

Winter 2018
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NASTT HEADS WEST FOR THE 2018 No-Dig Show

Mike Willmets
NASTT EXECUTIVE DIRECTOR



IT'S ALREADY PROVING TO BE ANOTHER STELLAR year in 2018 here at NASTT. The 2018 Board of Directors kicked off its first meeting of the year in New Orleans. We have four new board members who are already infusing their excitement into the committee. We have a lot of exciting things on tap both at NASTT and for our upcoming annual No-Dig Show!

NASTT's 2018 No-Dig Show will be held in Palm Springs, California in March. We can't wait to head back to the West Coast for the first time since 2013. With more than 160 technical presentations, forum discussions with industry experts and pre- and post-course training classes, the educational component of NASTT's No-Dig Show is unmatched. The stars of the trenchless industry come together for this premier event. If you want to stay up on the latest techniques and innovations in trenchless, Palm Springs will be the place to be, March 25-29.

We're also excited for the show-stopping exhibition hall. More than 190 organizations will be present and ready to showcase their trenchless products and services. If you are looking for the latest innovations, or have a special need for an upcoming project, we bet you will find what you are looking for on the exhibit hall floor.

The networking aspect of the conference is really a highlight of the week. We start off with a festive breakfast event Monday morning. While you dine, take in industry awards presentations and truly great entertainment. Our special breakfast guest this year is Derreck Kayongo, founder of the Global Soap Project, and an award-winning speaker who promises an incredible experience.

Later in the day on Monday evening, NASTT's 17th Annual Educational Fund Auction and Reception may be the most fun you've ever had at an auction. Wear your 1950s-themed costumes and GET RETRO with us! Since 2002, NASTT has raised

more than \$1 million! Those funds are used in support of our many educational initiatives. Due to your generosity, NASTT can provide targeted trenchless training courses to the industry, publish trenchless resources manuals and sponsor university students' attendance at NASTT's No-Dig Shows, as well as award scholarships. We hope you will join us at the sock hop and help us reach our education goals again this year.

Tuesday evening is the jewel in our crown at NASTT's Gala Awards Dinner. This formal affair is a time for us to recognize some of the trenchless champions of our industry with the presentation of NASTT's Hall of Fame induction. The intent of NASTT's Hall of Fame is to preserve the outstanding accomplishments of exceptional individuals and to honor their contributions to the advancement of both the trenchless industry and the Society. This year, I am pleased to recognize Chris Brahler of TT Technologies, Ian Doherty of Trenchless Design Engineering and George Ragula of PSE&G. These fine gentlemen embody the spirit of the NASTT mission and have dedicated their careers to the promotion of trenchless technology. Read more about them, beginning on page 30.

Tuesday evening will also recognize the winners of the Chair Award for Lifetime Service, the Abbott Award for Innovation Products and Services in New Installation and Rehabilitation, and the Ralston Young Trenchless Achievement Award.

Every year, the industry comes together at NASTT's No-Dig Show to celebrate and support the great work we've all done in support of our trenchless efforts. Please consider joining us in March in Palm Springs. For more information on the show, be sure to check out the following pages in this publication and visit the conference website at nodigshow.com.

Michael J. Willmets
NASTT EXECUTIVE DIRECTOR



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Across the Trenchless Market



Frank Firsching
NASTT CHAIR

AS I BEGIN MY SECOND YEAR AS CHAIR OF NASTT'S Board of Directors, I'm pleased when I look back at the growth we saw in 2017 and excited with the continued expansion we anticipate in the coming year.

We saw our student chapters grow once again with the onboarding of Purdue University to our roster of prestigious university chapter members. This year we will also roll out a new tier of membership for university students not affiliated with one of our student chapters. We are so excited to be able to share our resources and knowledge with any student interested in pursuing a career in the trenchless industry. It is an exciting time to see so many young people interested in trenchless technology and dedicating their professional lives to this industry and our communities.

We have so much to look forward to at NASTT's 2018 No-Dig Show. Don Del Nero of Stantec will serve as this year's Program Chair and Cindy Preuss of HydroScience Engineers joins him as Vice Chair. We feel that the abstracts submitted for the 2018 program are the strongest we've ever seen and the technical schedule reflects that. If you've ever wanted to learn more about trenchless technology and the latest in the industry, you definitely need to join us in Palm Springs, California, in March.

NASTT exists because of our volunteers and the 2018 Board of Directors is comprised of some of the top people in our industry. One of our goals is to make sure our Board reflects an industry cross-section of segments that are represented by various categories. I'd like to introduce our newest Board members: Lisa Arroyo, Wastewater System Manager for the City of Santa Barbara, California, representing the municipal/public utility category; Maureen Carlin, Strategic Marketing Manager with Laney Directional Drilling, representing the manufacturers/suppliers/contractors category; Babs Marquis, Construction Manager with McMillen Jacobs Associates, representing

the consultants/engineers category; and Charles Pullan, Senior Project Engineer with the City of Calgary's Water Resources Department, representing the municipal/public utility category. We know your industry knowledge and leadership capabilities will benefit our organization and the industry.

I'd also like to recognize the outgoing members who volunteered for six years to serve on the Board of Directors. Thank you, Don Del Nero, Tunneling & Trenchless Practice Leader and Vice President at Stantec. Don also serves as our Program Committee Chair and as a NASTT Good Practices Instructor. Thank you, Brenda Kingsmill, Project Manager at the Regional Municipality of Halton. Brenda is also active on our Educational Fund Auction Committee and the Program Committee, among many others. Thank you, Kevin Nagle, National Accounts Manager at TT Technologies. Kevin has served not only on the Board of Directors, but also as the Treasurer of the Board. He serves on the No-Dig Show Program Committee and is active with his regional chapter, as well. And lastly, thank you to Dan Willems, Special Projects Manager at the City of Saskatoon. Dan is actively working with the Northwest Chapter and local industry in Saskatchewan and Manitoba to expand NASTT's presence across the Prairie Provinces. We appreciate all his time and commitment to so many NASTT committees and to the trenchless industry at large.

In the first issue of the New Year, we take pride in highlighting and thanking our board members, so please turn to page 20 to read about the newest board members and the returning ones who will continue their service in 2018.

Our members and volunteers are this Society. We truly thank you for your dedication.

Frank Firsching
NASTT CHAIR



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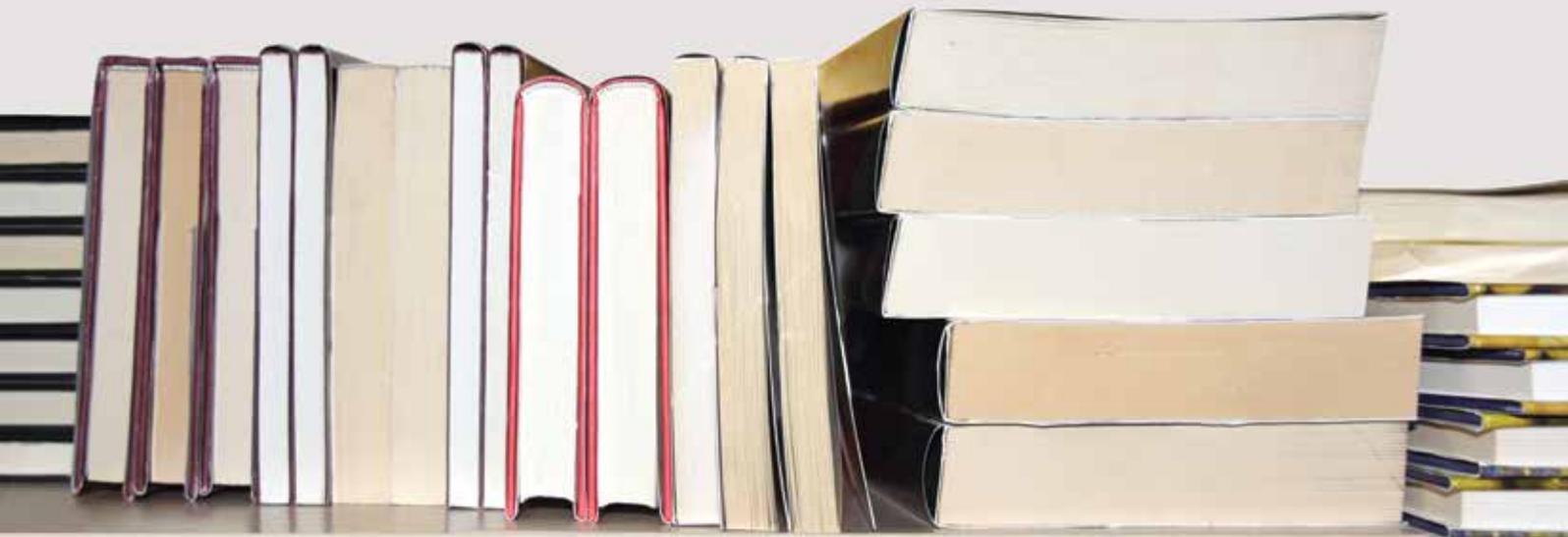




Michelle Hill
NASTT PROGRAM
DIRECTOR

Readers Make Leaders

NASTT TO RELEASE TWO NEW PUBLICATIONS IN 2018



AS MANY OF YOU KNOW, I HAD A BABY BOY back in June. One of the many goals I set for myself as a new mother was to read to him every night before bed. I remember my mom doing this with me, and I wanted to have that tradition with my new family.

Before Cole was even born I stocked his bookshelf with tons of books. “That’s Not My Puppy” and “Goodnight, Goodnight, Construction Site” have become our favorites that we read over and over. There’s something special about reading a new book, but what’s even more thrilling is the knowledge that is gained from each book we read.

We here at NASTT understand the excitement and necessity of new reading materials. Especially in this everchanging and evolving trenchless world we live in, it’s so important to keep up with the latest trends and techniques. This year we are excited to announce that we will be publishing two new books that serve as an introduction to our industry.

NASTT’s *Introduction to Trenchless Technology – Rehabilitation Methods Good Practices Guidelines* publication is intended to provide contractors, engineers, and utility owners with an overview of the many trenchless methods for the rehabilitation of existing pipelines. It can also aid more experienced individuals to refresh or reacquaint themselves with these constantly evolving technologies and applications.

It’s companion, NASTT’s *Introduction to Trenchless Technology – New Installation Methods Good Practices Guidelines*,

is intended to provide contractors, engineers, and utility owners with an overview of the many trenchless methods for the installation of new pipelines. As with its Rehabilitation counterpart, this book is also for the seasoned trenchless professional who is looking to brush up on the variety of techniques that are available.

