic Plan Committee will meet in October to review the data and make recommendations for the future of NASTT. The key output of this project is a concise strategic plan document that is anticipated to include NASTT's mission, vision and values, as well as its strategic objectives, key strategies and initiatives, monitoring framework, and finally, budgetary implications. The committee will look at all of these elements to develop the most comprehensive plan for the society.

This new initiative for NASTT is very exciting, and I hope you will all participate in helping us plan for a bright future for NASTT and the trenchless industry.

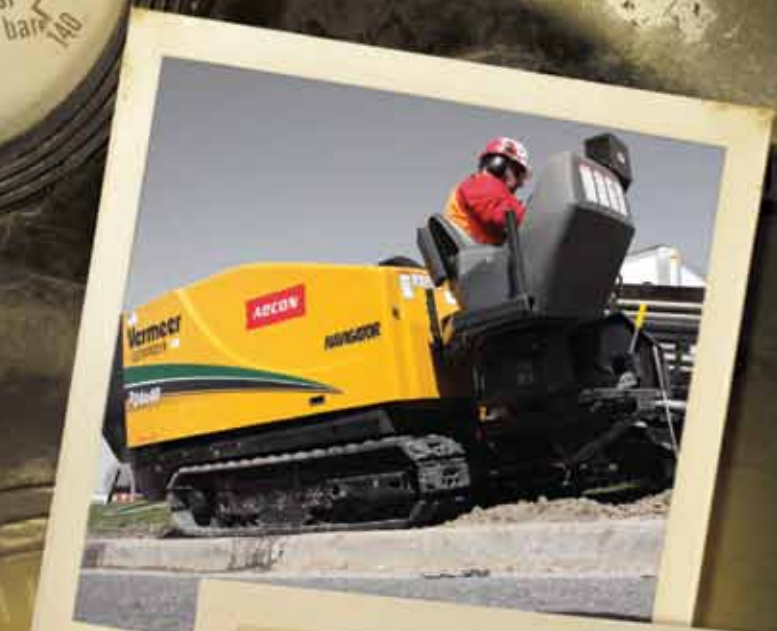
Derek Potvin
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EDUCATION UPDATE

I BELIEVE THE STUDENTS ARE OUR FUTURE TEACH THEM WELL AND LET THEM LEAD THE WAY



Today's students are the future of the trenchless technology industry. There is no doubt these bright minds will be the ones who will continue to advance this incredible industry.

NASTT is proud to sponsor 13 student chapters in North America. These energetic students are involved in a number of activities throughout the academic year. Members of student chapters also attend NASTT's No-Dig Show where they present amazing posters on their trenchless

research, participate in CCTV competitions and further their trenchless education by attending technical paper sessions.

About a year ago I received an email from Dr. Kalyan Piratla who had just become a faculty member at Clemson University. He had received his Ph.D. from Arizona State University under the direction of Dr. Sam Ariaratnam, and he had participated in the last four NASTT No-Dig Shows as a graduate student. He told me that being a student member of NASTT immensely helped him gain trenchless knowledge and allowed him to network with industry professionals. Music to my ears!



Sepideh Yazdekhashti, a Ph.D. student in the Clemson Department of Civil Engineering, and Josiah Hester, a Ph.D. student in the Clemson School of Computing, work together to collect data by attaching a vibration sensor to a 10-in. cast iron water pipe in a Clemson campus tunnel.

The reason for Dr. Piratla's email was also to discuss starting a new student chapter at Clemson University. I was thrilled that his experiences as a student encouraged him to give back and form a group out on the East Coast. Being a public institution with nearly 16,000 students and a strong engineering program, Clemson University was a great fit for NASTT.

NASTT officially welcomed Clemson University to the student chapter family in January of this year. Dr. Piratla hit the ground running and sent two students to NASTT's 2013 No-Dig Show in March. In the short time they have been an active chapter, the students have already gained hands-on experience monitoring utilities in underground tunnels. Dr. Piratla also plans to teach an underground construction class in the fall semester to spread the trenchless word.

If you'd like to help out with the student programs at NASTT's 2014 No-Dig Show, or be a guest speaker this coming school year at one of our student chapter universities, please feel free to contact me to coordinate.

Michelle Hill
NASTT Communications & Training Manager

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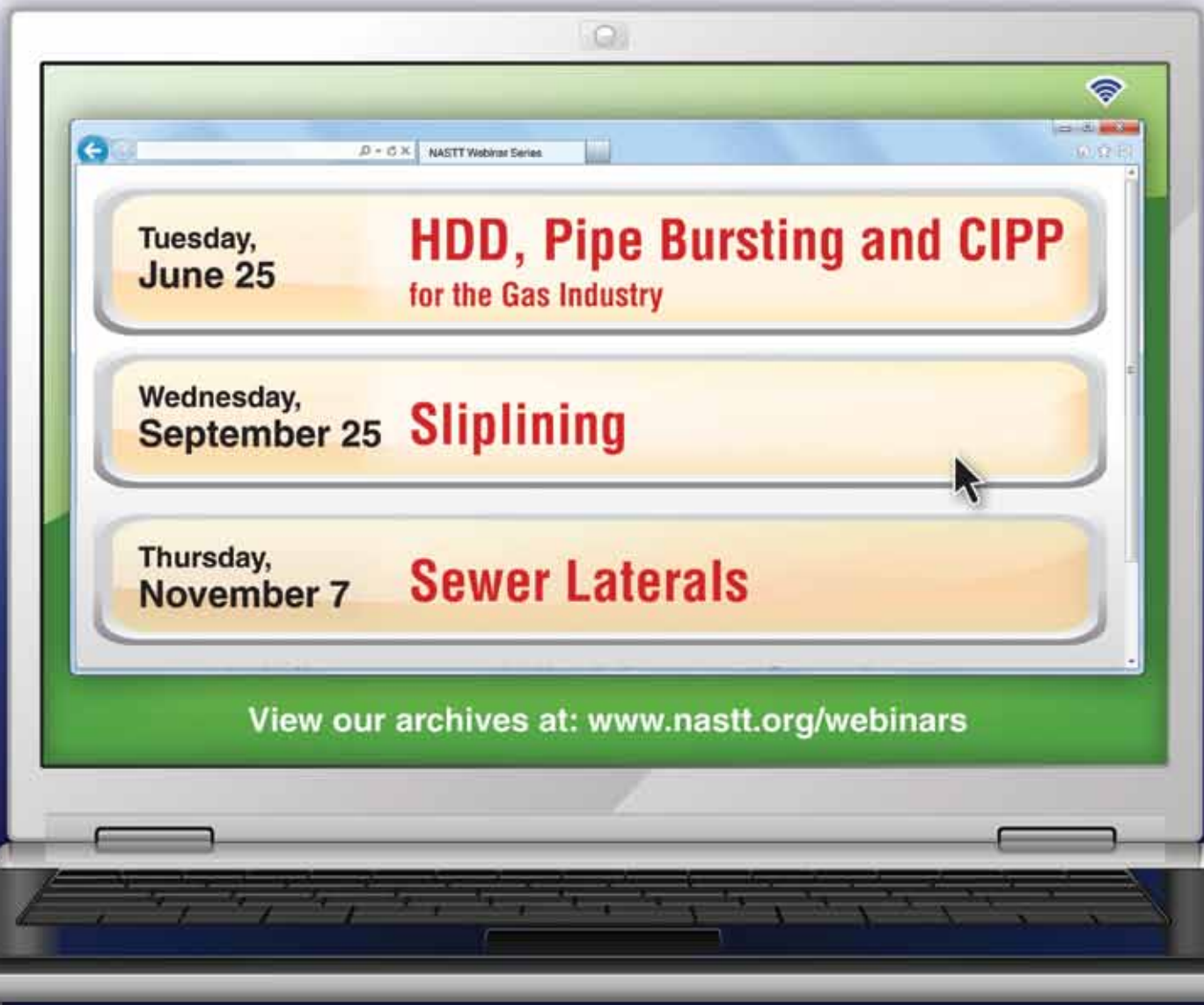
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JACK BURNAM'S FIRST MAJOR TRENCHLESS PROJECT CAME IN THE MID-1980S IN SACRAMENTO, WHERE MANY INNOVATIVE TRENCHLESS PRACTICES WERE EMERGING. HOW DOES HE FEEL ABOUT THE GROWTH OF THE INDUSTRY TODAY?



