



# NASTT's *Trenchless Today*

Educate - Train - Research - Publish



## 2012 NASTT Officers and Board of Directors

Winter 2012  
Volume 2  
Issue No. 1



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No-Dig Preview  
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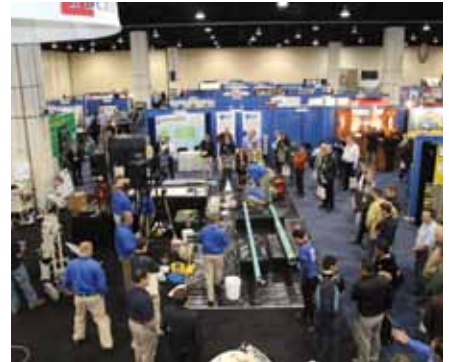
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# Message from the Executive Director



## New Year, New NASTT Exciting Changes to be Seen in 2012

With this issue, *NASTT's Trenchless Today* begins its second year of publication. They say life is a work in progress and each of us continues to evolve as we mature. We feel the same way about *NASTT's Trenchless Today* — it continues to evolve as we take the lessons learned in our first year and improve as a product. We have exciting things planned for the magazine this year and we can't wait to bring them to you.

We began this publication as a conduit between NASTT and its membership to showcase their exemplary volunteer spirit. The stories in these pages feature the faces and voices of our invaluable volunteers, who tirelessly promote the trenchless industry. We are so blessed with the quality of people who are involved in our organization and this magazine is a tribute to them and their hard work. Rewardingly, feedback of our efforts has been incredibly positive and supportive. We continue to ask for your input to make this magazine an outstanding read with each issue and a representation of what NASTT is all about.

NASTT is excited to get 2012 under way and we have many initiatives and programs that we are eagerly working on to grow our organization and the trenchless industry even more. Most importantly, we are working hard to grow our membership through municipalities and utilities — a key initiative for 2012. NASTT believes that connecting with this group is critical to the expansion of NASTT as well as the use of trenchless technology. These are the people who make the decisions on how key assets are managed, maintained and upgraded while our underground infrastructure ages and deteriorates. Having them as part of our membership will give trenchless technology a stronger voice as we move forward.

This year, we welcome five new members to the NASTT Board of Directors: Brenda Kingsmill, Halton Region; Kevin Nagel, TT Technologies Inc.; Don Del Nero, P.E., CH2M Hill Inc.; Tracy J. Lyman, P.E., Brierley Associates; and Dan Willems, P.Eng., City of Saskatoon. The board and staff are looking forward to working with this outstanding group of trenchless professionals as we enter the New Year. Some refer to new members as "new blood." It is always invigorating when new people join the board, bringing their fresh perspective and opinions to the table. No doubt they will do a superb job.

I also wanted to update you on an online survey the board conducted in 2011, asking our members to assist NASTT in selecting the site for the 2015 No-Dig Show. We canvassed the membership and received a great response to our call for suggestions, which included great cities like Denver, New Orleans and Vancouver. The board discussed the options at our January meeting in San Antonio. Our criteria for choosing a host city are very important and include availability of a facility to accommodate our show and all we offer. I will, at the behest of the board, send our request for proposal to the top selections. Our goal is to announce the decision of our 2015 host city at the No-Dig Show in Nashville, March 11-15. We want to thank all who participated in the survey and offered suggestions. We always respect and appreciate the perspective of our members.

Finally, I want to welcome Michelle Hill to the NASTT staff. Michelle recently joined us as our Communication and Training Manager and we wish her well in this new position. You can read more about Michelle in the Q&A of this issue.

I hope you enjoy this issue of *NASTT's Trenchless Today*. It's chock-full of features and news about our organization that we wanted to share with you. Please remember to let us know your ideas — this is your publication and we want it to reflect your trenchless stories.

Happy New Year!  
Mike Willmets  
NASTT Executive Director



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# Chairman's Message

## Enhancing Our Focus

### This Year's Goals Include an Increased Emphasis on Training and Education

Happy New Year! I am excited to begin my second year as your NASTT chairman and continue the mission of expanding the use and education of trenchless technology across North America. NASTT has a fantastic and engaged membership and I look forward to working with you as we make our way through 2012.

I want to congratulate our five new members to the Board of Directors. This group adds municipal, engineering and manufacturing perspectives to our diverse board. Their addition will only enhance the job of our hard-working board members already serving, and I look forward to their service and ingenuity during their terms. I also want to take this moment to thank those board members and officers whose terms ended in December 2011 for their years of service to NASTT. Organizations such as ours are led by strong leaders and we have been blessed with those who have served in leadership positions.

For an organization to be successful, it must commit to goals on how it will move forward and expand. In 2012, we are driven to expand our membership with a specific focus on municipalities and utility owners. We've initiated a major effort to attract owners to join NASTT by partnering with the American Public Works Association (APWA). Our membership is diverse, with contractors, manufacturers, academicians and engineers making up the majority. We do have growing municipal and utility representation in NASTT, but we believe this demographic can be even stronger. Trenchless technology is now more accepted by municipalities and utilities than ever before. As trenchless continues to be the choice of rehab and installation, we need this critical group to become a part of NASTT to increase trenchless awareness throughout North America.

I also want to update you on the status of our Carbon Calculator Committee. As you know, NASTT collaborated with NYSEARCH/Northeast Gas Association on this project. The Carbon Calculator represents a major opportunity to engage more municipal and utilities as NASTT members — which will assist in our efforts to increase this demographic of our membership. The benefit of a Carbon Calculator will reinforce the image of a trenchless technology as a “green” alternative, bringing trenchless to a higher level of awareness and focus to a viable product that will have meaningful results for the long-term. We anticipate Phase I of this project to be completed in April. I will continue to update you on its progress.

Training and education will continue to be a focus of NASTT in 2012. We are contemplating major changes and improvements in 2012 to our training programs so they reach an even wider audience with our top-notch expert information. In 2011, we initiated improvements to our CIPP and Sewer Lateral training programs and we plan to expand them this year. Currently, NASTT offers more than 20 in-depth courses each year in cities throughout North America covering targeted trenchless topics: CIPP, HDD, pipe bursting, laterals and new installation methods. I am looking forward to expand our offerings and reaching even more people in 2012.

I want to note just a few of NASTT's accomplishments from 2011. We updated our website ([www.nastt.org](http://www.nastt.org)) with a new look, new information and the ability to access data faster and more efficiently — comments and suggestions are always welcome! We also updated a specific section about trenchless technology in a utility right-of-way publication for APWA and initiated a NASTT instructor certification process for those interested in holding a NASTT course. I wish space afforded me to list each and every one of our accomplishments as they all have led to a stronger NASTT organization.

### 2012 No-Dig Is Here

The 2012 No-Dig Show will be here soon! We convene in Nashville with a full slate of technical papers, exhibits and meetings of our board, student and regional chapters, as well as a plethora of networking opportunities. I am excited about the program the 2012 No-Dig Program Committee will present to you.

One of the premier events at this year's No-Dig will occur at the Gala Dinner on March 13. Here, we will induct the inaugural class to the NASTT Hall of Fame: the late Gary Vermeer, founder of Vermeer Corp.; Frank Canon, Baroid Industrial Drilling Products; and Bernie Krzys, president of Benjamin Media and publisher of *Trenchless Technology* magazine. Congratulations to these deserving Hall of Famers and their families. Their contributions to the trenchless industry have had a lasting impact on its growth, education and acceptance around the world. The industry would not be where it is today without their contributions.

The idea of creating a NASTT Hall of Fame is something that is very near and dear to me and has tremendous meaning to all of NASTT. As our organization has come of age, we felt this was an appropriate time to recognize and immortalize those individuals who have played such integral roles in the evolution of trenchless technology in North America and beyond its borders. NASTT is rich in its choices for selection of this honor and I look forward in the coming years to see more of our industry's architects being inducted into our Hall of Fame.

See you in Nashville — I'll be the one with the cowboy hat!

George Ragula  
NASTT Chairman







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# Q&A



## Michelle Hill, Communications and Training Manager for NASTT, Looks Forward to a New Year with a New Organization

**NASTT's Trenchless Today (NTT):** Please give us a little information about your professional background.

**Hill:** I was so fortunate to know right after I graduated from Ohio University that I wanted to be an event planner. I have been planning different types of events including weddings, corporate meetings and trade shows ever since. I've worked for a concert production company, a brewery and, most recently, Benjamin Media Inc. as Conference Manager.

**NTT:** How did you get involved with the trenchless industry? How did you become involved with NASTT?

**Hill:** I started off as an Event Planner with Benjamin Media back in 2007. I was only with Benjamin Media for about two months before my first No-Dig Show in San Diego, Calif. What a way to break me in! It was great that most of the company was involved with No-Dig, so there were plenty of people to help me get acquainted with the show, the exhibitors and the NASTT volunteers. Since then I have managed five other No-Dig Conferences with Benjamin Media for NASTT, along with other trenchless related conferences and trade shows.

**NTT:** What areas will you be working in with NASTT?

**Hill:** The great thing about a small organization is you get to work on a little bit of everything. My main priorities will include planning 20-plus training seminars a year, creating new initiatives for increasing membership and handling all of the communications for the association. I hope to strengthen our relationships with other associations and keep spreading the word about trenchless technology.

**NTT:** Any big projects coming up within NASTT?

**Hill:** 2012 will be a busy year for NASTT. We are finishing up the final touches on the new and improved NASTT

website. The site is packed full of information, including past No-Dig papers, and is a great source for our members. We are also including a lot of information on the site to encourage non-members to become more involved in the trenchless industry. Make sure to check it out at [www.nastt.org](http://www.nastt.org).

We are also working on creating a new webinar series this year which will be a basic overview of trenchless technology. We understand that for a lot of organizations, especially municipalities, it is difficult to travel to receive trenchless education. This program will allow us to bring the education to them and ultimately increase the use of trenchless technology.

**NTT:** What are some of your most memorable professional experiences related to trenchless?

**Hill:** The final remarks at the No-Dig Show Closing Luncheon are always special moments for me. There is a great feeling of accomplishment at that time knowing that 15 months of hard work turned into a successful conference. It's bittersweet when the show ends. But then the very next day I'll be working on the next No-Dig Show!

**NTT:** What are you looking forward to most at this year's No-Dig?

**Hill:** This will be my sixth No-Dig Show, and the conference gets better year after year. I think what I will enjoy most is seeing the show from NASTT's perspective. When I was working with Benjamin Media, my focus was registration, the special events and the exhibit hall. With my new position at NASTT, I will be able to spend more time with the board members, session leaders, presenters and moderators. These volunteers are a very important part of the conference, and I look forward to working closer with them to make the No-Dig Show a success.



Chairman George Ragula, Michelle Hill, and Benjamin Media Inc.'s Mary Beth Butkovic and Kevin Duresky helped plan last year's No-Dig in Washington, D.C. Hill says she's looking forward to experiencing No-Dig on a different level this year in Nashville.



# ***The Great Trenchless Gold Rush!***

## **NASTT's 2013 No-Dig Show Booths & Sponsorships**

NASTT's 2013 No-Dig Show is heading to the Sacramento Convention Center on March 3-7, 2013. Reserve your 2013 Booth or Sponsorship on Wednesday, March 14th at the registration desk from 8:00am – 11:00am and get the best booth location at 2012 rates! We will announce the Prime Sponsors: Platinum, Gold and Silver, at the Closing Luncheon on March 14th.

We are excited to be heading to Sacramento for NASTT's 2013 No-Dig Show. 84,000 square feet of open space has been reserved, which will offer 6 loading docks and electrical services. Don't miss out on this opportunity to showcase your products and equipment at this premier trenchless event.



# In the Trenches



Trenchless professionals explain how they've benefitted from NASTTT membership

By Kelly Pickerel

Gearing up for this year's No-Dig, it's good to remember why NASTTT began. Professionals like Brian Avon, Gerald Bauer and John Matthews joined NASTTT for the educational and networking opportunities, and No-Dig is just the cherry on top. See what these three have to say about their experiences within the trenchless organization.

## Brian Avon

Brian Avon is a jack of all trades. After receiving a bachelor's in civil engineering and business administration, he set out into the workforce. Over the last decade, he's worked in sales, construction, geotechnical engineering and civil design. Once hired five years ago at Carollo Engineers as a civil engineer, he became involved with trenchless and felt the desire to learn more — one of the first times he felt really interested in his work.

Almost all of Avon's design jobs while with Carollo has involved trenchless, so joining NASTTT was a no-brainer. He originally got involved with the organization when he submitted an abstract for the 2010 No-Dig Show in Chicago.

"Since then, I have joined the program committee for the upcoming



show in Nashville and look forward to staying up-to-date with future trenchless technologies," he says.

NASTTT provides Avon with the opportunity to better himself as an engineer.