Since 1990, the all-volunteer members of NASTT have presented non-commercial information about green alternative engineering methods to North American communities and beyond. All NASTT publications are peer-reviewed by volunteer industry professionals to ensure the highest quality in technical information. These publications were funded solely by NASTT as part of our educational outreach program.

These two publications will be available for sale at NASTT’s 2018 No-Dig Show in Palm Springs, California, in March. After the show they will be available in our online bookstore: nastt.org/resources/bookstore. I encourage you to check out our bookstore to view the descriptions of these books, along with our other trenchless offerings. All of these publications would be great additions for the bookshelves you have set up in your office, and like Cole’s books, can bring you a great deal of knowledge.

Michelle Hill
NASTT PROGRAM DIRECTOR

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A Conversation with Chris Macey



Macey

NASTT's *Trenchless Today* recently caught up with Chris Macey, Americas Technical Practice Leader for Condition Assessment and Rehabilitation at AECOM Canada Ltd., to discuss trenchless industry trends and market opportunities.

What first piqued your interest in the construction business?

I kind of stumbled into it. It was mainly above-average skills in math and science that led me to become an engineer. When I started school, I thought I could continue my irresponsible lifestyle for another four years without having to think seriously about growing up! My first exposure to life as an engineer after school was in underground construction. I really became fascinated by the organizational skills the contractor had and the process of taking a bunch of lines on a piece of paper and turning them into something real.

Tell us about your first introduction to the trenchless industry.

Trenchless construction has been practiced in Winnipeg, Manitoba (my home town), on a widespread basis since the 1960s. Even in new subdivision work, we would install utilities in a trenchless manner under where the roads would be, before the roads were constructed. This was in the late 1970s and early 1980s before "trenchless" was used as a buzzword. All of the pipe rehab programs I worked on focused on minimizing the construction footprint using horizontal earth boring (HEB) technology. By the mid to late 1980s, we were carrying CIPP lining contracts every couple of years, transitioning to annual contracts in the 1990s. Focusing on the intelligent use of trenchless work in an urban setting is all I have ever known.

What are your thoughts on the current state of the industry? What are the trends on the engineering side?

The trenchless industry is the strongest I have ever seen, growing every year perfecting the ordinary and expanding the envelope annually into the extraordinary. Being a "lining" guy, one of the biggest trends I see is in pushing the

transition from gravity to pressure pipe solutions. Given the success of gravity lining technologies and the fact that the pressure pipe rehabilitation market involves more than a trillion dollars of investment in North America in the next 20 years or so, perfecting a pressure pipe rehabilitation model is both a huge opportunity and challenge.

Speaking of challenges, what do you see as the biggest challenge facing the trenchless industry today?

I think the biggest challenge is maintaining high standards of quality given the rapidly increasing volume of work and its specialized nature. The industry has much more complex work to do than the core base of specialist engineers and contractors out there to deliver the work. This is a serious challenge. Trenchless isn't successful because it's easy. It is inherently more complex than traditional work. In large programs, this focus on maintaining high quality standards is essential to successful program implementation. Education, effective knowledge transference and making sure you maximize your ability to access the whole knowledge pool are important aspects of meeting that challenge.

How did you first get involved with NASTT? Briefly summarize some of your activities within the Society.

I have been a member of NASTT as long as I can remember. I got involved originally as a means to learn and disseminate knowledge by participating at the annual No-Dig Show starting in the late 1990s. I was fortunate enough to be part of the group that developed NASTT's CIPP Good Practices course in 2005 and later the CIPP Good Practice Guidelines publication in 2015. I have been teaching CIPP for NASTT (and upgrading the course material) in a lot of places ranging from the Gold Coast in

Australia to Anchorage, Alaska. It's been a very rewarding experience.

Do you see any particular needs in the way of education/training? Is the industry doing a good job of promoting the benefits of trenchless methods?

There is and will continue to be an increasing need for education and training in all aspects of trenchless, from preliminary selection of technology through design and construction to inspection, as the requirements are quite unique. I think the industry does a very credible job promoting the benefits of trenchless, although we can always do better in increasing people's awareness of both the benefits and in proper procurement and delivery of technology.

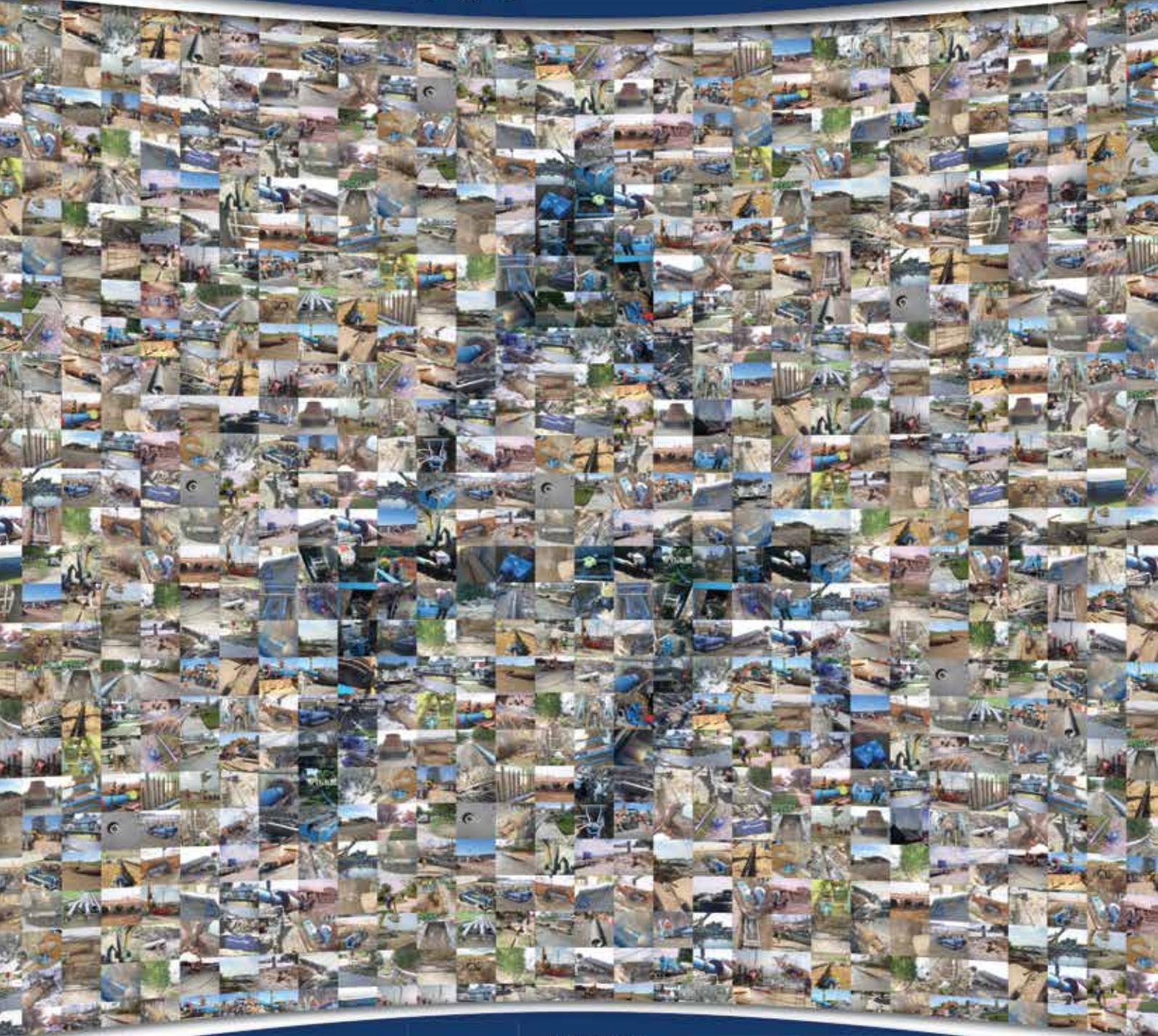
How has the acceptance of trenchless methods evolved?

While there is considerable growth to occur, it is a little daunting how large the industry has grown in the past 10 to 20 years. People used to think trenchless programs were for big cities only. The acceptance envelope has evolved into municipalities both large and small and to industries that are way outside the municipal base that started many trenchless technologies.

What do you enjoy most about working in the trenchless technology field?

The net benefit to society of working in a trenchless manner is immense. To be able to do the diagnostics we do and rehabilitate and create linear infrastructure with minimal impact on the public is quite an amazing thing. It's immensely satisfying to be part of that. The fact that there is so much more to learn, to perfect and to develop is also incredibly appealing. I either learn something every day in this business or just learn how to do things better. How can your day job life get better than that?

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In the Trenches

BY ANDREW FARR



Marc Lehmann

CDM SMITH

As far back as he can remember, Marc Lehmann had a desire to go into construction, rooted in his love of building.

“Ever since I was a kid I liked to build things – from Legos, to Pine-wood Derby cars, to being in the

Soapbox Derby, to my dad building a shed in the backyard,” he says. “Whatever needed built, I was in the middle of it.”

Lehmann selected engineering because he knew he wanted to shape the physical world. Involvement in the trenchless industry came later.

“I chose what I perceived at the time as one of the most stable, creative and interesting fields by studying civil engineering at Ohio University. Go Bobcats! I have never regretted that decision,” he says.

Early in his career, Lehmann worked on hydraulic models for sanitary sewer evaluation surveys (SSES) and inflow and infiltration (I/I) studies. In those days, he says, model inputs were mostly DOS-based and not the user-friendly graphical interfaces that are used today.

For the first six years of his career, Lehmann was tagged as a “data guy,” compiling VCR CCTV sewer inspection footage from SSES projects. From there, he experienced the transition from SSES projects that largely sat on a shelf to today’s living, breathing asset management projects that use GIS to link digital data to make intelligent decisions.

“I found that my strengths didn’t lie in the actual modeling, but rather with figuring out why a model and a flow meter could be so different,” he says. “This led me to analyzing hydrograph shapes, visiting project areas, reviewing and categorizing sewer inspections, managing all this data in a logical way to be accessed quickly and easily, and finally recommending appropriate repair and rehabilitation technologies in an informed way. Analyzing and extending the useful life of buried infrastructure has been my focus ever since.”

Today, Lehmann works as a project manager for CDM Smith in its Columbus, Ohio, office. He credits the underground construction industry as being receptive to new techniques and approaches in pipeline rehabilitation, noting that the complexity of projects is resulting in efficiency and innovation.

“Our nation’s infrastructure is rapidly showing its age and we have the opportunity to improve it before it fails,” he says. “The trenchless industry is all about finding the better, faster, cheaper and safer ways to improve and build new un-

derground infrastructure. Each project has extremely unique challenges where we can use our creativity and innovation to develop better solutions for our clients.