NASTT's Trenchless Today (NTT): Could you tell our readers a little bit about yourself and how you first became interested in engineering?

Jack Burnam: I was raised in the country and found that I was more interested in working in the field than working in the city. In 1979 I joined the Stinson Beach County Water and Wastewater District operating their onsite wastewater management program. I was fortunate to work with the district engineer for the agency (Dr. George Tchobanoglous, always called George T for obvious reasons) who was a professor of engineering at the University of California, Davis. We created innovative onsite wastewater system designs for a small but very complex community. This put me on the path to getting a master's in civil engineering in 1985.

NTT: How did you first become interested in the trenchless industry?

Burnam: I have always worked on conveyance projects. It's always been apparent that we need ways to economically replace existing lines when they reach the end of their useful life or install new lines in areas when open cut would create mass chaos (for example under rivers or other obstacles without damaging them). From the early 1970s to the mid-80s, Martin Cherrington was working on that problem (claiming the title of "father of HDD" to many). He finally created his own firm in Sacramento, Calif. – Cherrington Corp. – in 1984, where I was located. My first major trenchless project was the installation of 1,200 ft of 30-in. diameter steel pipe under an environmentally sensitive creek and meadow in the Lake Tahoe Basin. The installation contractor was Cherrington Corp. and the design was completed with a subcontractor named Bennett/Staheli Engineers. The race was on and I found myself sucked right in. I have been a supporter of trenchless technologies ever since.

NTT: How do you view the current state of the trenchless industry?

Burnam: The trenchless industry is always in a state of flux. That is what makes it exciting and keeps it current. The most recent trend is advances in condition assessment, both with and without having to take an existing line out of service. Horizontal directional drilling (HDD) keeps stretching the limits of how far they can install a new pipe from a single access location. While microtunneling or pilot bore is still the best way to trenchlessly install a new pipe on-grade, HDD is making inroads on this ability. Installing a microtunnel on a curved alignment has also been done. Every day one manufacturer and/or contractor is pushing the envelope – the industry is never static.

NTT: How did you first get involved in NASTT?

Burnam: I was introduced to NASTT first in 1993 at the [No-Dig] conference in San Jose, Calif., more by accident than anything else. One of the partners in the firm I worked for was scheduled to go, but had a conflict and I got sent instead. My real introduction was through Jim Hoggatt, construction manager at the South Tahoe Public Utility District. We were looking to find ways to get new pipe installed in sensitive environmental areas in the Lake Tahoe Basin and attended the No-Dig conference in Toronto in 1995.

NTT: During your time with NASTT, describe the growth you've seen in the industry over the years.

Burnam: The growth in the industry has been phenomenal. This is a niche industry that keeps expanding to fill in areas as they become known. For example, we all know that pipes degrade over time at different rates that are dependent on many factors. Initially, the only way to inspect these pipelines was to physically go into manholes, for instance, and examine what you could see from that location in both directions. Then CCTV was developed that could be floated down the line; then robotics allowing CCTV equipment to be carried down the lines; then more equipment was added (Laser, chemical sensors, sonar to see under the water level). This same expansion can be seen in HDD, microtunneling, rehabilitation techniques, etc. Each aspect of the industry is continually improving and pushing the envelope on what can be done.

NTT: What have been some of the more recent contributions to that growth?

Burnam: In the last two years, there seems to have been significant advancements in the areas of condition assessment and asset management. This seems only logical as every agency is trying to do more to protect and extend the life of their existing infrastructure given the loss of revenue they've been experiencing. The industry has grown to fill the need for better and newer methods of assessing the condition of in-place, existing infrastructure and in the areas of rehabilitation and repair of that infrastructure to prevent the need to completely replace it.

NTT: What do you see for the future of NASTT and for trenchless construction?

Burnam: I sincerely hope that NASTT continues to provide a platform for the trenchless industry to demonstrate its ability to fill the niche for non-destructive methods of repairing, rehabilitating or replacing existing infrastructure. I am looking forward to the day when reliable views of existing pipe wall thickness for pipes constructed of all materials can be generated using improved equipment run through the pipe. Improved microtunneling and HDD equipment, along with directional pipe bursting, can also allow existing lines to be replaced and new lines to be installed. It is going to be exciting.