"I believe that the most beneficial things that have come about from my involvement with NASTTT are the relationships that I have built and continue to build with very knowledgeable people," he says. "These relationships and the knowledge and experience that they share make me a better engineer."

## Gerald Bauer

Gerald Bauer became involved with trenchless technology after his job with the City of Fort McMurray, Alberta, found problems with the city's watermain system back in 1987.

"The city's watermain system was experiencing a large



number of breaks in some subdivisions. This was unusual, as much of the watermain system was only 10 to 15 years old," he says. "We determined highly corrosive areas of soils in these subdivisions to be the cause. Due to the extent of the problem, full replacement of the watermains was not financially feasible nor could it be achieved in the timeframe necessary."

The city turned to trenchless applications to extend the life expectancy of the watermains. Bauer says there were many skeptics, but the project worked well, and trenchless has become a big industry.

Bauer became a principal with Stantec Consulting Ltd. in Ottawa, Ontario, in September 2011. He says because Stantec is a multi-disciplinary firm with more than 170 locations, it gives him the opportunity to get involved in a broad range of unique projects.

When the International No-Dig Show came to Toronto in 1995, Bauer had been doing many projects involving studies and trenchless work, and he felt getting involved with NASTT would be a great opportunity to further his understanding of the industry. He's been a member ever since, presenting at conferences and holding chapter positions.

"For someone who wants to learn more about trenchless technologies, the No-Dig Show is an excellent venue on many fronts," he says. "The conference, magazines, opportunities for networking and exhibition booths all provide a tremendous amount of information on numerous trenchless technologies. I am always trying to use new approaches that provide better economics or products to our clients."

After submitting an abstract on styrene and its use in the cured-in-place lining industry, the paper was accepted for the Orlando No-Dig Show in 2004. The paper generated a lot of discussion in both the trenchless and manufacturing and installation industry.

"The manufacturing and installation industry were concerned to the extent that they met with me the night before the presentation to determine what the messaging on the product would be," Bauer says. "The presentation was geared to identifying an issue and presented methods on how to deal with it. Thus it achieved the objective in the industry that it was meant to." He says he's very proud of that moment in his career.

Bauer says NASTT has been a great organization to be involved with, and he's looking forward to the years to come.

"NASTT allows me to be involved with people in the industry that are as passionate on infrastructure as I am and dedicated to promote the trenchless industry," he says. "I look forward to seeing [at this year's No-Dig] what's new in

the industry, understanding how difficult situations were solved on the many trenchless projects at the presentations, and then looking for opportunities to apply trenchless technologies on our clients' projects."

## John Matthews

John Matthews' involvement with NASTT as an undergraduate student might be the reason he continued on for his master's and doctorate. While working toward his bachelor's in construction engineering technology at Louisiana Tech University and its Trenchless Technology Center (TTC), Matthews became involved with the school's NASTT student chapter and began attending No-Dig and other conferences.



"I really enjoyed the different areas of the trenchless industry, and I decided to stay on at the TTC to pursue a master's and eventually a Ph.D., where my research focused on trenchless technology decision support systems," he says.

Nine years since first joining NASTT, Matthews now works in Baton Rouge, La., as a principal research scientist for Battelle Memorial Institute. His work includes examining research projects and the applicability and performance of technologies used for condition assessment and rehabilitation of water and wastewater systems, the majority of which are trenchless technologies.

NASTT has allowed Matthews to continue expanding his knowledge about the trenchless industry.

"The various conferences and networking opportunities organized by NASTT each year have provided me with numerous educational opportunities and a chance to get to know many of the leaders in our industry, many of whom have now become my friends," he says.

Matthews recalls a surprising win in the student CCTV competition at his first No-Dig in 2003 as a great NASTT memory. He also won the 2005 ISTT No-Dig Award for Best Student Paper, an accomplishment he still holds dear. He has since served as LA Tech's student chapter president and as chapter advisor. More recently, he has been a member of the No-Dig Planning Committee and plans to continue showing his support to the organization that shaped his life.

"Each NASTT event provides me with the opportunity to meet up with old friends and make new ones, while learning about the latest and greatest technologies in our industry," he says.

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# 2012 No-Dig Show Heads to Nashville

**Trenchless Professionals Meet for Exhibits, Technical Papers and Honors**

By Sharon M. Bueno

Nashville is home to the historic Grand Ole Opry and all things country music, all the way down to the 10-gallon hats and cowboy boots. But for five days in March, the Music City welcomes back the trenchless technology community for its annual conference and exhibition.

Trenchless professionals from around the globe will gather in the Tennessee capital city March 11-15 for the 21st annual No-Dig Conference and Exhibition. The all-trenchless event takes place at the Gaylord Opryland Hotel and Convention Center.

Sponsored by NASTT, this annual event draws trenchless professionals from around the world to the largest conference and tradeshow in North America dedicated solely to the promotion of trenchless technology. Through exhibits, educational seminars and fun networking events, the No-Dig Show is a must-attend event for the trenchless professional. Of particular note in 2012 is the inaugural NASTT Hall of Fame class, honoring the industry-changing accomplishments of deserving NASTT members.

More than 140 exhibitors will fill the 70,000-sq ft exhibit hall, displaying the latest in trenchless equip-

ment and technology and will be on hand to answer attendee questions. This year's show brings 155-peer-reviewed technical papers to be presented, focusing on a diverse range of trenchless topics, including horizontal directional drilling, cured-in-place pipe (CIPP), microtunneling, inspection, case histories, asset management, pipe jacking and ramming, water and sewer rehabilitation, project planning, inspection and trenchless research.

Attendees can choose among what peer-reviewed paper presentations they want to see. The papers are evaluated based on relevance, usefulness and non-commercialism. The No-Dig papers are presented in a six-track schedule and are grouped mostly by subject matter so attendees can choose to attend six paper presentations at any given time.

Pre- and post-conference seminars are also on the schedule for attendees at an additional cost. On Sunday, March 11, NASTT's Trenchless Technology Short Course-New Construction and Rehabilitation will be held. The course is ideally suited for both newcomers to the industry and for anyone who is interested in seeking a refresher course on trenchless technology

methods. The course covers new installation and rehabilitation methods.

On March 14-17, several informative courses are slated, presented by NASTT and NASSCO. From NASTT: Cured-in-Place Pipe Good Practices Course; Laterals Rehabilitation & Replacement Good Practices Course; HDD Consortium Horizontal Directional Drilling Good Practices Guidelines Course; Pipe Bursting Good Practices Course; and New Installation Methods Good Practices. From NASSCO: PACP Trainer Recertification; PACP Trainer Upgrade; Pipeline Assessment and Certification Program; and Lateral and Manhole Assessment Certification Program.

Although the No-Dig show is the conduit to promote and advance the trenchless marketplace through education and exhibits, there's also the social aspect of the conference that fosters networking



Many awards are given out at No-Dig, including municipal and utility achievement awards, as the City Of Edmonton, Calif., won at the 2011 No-Dig Show in Washington, D.C.

## DESIGNING TO MANAGE RISK TRENCHLESS TECHNOLOGY



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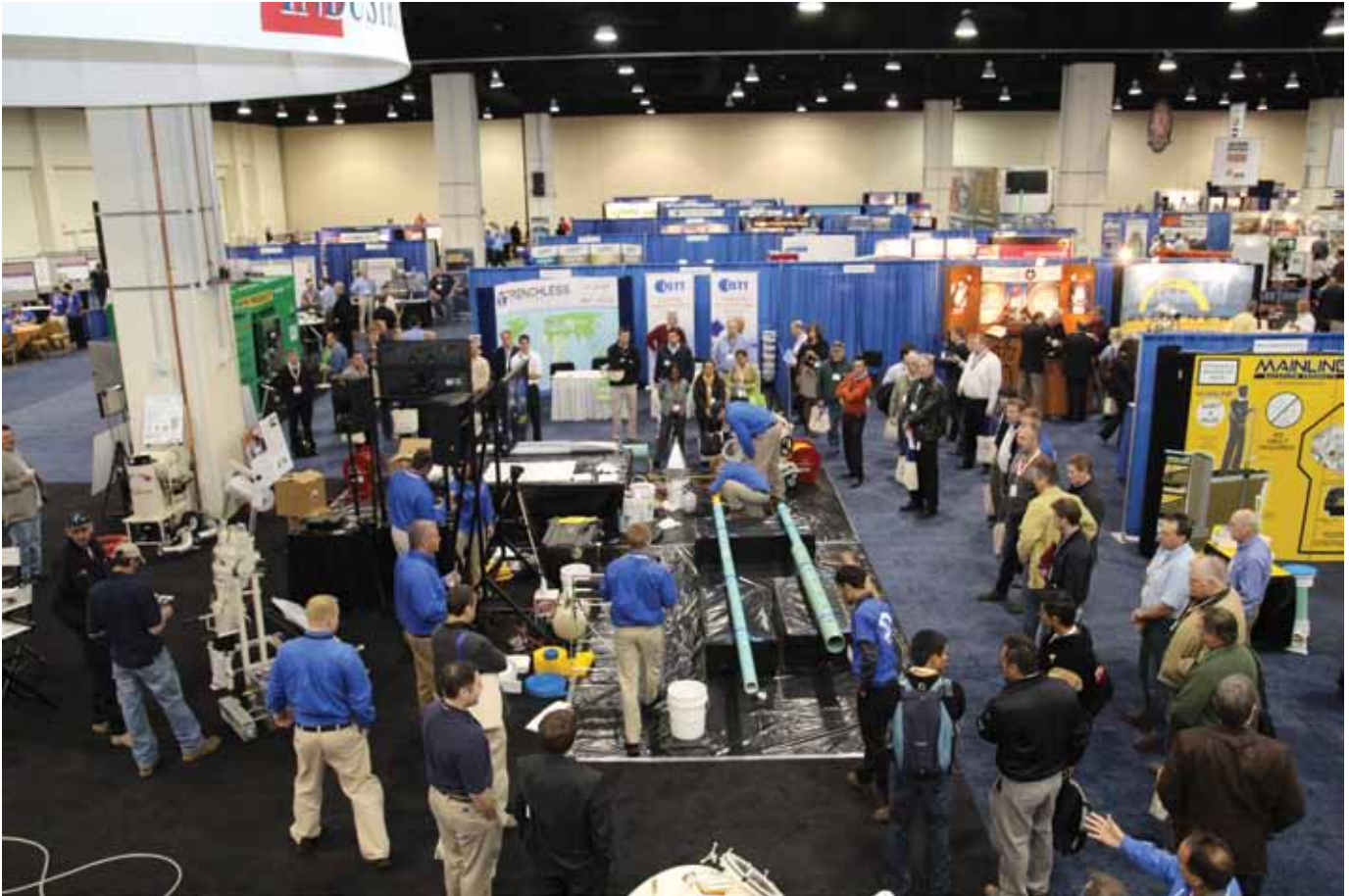
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This year's event in Nashville will feature more than 140 exhibitors in the 70,000-sq ft exhibit hall at the Gaylord Opryland Hotel and Convention Center.

opportunities for attendees, as well as just some fun and good times.

The conference gets under way with its annual Kick-off Breakfast on Monday, March 12. During this event, the formal presentation of the 2012 *Trenchless Technology* Person of the Year will be made. The winners, runners up and honorable mentions for the 2011 *Trenchless Technology* Projects of the Year for Rehabilitation and New Installation will also be recognized. Also, the 2011 Outstanding Papers in Rehabilitation and New Installation Awards will be announced. Entertainment for this event will be comedian Tim Gabrielson, who blends comedy, magic and inspirational principles in his performances.

Also on March 12, NASTT will hold its 11th annual Educational Fund Auction & Reception. This event is the perfect opportunity for attendees to mingle and relax, as well as bid on items for an excellent cause — the Educational Fund, which supports student chapters, target research, training modules and other student activities. Past items for bid have included trips, electronics, Major League Baseball tickets, NASCAR events, as well as jewelry and trenchless products. Since 2001, this auction has raised more than \$433,000, including 2011's record-setting total of \$75,000. Attendees are encouraged to come in their best western gear and compete for best costume.

On Tuesday, March 13, NASTT will host its annual Gala Awards Dinner. During this popular event, the

trenchless community gathers for a night of fun, food and dancing to live entertainment. Nashville-based band Sharie Bardo Explosion will entertain the crowd. Also, the inaugural inductees into the NASTT Hall of Fame will be enshrined: the late Gary Vermeer, Vermeer Corp.; Frank Canon, Baroid Industrial Drilling Products; and Bernie Krzys, president and publisher of *Trenchless Technology*.

To close out the 2012 No-Dig event is the annual Closing Luncheon on Wednesday, March 14. Here, attendees can enjoy lunch, entertainment and say goodbye to their fellow trenchless professionals before heading home.

For more information about the 2012 No-Dig Show, visit [www.nodigshow.com](http://www.nodigshow.com) or contact Benjamin Media, which handles the show's management, at 330-467-7588.