“I am encouraged by the number of emerging technologies in our industry, but it can be difficult to vet these technologies or find a common baseline for comparison,” he continues. “These challenges certainly keep the industry on its toes.”

During his time working in the trenchless industry, Lehmann has also embraced a role as a volunteer and advocate. He first joined NASTT when his mentor, John Schroeder, suggested he submit an abstract for NASTT’s No-Dig Show. Soon after, Lehmann was presenting papers and serving as a session leader at the No-Dig Show and now serves on the No-Dig Show Program Committee.

“Through NASTT and the No-Dig Show, I have had the opportunity to network with industry leaders many of whom I now call fiends and can call with technical questions,” he says. “I tell our younger engineers they will learn more walking the floor and talking to the vast number of exhibitors from across the country in one day than they will learn in years sitting in their office.”

While his love of shaping the physical world has never waned, Lehmann cites some other reasons for his continued interest in working in the trenchless industry.




Sam Ko Joins Bennett Trenchless Engineers

We are pleased to announce that Sam Ko has joined the firm as an Associate Engineer. Sam is a recent engineering graduate of Sacramento State University. Welcome to the Trenchless Industry, Sam!

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“To me, it is equal parts the people in the industry and the pace of work,” he says. “While I first started out basing my career on a few classes in college, it has been the people in the industry who have kept me in it. Our local team enjoys the work that we do and it creates a fun and enjoyable working environment. The typical pace of a rehabilitation or condition assessment project is pretty fast. So, with a great team, it keeps my days varied and interesting.”



Mary Neher
BENNETT TRENCHLESS
ENGINEERS

Mary Neher is one of the rising stars in trenchless engineering and her accomplishments thus far in her young career have brought her industry-wide recognition.

“I’ve enjoyed making and building things for as long as I can remember and, since I always loved math and science in school, pursuing a career in engineering was a natural fit,” she says.

In 2016, Neher was the recipient of NASTT’s Ralston Award for Young Trenchless Achievement.

“Receiving the Young Trenchless Achievement Award was a huge honor and a really amazing experience. Being asked to stand on the same stage where NASTT was recognizing some of the greatest contributors to the industry for their lifetime of achievements was incredibly humbling,” she says, referring to her receiving the award the same night NASTT inducted its 2016 Hall of Fame class. “I hope that one day when I look back on the entirety of my career I will have lived up to the potential that NASTT and my wonderful mentors at Bennett Trenchless see in me and will have achieved even a part of what those luminaries have.”

Neher’s first exposure to the construction industry, she says beyond looking curiously through the window at all of the awesome machinery while driving past job sites, was through an internship with an HVAC company in college.

“They introduced me to a wide range of the work that goes into making a construction project successful, from estimating and bidding all the way through construction management,” she says. “It really opened my eyes to the challenges and complexity of building things on a large scale, and after that I was hooked.”

Neher’s specific introduction to trenchless technology came at NASTT’s 2007 No-Dig Show in San Diego. Neher was graduating from UC Berkeley in May that year and the Bennett Trenchless team flew her down to Southern California to introduce her to the industry and interview her for a position with the company. “I sat in on technical paper sessions, explored the exhibit hall and met a bunch of people who were really excited about what

was going on in the industry,” she says. “It was a fantastic experience that I look back on fondly.”

Now working as a design consultant exclusively on trenchless work, Neher says she has had the amazing opportunity of being involved on a very wide range of new installation projects – from less than 100-ft auger bores to several-thousand-ft HDDs and just about everything in between.

She explains one project that wrapped up construction in 2017 that stands out in her mind as significant – a 3,000-ft HDD to install a new 12-in. recycled water pipeline. “What made it particularly noteworthy was that the new pipeline connected a tank at the top of a mountain to a pump station at the base so there was an over 500-ft elevation difference between the entry and exit points,” she explains. “This introduced a number of interesting and rather novel design challenges that had to be overcome.”

Neher says she is excited by the current state of the trenchless industry, noting that while the small, niche market faces several challenges, the realm of capabilities that exist to complete difficult projects is very much expanding. And that brings a new set of challenges.

“Every year we are pushing the boundaries of what is achievable,” she says. “There are projects being completed today that would have been deemed impossible when I started in the industry 10 years ago. With that being said, as specialty consultants, one of the challenges we’re running into these days is that there don’t seem to be many straight forward, ‘easy’ jobs anymore.”

One of the challenges that has long plagued growth in the trenchless industry is owner acceptance. From Neher’s perspective, the industry has certainly made progress in this area, and she says a challenge that exists now is making sure projects that require complex trenchless methods are actually feasible.

“We as an industry are growing so quickly that many more people are being exposed to trenchless technology and how it can help them achieve the results they’re looking for,” she says. “However, on the design side of things at least, this has resulted in some issues with engineers being asked to put trenchless design work out on the street without adequate knowledge to design a constructible project. NASTT is doing a great job of providing educational resources but I think there continues to be an opportunity to address the lag between engineers/owners being exposed to the benefits of trenchless and having adequate knowledge to design trenchless projects.”



Mark Wade
BLUEWATER SOLUTIONS GROUP

Mark Wade was putting himself through college, working during the summer months as a welder and structural steel fabricator for a general building contractor outside of

Detroit. Although he was still working on his civil engineering degree, it was during this time when he knew he truly wanted to devote his career to infrastructure, fixing it or building it.

While working in the late 1970s for his first employer, a global consulting firm, Wade was assigned to many projects associated with the EPA-funded construction grants to reduce sanitary sewer overflows (SSOs). It was during those years that several new technologies were being developed to assess the internal condition of collection systems. As more emphasis was placed on reducing I/I as part of larger wastewater infrastructure upgrades, the consulting community began to explore technologies to address I/I issues and improve hydraulic performance. This, of course, all started with a new company at the time from England called Insituform.

“My first exposure to CIPP was a demonstration by Insituform of their proprietary inversion system for the St. Louis MSD,” Wade recalls. “I was immediately captivated by it and the possibilities that such a system offered to other cities and agencies.”

Having always worked on the consulting engineering side of the industry, Wade launched Wade & Associates in 1988 and began a 19-year period of helping clients achieve their goals to improve buried pipeline assets using a constantly evolving and growing tool box of inspection and trenchless renewal tools and technologies. In 2007, the group was acquired by CH2M Hill and expanded its base to include global projects. In 2014, Wade left CH2M Hill and formed BlueWater Solutions Group along with a group of colleagues. Today, he is president of BlueWater Solutions and the firm has expanded its services to include inspection, assessment and trenchless renewal of water distribution systems. “[After] 40 years, I’m still engaged daily on projects that are rooted in the trenchless industry. Crazy,” he says.

Wade notes that over the course of his career, he’s witnessed amazing advancements in non-invasive technologies that have helped revolutionize the trenchless industry but also made it more competitive.

“The trenchless industry has finally reached a level of maturity where almost any pipeline or other buried structure can be inspected and rehabilitated without much actual excavation,” he says. “Most trenchless technologies are highly cost-competitive, particularly as more companies and competitors have entered the industry during the past 10 to 20 years.”

Wade also credits industry education and promotion as having a profound impact on owner acceptance of the technology and methods.

“The growth of specialty conferences including national, regional, and even statewide venues have also been an incredible resource for exposure of these systems to utility contractors, suppliers, municipalities, consultants, software and I/T developers, and government regulators,” he says. “We simply are getting better and better at this no-dig business.”

Wade joined NASTT in 1990 and immediately got involved with its regional chapters, MSTT, SSETT and RMSTT. “I’m quite certain that I’ve attended every conference since then,

presented as a speaker at most, and exhibited at some,” he says. “Back in the early days I collaborated with academic visionaries such as Tom Iseley, Mo Najafi, Ray Sterling and Rob McKim. I’m grateful to those who helped pioneer and raise the science and understanding of trenchless pipeline renewal.

“I think the many levels of training and education regarding trenchless are indeed meeting the needs of the industry,” he explains. “This is particularly true as we see more interest in other professional associations and societies to fold in and highlight no-dig topics at their own conferences, workshops and webinars.”

His respect and admiration for his colleagues at BlueWater Solutions and in other facets of the industry can be summed up in Wade’s description for the trenchless professional.

“They’re serious minded, problem solvers who still enjoy their work and the challenges that they face daily,” he says. “No egomaniacs needed here...we fix stuff that no one knows about unless it’s coming up through the basement floor drain.”

ANDREW FARR is the associate editor of *NASTT’s Trenchless Today*.

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Sunny Days Ahead for Trenchless Industry



NASTT'S 2018 NO-DIG SHOW HEADS TO PALM SPRINGS, CALIFORNIA

NASTT'S ANNUAL NO-DIG SHOW is generally billed as the largest and most comprehensive conference in North America devoted entirely to trenchless technology. Each year the conference successfully engages all industry segments – municipalities, engineers, contractors, manufacturers and service providers – to help showcase the latest advancements across the trenchless market.

But what sets NASTT's No-Dig Show apart is the people, namely the trenchless experts who volunteer their time as course instructors, session leaders, technical paper presenters and, most of all, the industry legends and pioneers who are recognized throughout the week.

"The case can be made that trenchless engineering and construction is one of the most innovative industries in the world today, and NASTT stays at the forefront of this innovation," says Don Del Nero, tunneling and trenchless practice leader at Stantec and this year's No-Dig Show Program Chair.

Located on the western edge of the Coachella Valley, Palm Springs boasts that it has 350 days of sunshine and an average winter temperature always in the 70s.

From March 25-29, the global community of trenchless professionals will gather in "Hollywood's playground" for NASTT's 2018 No-Dig Show at the Palm Springs Convention Center.

In 2017, NASTT's No-Dig Show attracted a record number of exhibitors and nearly 2,300 attendees for five days of trenchless networking, technical papers and innovative products. This year, the attendee count is expected to continue the upward trend it started at the record-breaking 2015 show in Denver, while more than 160 exhibitors are already signed up.

"This year's event will include one of the strongest programs assembled to date," adds Del Nero. "Coupled with three industry forums, the technical sessions and exhibit hall will offer any industry member a wealth of options to enhance their career footprint."

Smart phones and social media apps are becoming the norm at conferences, and NASTT's No-Dig Show is no different. For 2018, the NASTT's No-Dig Show smart phone app has been updated to give attendees unprecedented access to the No-Dig community. Everything you need to make the most of your time at the show can be found on the interactive app, which also allows you to share photos and "like" and comment on other app users' posts throughout the conference. Visit nodigshow.com/mobile-app to learn more. To download, visit the preferred app store for your device, download "CrowdCompass Attendee Hub" and search "NASTT's No-Dig Show" to join the fun.