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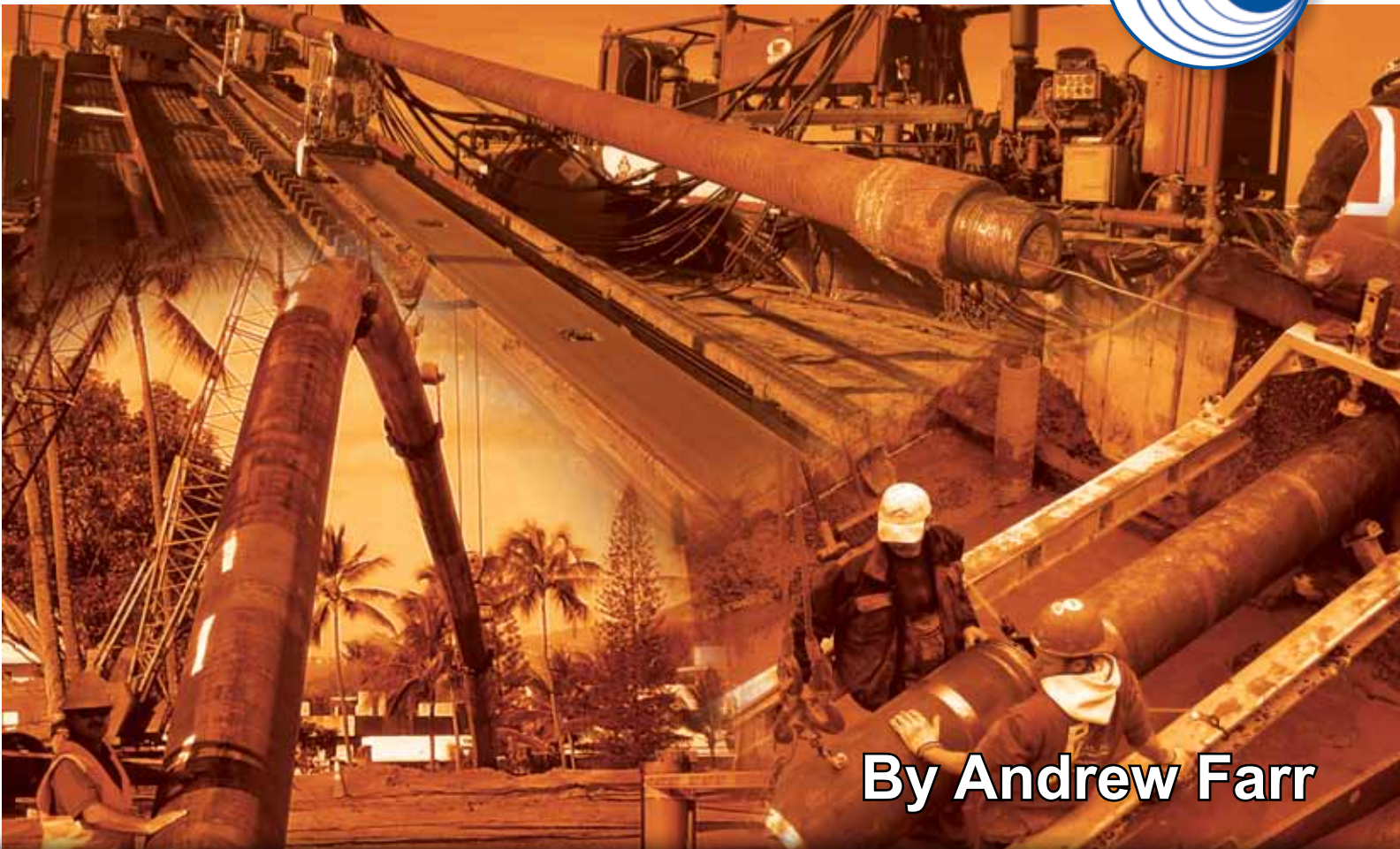
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By Andrew Farr

For this issue of *NASTT's Trenchless Today*, we spoke with three trenchless engineers that have continued to advance their leadership roles within NASTT and underground construction throughout the course of their careers. In these brief profiles for our In the Trenches series, it's always interesting to get a firsthand perspective from industry experts on the work they are doing and new methods being applied in the field. The knowledge they can offer in educational forums through NASTT comes straight from the experience they've gained and the problems they have solved working in the trenches.



George Bontus Insituform

George Bontus caught a glimpse of the engineering field through some of his friends while growing up.

"I was always fascinated by construction and equipment," he said. "I grew up in a small town and had a

friend whose brother was in engineering. It seemed like they were really doing some interesting things involving math and sciences."

Bontus said it was those early interactions with people in the engineering field that helped to spark his interest and eventually study civil engineering in school.

Bontus graduated from the University of Alberta and

began his career working for various municipal consultants in Edmonton, gaining experience in a wide variety of infrastructure projects. After 11 years on the consulting side, he joined the City of Edmonton Drainage Services Department as the supervisor of modeling and assessment and senior hydraulic engineer. There, Bontus worked for five years, focusing on system analysis and project management before returning to consulting engineering, where he became well versed in a variety of trenchless technologies, including different pipe lining processes.

In 2004, Bontus joined Insituform, where he has worked since then. As the director of pressure system applications, he has been involved in all aspects of the pressure pipe lining arena including marketing, business development, estimating and project management of HDPE and CIPP installations and design and review for

CIPP liners in gravity applications. He has also worked in product development with Aegion's research and development and operations groups.

"I was excited when I joined Insituform because while it [CIPP work] was something well established, pressure pipe lining was really in its infancy," he said. "We were really getting into improving pressure pipe lining technologies."

Bontus said one of the projects he is particularly proud of was job that involved the relining of a 5-mile, 20-in. water main in Victoria, British Columbia.

"I really like being able to work with different applications and with a wide range of solutions that can include various products and different curing methods for CIPP," he said. "It seems like things are always changing. Many product envelopes and capabilities we talk about now will probably change in six months. But it's quite an eye opener when you can see some of the unique problems that exist on projects."

Today, Bontus is a registered professional engineer in Alberta, British Columbia and Saskatchewan. He is a member of the AWWA committee updating Manual M28 for water main rehabilitation and also the AWWA pipeline rehabilitation standard committee. Bontus joined NASTT in 2004 upon beginning work with Insituform and said he is proud of what the association gives back to the industry in the way of education and promoting different

trenchless practices.

"There is a huge amount of work being done in CIPP," he said. "I'm still surprised when consultants and owners aren't aware of certain [trenchless] methods and techniques that are out there. I think we're still scratching the tip of the iceberg."



Michael Davison
Aqua-Pipe

Mike Davison developed his passion for engineering at a young age.

"I was always interested in how things worked, taking things apart and putting them back together," he said. "Going into engineering

in university seemed to be the right path for me. I was very technically sound, so I went into the more physical-mechanical side of engineering."

But Davison said he didn't initially plan on his career going to the side of underground infrastructure, but the opportunity presented itself while he was doing an internship in school.

"I had a direction in university, going more towards the structural buildings and bridges, which was more of the visible infrastructure rather than the hidden infrastructure," he said. "I ended up finding a summer

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job at a smaller municipality on the west side of Montreal and fell onto being an inspector on a job with Sanexen where they were doing water main rehab using Aqua-Pipe. It was really by chance that I fell into the industry.”

After his work with the city, Davison, having an interest in furthering his knowledge and experience in water rehab, followed up with some of his contacts at Sanexen and pursued a job. Eventually after graduating from McGill University in Civil Engineering, Davison joined the Aqua-Pipe team in 2002, where he began work as a project manager in multiple cities across Quebec. Since that time, Davison has been responsible for training, supply of materials and equipment, and the transfer of the technology to outside installers in order to push the success of Aqua-Pipe outside of Quebec.

“A lot of my job involves sharing experiences, because as we’ve gone along, people have come and gone [at Sanexen] and some of the experiences we’ve learned get lost,” he said. “When you can share directly, and talk with operators and other people in the industry, word of mouth is always a good transfer of knowledge.”