Sharon M. Bueno is managing editor of *Trenchless Technology*.

## Exhibit Hall Hours:

Monday, March 12: 11:45 a.m. to 3:45 p.m.

Tuesday, March 13: noon to 3 p.m.

Wednesday, March 14: 10 a.m. to 12:30 p.m.





# Meet the Board



The 2012 NASTT Board of Directors is ready to take on the new year. (Not pictured: Isabel Tardif)

*The NASTT Board of Directors directs the affairs of the society on behalf of the membership. The Board is comprised of a minimum of 16 and a maximum of 19 directors who are elected by the society's membership. This year, NASTT has a full roster of 19 directors, and five are brand new to the Board. Read more about NASTT's leadership team in the brief introductions that follow.*

## 2012 NASTT OFFICERS

### George Ragula, P.E. – Chairman

*International Representative, Director At-Large*



George Ragula, as distribution technology manager, is responsible for evaluating cutting-edge technologies that increase efficiency and effectiveness of operations for Public Service Electric & Gas (PSE&G). Responsibilities include planning, coordinating, managing and implementing procedural and equipment technology transfer with particular emphasis on increased use of various trenchless technologies. He has spent the last 21 years committed to the ever-growing technologies in trenchless construction.

George has a very diverse background in gas distribution engineering and operations. Prior to joining PSE&G in 1988, he held various positions at Brooklyn Union Gas responsible for project estimating, field engineering/construction, system planning and network analysis, design, codes and standards, contract administration, gas leak detection including emergency response as well as drafting.

He is a member of the American Gas Association, American Society of Mechanical Engineers, North American Society for Trenchless Technology, Society of Gas Operators and the New Jersey Society of Asphalt Technologists. He serves as Treasurer of the Northeast Gas Distribution Council and was actively involved as a Project Advisor for

the Gas Technology Institute Operations Technology Development Program and Sustaining Membership Program. In addition, he served as Chairman of the NYSEARCH - Northeast Gas Association R&D Committee. He received his B.S. in Mechanical Engineering from Polytechnic Institute of Brooklyn in New York.

### Derek Potvin, P.Eng. – Vice Chairman

*Director Central*

Derek Potvin is the president of the multidisciplinary engineering firm Robinson Consultants Inc. He obtained a bachelor of applied sciences with a minor in business administration from the University of Ottawa. Derek has been providing trenchless rehabilitation solutions to his clients for more than 20 years, including a trenchless technology project that won a Canadian Consulting Engineering Award.

Derek is actively involved with NASTT's No-Dig Show where he has authored many papers including an award winning Outstanding Paper, and for several years he has been an instructor of NASTT's Introduction to Trenchless Technology Short Course (sewer and watermain trenchless rehabilitation). Derek has also been involved as an organizer and instructor of NASTT's Good Practices Courses and regional trenchless conferences, such as the *Trenchless Technology Road Shows*. Derek is the Treasurer for the Great Lakes, St. Lawrence and Atlantic Chapter (GLSLA).



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### Benoît Côté, M.Sc. – Secretary

Director At-Large

Benoît Côté has been employed with Sanexen Environmental Services since 1995. In 1998, he was involved in the development and marketing of the Aqua-Pipe technology for water main rehabilitation. For the past ten years, he has managed the development and growth of the water main rehabilitation branch, and is currently the vice president of the division where he works to market and license the technology in North America. He has comprehensive expertise in water main rehabilitation and NSF certification protocols. He is also active with the AWWA. Ben earned his M.S. from the University of Sherbrooke.



### Dave Krywiak, P.Eng. – Treasurer

Director Canada Pacific



Dave Krywiak is a senior associate and project manager with Stantec Consulting Ltd. in its Edmonton, Alberta, office. He obtained a B.S. in Civil Engineering from the University of Alberta in 1977 and has been employed in the consulting industry since that time. Many of the projects that Dave has been involved with have included significant trenchless technology components, such as conventional and microtunneling, HDD

and CIPP lining. He is one of the founding members of the Northwest Chapter (NASTT-NW) and has served on the Chapter Board for a number of terms, including a term as the Chapter Chair.

### Chris Brahler – Immediate Past Chairman

Chris Brahler has been active in the development and growth of the underground construction industry for 30 years. He received a B.S. in Business Administration in 1974 and began his career in the cable installation equipment market that same year. Chris soon developed an interest in trenchless technology.

In 1991, Chris started TT Technologies Inc., a manufacturer of a wide range of



trenchless tools and equipment in Aurora, Ill. As President and CEO, Chris works with many different underground construction applications including boring systems, pipe ramming, HDD and pipe bursting.

Chris has been very involved in promoting the growth of the trenchless technology market and increasing the trenchless education level. He has spoken about trenchless technology and related applications to engineers, contractors, municipalities and construction related industry groups throughout the United States and the world, including China, Mexico and Europe.

Chris has been a featured presenter at conventions and conferences around the country including, UCT, PCCA, DCA and NUCA. As Immediate Past Chair, Chris served on the NASTT Board of Directors from 2005 to 2010 as well as the DCA Board of Directors and the NUCA Trenchless Committee.

## 2012 NASTT BOARD OF DIRECTORS

### Alan Atalah, Ph.D., P.E.

Director U.S. Central



Alan Atalah is the associate dean for graduate affairs and has been teaching construction management at Bowling Green State University since 2000. Alan earned a Doctorate of Engineering, M.S. in Civil Engineering, and MBA degrees from Louisiana Tech University. He graduated with a diploma in Construction Management and a B.S. in Civil Engineering from Ain Shams University, Cairo, Egypt. He has more than

27 years of construction experience in water and wastewater projects, 18 years of which were in trenchless technology construction. His thesis was on the design and construction of pipe jacking and microtunneling projects, and his dissertation was on the ground movement associated with pipe bursting. He delivered hundreds of trenchless technology and construction management presentations at many conferences and educational seminars.

### Don Del Nero, P.E., C.D.T.

Director At-Large

Don Del Nero has more than 23 years of experience including planning, studies, design and construction management in the areas of tunnel



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and trenchless engineering. Don obtained his M.S. in Geotechnical Engineering from Syracuse University and his B.S. in Civil Engineering from Clarkson University. His project experience covers more than 50 projects and 40 miles of tunnel and trenchless installations, worth more than \$1.3 billion in construction value. He has been involved in a variety of trenchless technologies for sanitary sewer, storm sewer, raw water, finished water, recycled water, SSO and CSO wastewater tunnels, highway tunnels, pedestrian tunnels, caverns, raw water intake tunnels and large diameter piping in sensitive areas. His tunneling experience is in a wide-array of geotechnical conditions across the United States, Canada and abroad. He is heavily involved in client and project risk mitigation, has engaged in several differing site condition claims and has developed expertise in mining in cobbles and boulders. His project experience has included tunneling from 8-in. pilot-tube micro tunneling to 36-in. directional drills to 30-ft diameter hard rock tunnel boring machines.

Don is a member of and/or involved in the Dispute Review Board Foundation, Underground Construction Association of the Society for Mining, Metallurgy and Exploration, Tunneling Association of Canada and the British Tunneling Society. He has been very active on the NASTT No-Dig Show Program Committee for several years and has written several articles for *Trenchless Technology* magazine.

He is currently vice president and assistant tunnel practice lead at CH2M HILL.

### Frank Firsching

Director At-Large



As the executive vice president of sales for UGSI, Frank Firsching leads UGSI's regional sales managers and coordinates all domestic and international sales activities. He has extensive engineering, sales and executive management experience with more than 20 years in the water and wastewater industry. He received an MBA at the Wharton School of Business and a B.S. in Mechanical Engineering from the University of Virginia.

Before joining UGSI, Frank worked for USFilter as President of the Water and Wastewater Systems Group with responsibility for USFilter's global process equipment and technology divisions. Frank also held the positions of executive vice president of the process water group, west region manager and general manager in USFilter. In addition, he has worked for Deloitte & Touche Management Consulting and GE.

### Jennifer Glynn, P.E.

Director At-Large



Jennifer Glynn is a senior project manager for RMC Water and Environment in its Walnut Creek, Calif., office. She earned her B.S. in Civil Engineering from the University of New Hampshire

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and then headed west to California. Jennifer has 16 years of experience in municipal infrastructure planning and design with an expertise in pipeline design and the use of trenchless technology. She has published and presented papers on projects she designed using trenchless technology at conferences across the country.

Jennifer has been a member of the No-Dig Show Program Committee for the past seven years and is one of the founding members of the Western Chapter (WESTT). She currently serves as the past chair of WESTT and is a volunteer NASTT Pipe Bursting Good Practices Course instructor. Jennifer is also a member of the American Water Works Association Water Pipeline Rehabilitation Committee and a past vice president of the Northern California Pipe User's Group (PUG).

**Jamie Hannam, MBA, P.Eng.**

*Director Canada Atlantic*

Jamie Hannam is the director of engineering and information services for Halifax Water, a position he obtained in 2007. Prior to this, he was the chief engineer with the Halifax Regional Water Commission from 1994 to 2007. A graduate of Acadia University (B.S. 1983), Technical University of Nova Scotia (B.Eng. 1985) and Dalhousie (MBA 1990), he spent the earlier years of his career in municipal government in both Halifax and Dartmouth working on a variety of engineering tasks. In his role as director



of engineering and information services, he is responsible for water and wastewater infrastructure master planning, asset management and capital project delivery with an average annual capital budget of \$50 million.

Halifax Water, the first regulated water, wastewater and stormwater utility in Canada and the largest utility in Atlantic Canada, serving 350,000 with pipes as old as 1856, has utilized trenchless technologies and NASTT resources as key components of its system rehabilitation program for the past 15 years.

**Tom Hayes**

*Director U.S. Atlantic*

Tom Hayes is the president of Haywood Associates LLC, a firm providing sales/management consulting services to the construction and trenchless construction industries. Previously, he was vice president of the North American rehabilitation division for Insituform Technologies, where he worked for 24 years. Tom has more than 35 years of experience in underground pipeline construction and rehabilitation including CIPP, folded pipe technologies, pipe bursting and trenchless new construction. Tom's management career has provided the opportunity to work in major water and sewer rehabilitation programs across the United States and Canada providing a full range of water and sewer repair technologies.



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Before joining Insituform he was a partner at Utility Surveys Inc., a utility construction firm. Prior to that, he worked for McCullough Environmental, a firm specializing in sewer system evaluation surveys (SSES) for municipal and federal utility systems. An Atlanta resident, Tom holds a B.A. degree in psychology from the University of South Carolina and a MBA degree from Jacksonville University.

**Brenda Kingsmill**

*Director At-Large*



Brenda is a graduate of Sault College and the British Columbia Institute of Technology. Initially working in the private sector for eight years, Brenda joined Halton Region 1989 where she became the in-house design supervisor. Now a project manager, Brenda is responsible for environmental assessment plus design and construction administration of numerous linear and facility projects. Aside from traditional open-cut methods for both potable water

and wastewater systems, Brenda is currently managing projects utilizing pipe ramming, tunneling and structural lining of wastewater systems using a UV curing system.

Always a willing volunteer, Brenda is a long-term member of the No-Dig Show Program Committee and has served as a session leader and moderator for the last three No-Dig Shows.

**Jason Lueke, Ph.D., P.Eng**

*Director At-Large*

Upon completion of his Civil Engineering degree in 1997, Jason began graduate studies at the University of Alberta. There he completed his M.S. (1999) and Ph.D. degrees (2005) in construction engineering and management with dissertations on trenchless pipe replacement and HDD. Jason has published more than 40 journal and conference papers in the field of trenchless technology and was the inaugural president of the University of Alberta NASTT Student Chapter. Jason joined Terraco in 2001 working on pipe bursting and lateral sewer replacement projects. In 2003, he joined Associated Engineering Ltd. managing numerous projects including water distribution, wastewater and storm water management, as well as providing specialized expertise for HDD, relining, pipe bursting, pipe ramming and tunneling. In January 2009, Jason changed careers and became an assistant professor with the Del E. Webb School of Construction at Arizona State University.



A strong promoter of the trenchless industry, Jason has been actively involved with NASTT for 12 years. He is a volunteer instructor for NASTT's Horizontal Directional Drilling, Pipe Bursting and Laterals Good Practices Courses. He is currently the chair of the WESTT Chapter and a member of the No-Dig Show Program Committee since

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2006. He was the chair for two and a member of seven organizing committees of the Alberta Trenchless Symposia and was the Edmonton Section Chair of the Northwest Chapter. Jason has authored two award winning papers: the NASTT No-Dig Rehabilitation Paper of the Year (2005) and the ASCE John O. Bickel Award (2001), and was the recipient of the Trent Ralston Award for Young Trenchless Achievement Award in 2010.