The Technical Program

Returning to the technical program once again this year are the popular No-Dig Show forums – 50-minute interactive educational sessions featuring trenchless experts who take part in a focused panel discussion that encourages attendee participation. The forums take place during the technical sessions and focus on: Owner Differing Site Conditions, March 26, moderated by Jennifer Glynn, Woodard & Curran; Claims, March 27, moderated by Don Del Nero, Stantec; and Close Fit Sliplining Technologies, March 28, moderated by Cindy Preuss, Hydro-Science Engineers.



The interactive No-Dig Show forums have been a hit in recent years.

NASTT's 2018 No-Dig Show Technical Paper Program has scheduled more than 160 peer-reviewed technical papers to be presented, focusing on a wide range of trenchless topics, including horizontal directional drilling (HDD), CIPP, micro-tunneling, inspection, asset management, pipe jacking and ramming, water and sewer rehabilitation, inspection and project planning. Papers are presented in a six-track schedule and grouped mostly by subject matter so attendees can choose to attend six presentations at any given time. Additionally, the forums will be dispersed throughout the program.

"Mixed into our technical program are three forums, two of which are directly pertinent to some of my own active design projects," says Preuss, who also serves as this year's No-Dig Show Program Vice Chair. "The forums have become one of my most favorite parts of the annual conference, given the panelists are especially competent in the subject matter and our participating audience members ask great questions and provide valuable input, as well."

Networking Events

NASTT's 2018 No-Dig Show officially gets under way with its annual Kick-Off Breakfast from 7:30 to 9:15 a.m., on Monday, March 26. During the breakfast, *Trenchless Technology* editor Jim Rush and managing editor Sharon M. Bueno, along with



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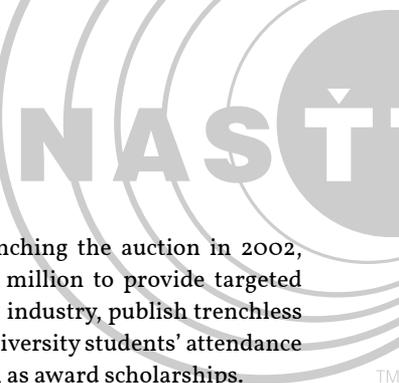
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publisher Bernard P. Krzys, will formally recognize *Trenchless Technology's* 2018 Person of the Year. Look for a complete profile of the award-winner in the March issue of *Trenchless Technology*. In addition, *Trenchless Technology* will also formally recognize the recipients of its 25th annual Projects of the Year for Rehabilitation – the West Palm Beach Force Main Rehabilitation Project – and New Installation – the Rebecca Trunk Wastewater Main Project in Oakville, Ontario, Canada.

Also at the breakfast, NASTT will introduce its incoming Board members for 2018 and preview the show for attendees. The breakfast will close with NASTT's 2017 Outstanding Papers in Rehabilitation and New Installation Awards.

Later that night, NASTT's 17th annual Educational Fund Auction & Reception will be held from 5:30 to 7 p.m. This fundraising event benefits NASTT's educational initiatives. The auction and reception is known for its themed fun, and this year, NASTT is asking attendees to "Get Retro." It's a fitting theme since Palm Springs was where the Rat Pack used to play and stay. As always, attendees are encouraged to dress accordingly in their best 1950s-themed attire. As always, the event will feature a costume contest, the tropical vacation raffle and 50/50 raffles. This year's live auction sponsor is Aegion, along with auction reception sponsors Bennett Trenchless Engineers, Ditch Witch

and Interplastic Corp. Since launching the auction in 2002, NASTT has raised more than \$1 million to provide targeted trenchless training courses to the industry, publish trenchless resource manuals and sponsor university students' attendance at NASTT's No-Dig Shows, as well as award scholarships.



NASTT's Education Fund Auction has raised more than \$1 million since 2002.



The Gala Awards Dinner features the induction of NASTT's new Hall of Fame class.

On March 27, NASTT will host its annual Gala Awards Dinner, headlined by the induction of NASTT's 2018 Hall of Fame Class: Chris Brahler, president and CEO of TT Technologies; Ian J. Doherty, B.A.Sc., P.Eng., president of Trenchless Design Engineering Ltd.; and George Ragula, distribution technology manager at PSE&G. The event will also feature the presentation of NASTT's Abbott Innovative Product Awards in Rehabilitation and New Installation, NASTT's Chair Award for Outstanding Lifetime Service and the Ralston Award for Young Trenchless Achievement. On Wednesday, March 28, the No-Dig Show Closing Luncheon will begin at 12:30 p.m., the final event for NASTT's 2018 No-Dig Show. The luncheon provides a recap of NASTT's initiatives going forward as the No-Dig Show's next program chair, Cindy Preuss, will preview NASTT's 2019 No-Dig Show in Chicago. For more info, visit nodigshow.com.

"I look forward to seeing you all in a forum, technical paper session, exhibit hall or one of the many networking events lined up," says Preuss. "Palm Springs here we come!"

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CALL
for Abstracts

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The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2019 No-Dig Show in Chicago, Illinois at the Donald E. Stephens Convention Center on March 17-21, 2019. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. **The abstracts must be submitted electronically at NASTT's website by June 30, 2018: nastt.org/no-dig-show.**

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

Potable Water and Pressure Systems

- Pipeline Inspection, Locating, and Condition Assessment
- Pipe Rehabilitation
- Pipe Bursting
- Emerging Technologies
- Case Studies

Wastewater, Storm water, and Non-pressure Systems

- Advanced Pipeline Condition Assessment
- I&I and Leak Detection
- Pipeline and Laterals Rehabilitation
- Pipeline Inspection, Locating, and Condition Assessment
- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Spray Applied Linings
- Grouting
- Manhole Rehabilitation
- Case Studies

Energy Pipeline Systems

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

Trenchless Research and Development

- University and Industry Initiatives
- Education and Training

Industry Issues

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

New Installations – Tunneling, Boring and Pipe Ramming

- New Concepts or Trenchless Equipment, Materials and Methods
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)
- Case Studies

Horizontal Directional Drilling (HDD)

- New Concepts and Applications for Horizontal Directional Drilling Equipment, Materials and Methods
- Case Studies

Microtunneling

- New Concepts and Applications for Microtunneling Equipment, Materials and Methods
- Case Studies

For more information visit
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Questions? Please contact:

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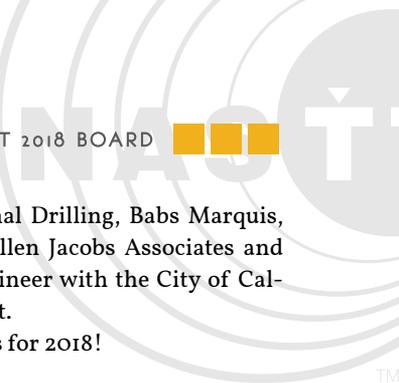
The No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at nastt.org.



Meet NASTT's 2018 Board of Directors

NASTT's Leadership, Representing All Industry Segments,
Guides the Society's Many Educational Initiatives





MANY OF THE ACTIVITIES ON NASTT'S ANNUAL TO-DO LIST can be broken down into four initiatives the Society uses to describe its role in the trenchless industry – educate, train, research, publish.

Of course, none of this would be possible without NASTT's countless volunteers who make the organization a go-to resource for the North American trenchless technology industry. At the top of this effort are the individuals who set the tone for the association's goals, growth and future direction.

Each year, NASTT's Board of Directors work tirelessly to coordinate the activities and events of the organization on behalf of the membership. The Board is made up of 20 executive officers and directors from across North America who are elected by the Society's members each fall.

Ending their tenure on the Board in 2017 were Don Del Nero of Stantec, Kevin Nagle of TT Technologies, Brenda Kingsmill of the Regional Municipality of Halton and Dan Willems of the City of Saskatoon. NASTT would like to thank Don, Kevin, Brenda and Dan for their outstanding contributions to the Board and looks forward to continuing to work with them in other facets of the Society.

At the same time, NASTT's Board is very excited to welcome Lisa Arroyo, Wastewater System Manager for the City of Santa Barbara, California, Maureen Carlin, Strategic Market-

ing Manager with Laney Directional Drilling, Babs Marquis, Construction Manager with McMillen Jacobs Associates and Charles Pullan, Senior Project Engineer with the City of Calgary's Water Resources Department.

Meet NASTT's Board of Directors for 2018!

Executive Officers

Chair & International Representative

Frank Firsching, B.Sc., MBA

PRESIDENT, INFRASTRUCTURE SOLUTIONS, AEGION



Frank Firsching is president of Aegion's Infrastructure Solutions, which is comprised of the global businesses of Insituform Technologies, Fyfe Co., Fibwrap Construction Services, MTC and Underground Solutions.

Prior to this role, his positions included executive vice president, general manager and executive vice president of sales for Underground Solutions. Be-

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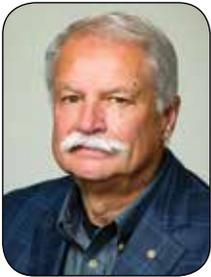


fore joining Underground Solutions in 2006, Frank worked for USFilter Corporation as President of the \$1 billion Water and Wastewater Systems Group with responsibility for USFilter's global process equipment and technology divisions. Frank also held the positions of Executive Vice President of the Process Water Group, West Regional Manager and General Manager during his 13 years at USFilter. Prior to joining USFilter he worked at Deloitte & Touch Management Consulting and at GE Corporation. He received an MBA at the Wharton School Business and a B.S. in Mechanical Engineering from the University of Virginia.

Vice Chair

Ed Saxon, P.E.

GENERAL MANAGER, BEAUFORT-JASPER WATER & SEWER AUTHORITY (BJWSA)



Ed Saxon, P.E., is the general manager of the Beaufort-Jasper Water & Sewer Authority (BJWSA) in South Carolina. A native of South Carolina, Ed earned a bachelor's and master's in mechanical engineering from the University of South Carolina. He worked for DuPont and Conoco for 13 years before moving to Beaufort in 1989 to join BJWSA as the chief engineer. Under Ed's leadership,

BJWSA has been utilizing trenchless technologies since the late 1980s to expand service to the island communities and to rehabilitate aging sewer system. BJWSA has employed different contracting methods to share risk as innovations in the trenchless technology industry are introduced.

Ed is active in many water/wastewater and engineering professional organizations and is the current president of the South Carolina Water Quality Association. Along with being NASTT's Vice Chair, he serves as the Chair of the Young Trenchless Award committee. Ed is also extremely community minded as past president of the local Rotary Club; former Board Member and Campaign Chair for the United Way; and former member of Beaufort Chamber Board and Economic Alliance Board. Ed enjoys golfing, boating and fishing in the local saltwater creeks.