As the success of Aqua-Pipe has increased over the years, Davison has also been involved with research and development of the Aqua-Pipe product, designing the next generation of Aqua-Pipe and improving the process through new techniques and equipment as well as putting in place quality control and quality assurance

procedures for the installers.

In regards to Davison’s thoughts on NASTT, he offered one simple analogy.

“NASTT, I associate with trenchless technology as much as you would associate peanut butter and jelly,” he said. “It’s my default information supplier where I learn about who’s doing what and what the next best thing is. In beginning to learn about trenchless technology, NASTT comes right out in the forefront as being one of the best information suppliers, promoters, presenters and getting people to talk about this industry.”

Since 2009, Davison has worked as product director at Sanexen and oversees design certification. He is also the author of standard operating procedures along with technical support to operators and licensees in North America, and even finds time to manage special projects in order to maintain awareness of the ever changing water main infrastructure problem.



Jeff Maier

Summit Water Consulting

Jeff Maier has had a busy year thus far in 2013, stepping into some new business ventures with the co-founding of Summit Water Consulting earlier in the year, and more recently

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being appointed the newest member of the NASTT Board of Directors.

Maier is a registered professional engineer in the state of Colorado and a graduate of the University of Michigan College of Civil and Environmental Engineering. Having always been interested in the environmental engineering field, Maier became involved in land development during the early part of his career, but quickly progressed into the water and wastewater arena. Over the course of his 15-year career, he has become recognized as an industry expert in the fields of condition assessment and trenchless rehabilitation of pipelines, manholes and other water and wastewater facility and conveyance structures.

After working for the Metro Wastewater Reclamation District in Denver, Colo., for more than 10 years, he decided to return to the consulting side and co-founded Summit Water Consulting, LLC, a niche engineering firm based in Evergreen, Colo. Summit specializes in water and wastewater infrastructure condition assessment, asset management program development and trenchless rehabilitation design solutions.

"I've been able to take the valuable experience of working for a municipality, combined with the specialized expertise that I developed in condition assessment and trenchless rehabilitation, and put it into a good business model for consulting," he said.

Maier said he is looking forward to what the future holds

for Summit Water. In addition to his new business, Maier's increased involvement in NASTT over the last couple years is another initiative that points to his leadership growth within the trenchless industry. Maier has been actively involved in NASTT's Rocky Mountain regional chapter, the No-Dig Show Program Committee and has been elected the 2013 Rocky Mountain Chapter Regional Conference Chair.

Maier was also recently appointed to the NASTT Board of Directors at the national level, assuming the role previously occupied by Tracy Lyman. Maier said Lyman was a key asset in the development of his involvement within the organization, starting on the regional level.

"He [Tracy], along with Kim Staheli and Mike Willmets have been very supportive of my growth within the NASTT organization and my position on the Board today," Maier said. "I'm certainly thankful for their encouragement.

"This is a niche industry and NASTT as an organization has been instrumental in being able to help educate owners, municipalities, engineering consultants and others about the benefits of trenchless technology. They've really helped promote the development of the trenchless industry through the No-Dig conference, ongoing educational opportunities and effective outreach with the various regional chapters. The future of NASTT and trenchless looks very bright and is full of exciting opportunities ahead."

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2013 NASTT Membership Directory

The North American Society for Trenchless Technology presents its 2013 NASTT membership directory. Founded in 1990, NASTT is a not-for-profit educational and technical society dedicated to promoting the benefits of trenchless technology. The directory pages are divided into three categories: individual, corporate and municipal. Individuals are listed with their company affiliation. Members and contact information are listed for each corporate and municipal listing. The membership directory printed in this issue was current as of Aug. 16, 2013.

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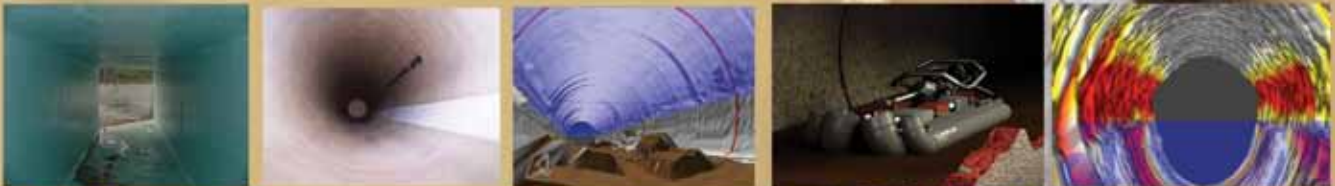
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NASTT'S EYE ON THE INDUSTRY

The North American Society for Trenchless Technology (NASTT) takes pride in its members. Whether it's the project owner or a company on the consulting engineering, contracting or manufacturing side, NASTT members are involved in countless projects each year that continue to break barriers and drive underground construction forward. This year in *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. Check out this month's assortment of trenchless projects.

York Region

Keswick, Ontario, Canada - Microtunneling



The Keswick WPCP Effluent Outfall Project includes the construction of a 48-in. outfall including more than 3,000 ft of microtunneling. The project includes the first compound curve microtunnel drive completed in North America, the first curved

microtunnel drive completed in Canada and the first in-lake reception of a microtunnel boring machine in Canada. Hatch Mott MacDonald is the design engineer on the project, Ward and Burke is the microtunneling contractor and McNally Construction is the general contractor.

James W. Fowler Co.

Yorba Linda, Orange County, California - Microtunneling



The Orange County Public Works Department recently passed another milestone on the Santa Ana River Interceptor (SARI) Relocation — SARI Mainline project. James W. Fowler Co., the microtunneling subcontractor, completed

the longest S-curve microtunnel drive in North America. This tunnel included the first use of the jack control hydraulic joints in North America. Hatch Mott MacDonald provided tunnel design and construction services as a sub-consultant to Tetra Tech.

Rain for Rent

Bakersfield, California - Liquid Handling

Rain for Rent's engineering team recently designed and deployed a custom containment solution 175 ft in the air above the San Francisco Bay during construction of the San Francisco-Oakland Bay Bridge, which is to be the largest self-anchored suspension bridge in the world.

In preparation for a complex bolt repair that required drilling into the concrete structure, the bridge contractor

needed to find a way to safely disperse the water necessary for cooling during the drilling process. The contractor needed a liquid handling partner with the resources to capture and transport the water from this confined and uniquely positioned jobsite.



An urgent call brought Rain for Rent's local engineering team to the site to assess the job requirements. After constructing a steel gutter to capture the water under the drilling site, Rain for Rent ran a vertical pipe

down 160 ft to direct the water into tanks placed on the floating pier end caps below. For additional protection against leakage, Spillguards — one-piece temporary containment berms — were installed under the tanks. Upon project completion, the water will be pumped from the tanks on the bridge to a set of tanks on a barge for transportation to the Port of Oakland for treatment and sanitary disposal.