**Tracy J. Lyman, P.E., P.G.**

*Director U.S. Continental*



Tracy Lyman is a senior consultant for Brierley Associates LLC. He holds a M.Eng. from the Colorado School of Mines and has more than 35 years of experience in geology, geotechnical engineering and tunnel engineering for heavy civil infrastructure projects. Tracy has provided design and construction management services for more than 250 tunnel and trenchless projects in the United States and overseas. He is a registered professional engineer in eight states

and a registered geologist in Idaho and California. He is active in ACEC, ASCE, NASTT and AEG and has lectured extensively on geotechnical and tunnel engineering topics throughout his career. Tracy is the founding chairperson for the Rocky Mountain NASTT Chapter.

**Kevin Nagle**

*Director At-Large*



Kevin Nagle is a graduate from the University of Illinois, earning his B.S. in Civil Engineering in 1997. He worked for six years as a design engineer for a structural engineering firm before moving on to work as national accounts manager for TT Technologies Inc., Aurora, Ill., a manufacturer of a wide range of trenchless tools and equipment. As part of the TT team, Kevin works in and out of the office in an effort

to grow the trenchless market through education, training and marketing. He has worked at an industry level to help move the trenchless industry forward through organizations such as NASTT (member of the program committee), Midwest Society of Trenchless Technology (board member), International Pipe Bursting Association (member of marketing committee) and UCA (member of the construction materials methods and specifications committee). Kevin has gained firsthand trenchless field experience in the pipe bursting, pipe ramming, HDD and horizontal boring processes.

**Cindy Preuss, P.E.**

*Director At-Large*



Cindy Preuss graduated with a B.S. in Civil and Environmental Engineering from the University of California at Berkeley and is a licensed professional civil engineer in California. She is a senior project



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manager with HydroScience Engineers Inc. (HSE) and works out of its Berkeley, Calif., office. With more than 12 years of civil engineering design experience, Cindy's engineering expertise includes designing new and rehabilitated pipeline systems and other infrastructure facilities.

Her pipeline design projects include such trenchless technologies as HDD, jack and auger boring, slip lining, cast-in-place plastic lining and pipe bursting. Her experience prior to HSE includes civil design with Harris & Associates and monitoring and enforcing cleanup orders for soil- and groundwater-contaminated sites in the San Francisco Bay during her employment with the Regional Water Quality Control Board.

Cindy is currently serving her eighth year on the Board of Directors for the Northern California Pipe User's Group (PUG), an association of public agencies, private consultants, contractors, vendors and suppliers that study current, conventional and trenchless pipe technologies. PUG has been active in sponsoring attendance to and scholarships for NASTT's No-Dig Show, regional No-Dig conferences offered through the WESTT Chapter, and in offering courses to PUG members on various trenchless technologies administered by NASTT.

### Jim Rankin

*Director At-Large*

Jim Rankin has been with the Vermeer Corp. for more than 33 years and has amassed a vast array of knowledge of industrial equipment and trenchless technology applications. For the past 23 years, Jim's focus has been on the Vermeer hori-



zontal directional drills and is currently an application engineer. He was the project leader for the team that developed the first drill commercially marketed by the Vermeer Corp. Prior to working with HDD equipment, he was involved with the development for Vermeer's Utility Products (formerly Rubber Tire) and track equipment.

He has demonstrated his innovation abilities and technical skills by earning 14 industrial patents. Jim delivers the Vermeer Vision (taking care of customers worldwide with better solutions) through extensive domestic and international travel and by meeting the business needs of the Vermeer customers and dealers.

Jim is a long-term member of the No-Dig Show Program Committee and serves as the chair of NASTT's Educational Fund Auction Committee.

### Kimberlie Staheli, Ph.D., P.E.

*Director U.S. Pacific*

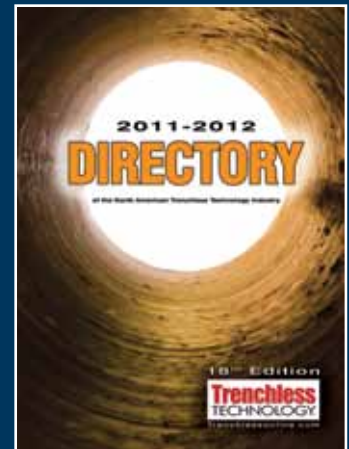
Kimberlie Staheli is the president and founder of Staheli Trenchless Consultants in Seattle, a trenchless engineering consulting firm specializing in the design and construction management of all types of high risk trenchless projects for more than 19 years.

Kim has a B.S. in Mechanical Engineering from Rensselaer Polytechnic Institute, a M.S. in Civil Engineering from Mississippi State University and a Ph.D. in Geotechnical Engineering from Georgia Institute of Technology. She is a



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registered professional engineer in Washington, Oregon and California.

Kim has specialized in trenchless design and construction working for contractors, performing trenchless research and working as a consultant. She is particularly interested in minimizing the risks of installation techniques including microtunneling, directional drilling, pipe ramming, auger boring and large diameter tunneling. Kim has focused on risk reduction through the development of geotechnical baseline reports as well as pro-active construction risk management. She has vast experience in trenchless forensics and post construction claims analysis and provides expert testimony.

**Isabel Tardif, B.Eng., LL.B., M.P.M.**  
*Director At-Large*

Isabel Tardif holds a B.S. in Civil Engineering from McGill University and a Law Degree from the University du Québec in Montreal. She also earned a M.S. in Project Management from the University du Québec en Outaouais.

Isabel is a technologies director of underground infrastructures for the Centre for Expertise and Research on Infrastructure in Urban Areas (CERIU). Prior to CERIU, she has held the position of operations manager of potable water and sewer networks for the City of Aylmer and as well as coordinator of potable water and sewer rehabilitation of the engineering department for the City of Gatineau.



She is currently chair of the GLSLA NASTT Chapter. She was involved in several INFRAGuide Committees and is now active with the BNQ (Bureau de Normalisation du Québec) and the National Association of Sewer Service Companies (NASSCO). Isabel has moderated and has given conferences in Africa, Europe and North America on trenchless technologies and asset management. She currently gives courses and lectures on trenchless technologies to engineers, technicians and university and college students.

**Dan Willems, P.Eng.**  
*Director At-Large*

Dan Willems is currently preservation manager with the City of Saskatoon (Saskatchewan) Infrastructure Services department's strategic services branch. Dan holds a B.S. in Civil Engineering from the University of Saskatchewan. Since 2001, Dan has worked for various municipal government and private consulting organizations across the Canadian Prairie Provinces. Over his career, Dan has been involved in several trenchless construction projects, including CIPP lining, microtunneling, case boring, tunneling, directional drilling and pilot tube microtunneling. Dan has been heavily involved in the Northwest Chapter of NASTT since 2005 and has also been a regular contributor at the annual No-Dig Show. Dan is actively working with the Northwest Chapter and local industry in Saskatchewan and Manitoba to expand NASTT's presence across the Prairie Provinces.



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# NASTT's Inaugural Hall of Fame

At Tuesday's Gala Awards Dinner at this year's No-Dig, not only will the 2011 *Trenchless Technology* Projects of the Year be honored, so will the inaugural Hall of Fame class of 2012. 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 the NASTT 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 NASTT.

Members may be elected from all five NASTT membership categories: Manufacturers and Suppliers, Engineers and Consultants, Municipal and Utility Employees, Contractors and Academia. This year's NASTT Hall of Fame Class is: the late Gary Vermeer, founder of Vermeer Corp.; Frank Canon, Baroid Industrial Drilling Products; and Bernie Krzys, President and Publisher of *Trenchless Technology* magazine. Congratulations!

## Frank Canon

*Senior Account Representative,  
Baroid Industrial Drilling Products*

Since starting with Baroid in 1975, Frank Canon has been involved in many different drilling disciplines including oilfield, water well, HDD, tunneling, microtunneling, auger boring and foundations drilling. Frank has traveled the world working with distributor development and technical support for both distributors and contractors. He was instrumental in developing drilling practices and principles for HDD and has worked closely with rig manufacturers. Frank has held a variety of positions with Baroid including operations, management and technical support.

Frank's accomplishments include the Texas Ground Water Association Manufacturer and Supplier Man of the Year Award for 1991-1992, *Trenchless Technology* Person of the Year award for 2000-2001 and the Northeast Trenchless Association Founder's Award 2010. Frank was a member of NASTT Board of Directors from 2001- 2005 and conducts approximately 40 educational seminars per year.



## Gary J. Vermeer

*Founder and Chairman of Vermeer Corp.*

Gary J. Vermeer was the founder and chairman emeritus of Vermeer Corp. (previously known as Vermeer Manufacturing Co.), located in Pella, Iowa. He is known for his innovation and contributions to the agricultural and industrial equipment industries, and for his philanthropic efforts that touch lives locally and around the globe.



Gary made several contributions to the industry, including a tree spade and stump cutter. His agricultural interests kept him focused on ways of laying tile and draining excess moisture from farm fields. That launched Vermeer into the world of trenching products, and eventually, as chairman emeritus, Gary was a strong supporter of pursuing trenchless drilling methods and markets that were new to the industry. By the early 1990s, horizontal directional drilling was the company's leading product line and is a mainstay of Vermeer equipment offerings today.

On Feb. 2, 2009, Gary Vermeer passed away at 90 years of age. His legacy continues through his family members, who honor him by leading Vermeer in taking care of customers worldwide with better solutions.

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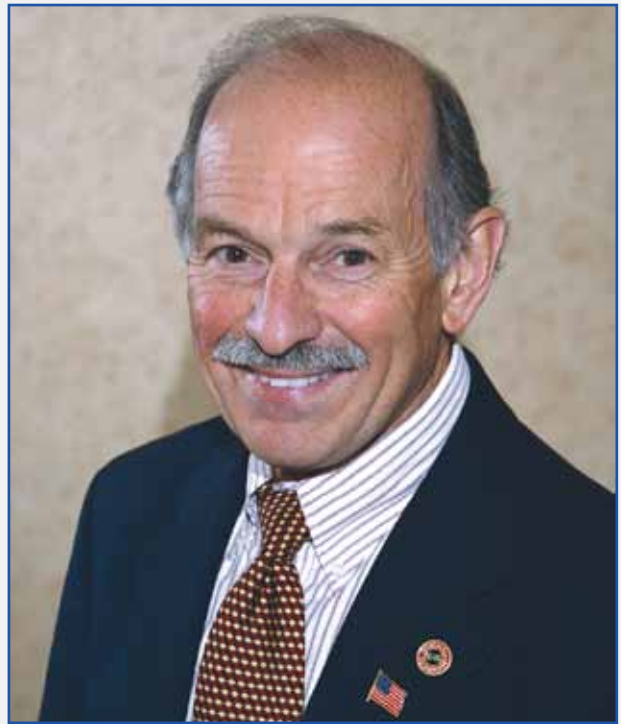
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## Bernard P. Krzys

*Founder of Benjamin Media Inc.*

Bernard P. Krzys is the founder of Benjamin Media Inc., publishers of *Compact Equipment*, *NASTT's Trenchless Today*, *North American Oil & Gas Pipelines*, *Solar Builder/Wind Builder*, *Trenchless Technology*, *TBM: Tunnel Business Magazine*, *Utility Contractor* and *Water Utility Infrastructure Management (UIM)*. Bernie's media background spans over 20-plus years, including a senior executive position with Harcourt Brace Jovonovich (at that time, a NYSE company).

Bernie has served on various boards of directors including an off-shore product liability insurance company, a \$100 million utility contractor, NASTT, the National Utility Contractors Association (NUCA), the Trenchless Technology Center, the Centre for the Advancement of Trenchless Technology and a predecessor association to the Association of Equipment Manufacturers. He has received an Industry Achievement Award from the Power & Communication Contractors Association, he was the 2005 Associate Member of the Year for NUCA, and he has received the Chairman's Award from NASTT.



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# NASTT Chapter News

## Regional Chapter News

### British Columbia

NASTT-BC held its “Trenchless Technology Lunch and Learn” in Kelowna, B.C., on Oct. 20, 2011, at the Ramada Hotel and Conference Centre. Its presenters included David O’Sullivan, president of PW Trenchless Ltd; George Bontus, senior engineer with Insituform Technologies Ltd; Marcus Schmieder, senior materials testing specialist with Metro Testing Laboratories Ltd.; and Marek Pawlowski, principal engineer for M.J. Pawlowski & Associates.

On Dec. 6, 2011, the chapter had a Cured-in-Place Pipe Good Practices course in Victoria, B.C., at the Comfort Hotel and Conference Centre. The one-day course featured instructors Chris Macey, P.Eng., senior technical director of water infrastructure management for AECOM, and Marek Pawlowski.

On Dec. 7, 2011, the chapter had a Lateral Lining Good Practices course in Delta, B.C., at the Delta Town & Country Inn. The one-day course featured instructors Dr. Ray Sterling, professor emeritus of the Trenchless Technology Center at Louisiana Tech University, and Dr. Jason Lueke, P.Eng., assistant professor at the Del E. Webb School of Construction at Arizona State University.