Secretary

Joe Lane

GENERAL MANAGER, INSITUFORM PACIFIC PTY LTD.

Joe Lane is general manager of Aegion's Insituform Pacific pipeline rehabilitation business unit based in Australia.

Prior to this role, he served as president of an international energy services pipeline rehabilitation company and as a consultant for the trenchless industry. Joe started his career in the trenchless pipeline industry with Insituform in 1991, holding positions in business development, BD management, operations, training and business unit management general manager of the central and western regions of the United States.



Joe holds a Bachelor's Degree in Biology from the University of Northern Colorado and is a graduate of the University of Michigan School of Business Management and the Leadership Program of the Rockies. He is active in several water and energy pipeline focused organizations, is an Executive Board Member for the North American Society for Trenchless Technology

(NASTT) and is Past President of the Rocky Mountain Chapter of NASTT.

Treasurer

Michael Davison, P.Eng.

PRODUCT DIRECTOR, AQUA-PIPE DIVISION, SANEXEN ENVIRONMENTAL SERVICES INC.



Michael Davison, P.Eng. is product director for the Aqua-Pipe division at Sanexen Environmental Services Inc., in Montreal, Canada. Since 2002, he has been involved in the design and manufacturing of the product, the creation and maintenance of installation operation procedures, training of operators and licensees, the development of QA/QC procedures, the planning

and management of the largest Aqua-Pipe projects to date and improvements through research and development. Mike is currently the lead for all technical aspects within the Aqua-Pipe team.

A graduate of McGill University in Civil Engineering, Mike is an active member of NASTT's No-Dig Program Committee and is a technical session leader. He is also involved in ASTM International standard committees and is the Chair of the American Water Works Association (AWWA) standards and M28 CIPP subcommittees. Mike is a member of the American Society of Civil Engineers (ASCE), and also works locally to improve the trenchless industry with the Bureau de Normalisation du Québec (BNQ).

Outside of the office, Mike is an avid hockey player, coach and fan.

Officer-at-Large

Craig Vandaele

GENERAL MANAGER, MICHELS TUNNELING & MICHELS CORP.



Craig Vandaele is a general manager for Michels Tunneling and Michels Corp. He oversees business development, estimating, and assists with the overall management of Michels' tunnel operations in the United States and Canada.

Craig has more than 17 years of design, inspection and construction experience in the North American tunneling and trenchless technology industries.

In his 10 years at Michels, Craig has served as the project manager on many significant tunneling, HDD and cured-in-place pipe (CIPP) rehabilitation projects. Among them are the McOrmond Drive Sanitary and Storm Sewer Trunks in Saskatoon, Saskatchewan, Canada; Big Lake Offsite Gravity Portion (W14) in Edmonton, Alberta, Canada; Vancouver City Central Transmission Project, Vancouver, British Columbia, Canada; and Upper Northwest Interceptor Sections 3 & 4 in Sacramento, Calif. He has worked on projects that include

conventional tunneling, microtunneling, slurry shield tunneling, pipe jacking, pipe bursting, CIPP and shaft construction of various types and sizes.

Craig is proud to be a leader and an advocate of the trenchless technology industry. In addition to the national Board of Directors, he serves as the Chair for NASTT's Northwest Chapter. He has also co-authored papers for No-Dig Shows and has won awards for his projects and papers.

Immediate Past Chair

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

PRESIDENT & PRINCIPAL ENGINEER, STAHELI TRENCHLESS CONSULTANTS INC.



Kimberlie Staheli is the president and founder of Staheli Trenchless Consultants in Seattle, Washington, a trenchless engineering consulting firm specializing in the design and construction management of all types of high risk trenchless projects for more than 20 years.

Kim has a B.S. in Mechanical Engi-



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and
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neering 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 Registered Professional Engineer in Washington, Oregon, California, Colorado, Ohio and Florida

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.

Directors

Erez Allouche, Ph.D., P.Eng.

TECHNOLOGY LEADER, TUNNELING AND TRENCHLESS GROUP, STANTEC CONSULTING LTD.



Dr. Erez Allouche is the trenchless technology leader for the Tunneling and Trenchless Practice at Stantec, specializing in the condition assessment and rehabilitation of large diameter pipes, as well as the design of complex HDD crossings. Prior to joining Stantec, he was an associate professor of civil engineering at Louisiana Tech University, the Director of the

Trenchless Technology Center, and the holder of the T.L. James Eminent Scholar Chair in Civil Engineering. He is a licensed professional engineer registered at the Province of Alberta, Canada.

For the past 17 years, Erez served as the PI and Co-PI of research projects in the area of buried infrastructure totaling more than \$14 million, and supervised 50 graduate students in this field. Many of these students are practicing professionals or educators in the fields of municipal engineering or construction management. He is the inventor (or co-inventor) of 17 patents in the area of trenchless technologies, and the author (and co-author) of more than 260 publications in the fields of buried infrastructure management and trenchless techniques, including 64 peer-reviewed journal papers. He is also the co-founder of two start-up companies based in Ruston, Louisiana. He is also an associate editor of the ASCE Journal of Pipeline Systems.

Lisa Arroyo, P.E.

WASTEWATER SYSTEMS MANAGER, PUBLIC WORKS, CITY OF SANTA BARBARA



Lisa Arroyo is the wastewater system manager for the City of Santa Barbara, California, where she oversees a staff of 55 who are responsible for operating and maintaining an 11 MGD wastewater treatment plant, 3 MGD recycled water facility, 256 miles of wastewater collection system infrastructure and a water resources laboratory. Lisa holds Bachelor of Science

in both mathematics and in civil engineering and is a licensed professional civil engineer.

During her 16-year tenure with the City of Santa Barbara, Lisa has risen through the ranks, holding progressively increasing roles of responsibility in the areas of engineering design, project development and program management. Currently she oversees the operations and maintenance of the wastewater treatment plant and collection system, and manages a multi-million-dollar Capital Improvement Program that is focused on upgrading the waste treatment plant's processes and annually replacing or lining approximately three miles of wastewater collection system mains.

Lisa is an active wastewater professional and was elected to the Board of Directors for the Western Chapter of NASTT in 2016, where she served as the Secretary. Lisa has long been a champion of trenchless technology, as it is proven to be both an effective and economical solution for improving wastewater collections systems.

Maureen Carlin, Ph.D.

STRATEGIC MARKETING MANAGER, LANEY DIRECTIONAL DRILLING CO.



Maureen holds undergraduate degrees in civil and architectural engineering from the Missouri University of Science & Technology (2005) and a MBA from University of Nevada-Las Vegas (2011). She has more than 11 years of experience in construction engineering and management for both vertical commercial construction and buried pipeline construction.

Maureen received her Ph.D. from Arizona State University in December 2014 in Civil Engineering with an Emphasis in Construction Engineering and Management. At Arizona State, she became involved with trenchless technologies and NASTT while working closely with her advisor Dr. Samuel Ariaratnam. Under his advisement, Mau-

reen spent extended time in mainland China developing her dissertation studying horizontal directional drilling methods in China compared to North America. She is former NASTT No-Dig Show student chapter presentation and student poster competition winner from her time at Arizona State.

During the summer of 2014, Maureen moved to Houston, Texas, to join Laney Directional Drilling as a project engineer and to complete her dissertation. Since then, Maureen has continued to work in the estimating and engineering department at Laney and was recently promoted to Strategic Marketing Manager at Laney.

Alan Goodman

GLOBAL SALES MANAGER, HAMMERHEAD TRENCHLESS

Alan Goodman has more than 15 years of experience in the underground construction industry. He started his career working in the auger boring industry as a sales representative and is currently employed with HammerHead Trenchless as the Global Sales Manager in the Unit-

ed States and Canada. Fluent in Japanese, Alan studied abroad in Japan and served as the Ambassador for the rotary exchange group. Alan completed his education with a B.A. in International Business from the Stephen F. Austin State University in east Texas.



During his tenure at HammerHead Trenchless, he has worked closely with municipalities, engineering firms, and contractors around the world providing customer training, technical support, pre-project planning, project specifications, and installations for pipe ramming, pipe bursting, cured-in-place pipe (CIPP) and other trenchless projects.

Alan also serves as the vice chair of NASTT's South Central regional chapter and is an active member of the following industry associations: NUCA (National Utility Contractor's Association), Alliance for PE Pipe, NASSCO (National Association of Sewer Service Companies), IPBA (International Pipe Bursting Association), AGA (American Gas Association), PLCA (Pipe Line Contractors Association) and PLCAC (Pipe Line Contractors Association of Canada).

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Tony Hranicka, P.E.

OWNER, TONY HRANICKA LLC



Tony Hranicka currently works for ULC Robotics as an LLC consultant helping project managers and engineering teams to develop robotics systems ranging from concept to commercialization for the utility/energy industry. He plays a role in the R&D department by supporting all facets of the development of new products and services, working with ULCR's management team, administrative staff and engi-

neers to ensure projects are performed on time, on budget and at the highest level of quality.

Tony previously worked for PPM interacting with gas utilities and other pipeline industries. He also previously worked for the Gas Technology Institute (GTI) as a senior engineer in the Delivery Sector working on infrastructure improvement research projects.

Tony has a diverse background in gas distribution engineering and operations during his 33-year career. His expertise includes planning, coordinating, managing and putting into place new technologies, both procedural and equipment-focused, with particular emphasis on increasing the use of various trenchless technologies.

He is a member of the American Society of Mechanical Engineers since college, and holds a Professional Engineering license in New York State since 1989. Tony is the recipient of the American Gas Association 2007 Gas Industry Research Award for commercialization of CISBOT, a robotic rehabilitation system for live gas mains. He received both his Bachelor of Mechanical Engineering in 1980 and a Master of Engineering in 1985 from Manhattan College. Lastly, a Master of Science was completed from the New York Institute of Technology in 1997.

Larry Kiest, Jr.

PRESIDENT, LMK TECHNOLOGIES, LLC



Larry Kiest Jr. is an innovator, inventor and entrepreneur who has worked in the underground and trenchless utility industry for more than 30 years. Larry started his career as a Licensed Master Plumber in Ottawa, Ill., in the early 1980s, and in 1993, founded LMK Technologies. Throughout his career, Larry has grown as an internationally respected leader and speaker in the trenchless industry and holds 117 patents issued throughout North America, Europe and Australia for the innovative solutions and products he has developed. He is personally responsible for the issuance of ASTM standards F2561 and F2599 and is currently balloting two additional ASTM standards.