Underground Solutions, Inc.

Romulus, Michigan - HDD



In order to minimize disruption to airport operations, HDD was used to install large diameter conduits under the taxiways as part of the Runway 4R/22L Reconstruction Project at Detroit Metropolitan Wayne County Airport

in Romulus, Mich. Large conduits were successfully installed under active taxiways and de-icing aprons; avoiding open-cutting of areas that would have forced airplane traffic to be re-routed and disrupted airport operations.

The contractor selected 20- and 30-in. DR25 Fusible PVC pipe, provided by Underground Solutions, Inc., for the casings and began work that spring. Once drilled in place, the Fusible PVC pipe was loaded with electrical conduits and spacers. The 20-in. pipe was loaded with four 4-in. conduits for primary power and the 30-in. pipe was loaded with nine 5-in. conduits for future expansion needs. The smaller conduits and spacers were eventually grouted in place to fill the voids.

Underground Solutions completed fusion, staging and pulling of the fusible PVC pipe, which was accomplished without interruption of taxiways and airport scheduling.

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 "Eye of the Industry."



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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. 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. For more information on chapter events, please visit the website at www.nastt-bc.org.

Great Lakes, St. Lawrence & Atlantic

The GLSLA board of directors and member volunteers are continuing to work to provide value to our members through training, publications and the GLSLA website.

GLSLA is proud to announce that we have joined with Craig Kelman and Associates to publish the next GLSLA magazine. Craig Kelman is an experienced publisher and is well known to the trenchless industry, having already published other chapter magazines. We look forward to working with Craig Kelman to produce our magazine, which is scheduled for release in February 2014. We are also looking for interesting project articles, so if you have been involved in a trenchless project, please consider writing an article about your project so others can benefit from your experience.

Some other ongoing initiatives include working with the Atlantic Canada Water and Wastewater Association (ACWWA) and NASTT to bring a laterals training course to Halifax this fall. Stay tuned for details. We also 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.

We are continuing to look at new ways to improve the value of our website and are currently reviewing the development of a job posting page, so continue to visit the website for upcoming additions and updates.

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

For more information on GLSLA, our events and our training sessions, please visit our website at 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 is 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 Wa-

ter and Wastewater. The second day guest presenter was Calvin Farr, Jr., P.E., Washington Suburban Sanitation Commission (WSSC), Wastewater Collection Group Leader, with the presentation "Historic Bladensburg Waterfront Park Condition Assessment & Structural Analysis of the 102-in. Anacostia Trunk Sewer."

The seminar had an excellent assembly of local contractors, engineers and municipal employees who networked and learned about trenchless technology for the two days. The seminar offered 13 PDHs with a certificate for attendance completion and was sponsored by the ASCE Maryland Section.



The "Trenchless Technology, SSES and Buried Asset Management" two-day seminar in Baltimore, Md., was well attended by local contractors, engineers and municipal employees who attended technical presentations, networked and learned about trenchless technology.

MASTT has a seminar tentatively planned in late November or early December 2013 in Newark, N.J. Please go to http://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 dates, venues and programs are finalized.

Midwest

The Midwest Chapter conducted the trenchless technology seminar, "Trenchless Technology, SSES and Buried Asset Management" in Kansas City, Mo., on August 8-9 at the Embassy Suites Kansas City - Plaza, Kansas City, Mo. The ASCE Kansas City Section was co-sponsor of the seminar which offered 11 PDHs and was a great success with engineers, contractors, manufacturers and municipal employees attending to network and learn about trenchless technology. The guest presenter was Andy Shively, P.E., engineering officer of the Kansas City [Missouri] Water Services Department with the presentation, "Kansas City's Trenchless Program." The seminar also had an outside jet cleaning demonstration by NozzTeq, Inc.

The MSTT seminar "Trenchless Technology, SSES and Buried Asset Management" is tentatively planned for early 2014 in Louisville Ky. Please visit www.mstt.org/proposed_seminar.html to view the MASTT, MSTT &



MSTT's "Trenchless Technology, SSES and Buried Asset Management" seminar in Kansas City, Mo., featured an outside jet cleaning demonstration by NozzTeq, Inc.

SESTT 2013 Proposed Seminar Schedule. Seminar locations and dates will be updated as the seminar's dates, venues and programs are finalized.

On Aug. 1, 2013, MSTT proudly mailed out the inaugural issue of the *Midwest Journal of Trenchless Technology 2013*. The MSTT Officers, Board of Directors and staff want to thank all who participated in the organization and production of this fine journal. The journal was a great success with numerous Midwest project articles, messages and advertisements. The journal can be viewed online at www.mstt.org.

Pacific Northwest

The Pacific Northwest Chapter has continued to strive toward its 2013 goal of increased educational outreach throughout the region. The PNW Chapter is tapping into the wealth of knowledge held by our diverse membership in order to promote the use of trenchless technology. The recently formed PNW Chapter Membership Committee is diligently working to develop new single-day introductory and education seminars that will be conducted by local members from Alaska to Idaho. The goal is to publicize the breadth of capabilities and advantages made available through trenchless technology and to provide an introduction to our organization.

We are also looking forward to No-Dig 2014 and plan to once again bring a wide range of trenchless experiences from our region to the show. Look for our annual magazine at the end of 2013 for in-depth information on local projects featuring design and construction. If you would like to contribute an article, please contact Laura Wetter at laura@staheli-trenchless.com for more information.

Northwest

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.

Rocky Mountain

The Rocky Mountain Chapter's fourth annual No-Dig conference and NASTT Short Course is scheduled for the week of Nov. 4, 2013 at the DoubleTree Hotel in Westminster, Colo. The conference will provide a unique and important opportunity to share information, hear from respected trenchless practitioners, visit exhibitor booths and network with trenchless technology professionals actively engaged in trenchless pipeline projects in Colorado, Utah and Wyoming. Key presentations will include topics such as asset management, new installation, rehabilitation and repair, trenchless construction, and a best practices trenchless short course. For more information on chapter events, please visit www.rmnaastt.org.

Southeast

The Southeast Chapter had a successful "Trenchless Technology, SSES and Buried Asset Management" two-day seminar at the Hilton Savannah DeSoto Hotel Downtown in Savannah Ga., on July 10-11. The guest presenter was Jim Laplander, P.E., director of the City of Savannah Sewer Conveyance and Water Distribution with the presentation "Savannah's Trenchless Program." The seminar was co-sponsored by the ASCE Savannah Branch and offered 10 PDHs and a certificate for attendance completion. The seminar also had an outside jet cleaning demonstration by NozzTeq, Inc.

Please visit http://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. The technical conference will take place Oct. 28, and the education program is scheduled for Oct. 29. 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. More information and registration will be posted on the website in the coming months at www.westt.org.