### Great Lakes, St. Lawrence & Atlantic

Elections were recently held, and many new members joined the GLSLA board: Isabel Tardif, CERIU; Kevin Bainbridge, Robinson Consultants; Derek Potvin, Robinson Consultants; Gerald Bauer, Stantec; Frank Badinski, York Region; Erika Waite, City of Hamilton; Sandra Gelly, Genivar; Jamie Hannam, Halifax Region; Anna Polito, City of Dollard-des-Ormeaux; and Mark Bajor, Halton Region.

In an effort to encourage more NASTT chapter students to attend No-Dig, funds are being collected to award a GLSLA scholarship for the five student chapters within the region. The chapter’s *Trenchless Report Magazine* will be distributed in both French and English before and at No-Dig.

### Mid Atlantic

MASTT had a very successful “Trenchless Technology, SSES and Buried Asset Management” two-day seminar in Virginia Beach, Va., Dec. 14-15, 2011, at the Wyndham Virginia Beach Oceanfront Hotel. Bruce W. Husselbee, P.E., Director of Engineering for Hampton Roads Sanitation District (HRSD), was the guest presenter with the presentation “HRSD Trenchless Technology Program.”

### Midwest

After a successful summer and fall, MASTT staff and officers look forward to No-Dig in Nashville.

## NASTT’s 11th Annual Educational Fund Auction & Reception

### Take a Chance to Win a Trip to Hawaii!

“Here Today, Gone to Maui” raffle, sponsored by Vermeer Corp, gives you a chance to win a dream vacation to Hawaii! Preorder your tickets today by visiting the NASTT **website: [www.nastt.org/products/21](http://www.nastt.org/products/21)**. Tickets are \$25 each or \$100 for 5 tickets, and only 1,000 tickets will be sold. Tickets will be mailed to you if purchased before Monday, March 5. Online orders will end on Thursday, March 8, 2012. After March 8, 2012 you can purchase your raffle tickets onsite at the NASTT bookstore. The winning ticket will be drawn during the No-Dig Closing Luncheon on Wednesday, March 14, 2012. **You do not need to be present to win.** Grab your mini umbrella coconut cocktail and your grass skirt and buy your raffle tickets to take a chance on a trip of a lifetime!

### eBay Auction

eBay Auction will go live 3/2/12! Go to **[www.nodigshow.com](http://www.nodigshow.com)** and click on eBay auction to start your bidding on some great items.

### How to Contribute

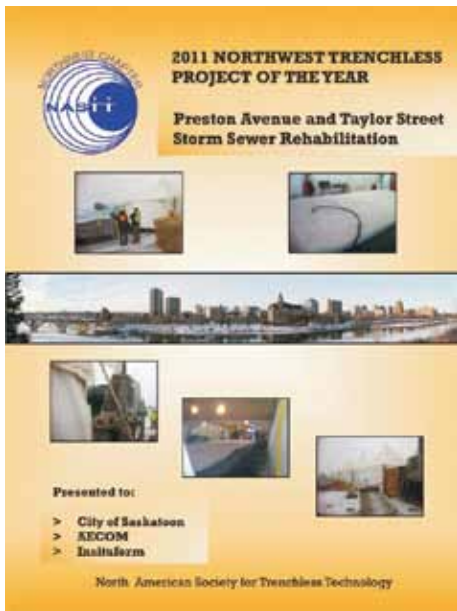
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**Auction conducted by Ritchie Bros. Auctioneers**



**Northwest**

NASTT-NW presented its 2011 Northwest Trenchless Conference in Calgary, Alberta, on Nov. 16-17, 2011, at the Coast Plaza Hotel, with the CIPP Good Practices Short Course held on the first day and the Symposium on the second. The short course attracted 34 attendees, while 140 attended the Symposium where they heard 12 presentations on a variety of trenchless topics. A trade show with 25 exhibitors was also held on the second day of the conference. The NW Chapter Project of the Year award was also presented to the City of Saskatoon for its project "Preston Avenue and Taylor Street Storm Sewer Rehabilitation."



The NW Chapter Project of the Year was awarded to the City of Saskatoon for the Preston Ave. and Taylor St. storm sewer rehabilitation.

A short course was also held Jan. 25 at the Holiday Inn South in Winnipeg, Manitoba. More than 25 people attended the new installation methods short course.

**Pacific Northwest**

The Pacific Northwest Chapter is excited to announce that its chapter website is now up and running and can be viewed at [www.pnwnastt.org](http://www.pnwnastt.org). Through its membership, PNW hopes to help populate the website with additional project highlights, papers and businesses for the directory.

The second annual *PNW Trenchless Review* magazine mailed to members at the end of January. Copies of the magazine will be available at the No-Dig Conference in Nashville. The PNW Chapter is also working on several outreach meeting opportunities with the City of Portland, Ore., and surrounding communi-

ties. Kim Staheli is working with the city to identify possible dates for two separate opportunities with one being a trenchless forum where local papers are presented, and the second being a training day on trenchless installations.



## Rocky Mountain

The Rocky Mountain Chapter had a successful Rocky Mountain No-Dig Conference and Exhibition held in Westminster, Colo., on Oct. 7, 2011. There were 75 attendees at the conference with the support of 15 sponsors and 12 exhibitors that enhanced the conference with their financial support, booth exhibits and knowledge of their products and services. Tracy Lyman, the 2011 Rocky Mountain Chapter Chairman, welcomed the attendees to the conference and introduced George Ragula, Chairman of NASTT, who provided an introduction to NASTT to open the conference.

The conference and exhibition included 12 presentations in four key interest categories:

1. Planning and Asset Management – Chaired by Ken Matthews, Stantec
2. New Installations – Chaired by Aaron Burns, MWH
3. Rehabilitation and Repair – Chaired by Joe Lane, SAK Construction
4. Trenchless Construction – Chaired by David Emm, BT Construction

Conference presentations are posted on the RMC website [www.rmnastt.org](http://www.rmnastt.org). Planning for the 2012 event has already begun. An NASTT short course will be conducted on Nov. 7, 2012, and the Rocky Mountain No-Dig will be Nov. 8.

This year, the chapter would like to increase participation in Wyoming and Utah. The outreach committee will focus on encouraging membership, increasing conference participation, promoting short course attendance and establishing local meetings and networking opportunities to promote trenchless technology. There will also be the Colorado Front Range “Field Lunch Program,” an on-site program promoting trenchless technology applications and sharing real world experiences.

## Southeast

SESTT had a “Trenchless Technology, SSES and Buried Asset Management” seminar in Miami on Sept. 28-29, 2011, at the Hyatt Regency Miami Hotel. Rod Lovett, Chief of the Miami-Dade Water and Sewer Department, was one of the first-day guest presenters with the presentation “Miami-Dade Trenchless Sewer Program.” The second-day presenter was Luis Aguiar, Chief of the Miami-Dade Water and Sewer Department and its Water Distribution, with the presentation “Miami-Dade Trenchless Water Program.”

The chapter also had an additional SSES and Buried Asset Management two-day seminar Feb. 1-2 at the Atlanta Marriott Norcross Hotel in Norcross, Ga. The guest presenter was Steve Sheets, P.E., with the Gwinnett County Department of Water Resources with the presentation “Gwinnett County Trenchless Program.”



## eBay Online Auction



### NASTT Educational Fund

- Auction starts on Friday March 2nd
- Closes evening of Monday, March 12th during the No-Dig Show on-site auction
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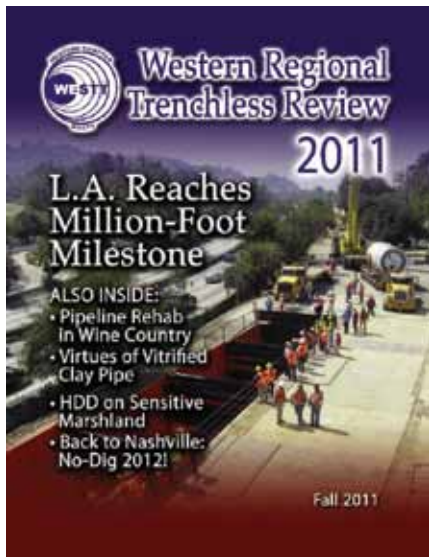
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**Auction items as of February 1st**  
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**Western**

The Western Chapter held its seventh annual Western Regional No-Dig Conference in San Jose, Calif., on October 3-4, 2011, at the San Jose Wyndham Hotel. While registration started off slow, 97 registrants showed up on the day of the conference — one of the chapter's best attendances since starting the mini No-Dig show in 2005. Exhibit space was oversold, and the nearly two-day event included the presentation of 14 technical papers, a keynote address by Greg Scoby from the City of Palo Alto and a networking reception. Additionally, the chapter published its fifth WESTT magazine, which was distributed in conjunction with the annual conference.



The Western Chapter recently published its fifth WESTT magazine, which was available at its regional No-Dig conference.



NASTT relaunched its website in December, helping to make navigation easier and membership benefits more accessible. Have you checked it out yet? Visit [www.nastt.org](http://www.nastt.org), and let the organization know what you think!

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# NASTT Regional Chapters

## British Columbia

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

### Chapter Contact

Karl Mueller, Chair  
Phone: (604) 293-3293  
E-mail: [kmueller@kwl.ca](mailto:kmueller@kwl.ca)

### Website

[www.nastt-bc.org](http://www.nastt-bc.org)

### Elected Officers

Chair - Karl Mueller  
Vice Chair - Rod Loewen  
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

Isabel Tardif, Chair  
Phone: (514) 848-7031  
E-mail: [isabel.tardif@ceriu.qc.ca](mailto:isabel.tardif@ceriu.qc.ca)

### Website

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

### Elected Officers

Chair - Isabel Tardif  
Vice Chair - Kevin Bainbridge  
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](mailto:rthomasson@pirmie.com)

### Website

[www.mastt.org](http://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](mailto:jeffboschert@yahoo.com)

### Website

[www.mstt.org](http://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 2005, the members in British Columbia established the NASTT-BC Chapter. In 2009, the members in Washington state established the Pacific Northwest Chapter and the Northwest Chapter adjusted the geographic area to include the members in the provinces of Manitoba and Saskatchewan, Canada.

### Chapter Contact

Duane Strayer, Chair  
Phone: (403) 262-4500  
E-mail: [strayerd@ae.ca](mailto:strayerd@ae.ca)

### Website

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

### Elected Officers

Chair - Duane Strayer  
Vice Chair - Dan Willems  
Secretary - vacant  
Treasurer - Mark Brand



## 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](mailto: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

Tracy Lyman, Chair  
Phone: (303) 534-1100  
E-mail: [tlyman@lymanhenn.com](mailto:tlyman@lymanhenn.com)



#### Website

[www.rmnastt.org](http://www.rmnastt.org)

#### Elected Officers

Chair - Tracy Lyman  
Vice Chair - Al Paquet  
Secretary - Ken Matthews  
Treasurer - Aaron Burns

### 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

Jerry Trevino, Chair  
Phone: (877) 462-6465  
E-mail: [jerry@mechanicaljobbers.com](mailto:jerry@mechanicaljobbers.com)



#### Website

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

#### Elected Officers

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

Jason Lueke, Chair  
Phone: (480) 965-7417  
E-mail: [jason.lueke@asu.edu](mailto:jason.lueke@asu.edu)



#### Website

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

#### Elected Officers

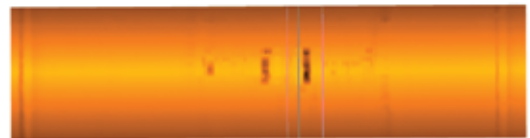
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# NASTT Student Chapters



## Arizona State University

Tempe, Ariz.

Advisor: Dr. Samuel T. Ariaratnam

E-mail: [samuel.ariaratnam@asu.edu](mailto:samuel.ariaratnam@asu.edu)

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## Bowling Green State University

Bowling Green, Ohio

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Concordia  
UNIVERSITY

## Concordia University

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---

IUPUI

INDIANA UNIVERSITY  
PURDUE UNIVERSITY  
INDIANAPOLIS

## Indiana University - Purdue University Indianapolis

Indianapolis

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LAVAL

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## Trenchless Technology Center/Louisiana Tech University

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## McGill University

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## CUIRE/University of Texas at Arlington

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## Virginia Tech University

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## University of Alberta

Edmonton, Alberta

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## Paper D-1-03 Photogrammetric Methods For Quality Control Of Trenchless Construction Projects

Jason S. Lueke,<sup>1</sup> Samuel T. Ariaratnam,<sup>1</sup> Siddarth Banerjee, and Sun Pinghe,<sup>2</sup>

<sup>1</sup> Del E. Webb School of Construction, Arizona State University, Tempe, Ariz.