In 2013, Larry was honored as the *Trenchless Technology* Person of the Year. In 2014, LMK was named a top 10 winner of the prestigious Chicago Innovation Awards and Larry was featured on "Boot-

strapping in America," in a live online TV interview. Larry is a member of NASTT's No-Dig Show Program Committee and an Advisory Board member for the Trenchless Technology Center at Louisiana Tech University. He is also involved in other industry associations like NASSCO, ASCE, ASTM and WEF. Larry has had technical papers published in ASCE Pipelines Journal, *NASTT's Trenchless Today* and in NASTT, ISTT and UCT conference proceedings.

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Gerard P. Lundquist, P.E.

DIRECTOR OF GAS CONSTRUCTION NEW YORK, NATIONAL GRID



Gerry Lundquist is a director with National Grid, an International Electric and Natural Gas Transmission and Distribution Company. He is the director of gas construction for New York State and has more than 30 years of experience in all phases of construction, design, engineering and project management. His responsibilities include the execution of the capital work plan while also insuring the safety, security and reliability of the natural gas distribution system. Prior assignments have included Project Manager for the JFK Airport Cogeneration Facility and the Stony Brook Cogeneration Facility. He integrates innovative technologies to reduce costs and increase operational efficiencies.

Gerry has a bachelor's in civil engineering from The Cooper Union, a master's in business administration from Adelphi University and a master's in economics and finance from NYU. He is a registered professional engineer in New York State.

His affiliations include serving on the on the Board of Directors for the (NEGDC) Northeast Gas Distribution Council, consisting of natural gas utilities throughout the northeast, an active member of the National Society of Professional Engineers (NSPE) and American Society of Professional Engineers (ASPE). He is a Member of the (APWA) American Public Works Association and serves on the (UPROW) Utility and Public Right of Way Technical Committee and is the Chair of the Construction Practices Subcommittee. He also serves on NASTT's No-Dig Show Program Committee.

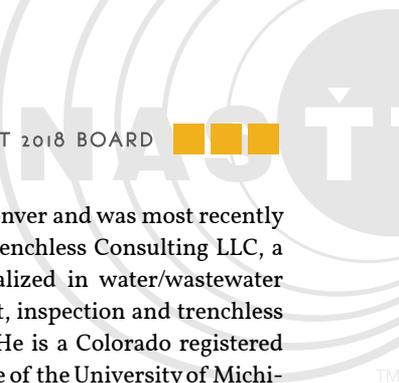
Michelle Macauley is the principal engineer and owner of Macauley Trenchless, PLLC. She earned her B.S. in Geological Sciences from the University of Washington and her M.S. in Geological Engineering from the University of Alaska, Fairbanks. She is a licensed professional engineer in Washington, Oregon, Alaska, California and Texas, and a licensed engi-

Michelle L. Macauley, P.E., LEG

PRINCIPAL ENGINEER & OWNER, MACAULEY TRENCHLESS, PLLC



Michelle Macauley is the principal engineer and owner of Macauley Trenchless, PLLC. She earned her B.S. in Geological Sciences from the University of Washington and her M.S. in Geological Engineering from the University of Alaska, Fairbanks. She is a licensed professional engineer in Washington, Oregon, Alaska, California and Texas, and a licensed engi-



neering geologist in Washington.

Michelle has more than 18 years of experience in geotechnical engineering, with a particular emphasis on trenchless feasibility, design and constructability. She most recently served as the national trenchless technology practice leader for Jacobs and previously as a geotechnical engineer specializing in trenchless design and construction with GeoEngineers and Staheli Trenchless Consultants. She has been involved in projects using horizontal directional drilling, microtunneling, pipejacking, auger-boring, pipe ramming, and pilot-tube microtunneling — just to name a few.

Michelle has been involved with NASTT since 2006. During that time, Michelle has been involved with the Pacific Northwest Chapter both as a chapter president and an organizer of the chapter's inaugural trenchless technology symposium. She has been a contributor to the PNW Chapter Trenchless Review (bi-yearly publication) and is a regular speaker, attendee and program committee member for NASTT's No-Dig Show.

Jeff Maier, P.E.

DIRECTOR OF ENGINEERING, C&L WATER SOLUTIONS INC.

Jeff Maier, P.E., is the director of engineering at C&L Water Solutions in Littleton, Colo. Prior to joining C&L, Jeff worked for more than 10 years as an engineer with the Metro Wastewater

Reclamation District (MWRD) in Denver and was most recently the owner/principal of Colorado Trenchless Consulting LLC, a niche engineering firm that specialized in water/wastewater infrastructure condition assessment, inspection and trenchless corrosion rehabilitation solutions. He is a Colorado registered professional engineer and a graduate of the University of Michigan – College of Civil & Environmental Engineering.



Jeff has more than 17 years of project management and engineering design experience, primarily in the water and wastewater industry. He is recognized as an expert in the fields of condition assessment and trenchless rehabilitation of pipelines, manholes and wastewater facility structures. He developed and successfully managed wastewater pipeline and manhole condition assessment and rehabilitation programs for the MWRD and was the co-founder of the MWRD Concrete Rehabilitation Product Evaluation Program.

Jeff is actively involved in NASTT's Rocky Mountain Chapter and is the chairman-elect for the upcoming 2016 No-Dig Show in Dallas. Jeff is NASSCO PACP/MACP/LACP certified, a NACE Certified Coating Inspector – Level 3, and is a certified NASSCO CIPP rehabilitation inspector. In his free time, Jeff enjoys skiing, cycling, hiking and playing golf.



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Babs Marquis, CCM

CONSTRUCTION MANAGER, MCMILLEN JACOBS ASSOCIATES



Babs Marquis, with more than 26 years' experience in underground project design and construction, is a construction manager with the Burlington, Mass., office of McMillen Jacobs Associates. He previously worked for Jacobs Engineering Group for 10 years and Stone & Webster Engineering Corporation for 11 years. During his extensive career in the trenchless industry, Babs has been involved in major tunneling and trenchless projects in the Northeast for clients such as the Massachusetts Water Resources Authority, Boston Water & Sewer Commission, the Metropolitan District Commission (Hartford, CT), Narragansett Bay Commission (Providence, RI), District of Columbia Clean Waters, New York City Department of Design & Construction and New York City Environmental Protection.

For the past 17 years, he has focused on underground construction management for tunnels and conveyance including water and wastewater pipeline design and construction projects, with emphasis on trenchless methods. He has worked on various pipeline projects utilizing microtunneling, pipe jacking, horizontal auger bore and pipelines renewal methods such as pipe bursting, slip-lining and relining. He has authored several papers for the NASTT No-Dig Show, ASCE Pipelines and RETC Conferences and is a member of the NASTT, ASCE, UCT and CMAA.

Babs is an active member on the board for NASTT's Northeast Regional Chapter and is serving as vice chair in 2018. He played an active role in the launch of the chapter and its successful inaugural conference and journal for trenchless practices for the Northeast region.

John C. Matthews, Ph.D.

DIRECTOR, TRENCHLESS TECHNOLOGY CENTER & ASSOCIATE PROFESSOR, LOUISIANA TECH UNIVERSITY



Dr. John Matthews has more than 15 years of experience in the rehabilitation and inspection of infrastructure systems. He currently serves as director of the Trenchless Technology Center (TTC) and as an Associate Professor of Civil Engineering and Construction Engineering Technology at Louisiana Tech University.

Prior to rejoining the TTC, John served as the Pipe Renewal Service Line Manager at Pure Technologies providing their clients with guidance on the selection and use of trenchless rehabilitation technologies. Prior to joining Pure, he served as Battelle's Water Infrastruc-

ture Management Lead, where he led multiple water and sewer infrastructure research studies. Prior to joining Battelle, he led multiple projects at the TTC relating to the development of automated decision support systems for technology selection.

John has given more than 105 conference presentations and authored more than 145 publications in the area of trenchless technology for which he has received two International Society for Trenchless Technology (ISTT) No-Dig Awards (2005, 2012) and a North American Society for Trenchless Technology (NASTT) Outstanding Paper Award (2015). He has been an active member of NASTT since 2003, serving on the No-Dig Show Program Committee and Quality Control Subcommittee and as an NASTT course instructor. He also serves on the Editorial Advisory Board for *Trenchless Technology* magazine.

Charles Pullan, P.Eng.

SENIOR PROJECT ENGINEER, INFRASTRUCTURE DELIVERY, WATER RESOURCES DEPARTMENT, CITY OF CALGARY



Charles Pullan is a senior project engineer with the City of Calgary's Water Resources Department in Calgary, Alberta, Canada. Charles holds a Bachelor of Science in Civil Engineering from the University of Calgary. In his current role, he focuses on linear capital construction of water, sanitary and drainage systems. Charles has been involved with various trenchless technologies,

including electromagnetic inspection of PCCP water mains, HDD projects and microtunneling installations.

Charles has been heavily involved in the Northwest Chapter of NASTT since 2014, and has been part of the organizing committee for the 2015 and 2017 Northwest Trenchless Conferences. He has also co-authored papers for NASTT's No-Dig Show and various Northwest Trenchless Conferences.

Matthew Wallin, P.E.

PARTNER & SENIOR PROJECT MANAGER, BENNETT TRENCHLESS ENGINEERS, LLP



Matthew Wallin is a partner and senior project manager with Bennett Trenchless Engineers (BTE), based in Folsom, California. BTE's engineering practice is focused entirely on trenchless technology design, construction management and claims assistance with clients and projects located throughout California, as well as Texas, Florida, Nebraska, Iowa, South Dakota and Tennessee.

Matthew holds both bachelor's and master's degrees in civil engineering from Case Western Reserve University in Cleve-

land, Ohio. He began his career working for URS in Oakland, California, in 2001 in its geotechnical group. Since that time, Matthew has focused his practice on geotechnical engineering and the design and construction management of new pipeline projects using horizontal directional drilling, microtunneling, open-shield pipejacking, pipe ramming and auger boring.

Matthew has been a member of NASTT since 2002. He has been an active member in the Western Chapter (WESTT) since 2003 and has served as a member of the Board of Directors and as the Chapter Treasurer since 2008. He joined NASTT's No-Dig Show Program Committee in 2010 and has acted as a Session Leader for the conference since that time. Matthew is also an instructor for NASTT's HDD Good Practices Course as well as the Introduction to New Trenchless Methods Course, each of which are taught annually at the No-Dig Show and at other off-site venues throughout the year.

Dennis Walsh, P.E.

SENIOR PROJECT MANAGER, HORIZONTAL DIRECTIONAL DRILLING, PUBLIC SERVICE ELECTRIC & GAS (PSE&G)

Dennis M. Walsh, P.E. is a senior project manager for horizontal directional drilling for Public Service Electric & Gas in New Jersey. Dennis is a 1972 graduate of the University of Day-

ton, Ohio, with a B.S. in Civil Engineering and a 2002 graduate of the Polytechnic University of New York with a M.S. in Technology. He retired from KeySpan Energy Company in 2005 after a 28-year career in the gas utility field with a background in engineering, operations, construction, Quality Assurance and HVAC. He led KeySpan's efforts to expand the use of trenchless technology in the early 1990s to decrease its main and service installation costs. Prior to joining PSE&G, he was a consulting engineer for various consultants in the natural gas industry.