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
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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.nasttgsln.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
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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
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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
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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
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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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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
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Website: www.westt.org

Elected Officers
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Vice Chair - Cindy Preuss
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NASTT STUDENT CHAPTERS



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



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

October 29 **NASTT's New Installations Good Practices Course**
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 13 **NASTT's New Installations Good Practices Course**
Boston, Massachusetts

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

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INVESTIGATION OF HORIZONTAL DIRECTIONAL DRILLING CONSTRUCTION RISKS

Manley Osbak, Vice President of Engineering, The Crossing Company Inc., Nisku, Alberta

Hossein Akbarzadeh, MSc., Ph.D. student, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Alberta

Alireza Bayat, Ph.D., PEng., Assistant Professor, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Alberta

Carrie Murray, M.Eng, P.Eng., Ph.D. student, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Alberta

The risks associated with horizontal directional drilling (HDD) can have a significant impact on project schedule and cost. The potential disparity between tendered or budgeted cost and final cost are a source of concern for the industry. All the parties involved share a desire to decrease the uncertainty associated with the final cost of an HDD project. However, the methods that may be employed to decrease this uncertainty come at a cost themselves. Since these methods generally only serve to decrease risk without necessarily eliminating it, there is a degree of uncertainty concerning the effectiveness of dollars spent on risk mitigation. Thus, owners may be reluctant to spend budget funds on decreasing risk without sufficient assurance as to the value of such expenditures. There is a deficit of industry literature that can be used to assist in enumerating risks, the probability of occurrence and the impact of risk in quantitative terms.

For much of the HDD industry, the assessment and valuation of risk mitigation can only be estimated and communicated using qualitative methods, which may be insufficient to demonstrate the value of risk mitigation. This paper discloses the risk events that have occurred on 100 medium and large HDD projects, the frequency of occurrence and the average schedule impact and risk factor of each event type. This work provides a body of information that can be used to quantify the probability of occurrence and the probable impact of a risk event – which can feed into an estimate of the potential cost of a risk event, and in turn, to evaluate and justify the cost of risk mitigation.

BACKGROUND

Actual project costs and project durations, associated with horizontal directional drilling (HDD) projects, can be significantly higher than originally budgeted, contracted or anticipated. The possibility of going over budget and over schedule is a risk that all HDD projects are exposed to, and this risk represents a potential for loss. The process of risk mitigation, specific to cost and schedule certainty, requires us to answer seven basic questions:

1. What are the construction events that lead to cost and schedule overruns?

2. What is the probability of these events occurring?
3. What is the probable impact should these events occur?
4. What is the priority of risk events?
5. How do we mitigate the risk of these events occurring?
6. What is the cost of mitigation?
7. How much value or potential value does mitigation add to the project?

Many industry specialists are aware of the risks associated with HDD construction in a qualitative sense, and are also aware of the processes that can be used to mitigate those risks. A difficulty arises however, when decision makers require a quantitative justification of mitigation measures in terms of the money that may be saved as a result of such mitigation. Without a body of quantitative information to draw from, it may often be very difficult to provide such estimates. Currently, the HDD industry could benefit from a body of quantitative information that could be used to provide reasonable estimates of the costs associated with risk on HDD projects.

RESEARCH OBJECTIVE

The purpose of this paper is to provide the industry with a body of information that can be used to identify risk events, the probability of occurrence, the probable impact and priority of those events. Coupled with an understanding of appropriate engineering and construction mitigation processes and the cost thereof, the potential cost without mitigation and with mitigation can be addressed quantitatively. Having defined the potential cost of risk and the cost of mitigation, the justifiable cost of mitigation can be better determined.

METHODOLOGY

The authors reviewed the daily work records of 100 HDD projects that were constructed in western Canada between 2005 and 2009. All of the projects were constructed by one contractor, and all were constructed within a geological environment comprising of some combination of clay, clay till, shale, mudstone and sandstone within relatively minor



inclusions of sand, gravel, siltstone and coal. The regions in which the projects were constructed have been impacted by glaciation and the processes of glacial retreat. The projects ranged in length from 219 m (718 ft) to 1594 m (5229 ft), with diameters ranging from 251 mm (9 7/8 in.) to 1524 mm (60 in.).

The review consisted of identifying every occurrence of an unplanned event on each project. Each occurrence was categorized under one of 22 event descriptions. For example, if a piece of surface equipment required repair or unscheduled maintenance, the event was categorized as E11: Unscheduled Maintenance/Repair of Surface Equipment. The time that the event occurred was recorded as well as the time taken to return to the point of production that was first interrupted by the event. The event begin time was subtracted from the event end time to yield the event duration. The event duration was divided by the overall project time and then multiplied by 100 to give the event's contribution to the project schedule in terms of percentage. For example, if the total project time was 250 hours and an event, EX, consumed 22 hours, then 8.8 percent of the project schedule was due to event. All of the events that occurred on a project were grouped by event ID, and the event duration and schedule impact were summed for each event. If three EX events occurred on one project for example, and the three events contributed 10 hours, five hours and seven hours respectively, the elapsed event time for each individual occurrence was summed to yield a total elapsed time of 22 hours for that event type. The schedule impact of each individual event occurrence was also summed to give the aggregate schedule impact of the event type. If the project duration was 250 hours and three EX events contributed 10, five and seven hours, then the schedule impact of each individual event occurrence was 4 percent, 2 percent and 2.8 percent, respectively, with a total impact of 8.8 percent to the project schedule.

Following review of each project, the aggregate event duration and aggregate schedule impact was recorded in a registry. The aggregate event time and aggregate schedule impact of each event type was listed in the registry under the corresponding event ID, and was associated with each unique project number. For example, if Project #001 experienced three EX events totaling 22 hours of elapsed time and contributed a total 8.8 percent to the project schedule, then the values of 22 hours and 8.8 percent were recorded under the EX header. Following review of all 100 projects, the number of entries in the EX field, were counted to yield a value denoting the frequency of occurrence. If for example, the event EX contained 27 entries out of 100 projects, then the frequency of occurrence was 27. The aggregate schedule impact was also summed and then divided by the number of occurrences to find the average schedule impact or simply, the average impact. If EX occurred on 27 projects for example, the percent schedule impact for each project was summed and then divided by 27 to yield the average impact.

The frequency of occurrence was then multiplied by the

average impact to yield a risk factor, which serves to prioritize the risks events. The three values, frequency of occurrence, average impact and the risk factor for each event were then graphed in a horizontal bar chart and arranged in descending order to form an inverted funnel diagram.

RESULTS & IDENTIFICATION OF RISK EVENTS

The review resulted in the enumeration of 22 risk events, defined as:

E1: Frac-out – An event in which drilling fluid has escaped the confines of the borehole and has come to surface.

E2: Collapsing Soil/Lost Hole – An event in which a section of the borehole has collapsed resulting in a loss of a section of the borehole.