<sup>2</sup> Faculty of Engineering, China University of Geosciences, Wuhan, 430074, P. R. China

### INTRODUCTION

Ground movements associated with trenchless construction operations can cause significant damage to existing buried and surface infrastructure. This may be the result of soil displacement, slurry or drilling fluid pressurization, over-excavation or settlement. The type of ground movement that occurs is related to the trenchless method utilized, soil conditions, and the contractor's methodology or actions during the construction operation. Subsurface soil movements may damage buried utilities, foundations, structures, and depending on the depth of cover, may manifest in surface movements. Surface movements, either settlement or heave, can damage pavements, sidewalks and on-grade foundations.

It has become common for municipalities and infrastructure owners to specify the monitoring of surface movements in their contracts for trenchless installations beneath roadways or rail lines. The requirements include documenting the surface elevation prior to the start of construction, then as the construction progresses either daily or at critical junctures in the project. The goal of monitoring ground movements is essentially different for the owner and contractor. Owners monitor ground movements to determine if movements have occurred, what the magnitude of the movement was, and if there are any potential consequences to their infrastructure. Contractors should monitor ground movements as the installation or replacement progresses to see how their procedure is influencing the development of ground movements. Then, they should use this information to modify their methodology in order to control heave or settlement.

Table 1. Overview of methods used in measuring surface displacements and their precision

Method	Results	Typical Range	Typical Precision
Surveying Triangulation	$\Delta X, \Delta Y, \Delta Z$	<300-1000 m	5-10 mm
Geometric Leveling	$\Delta Z$	Variable	2-5 mm/km
GPS Survey	$\Delta X, \Delta Y, \Delta Z$	Variable (usually <20 km)	5-10 mm + 1-2 ppm
Terrestrial Photogrammetry	$\Delta X, \Delta Y, \Delta Z$	Ideally <10 m*	2 mm from 10 m*

\* scaled down to 20 mm from 100 m to be applicable to the conditions in this investigation

There are several methods utilized to measure ground surface movements. Some of the most common include total station (surveying triangulation), conventional rod and level (geometric leveling), terrestrial photogrammetry, and surveying utilizing global positioning satellite

technology. Based on work done by Gili et al. (2000) for the monitoring and measurement of landslides, information pertaining to the precision of the methods applicable to measuring ground movements on trenchless projects is provided in Table 1.

Traditionally, the measure of ground movements was accomplished utilizing geometric leveling, or at times, triangulation by total station or theodolite. Now, GPS has become more common on most construction sites. The major drawback of these methods is that they require direct access by a person to the targets being measured so that the rod or reflector can be positioned for a measurement. Additionally, these methods cannot take simultaneous measurements of all targets at a specific time interval, as time is required between each target measurement to reposition the rod or reflector. These limitations prevent utilization of these methods if access cannot be provided to the area being monitored or if it is not possible or practical to stop the construction process long enough to survey all the targets.

This paper proposes that photogrammetry would be an effective and efficient method of performing quality control on trenchless projects. Photogrammetry is a remote sensing technique in which the geometric properties of objects and surfaces can be determined from photographic images. It essentially allows measurements to be made from photographs. The method used in this research is more appropriately termed stereophotogrammetry, and it is capable of estimating the location of points on objects and surfaces in three dimensions through analysis of two or more photos taken from different positions of the target area.

The photogrammetric process is based on line of sight and analysis of the geometry of the scene or subject. Utilizing a series or set of photos of the subject area, common points of interest, or targets, are identified in each photograph. A line of sight, or ray, is created between each target and the camera for each photograph. Through the triangulation of these rays for each unique target from each photograph, one can solve for the position of the camera and points relative to each other in three-dimensional space. By knowing at least one dimension in the subject scene, typically the distance between two targets, the solution can be scaled. The solution creates a virtual model of the scene, from which accurate measurements can be made of the target positions.

Photogrammetry has many advantages over more traditional methods of monitoring ground movements. Some of these are as follows:

1. Simultaneous measurement of all targets/surface points in the area monitored – all targets in the camera's field of view can be measured.
2. Fast measurements – each measurement set requires a minimum of two pictures (more are preferable) and the measurement of all targets is complete in the time required to take the pictures.
3. Minimal equipment required – camera and tripod, with a computer to process the photos.

4. No specialized equipment required – typically the equipment required to monitor ground movements, a camera, is generally standard issue for a foreman or superintendent.
5. Minimal training required for operator – operator must be familiar with operation of camera and how to stage pictures for optimal area coverage.
6. Quick turnaround for results – after downloading pictures to the computer, software can analyze photos in a matter of minutes and provide Cartesian coordinates for all targets included in the photos; and,
7. Measurement without access to targets – measurements can be made without having to access the area where the targets are located.

Table 2 summarizes the four main survey techniques for measuring ground movements and their associated cost of equipment required to take the measurements, time to take the measurements, expertise of the data gatherer, and the speed at which results are available.

Table 2. Comparison of cost and time required to survey by method

Method	Cost of Equipment	Time to Take Measurement	Expertise of Data Gatherer	Speed of Results
Surveying Triangulation	\$5-10,000	<60 min	High	Hours
Geometric Leveling	<\$1,500	<30 min	Medium	Minutes
GPS Survey	\$15-25,000	<60 min	High	Minutes
Terrestrial Photogrammetry	<\$2,000	<5 min	Minimal	Minutes

The remainder of this paper discusses the development of a procedure to utilize photogrammetry to perform quality control on a trenchless project. This includes discussion of camera calibration, trial measurements to determine the precision of the technique on targets in a similar configuration to an actual field installation, results from this analysis and discussion of the results compared to other survey techniques.

## CAMERA CALIBRATION

This research is utilized by PhotoModeler, photogrammetry analysis software developed by EoS Systems. Prior to using the software to perform measurements, the cameras must be calibrated. Included in the software is a module to calibrate the camera used for taking the images. This software produces highly accurate measurements with “off the shelf” commercially available digital cameras. The calibration involved taking a set of 12 images for a full field calibration. The camera used for this project was a Canon EOS Rebel XSi digital SLR 12.2 megapixel camera, CMOS sensor, with an EF-S 18-55 mm f/3.5-5.6 IS lens. For this project, the calibration was done at both an 18 mm and 55 mm focal length. The calibration grid consisted of a total of 100 dots, including four control target points on a sheet of paper one square meter. The process of calibration is done such that a total of 12 pictures of the grid were taken. Four pictures from each side of the grid were taken at three different orientations of the camera. The first set of pictures was taken with the camera in the landscape position; the second in portrait; and the third set in an inverted portrait position. The camera was mounted on a tripod stand to eliminate shaking, while taking the pictures as shown in Figure 1, using a remote trigger to further stabilize the pictures. The objective of this calibration is to determine the characteristics of the camera lens and body. This is accomplished by taking pictures so that much of the field of view is covered by the calibration grid.

The camera calibration software is able to recognize the position of various points with the help of the control targets by the principle of spectrographs. The relative position of all the points is found using the principle of bundle triangulation. Based on the position of the control points, the positions of the other points are found using positional transformations. Hence it is of utmost importance that there is adequate overlapping of points in the photos and at least 80 percent of the total points are captured in each image. The whole idea behind having good overlap of the images is that the number of equations possible for the common points outnumber the points; hence, a definite solution is possible.

At completion of the calibration sequence, the software generates a report that summarizes the quality of the calibration, any issues or concerns, and also suggests remedies or methods to improve the calibration. The values of the standard deviations on all the variables should be as small as possible for a well-calibrated camera. Some of the important parameters to be checked in calibration are “total error” (final error) and “point marking residuals” (overall RMS and maximum residual). The point marking residuals are used for identifying if the calibration is properly done and to check for points that have the maximum residual. The final total error value is used to check that the calibration is done properly. For a well-calibrated project, these values should be less than one. The lesser the error values, the better the calibration. Table 3 summarizes some of the important parameters for the two focal lengths utilized in the study. Calibrations were undertaken at two different focal lengths to account for varying site conditions and constraints that may restrict placement of targets or camera positioning when taking pictures.



Figure 1: Camera setup for taking images for calibration

Table 3: Parameters related to Camera Calibration

Parameter/Focal Length	18 mm	55 mm
Average Photo point coverage	81%	85%
Overall Residual RMS	0.320	0.137
Maximum Residual	1.706	0.531

The average photo point coverage, given in percentage, denotes how much of the camera lens is calibrated. The field of view must be filled with the maximum number of points possible for proper calibration. The minimum recommended value of this parameter for a good calibration process is 80 percent. Overall residual Root Mean Square (RMS) and maximum residual values are important parameters to compare the calibration results for different focal lengths of the same lens. These residual values are indicative of the deviation of the processed point to the actual position of the point. In simpler terms, point residual is the difference between where the algorithm processes the point and where the

software algorithm thinks the point should have ideally been. The point locations are obtained using bundle ray adjustment from multiple photographs. The points with the largest residuals should ideally have RMS and maximum residual values less than one pixel for a well-calibrated project. From Table 1, we see that a 55 mm focal length is better calibrated than the others. A single calibration is sufficient if the same camera is used throughout the project, as long as the camera parameters are unchanged. However, subsequent calibrations are required each time a new camera is used, or as the focal length of the lens is changed. These calibrated cameras can be saved for future use.

## TRIAL MEASUREMENTS USING PHOTOGRAMMETRY

In preparation for utilizing photogrammetry for measuring ground movements in the field, a series of trial measurements were done under various scenarios. This was done to develop a procedure that considered camera focal length and the number of pictures to be taken to conduct each measurement. The focal length determines the field of view, which in turn determines how close to the subject area the camera has to be in order to take suitable pictures. Higher focal lengths allow the camera to be further away from the subject area. Being able to take pictures at various “zoom” levels is essential on construction sites where access to the subject area may not be optimal.

The Photomodeler software develops a three-dimensional virtual model of the subject area, based on the analysis of a set of photos. A photo set is composed of some number of photos of the same subject area, at the same or similar instance in time, which captures all the survey targets of interest. The number of photos in a set influences the ability of software to develop a solution for each target in three-dimensional space. Minimally, a set of two photos is required to develop a solution, however better solutions can be achieved utilizing more photos. In developing a measurement procedure for the field, a mock monitoring scenario was conducted to understand the influence of focal length and number of pictures in each measurement set.

This trial was conducted to gain familiarity with the actual project scenario, to gain comfort levels before going for the actual site location and mainly, to check the precision of Photomodeler software. This trial experiment involved the following steps: 1) setting up the targets; 2) taking pictures of the targets; and 3) analysis in Photomodeler. The images were taken for focal lengths of 18 mm and 55 mm in 20 sets of three pictures, four pictures and five pictures, resulting in a total of 480 pictures taken. We did not anticipate drastic change in results for the number of pictures in a set. However, all the cases were tested nonetheless for comparison purposes and for repeatability.

### Setting Targets

The targets discussed in this section were as shown in Figure 2. Each target was square in shape of size 2.75-in. by 2.75-in. and consisted of a white circular region within the black entirety. A cross hair was provided within the target that would be taken as the reference while marking them in the software. The marking of the point of intersection of the cross hair would represent

the location of that particular target. A total of 22 identical targets were set up on the ground for this experiment. The targets were set up in two rows of 11 each and placed at a distance of 1 ft between each target in the line. The distance between the two rows was also 1 ft (Figure 3). The distances were measured using a standard steel measuring tape. All the targets were fastened in all directions to the ground using a tape so that they would not move from wind or any other disturbance. Even a slight movement in any of the targets would hamper the actual result and as a precaution, we opted to affix them to the ground. Since this experiment was conducted in an open parking lot, signs were placed to warn people of the ongoing experiment and people were cooperative not to disturb the experimental setup.

### Taking Pictures

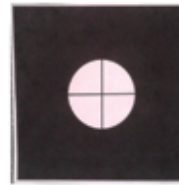


Figure 2: Sample target (actual size 2.75" by 2.75")

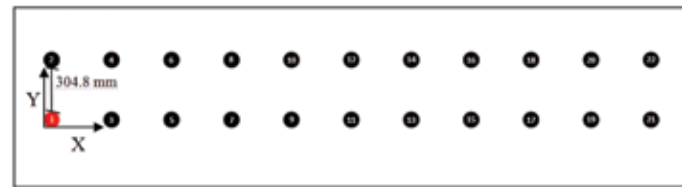


Figure 3: Target arrangement for field trial

After setting the targets on the ground, we started taking the pictures. We started with a 55 mm focal length with five pictures sets, four pictures sets and three pictures sets, respectively in that order. The same was repeated for 18 mm focal length. Care was taken that the focal length of the camera did not change at any instant of time during the experiment. A piece of tape was fastened at the end of the lens to curtail its rotation. In order to achieve higher accuracy, we tried to maintain an angle greater than 45 degrees between any two consecutive photos (Photomodeler v6.0). Also, effort was made to take the pictures 360 degrees of the targets, covering all the sides for proper perspective from all the directions. The photos were taken so as to capture all the targets within the lens calibrated region. In other words, the efforts were to capture all the targets in the center of the lens. The camera was mounted on a tripod and pictures were taken with a remote wireless trigger to minimize camera body movement as pictures were taken.