In addition to serving on the NASTT Board, he is also a Board member for the NASTT Mid-Atlantic Regional Chapter and also serves on the annual No-Dig Show Program Committee. He has designed numerous HDD installations for various utilities including a 1,800-ft HDD for a 30-in. gas main under a tidal basin in Brooklyn, N.Y.; a 2,000-ft, 12-in.

HDD under an environmental sound in South New Jersey; a 400-ft jack and bore installation in Newark, N.J. Dennis is currently a senior project manager for a 1,900-ft HDD of a 30-in. steel pipeline for a 69kV electric system. Dennis is a licensed professional engineer in five states. When he is not involved in trenchless projects, he enjoys traveling and trying to play golf.

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Living Legends of Trenchless

NASTT'S 2018 HALL OF FAME CLASS TO BE HONORED IN PALM SPRINGS

NASTT HAS ANNOUNCED THE INDUCTEES of the Society's seventh Hall of Fame class. Joining this elite group of trenchless technology innovators and pioneers are Chris Brahler, president and CEO of TT Technologies, Ian Doherty, president of Trenchless Design Engineering and George Ragula, distribution technology manager for Public Service Electric & Gas.

The careers of the 2018 Hall of Fame class will be celebrated on the evening of March 27 when they will be formally inducted at the Gala Awards Dinner at NASTT's 2018 No-Dig Show in Palm Springs, California. The new inductees will join an already distinguished group of industry icons who have helped transform trenchless technology and pave the way for the current generation of leaders.

Chris Brahler is an industry educator, mentor, leader and innovator who has worked with water, wastewater and gas utilities, plumbers, telecommunication companies, engineers and contractors to promote the value of trenchless technology and help build the market in North America. Ian Doherty is a 30-plus year veteran of the trenchless industry. For the past 22 years, as the president of Trenchless Design Engineering, he focused solely on the trenchless rehabilitation of existing pipelines with the exception of a few directional drilling and pipe bursting projects in the early years. A recognized leader, George Ragula has spent the last 31 years of his 40-year career in the gas industry committed to promoting the ever-growing use of trenchless technologies and construction.

"The lifelong dedication of these individuals has made innovative trenchless technology practices acceptable and sustainable, not only for today's infrastructure solutions but for those of the future," said Mike Willmets, NASTT executive director. "Their commitment to trenchless technology has been pivotal to the growth of the entire industry and has impacted infrastructure management in countless communities throughout North America."

NASTT's Hall of Fame was created by the NASTT Board of Directors to celebrate the Society's most outstanding and accomplished members who have made a lasting impact on the trenchless industry. The Hall of Fame allows the outstanding work and dedication of these members to be recognized, honored and preserved. Members may be elected from all five NASTT membership categories: Manufacturers and Suppliers; Engineers and Consultants; Municipal and Utility Employees; Contractors; and Academia. The NASTT Board of Directors met last year and voted these trenchless icons as members of the 2018 class. Congratulations to the new inductees!



Chris Brahler
President & CEO
TT Technologies Inc.

Chris Brahler has been a leader in the underground and trenchless construction industries for more than 40 years. He received a bachelor's degree in marketing and business administration in 1974 and began his career in the cable installation equipment market that same year. Early on, Chris worked with several different pieces of cable installation equipment and soon developed an interest in trenchless technology. In 1975, he helped secure an arrangement with Tracto-Technik in Germany to bring several trenchless product lines to North America. In 1991, Chris started TT Technologies, Inc., an Aurora, Ill.-based manufacturer of trenchless tools and equipment.

As president and CEO, Chris has worked tirelessly with water, wastewater and gas utilities, plumbers, telecommunication companies, engineers and contractors to promote the value of trenchless technology and help build the market in North America. Over the years, he has dedicated the time and resources needed to develop, improve and refine trenchless equipment, methods and solutions. He has been a featured presenter at conventions and conferences around the country, as well as in Canada, Mexico, China and South America, helping develop emerging markets for trenchless.

In 2007, he was named *Trenchless Technology's* Person of the Year. He has served on NASTT's No-Dig Show Program Committee, the marketing and management committees for ICUEE, DCA's Board of Directors and the NUCA Trenchless committee. In 2009, Chris began a term as NASTT Board Chair and in 2014 he received NASTT's Chair Award of Lifetime Service.



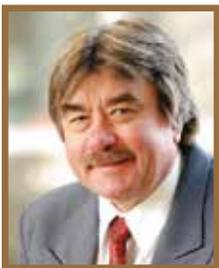
Ian J. Doherty,
B.A.Sc., P.Eng.
President
Trenchless Design Engineering Ltd.

Ian Doherty's introduction to trenchless technology happened 30 years ago at the 1988 ISTT No-Dig Show in Washington, D.C. At that time, Ian was an engineer with a Canadian plastic pipe manufacturer looking for new product lines. A year later he was in the UK touring Rolldown lining installations. By 1991, well hooked on

trenchless, Ian was managing a Canadian contractor installing HDPE fold/form liners. While that learning endeavor ended in late 1993 the attraction to trenchless continued. In 1994 following a short stint Swagelining Ian started as an independent engineer providing trenchless rehabilitation engineering to municipalities, contractors and manufacturers. His first project was a water pipeline sliplining rehabilitation. This project was presented at No-Dig 95 and was the only paper on pressure pipeline rehabilitation.

In 1995, Ian incorporated Trenchless Design Engineering and for the last 22 years has focused solely on the trenchless rehabilitation of existing pipelines with the exception of a few directional drilling and pipe bursting projects in the early years. Over the years, Ian has designed rehabilitations, including most lining methods, for both non-pressure and pressure pipes. Many rehabilitation specification, tender and RFP documents were written for municipalities and others. Equally important Ian believes, is the extensive design, engineering and troubleshooting he provided to many CIPP and other trenchless installation contractors in Canada, USA and Mexico. This mix of experience helped Ian identify issues to be tackled from both sides of the construction contract, a useful perspective for realizing success in trenchless rehabilitation projects. Since 2010 these projects have included extensive experience with UVC CIPP.

Ian has been a member of NASTT since 1991. He has served on the ASTM F17-67 trenchless technology sub-committee. He has presented or co-authored 13 papers at NASTT No-Dig conferences from 1995 to 2016. He has been a volunteer instructor for the NASTT CIPP Best Practice Course and for the CIPP Design course before that. In 2000, Trenchless Design Engineering shared a Canadian Consulting Engineering award for pressure pipe rehabilitation. For 2015 Ian received the CATT Award of Excellence for outstanding service to the trenchless industry. He is one of the co-authors of NASTT's 2015 CIPP Good Practices Guidelines manual. Ian received his engineering degree from the University of Toronto and is a registered Professional Engineer in Ontario Canada.



George Ragula
Distribution Technology Manager
Public Service Electric & Gas

George Ragula is responsible for evaluating cutting-edge technologies that increase efficiency and effectiveness of operations through his leading role in gas industry research, design, development and deployment. He has been directly involved with the implementation of many innovative technologies utilized by the gas industry, specifically the development and technology transfer of various trenchless technologies for gas industry applications. A recognized leader, he has spent the last 31 years of his 40-year career in

the gas industry committed to the ever-growing technologies in trenchless construction.

Prior to joining PSE&G in 1988, he held various positions at Brooklyn Union Gas in engineering, operations, construction and management. He is a member of the American Gas Association (AGA) where he serves as Vice Chair of the Construction Operations Committee, American Society of Mechanical Engineers, Society of Gas Operators where he served as President from 2014-2015, 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. George served as Chair of the Board of Directors for the North American Society for Trenchless Technology from 2011-2012 and served as Program Chair for the Annual No-Dig Conference in 2012. George also previously served as a Distribution Project Advisor for the Gas Research Institute for 15 years.

George has published more than 50 papers and reports and has presented numerous papers. He has been honored with several AGA awards including the 2000 Milton W. Heath Sr. Memorial Award for his contributions in the field of leak detection, the 2004 Distribution Achievement Award to recognize his outstanding contributions to the science and art of gas distribution, the 2006 Acker Medal and Award for his outstanding paper and presentation, "Robotics Technology Goes 'Live' for Repairing Gas Mains."

George received his B.S. in Mechanical Engineering from Polytechnic Institute of Brooklyn in New York. He is an avid technical diver, enjoys skiing and is a Corvette collector and competes in amateur racing.



Chris Brahler, Ian Doherty and George Ragula are the seventh Hall of Fame class to be commemorated by NASTT. To learn more about NASTT's Hall of Fame and its inductees, visit nastt.org. NASTT's 2018 No-Dig Show will be held March 25-29 at the Palm Springs Convention Center in Palm Springs, California. For details, visit nodigshow.com.



NASTT'S
EYE ON THE INDUSTRY
OUR MEMBERS IN ACTION

CUIRE awarded formal review of CIPP safety

IN RESPONSE TO THE GROWING USAGE of cured-in-place pipe (CIPP) installations and recent industry reports, NASSCO submitted requests for proposals to facilitate a formal review of potential safety impacts associated with CIPP. Of particular interest is the use of polyester resins in CIPP that result in volatilization of styrene during the steam curing process.

Previous studies have focused on the concentration of styrene present in the air of residential homes tied to sanitary sewers during pipeline renewal. There have been very few studies, however, on the impact of styrene emissions on the safety of construction workers and the general public when used for rehabilitating sanitary and storm sewer pipes. Therefore, there is a critical need to study organic chemical emissions associated with the CIPP installation process, and recommend methods to mitigate any potential adverse impacts on human health.

After careful consideration of all responses received, NASSCO has awarded the review to the Center for Underground Infrastructure Research and Education (CUIRE) at the University of Texas at Arlington. The overall goal of this two-phase project is to evaluate the potential release of organic compounds during pipe rehabilitation using the steam cure CIPP method. Potential impacts on health will be assessed and policies will be recommended to protect construction workers, the public, and the environment.

Phase one of this project launched on Dec. 1, 2017, and is expected to conclude in April 2018. During that time the CUIRE team, led by Dr. Mo Najafi, Dr. Melanie Sattler and Dr. Kevin Schug — with support from the Institute for Underground Infrastructure (IKT) in Germany and CUIRE graduate research assistants — will review recent publication(s) that propose the presence of organic chemicals and other available literature relating to emissions associated with the CIPP installation process. Phase two of the project will include the development of a scope of services for additional sampling and analysis of emissions during the field installation of CIPP using the steam cure process.