E3: Loss of Circulation – An event in which drilling fluid has stopped flowing to either the entry or exit points but is being lost into the ground with no inadvertent flow to surface (frac-out).

E4: High Annular Pressure – An event in which the drill bit is tripped back or completely out of the borehole in an attempt to clean the borehole and lower the annular pressure.

E5: Inspect/Change Bottom Hole Assembly – An event in which the bottom hole assembly (BHA) was tripped out of the borehole to inspect or change some aspect of the BHA, usually the drill bit or reamer. The event was categorized as an E10 event if the inspection found a catastrophic failure of a component, such as a missing cutter.

E6: Tripping to Clean/Gauge Hole – An event in which the drill bit or reamer was tripped out of the borehole to mechanically clean the cuttings from the borehole and/or gauge the borehole.

E7: Stuck in Hole – An event in which the drill pipe is stuck in the borehole.

E8: Wait on Vacuum Truck – An event in which production (active drilling or reaming operations for example) have been stopped while waiting for drilling fluid to be recovered from a frac location or from exit side. This event may also apply to waiting for a vacuum truck to empty holding pits or holding tanks that are full of water, drilling fluid or solids that have been produced from the borehole.

E9: Wireline/Steering/Pressure Tool Failure – An event in which a component of the navigation or annular pressure system has stopped working and has to be stripped out of the borehole for repair or replacement.

E10: Downhole Tooling Failure – An event in which the drill pipe or a component of the BHA has suffered a catastrophic failure or rapid degradation failure that does not represent normal and managed wear and tear.

E11: Unscheduled Maintenance/Repair of Surface Equipment – An event in which a component of the surface equipment required repair, replacement or unscheduled maintenance.

E12: Wait on Others – An event in which production or event remediation has been halted while waiting on the client or client's contractors to make a decision seek authorizations or



accomplish work. This category also included waiting until daylight to install the product line at the client's request.

E13: Wait on Equipment/Services – An event in which production or event remediation cannot proceed until equipment or services under the Drilling Contractor's control arrives on site.

E14: Pilot Hole Out of Specification/Directional Rework – An event in which the radius of a segment of the pilot hole is outside of the specified minimum radius of curvature or the X, Y, Z position of the pilot hole beyond the specified maximum deviation from the planned drill path. This may also include sourcing suspected errors in positional data.

E15: Flow to Exit – An event in which remedial action is taken in response to drilling fluid flowing to exit.

E16: Wait on Water – An event in which production or event remediation has been halted while waiting for water to arrive on location so that drilling fluid can be made up, even if the drilling fluid is simply water.

E17: Drilling Fluid/Solids Control Work – An event in which production or event remediation cannot proceed until the drilling fluid is built or modified, or until solids (cuttings) have been cleaned out of a holding area.

E18: Weather Related Delay – An event in which production or event remediation has stopped due to problems directly attributable to the weather.

E19: Water Production – An event in which the borehole has started to produce water such as may occur from artesian conditions or when drilling above rig elevation through a perched water table.

E20: Hung Up on Casing – An event in which the BHA or the product line will not enter the casing when casing has been installed.

E21: Damaged Product Line – An event in which the product line or product line coating has been damaged to the point that remedial action must be taken.

E22: Product Line Stuck in Hole – An event in which the product line has become stuck in the hole and cannot be pulled any further towards the entry point.

There were numerous dependences within the 22 events. An E3: Loss of Circulation event for example, could lead to an (E1) frac-out event, which in turn, could lead to an (E12) waiting on others event. For the most part, events were categorized under their specific heading whether or not there was a precipitating event, and were categorized under the most descriptive event type given the evidence in the daily work records. An (E3) loss of circulation event for example, was categorized as such when there was no evidence of occurrence of another event such as a frac-out. Likewise, a frac-out event was categorized as such when it occurred even though it may have been precipitated by a loss of circulation event.

Often times, events would occur within the duration envelope of another event. In some cases the events were related and in other cases they were not. In either case, the initial event was recorded from the time the event disrupted

production until production resumed from the point of disruption. The start and end time of any other event that occurred within the envelope of the first event (whether or not they were related) was recorded and subtracted from the first event time. For example, if an E3: Loss of Circulation event occurred, that required from 08:00 hours to 14:00 hours to remediate, and during that envelope, an E11: Unscheduled Maintenance/Repair of Surface Equipment event occurred that took from 09:30 hours to 10:00 hours, the 0.5 hours consumed by the E11 event was subtracted from the 6 hour E3 envelope to yield an E3 event time of 5.5 hours and an E11 event time of 0.5 hours. Likewise, if an E3: Loss of Circulation event occurred, and then within that event duration, an E1: Frac-out event occurred, the time spent on the E1 event was subtracted from the E3 event, even though the two were most probably related.

FREQUENCY, IMPACT AND RISK FACTOR

The frequency of occurrence, average impact and the resulting risk factor associated with each event type is shown in Figures 1 to 3, respectively.

Figure 1 is the frequency of occurrence of each event and lists the events in descending order of frequency. It can be seen from the figure that E11: Unscheduled Maintenance/Repair of Surface Equipment occurred on 80 out of 100 projects, E6: Tripping to Clean/Gauge Hole occurred on 69 out of 100 projects, and so on until finally E20: Damaged Product Line occurred on only 1 out of 100 projects.

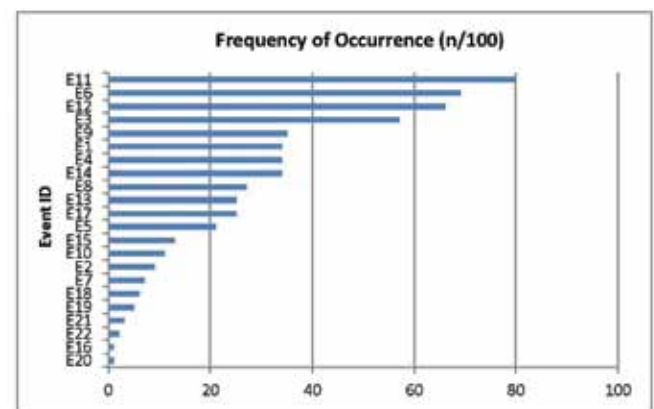


FIGURE 1

Figure 2 is the average impact for each event, with the results differing significantly in comparison to the frequency of occurrence. E11: Unscheduled Maintenance/Repair of Surface Equipment for example, ranked highest in terms of frequency of occurrence, but ranks far down the scale in terms of average impact, contributing on average, less than 3 percent to the total project schedule. E22: Product Line Stuck in Hole, while occurring on only 2 out of 100 projects, has an average impact of nearly 30 percent and ranks as having the largest average impact when occurring. Thus, while having a



low frequency of occurrence; E22 Product Line Stuck in Hole can have a significant impact on the project schedule.