### Analysis in Photomodeler

Once all the pictures were taken for 55 mm and 18 mm focal length, the pictures were loaded in the laptop for analysis in Photomodeler software. All the pictures were categorized into their respective sets before analysis.

Having done this, each set was individually worked upon in the software. In each set, all the targets were sub-pixel marked on the first picture. These were then referenced with the targets in the remaining pictures



and the software was able to establish all the point coordinates. It is important to have at least two photos in which a particular target is clearly recognizable. After referencing all the points, the pictures were processed. Upon successful processing of these pictures, the coordinates of all 22 points were copied into an Excel sheet. Photomodeler indicates any problems encountered during the processing and also provides suggestions for those problems. Similarly, the coordinates of the points from all the sets are copied in to the Excel sheet.

### PRECISION ANALYSIS

To determine the effectiveness and practicality of utilizing photogrammetry as a means to provide quality control or monitor surface movements in the field, it is essential to determine the accuracy and precision of the technique. The accuracy of a measurement system is defined as the closeness of the measurement to the actual value, while precision is defined as repeatability or tightness of the measurement. The precision of a measurement is its standard deviation when the physical quantity (point being measured) remains constant. The information presented in this paper focuses only on an analysis to determine the precision of measurements determined by our methodology utilizing the Photomodeler software.

In this analysis, a total of 480 pictures were taken, comprising of 20 measurements of the 22 surface targets taken in sets of three, four and five pictures at 18 and 55 mm focal lengths. Each set of pictures was analyzed in Photomodeler, solving the three-dimensional Cartesian coordinates (x,y,z) of each target. Coordinates for this analysis were determined by assigning a specific target as the origin, and then determining the scalar value of each coordinate based on the position of the origin. For application in the field, one target would be tied into the survey datum on site so that the measurements are pertinent to the project.

All pictures taken for this analysis were completed over a four-hour time period utilizing the same procedure, with the targets left in the same place for all measurements. While the actual position of the targets was not determined, the precision analysis could still be undertaken as it only determined the repeatability of the measurement. Table 3 summarizes the results of the analysis and provides the average standard deviation achieved for each axis, for the different focal lengths, and for the number of pictures taken for each measurement. Each average standard deviation value shown is the average of 20 measurements of 22 targets.

Table 4. Average standard deviation by number of pictures and focal length

Focal Length	Pictures in Set	Average Standard Deviation		
		X	Y	Z
18 mm	3	11.06	1.49	1.53
	4	3.16	1.29	0.69
	5	3.20	1.01	0.68
55 mm	3	9.43	3.15	0.57
	4	4.92	3.93	1.95
	5	2.93	1.41	0.86

For the measurements taken with the camera set with an 18 mm focal length (wide angle thus closer to the targets), the standard deviation of the coordinates de-

creases with an increasing number of pictures included in a measurement. As additional photos are added to the model Photomodeler creates, the solution for the coordinates for each target strengthens, thus “focusing” the modeled target location. Similar improvements to the standard deviation of measurements taken with a focal length of 55 mm (telephoto thus camera further from targets) are observed as the number of photos taken with each measurement set increases. It should be noted that there were some abnormalities in the processing of a few of the photo sets taken at a 55 mm focal length and four pictures in the measurement set resulting in slightly higher standard deviations than expected.

This analysis determined that the typical standard deviation on the z-axis was less than 1 mm for photo sets consisting of more than three photos. This means that the precision of this technique is less than 1 mm. This is significantly better than conventional leveling, triangulation and surveys using GPS.

### FUTURE WORK

Accuracy determination will be conducted on an auger bore installation in Glendale, Ariz. The project involves the installation of a 1,372-mm (54-in.) steel casing pipe beneath Grand Avenue, a rail line and a block wall fence. The installation is approximately 125 m (410 ft) in length, and designed with approximately 5 m (16.4 ft) of cover beneath the Grand Avenue and 7 m (23 ft) of cover beneath the rail line. The city and railroad company were very concerned with any ground movements that might occur during the installation process, and outlined specific means to monitor ground movements as part of the construction contract. In the construction specifications for this project, the city requires the contractor to install settlement points consisting of a 150-mm (5.9-in.) diameter concrete pile to a depth of 1,200 mm (3.9 ft) into which a leveling hub is to be set. Elevations of the hub are to be taken at regular time intervals to monitor the settlement or heave that might occur.

To determine the accuracy of the photogrammetric process, the contractor will be monitoring the settlement points with a conventional rod and level as well as GPS. We will be monitoring the same points utilizing photogrammetry and comparing the measured values. By comparing the measured elevations and differences in settlement point elevations, we should be able to determine the accuracy of the method.

### CONCLUSIONS

Based on the results of this analysis, it has been determined that the precision of this photogrammetric technique to measure surface, is generally better than 1 mm. This value is based on a total of 120 individual measurements of 22 surface targets. This level of precision is better than conventional survey techniques and has several advantages in terms of the speed of data gathering, lower costs and minimal training required to conduct the measurements. These results support the premise that this technique could see application in the monitoring and quality control of trenchless construction projects.

To view the complete version of Paper D-1-03, please visit [www.nastt.org](http://www.nastt.org).

## Paper D-5-03 The Legal Impact Of Geotechnical Baseline Reports

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### INTRODUCTION

The stated objective of a Geotechnical Baseline Report (GBR) is to define and allocate the risks associated with subsurface excavation. In theory, the GBR works in tandem with the Differing Site Condition (DSC) clause in the contract documents to provide a mechanism for the contracting parties to identify any truly unanticipated conditions that may be encountered and pay the contractor an equitable adjustment for costs incurred to complete the work.

While sound in theory, this objective can be thwarted by the geotechnical engineer's use of language in the GBR that the courts will either disregard as unenforceable or interpret as vague or ambiguous. Because the GBR and similar documents are, fundamentally, contract documents, the courts have developed a body of rules and principles applicable to the interpretation of geotechnical documents. Achieving the stated objective of the GBR thus depends not only the technical expertise of the geotechnical engineer, but also on careful consideration of how the courts actually interpret the engineer's work product. With knowledge of the courts' approach to the interpretation of GBRs, the geotechnical engineer can create a document that achieves its central purpose. Without such knowledge, however, owners and their engineers sometimes resort to terms and conditions in GBRs that they may believe are useful in clarifying the allocation of risk, or shedding liability for a particular condition, only to discover later in court — the hard way — that such terms and conditions don't mean what the engineers and owners think they mean.

This paper therefore seeks to provide the legal context in which GBRs are interpreted and applied in order to assist owners and engineers in achieving the stated purpose of risk allocation.

### GENERAL RULES OF INTERPRETATION

The GBR is intended to operate hand-in-hand with the DSC clause, in which the purpose is to save the government money by minimizing the amount of speculative cost contingency, thereby removing uncertainty from the contractor's perspective. The typical DSC clause defines a Type 1 claim as arising from "subsurface or latent physical conditions at the site which differ materially from those indicated in the contract." To prevail in a Type 1 claim, the contractor must prove five essential elements, but only the first of those elements is pertinent here — specifically, whether the contract documents affirmatively "indicate" the ground conditions or not, and if so, to what extent.

Without a GBR, equivalent soils report or associated boring logs, it is doubtful that a contractor could main-

tain a Type 1 DSC claim at all. As numerous courts have held, there can be no Type 1 DSC claim "unless the contract indicated what that condition would be through reasonably plain or positive indications." Because of this rule, the courts frequently recite the general rule that a Type 1 DSC claim "stands or falls" upon what is actually indicated in the contract documents.

While this rule is easy to state, its application in practice is more complex because contract documents in most complex civil construction projects are not entirely silent in regards to subsurface conditions. In the case of complete silence on the part of the contract documents, the rule that no Type 1 DSC claim can be maintained unless conditions that are "indicated," can be applied in a straight-forward manner. More typically, however, the issue presented by a Type 1 DSC claim is not whether the contract documents provided "indications" of subsurface conditions. Rather, it depends on how those conditions are described, how those descriptions will be interpreted by the courts in the event of a controversy, and how any warnings, caveats or limitations set forth in the geotechnical report will be construed by the courts.

Unless an owner elects to remain completely silent regarding subsurface conditions, the following general principles developed by the courts should be kept in mind by geotechnical engineers and owners as they prepare to issue baseline documents:

1. Referring to the GBR as a mere reference document or attempting to classify it as something other than a formal contract document will not by itself negate the bidder's right to rely on the geotechnical information. On the contrary, even if the documentation (i.e., soils report, boring logs, GBR) is not part of the contract in a technical or official sense, a reference to the materials can be enough to make the documentation part of the representation of subsurface conditions for purposes of bidding and any subsequent DSC claim.
2. The courts regard boring logs as "usually the best indicators of subsurface conditions, and bidders ought to rely heavily on them" and that a "pattern of test borings is usually reasonably representative of the entire site." Because the contractor must consider all of the information provided in the bid documents, however, the bidder must also consider (1) whether the borings are numerous and well-spaced, or whether they are few and far between, (2) whether the boring results are relatively consistent with one another, and (3) the general description of the site and any warnings of conditions which might be encountered. Courts do not automatically assume that test borings necessarily represent an overall or general depiction of the project site and will instead engage in a detailed examination of the entirety of the contract documents to assess the relative strength of the indications made by the borings.
3. General statements that geotechnical information is provided for information only or that the bidders should make their own borings, or draw their own in-

ferences and extrapolations, are typically given little weight by the courts. However, as discussed below, this rule does not prevent owners and their geotechnical engineers from placing legally effective conditions on geotechnical information or from limiting the right of bidders to rely on specific information. With that said, the general rule against disclaimers does illustrate the tendency of the courts to discount broadly worded, generic warnings with hostility. If literal effect were to be given such disclaimers, then the courts believe the DSC clause and its beneficial purpose would be eviscerated.

4. The contractor's interpretation of the indications represented in the contract documents does not necessarily need to be the best interpretation or the only interpretation, but at least a reasonable one.
5. At the same time, however, the contractor must take into consideration the entire set of representations made in the contract documents and may not cherry-pick indications or selectively rely on one statement to the exclusion of others. As a result, the court in determining the nature and extent of indications in the contract documents must read the contract as an "organic whole, according reasonable meaning to all of the contract terms" from the vantage point of a "reasonable and prudent contractor."
6. A contract is "ambiguous" when there are two reasonable interpretations that are consistent with the contract language. As a result, if the indications of subsurface conditions in the contract documents are ambiguous (i.e., two or more reasonable interpretations when read as a whole), there is an increased likelihood that the court will give the contractor the benefit of the doubt and conclude that its reasonable interpretation is the controlling one.
7. However, the mere fact that the parties may disagree over the interpretation of the contract does not make the contract ambiguous. If the ambiguity is so obvious as to raise a duty to inquire, the bidder's failure to inquire regarding such a patent ambiguity means that the contractor assumes responsibility and liability for the ambiguity.

## SPECIFIC CASE STUDIES

With this background in mind, we turn now to the main purpose of the paper: to describe what has worked — and what has not worked — in efforts by authors of GBRs or equivalent soils reports to clarify the allocation of risk in geotechnical documents and instruct bidders on how they may or may not permissibly rely on the information provided.

As noted above, overreliance by owners and their engineers on generic, broad-stroke disclaimers has not been an effective method for risk allocation. Moreover, insufficient clarity in drafting of geotechnical documents has caused many courts to conclude that the GBR or equivalent soils report is "ambiguous" from a legal standpoint. As noted, an ambiguous GBR essentially provides no predictable baseline because, by definition, the GBR (if ambiguous) is said to have two or more reasonable interpretations. For both reasons, the stated objective of the GBR is not achieved and the owner may incur extra liability that it believed to have been adequately managed by the GBR author.

A close reading of the court cases across the country yields a middle ground in which appropriate caveats

and limitations on the use of the geotechnical information will be respected by the courts. At the same time, it will advance the fundamental purposes of the GBR to provide a clear baseline for risk allocation. The essential thrust of these cases is that caveats, conditions, limitations or disclaimers will be respected if they are focused and specific in nature.

## Judicial Rejection of GBR Risk Allocation

To appreciate what this means, we begin with several illustrative cases in which the courts have held that purported attempts to allocate the risk of geotechnical conditions are unenforceable, confusing, ambiguous or simply unfair.

### Case Study 1

A missile test facility was to be built for the military at a site where dewatering was likely. At the time that the project was designed, the geotechnical borings did not reveal the existence of a high groundwater table. However, the contract indicated the need for "drainage and dewatering." The contractor filed a Type 1 DSC claim due to the groundwater encountered on the site during construction of the facility. The government rejected the claim and argued that the contractor was on notice of high groundwater due to its general knowledge of the vicinity as well as other parts of the contract indicating the need for "drainage and dewatering" incidental to the performance of work. The court rejected the government's argument. According to the court, the need for draining and dewatering could just as easily have been referring to operations necessitated by rainfall. As a result, the reference to draining and dewatering was not enough to override the impression given by the boring logs that no significant groundwater would be encountered. In this case, the contract documents were too vague and did not specifically address the fact that there would likely be required dewatering even though the borings did not indicate a high groundwater level.

### Case Study 2

A similar outcome is illustrated in a contract to construct over a mile of concrete tunnel utilidors, having heights and widths of 2 to 6 ft and depth of tunnel excavation from 5 to 9 ft. The boring logs for the project did not indicate a high groundwater table. However, a baseline statement in the contract documents stated that a condition of high groundwater exists in this area. The contractor filed a Type 1 DSC claim for groundwater pumping and dewatering costs. The government denied the Type 1 DSC claim based on the baseline statement. The court held that the contract stated that the condition of high groundwater existed in the area was a low key message that was muffled by the specific information in the borings. Thus, it was nothing more than an indefinite caveat since the term "high groundwater" is "obviously a relative term" and therefore, the precise information in the borings was not negated by the "undefined and unexplained generality of the high groundwater" clause. The court also held that even though the water level might vary from month-to-month — and that a prudent bidder should be aware of such fluctuations and therefore question whether the borings taken at a snapshot in time are truly representative— it did not negate the bidder's right to rely on the borings as presented in bid documents.

### Case Study 3

For the construction of a federal bridge, contract documents were prepared containing logs of drill holes and describing conditions to be encountered during excavation for pier foundations. The information consisted of profile drawings and legends to accompany them. The geotechnical documents for the project also contained a statement that said the geotechnical information contained within the borings and geotechnical report are not guaranteed, not representations, and that the bidder is urged to draw his own conclusions. The contractor filed a Type 1 DSC claim on the ground that its pier excavation activities encountered wetter conditions than indicated in the borings. The claim was denied by the government based on the clause in the geotechnical report stating that the borings did not guarantee the conditions or necessarily represent them. The court interpreted the logs as conveying the existence of relatively impermeable, stable and firm materials for the foundation piers. The court held that a standard mandatory clause of broad application that purported to disclaim responsibility for the accuracy of the logs (i.e., that the logs “are not guaranteed, not representations and that the bidder is urged to draw his own conclusions”) was not a proper defense. This case clearly illustrated that broad disclaimers within the geotechnical documents are not valid mechanisms for transferring geotechnical risk from the owner to the contractor.

### Judicial Acceptance of GBR Risk Allocation

With examples of attempted risk allocation gone awry outlined above, we now turn to the illustrative court cases upholding the GBR or equivalent soils report allocation of risk as enforceable and sufficiently specific to co-exist with the other indications in the contract.

### Case Study 1

The contractor in this case was awarded a contract to build a lock and gate bay for the Army Corps of Engineers in West Virginia. The scope of the work involved dewatering the work site by excavating a designated area to form a new cofferdam and building and implementing a dewatering system to lower the water table within the excavation area. The contract established baseline geotechnical conditions and conditions for dewatering. In addition, the contract contained disclaimers regarding the information provided in the geotechnical documents. After identifying pre-drainage design assumptions underlying the design of the prescribed minimum dewatering system, the contract documents went on to state that “these assumptions may or may not be completely valid” and such disclaimers regarding the minimum dewatering system appeared throughout the contract.

In its Type 1 DSC claim, the contractor alleged that the dewatering system specifications presented five conditions that differed from the actual work site conditions resulting in excess, unforeseeable costs. For example, the contractor claimed that the specifications falsely indicated that bedrock at the site was tight, the bottom of the cofferdam cells would form a tight contact with bedrock preventing excess water seepage, and that the excavation would be performed “in the dry.”

The court denied the DSC claim, holding that the con-

tract does not contain representations regarding subsurface conditions. Rather, the specifications “merely list baseline assumptions incorporated into the design of the minimum prescribed dewatering system” and advised the contractor on how to operate the dewatering system. The specifications as a whole put contractors on notice that they might have to augment the minimum system to fulfill the contract if conditions at the site differed from the assumptions undergirding the minimum prescribed dewatering system. The court also took up the validity of disclaimers that had been written into the contract. The court concluded that these provisions “expressly warned contractors to determine for themselves the necessity of supplementing the minimum required dewatering system to achieve desired worksite conditions, making plaintiff ultimately responsible for the construction and performance of the dewatering system.”

### Case Study 2

In this subway tunneling contract, the successful low bidder purchased a tunnel boring machine capable of tunneling at an average rate of 5 ft per hour through rock at the strength indicated in the bid documents, particularly the rock borings. At completion of the tunnel work, the contractor submitted a Type 1 DSC rock hardness claim. There appears to have been no question that the compressive strength of the rock in the tunnel alignment was approximately twice that indicated in the owner’s bid documents and boring logs.

The contract documents contained both an exclusion and a disclaimer that lead the court to deny the DSC claim. In the DSC clause itself, the contract stated that “the provisions of this article shall not apply to the rock conditions encountered during construction of this project.” In addition, the special provisions in a clause entitled “data relating to rock conditions,” reiterated that the DSC clause “shall not apply to rock encountered during construction of this project.” The contractor urged the court to disregard the exclusion and disclaimer on the ground that “to uphold the exclusion would practically nullify the DSC clause.” The court ruled in favor of the government, however, stating that the contract was “unmistakably clear” that the contractor, rather than the owner, must bear the risk of adverse rock conditions. The court stated, “Whether that action was wise is not for us to question, so long as it was clearly and unmistakably taken, and was not in violation of law, statutory or case.”

### Case Study 3

The contractor in this case was awarded a \$72 million contract to widen roadways, construct interchanges and build four new bridges in Virginia. The contractor brought a DSC claim based on “elevated lake water levels” at a nearby reservoir. The government denied the claim, relying on a site information clause that advised bidders that the water level of the lake “routinely fluctuates” by several feet and that directed bidders to review historical records to take into account non-routine “possible fluctuations” of those levels. The site information clause also advised bidders that the lake level fluctuations were “beyond the control” of the government.

The court denied the contractor’s DSC claim. The court held that the site information clause “unmistakably informed” the bidder that factors beyond the con-

trol of the government caused the lake water to routinely fluctuate by as much as several feet. The court stated that the contract established neither a baseline nor even a range of fluctuations, but instead advised [the bidder] that the water level of the lake routinely fluctuates by several feet. The court summed up the contract indications as follows: “The contract steered clear of making any binding representations on the subject.”

The bidder nonetheless claimed that the government had conceded liability to pay the contractor for delays due to high water by extending the contract completion date for this very reason. The court also rejected this contractor argument. The court held that merely granting additional time for an excusable delay does not give rise to compensation and that to hold otherwise would badly disorient the management of government contracts.

## APPLICATION OF THE FINDINGS

When reviewing the case studies as presented here, it becomes clear that it is critically important to clearly present baseline statements and avoid generalities and the risk of multiple interpretations. It is also clear that if the owner chooses to allocate a specific risk to a contractor that is not immediately evident on the boring logs, it is prudent to explicitly state the baseline condition. It is also important to note that the condition is different from what was encountered in the borings to avoid confusion and/or multiple interpretations. To illustrate this point, the following hypothetical case study is presented with suggested baseline statements:

A 60-in. diameter gravity sewer is to be constructed with trenchless construction methods at depths ranging from 20 to 30 ft below the ground surface. The geotechnical investigation for the project includes several borings and test pits that indicate relatively uniform geotechnical conditions. These consist of lacustrine deposits of primarily medium dense to dense sandy silt at the elevation of the tunnel excavation. No gravel, cobbles or boulders were encountered at any elevations in the borings or test pits. However, the site is located in an area that experienced historic glacial activity. As a result, the owner is concerned about the risk of encountering cobbles and boulders during tunneling, even though the geotechnical investigation indicates that these materials did not present a high probability of occurrence during tunneling. Further, the owner wants to place the risk of encountering the occasional boulder on the contractor, but is willing to accept the risk of encountering a large number of boulders or nested cobbles (considering that the risk of occurrence is very low).

In the preparation of the GBR, it is necessary to acknowledge that a baseline is established for encountering cobbles and boulders even though no cobbles and/or boulders were discovered during the geotechnical investigation. By doing so, the contractor (and the court) will be alerted that the baseline information is going beyond what was indicated in the borings and that the contractor should use this information to establish the bid price rather than just relying on the borings. Further, it is necessary to clearly indicate the number and size of boulders the contractor is to include in the base bid, so that a DSC can be clearly determined from the GBR. Therefore, to address the cobbles and boulders, a suggested baseline statement could read as follows:

“Although no gravel, cobbles or boulders were encountered during the geotechnical investigation for this project, the tunnel is going to be constructed in soils that went through historic periods of glaciations. As a result, glacial drop stones, ranging in size from gravel to boulders, can be encountered within the lacustrine formation. For the purpose of preparing the bid, the contractor is instructed to assume that 5 percent of the material by weight is gravel, 5 percent of the material by weight is cobbles and that five boulders will be encountered during tunneling operations. Boulders will have a maximum dimension of 18-in. in the longest dimension. The baseline makes no representation as to the location along the tunnel alignment where the gravel, cobbles or boulders will be encountered.”

In this case, it is important to acknowledge that the baseline statement is in conflict with the information gathered in the geotechnical investigation (i.e. no gravel, cobbles, or boulders were encountered in the borings, so the contractor is alerted that they need to base their bid on the baseline and not solely rely on the borings). In addition, although “trace gravel” and cobbles may be expected, “trace” is defined by the Unified Soil Classification System as containing “up to 5 percent by weight.” Since a reasonable interpretation of “up to 5 percent” may be 0 percent, it is important to baseline the upper bound of 5 percent.

## CONCLUSIONS

When the geotechnical engineer prepares a GBR, it is critically important to understand not only the technical implications of the baseline statements but also how the court will interpret each baseline, should a DSC arise. Without such knowledge, owners and engineers can sometimes establish geotechnical baselines that they believe to accurately reflect their desired allocation of risk. They then later find out during dispute resolution, that such statements do not have the legal interpretation that is in line with the original intent of the engineer who authored the report. In developing the GBR, it is important to remember that broad, generic statements attempting to transfer risk from the owner to the contractor are generally given little weight by the courts. Risk allocation is most effectively achieved with precise, clear statements that have only one reasonable interpretation. In addition, and contrary to what many geotechnical engineers believe, the contractor has the right to rely on all of the geotechnical information that was referenced in the bid documents for the project — not just what was provided to them in the GBR when preparing their bid price. As such, if a baseline is presented that differs from the borings (i.e. the baseline addresses boulders when no boulders were encountered during the geotechnical investigation), it is important to acknowledge the fact that the baseline is a departure from the information gathered during the geotechnical investigation in the baseline statement. Finally, since the GBR is a contract document with the potential to significantly impact the outcome of a DSC claim on a trenchless project, review by an experienced attorney prior to release of the document is highly recommended.

To view the complete version of Paper D-5-03, please visit [www.nastt.org](http://www.nastt.org).

# Calendar

## NASTT Training Courses, Conferences & Chapter Events

2012

### February

23-24

#### **NASTT's Cured-in-Place Pipe Good Practices Course**

Bowling Green, Ohio

**Contact Info:**

Alan Atalah

Phone: (419) 372-8354

E-mail: [aatalah@bgsu.edu](mailto:aatalah@bgsu.edu)

### March

11-15

#### **NASTT's 2012 No-Dig Show**

Nashville, Tennessee

**Contact Info:**

Web: [www.nodigshow.com](http://www.nodigshow.com)

Vicki Losh

Phone: (330) 467-7588

E-mail: [vlosh@benjaminmedia.com](mailto:vlosh@benjaminmedia.com)

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#### **NASTT's An Introduction to Trenchless Technology Short Course**

Nashville, Tennessee

**Contact Info:**

Web: [www.nodigshow.com/special-seminars/](http://www.nodigshow.com/special-seminars/)

Michelle Hill

Phone: (440) 638-4676

E-mail: [mhill@nastt.org](mailto:mhill@nastt.org)

14-15

#### **NASTT's HDD Consortium Horizontal Directional Drilling Good Practices Guidelines Course**

Nashville, Tennessee

**Contact Info:**

Web: [www.nodigshow.com/special-seminars/](http://www.nodigshow.com/special-seminars/)

Michelle Hill

Phone: (440) 638-4676

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14-15

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14-15

#### **NASTT's Cured-in-Place Pipe Good Practices Course**

Nashville, Tennessee

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Web: [www.nodigshow.com/special-seminars/](http://www.nodigshow.com/special-seminars/)

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14-15

#### **NASTT's New Installation Methods Good Practices Course**

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14-15

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

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**Questions? Please contact:**

**Mike Willmets, NASTT Executive Director**

**E-mail: [mwillmets@nastt.org](mailto:mwillmets@nastt.org)**

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