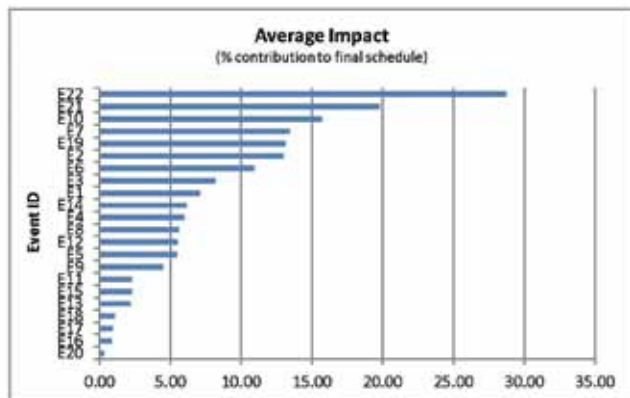


FIGURE 2

Figure 3 is the risk factor of each event. The risk factor is simply the product of the frequency of occurrence and the average impact. Figure 1 drew our attention to E11: Unscheduled Maintenance/Repair of Surface Equipment because it occurred with the greatest frequency. Figure 2 on the other hand, showed E11 to be of relatively minor importance in terms of average impact and drew our attention to E22: Product Line Stuck in Hole, as having the highest average impact. Figure 3, Risk Factor, again suggests a new order of priority, placing E6: Tripping to Clean/Gauge Hole, E3: Loss of Circulation and E12: Wait on Others as the three most important problems or risk events. While E11: Unscheduled Maintenance/Repair of Surface Equipment ranks seventh in order of priority and

E22: Product Line Stuck in Hole, being listed as one of the low priority events with a risk factor of only 0.6.

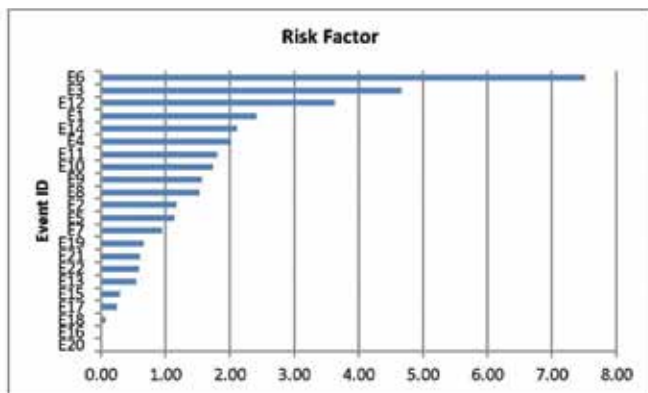


FIGURE 3

CONCLUSION

It can be argued that these results are specific to one contractor and may not reflect the frequency of occurrence and average impact of the same events given a different

contractor. While this is a reasonable argument, it may also be suggested that if the contractor is deemed to be competent, then the frequency of occurrence and average impact, and thus the risk factor, should be similar for all competent contractors in the same geological conditions.

Cost and schedule certainty are objectives of any construction activity, including HDD. The degree of uncertainty associated with above-ground construction, such as conventional pipeline and facilities construction, is generally well known and contained within a small margin of project cost and duration. The long history of these forms of construction have allowed that industry to develop a common understanding of the risk issues, mitigating practices, associated costs and the resulting value. Within the above-ground construction community, knowledgeable industry stakeholders operate within a shared understanding of risk and the general mitigation processes, acting in somewhat independent concert to affect an acceptable level of cost and schedule certainty.

The ability to act in independent concert is due to the shared understanding of risk, but more than that, a shared value system which places a high value on participation from all stakeholders in the identification and control of risk. The result being that stakeholders recognize their respective roles in identifying and managing risk and participate in general independent concert to manage risk and achieve an appropriate level of cost and schedule certainty. HDD however, is a rather young industry and is still within the beginning stages of defining risk, developing mitigating practices and disseminating that information amongst owners, engineers, contractors and regulatory bodies. Developing a shared understanding of HDD construction risks, mitigation processes and the value of mitigation is a prerequisite to developing a shared value system in which industry stakeholders recognize and function within their respective roles to identify and mitigate risk, and thus affect a greater degree of schedule and cost certainty. The tools provided in this paper are intended to serve that end.

The research undertaken by the authors thus far has resulted in the creation of a database that lists the risk events that have occurred on 100 medium to large HDD projects, and the frequency of occurrence, average impact and Risk Factor associated with those events. This database can be used for further risk analysis and the development of additional risk analysis tools. It is the author's intent to continue such analysis and to develop further risk analysis tools based on the currently existing database.

This paper was edited for style and space in *NASTT's Trenchless Today*. To view the full version of Paper E-4-01, please visit nastt.org.

CALENDAR

October

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NASTT's CIPP Short Course

In conjunction with International Construction and Utility Equipment Exposition (ICUEE)
Kentucky Exposition Center
Louisville, Kentucky

Contact Info:
Michelle Hill
Email: mhill@nastt.org
Web: www.icuee.com

28-29

9th Annual Western Regional No-Dig Conference & Exhibition

Ala Moana Hotel
Honolulu, Hawaii

Contact Info:
Craig Camp
Email: Craig.Camp@HatchMott.com
Web: www.westt.org

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NASTT's New Installation Methods Good Practices Course

In conjunction with the 9th Annual Western Regional No-Dig Conference & Exhibition
Ala Moana Hotel
Honolulu, Hawaii

Contact Info:
Craig Camp
Email: Craig.Camp@HatchMott.com
Web: www.westt.org

November

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4th Annual Rocky Mountain Regional No-Dig Conference and Exhibition

Doubletree Hotel
Westminster, Colorado

Contact Info:
Bo Botteicher
Email: bbotteicher@undergroundssolutions.com
Web: www.rmnaastt.org

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NASTT's Pipe Bursting Good Practices Course

In conjunction with the 4th Annual Rocky Mountain Regional No-Dig Conference and Exhibition
Doubletree Hotel
Westminster, Colorado

Contact Info:
Bo Botteicher
Email: bbotteicher@undergroundssolutions.com
Web: www.rmnaastt.org

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NASTT's Complementary Laterals Webinar

Contact Info:
Vicki Losh
Phone: (330) 467-7588
Email: vlosh@benjaminmedia.com
Web: www.nastt.org/webinars

13

NASTT's HDD Good Practices Course

In conjunction with the 2013 Northwest Trenchless Conference
Coast Plaza Hotel
Calgary, Alberta

Contact Info:
Nadeer Lalji
Email: nlalji@nastt-nw.com
Web: www.nastt-nw.com

13-14

NASTT's New Installation Methods Good Practices Course

In conjunction with the Boston Trenchless Technology Road Show
Holiday Inn Boxborough
Boston Area, Massachusetts

Contact Info:
Melanie Roddy
Email: mroddy@benjaminmedia.com
Web: www.trenchlessroadshows.com

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