For questions or additional information, contact NASSCO at 410-442-7473 or visit nassco.org.

OBITUARY

Jack Doheny

Founder, Jack Doheny Companies



ON JAN. 1, THE VACUUM TRUCK AND SEWER CLEANING INDUSTRY lost a champion and leader. John “Jack” Leary Doheny, founder of Jack Doheny Companies, died with his children Kay, Michael and Mary Jo by his side. He was 87.

Born in St. Paul, Minnesota on Nov. 13, 1930, Doheny became an industry leader through his commitment and dedication to

the maintenance of sanitary sewer systems. After serving our country in the United States Air Force, he joined his uncle’s company traveling across the United States with his father to demonstrate coiled and sectional rodding machines. In 1973 he started his own business Jack Doheny Supplies, which today is under the Jack Doheny Companies umbrella. Jack Doheny Companies is North America’s largest provider of sewer cleaning, pipeline inspection, and multi-use vacuum trucks for sale, rental, service, parts and training.

When interviewed in 2014 as a NASSCO Standard Bearer, Doheny shared: “I believe it would be hard to find anyone who is against sewer clean-up. It’s as American as Chevrolet and apple pie. For me, it’s also a family tradition. My father lived to be 107 and was instrumental in changing the way sewers are cleaned. I am proud to be part of this legacy and hope to follow in his footsteps to contribute to this great industry for many years to come.”

With representation in all 50 states, plus Canada, and with hundreds of people employed by Doheny Companies, Doheny’s legacy will continue on. “My dad was happiest when he was working,” shared Kay Doheny, current CEO and Owner of Doheny Companies. “Even in his last days he talked about taking care of our customers, but what he found most satisfying throughout his career was finding ways to help people succeed.”

Perhaps his greatest legacy, however, was the love and pride he had for his family. Preceded in death by his first wife Edith in 1997, as well as brothers Patrick and Thomas, Jack is survived by Patricia Roux Doheny, his wife of 19 years; siblings Jean Partridge, Jerry and Michael; children Kay, Michael [Clare], Mary Jo [Kirk]; grandchildren Ryan, Jack, Thomas, Christine, Stacey, Andrew, Sara, Albert Henry, Laura [Spencer], John and James. Jack also received loving care and compassion from his caregiver, Tammy Kelley, among so many others that helped Jack enjoy his final years.

The family requests contributions by check or credit card may be made to:

The Jack Doheny Memorial PACP Scholarship
Nassco, Inc.
2470 Longstone Lane, Suite M
Marriottsville, MD 21104
Attn: Doheny Memorial
410-442-7473



Arizona State unveils new ‘dorm built for engineers’

ENGINEERING UNDERGRADUATES MOVING into a new Arizona State University residence hall will find themselves immersed in a collaborative, technology-laden living and learning community built specifically for engineers.

The Fulton Schools Residential Community at Tooker House is a 1,600-person, co-ed residential community for undergraduate students in ASU’s Ira A. Fulton Schools of Engineering. The “dorm built for engineers” features on-site digital classrooms, state-of-the-art makerspaces complete with 3D printers, laser cutters, and design tools needed for a broad range of engineering courses and projects.

“Innovation has a new home address at Tooker House,” said Kyle Squires, dean of the Fulton Schools of Engineering. “This mixed-use living and learning facility sets a new standard in engineering education and reflects the breadth and depth of the student experience at the largest engineering school in the nation.”

Situated in a prominent location on the ground floor of the building, the maker lab allows students to work on class projects and explore ideas steps away from their living suites – essentially in their living room. The lab features sliding glass walls that encourage activities to spill outdoors, where exhibition pedestals enable students to present their work and invite discussion and feedback.

The seven-story, co-ed community was built by American Campus Communities on ASU’s Tempe Campus. Tooker House is owned and developed by American Campus Communities under the company’s ACE program, a public-private partnership that provides on-campus housing to universities without using their funds or tax-payer dollars. For more, visit americancampus.com.

Jim Williams joins Brierley Associates



BRIERLEY ASSOCIATES has announced the addition of Jim Williams, P.E. Williams has more than 24 years of experience in underground engineering and construction with special emphasis in horizontal directional drilling (HDD). His experience includes complex HDD design, design-build, construction feasibility, risk assessment, execution planning and project

management. He is a licensed engineer in 15 states including Texas and Florida.

“Jim further increases our bench strength in HDD planning and design, and provides us the unique perspective of an experienced contractor,” said Nick Strater, associate at Brierley Associates. “We’ve worked with Jim for years, and we’re truly excited he’s decided to join Brierley Associates.”

Williams will be based in Texas, where he will work with the Austin and Houston offices to provide assistance to the energy industry, and other market sectors using HDD and trenchless technologies.

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NASTT Chapter News



British Columbia

As of fall 2017, the British Columbia Chapter (NASTT BC) is continuing its efforts to introduce trenchless technologies into educational institutes. The chapter has had very promising meetings with the University of Victoria and the British Columbia Institute of Technology. Stay tuned for more information.

NASTT BC has also developed an online Carbon Calculator to identify the reduction in greenhouse gases that can be realized using trenchless technology. The Carbon Calculator is the basis for a more sophisticated calculator being developed in conjunction with NYSEARCH, the R&D arm of several gas companies across North America. For more information, please visit utilitycarboncalculator.com.



Great Lakes, St. Lawrence & Atlantic

The GLSLA Chapter held its second CIPP good practices course in 2017 in Halifax, in partnership with NASTT and ACWWA. The course was well attended with more than 20 participants. The GLSLA Chapter would like to thank ACWWA for its partnership in presenting the course and it looks forward to continuing to promote the trenchless industry in Atlantic Canada with ACWWA. For more information on GLSLA, events and our training sessions, please visit glsla.ca.



Mid Atlantic

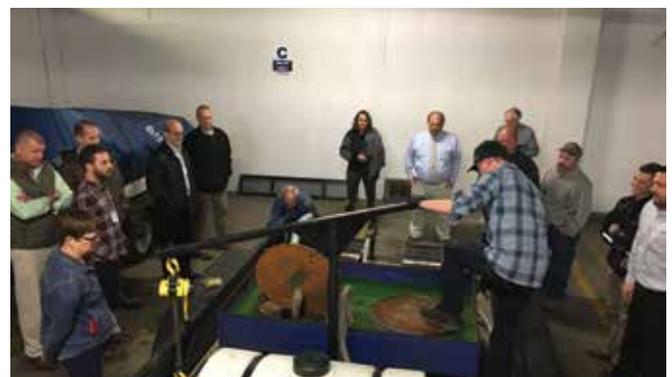
The Mid Atlantic Society for Trenchless Technology (MASTT) recently held successful Trenchless Technology, SSES and Buried Asset Management seminars in Richmond, Va., and Philadelphia, Pa. The guest presenter in Richmond was Susan Hamilton, operations manager with the Department of Public Utilities for the City of Richmond, with the presentation "Richmond's Trenchless Technology Program." The guest presenter in Philadelphia was Jeff Twardzik, engineering supervisor with the Philadelphia Water Department, with the presentation "Philadelphia's Trenchless Technology Program." MASTT also published its *MASTT Journal of Trenchless Technology* in April 2017.



Midwest

The Midwest Chapter (MSTT) conducted two seminars in 2017; Milwaukee, Wisconsin in July and Cincinnati,

Ohio in December. The MSTT Board elected to try running the first 2017 seminar program as a single-day event. The thought was it may enable many more people from around the region to attend. The result was a significant increase in participation and as such, both of the 2017 seminars were changed from the standard two-day format into a lengthier one-day program with 13-14 speakers each. MSTT board member Cathy Morley, P.E., played a key role in the successful implementation of the new one-day format tested in Milwaukee. The Milwaukee seminar welcomed a presentation by Kevin Lyons, P.E., engineering design manager of the Milwaukee Metropolitan Sewerage District, who gave an overview of MMSD's tunnel program. For the Cincinnati seminar, MSTT conducted an outdoor live demonstration of a method to remove manhole inflow during rain events. The MSTT is currently planning its early 2018 MSTT program in Des Moines, Iowa. The annual *Midwest Journal* magazine published in September of 2017 and can be found at mstt.org.



MSTT conducts an outdoor live demo of a method to remove manhole inflow during rain events in Cincinnati in December.



Northeast

The Northeast Regional Chapter enters its third year with a very strong foundation following successful implementation of several key initiatives. In addition to setting up the chapter website at nastt-ne.org, two regional journals are published each year in the spring and fall, and a full day conference is held each November. A very active student chapter has been established at UMass Lowell. The students and their advisor, Dr. Raj Kumar Gondle, have been incorporated into

the operation of the chapter and have been instrumental in the success of the chapter conferences. The 2016 conference at UMass Lowell and the 2017 conference in Cooperstown, N.Y., were both very well attended, and the 2018 conference is scheduled to be held in Hartford, Conn., this November. Please join us!



UMass Lowell Student Chapter members assisting with registration at the annual Northeast Regional Chapter conference in Cooperstown, N.Y., Nov. 16, 2017.

Northwest

Continuing again this year, NASTT's Northwest Chapter will be presenting its Technical Lunch Program. This program provides a venue for members to learn from each other's accomplishments and from suppliers/manufacturers about new innovative products. There will be three Technical Lunches in Edmonton scheduled for Jan. 25, Feb. 22 and March 22. For further information on these events, please refer to the chapter's events webpage at nastt-nw.com.

The Northwest Chapter is also commencing the planning of the 2018 Trenchless Conference. This year's conference will be a national focus and will be presented in partnership with TAC. The conference will take place in Edmonton, Nov. 7-9, at the Fantasy Land Hotel at West Edmonton Mall. The Conference will be a three-day event and will include a short course on Nov. 7 followed by the conference on Nov. 8-9 and a TAC Awards Gala. Please watch the chapter's webpage for upcoming announcements. For more information, email gtip-pett@nastt-nw.com.

Pacific Northwest

After a successful NASTT CIPP Good Practices Course in Anchorage, Alaska last month, the Pacific Northwest (PNW) Chapter is again focused on future events. NASTT's 2018 No-Dig Show is just around the corner and the chapter will be holding its annual general meeting on Sunday, March 25 at 4 p.m. The chapter is also in early talks regarding another NASTT training event this fall. The biennial symposium is a year away and will be held in Portland, Ore., in January 2019. The chapter is currently seeking volunteers to join the Planning Committee for this event. If you are a PNW member and interested in getting involved, please contact a PNW Chapter board member. More information is available at pnwnastt.org.

Rocky Mountain

At the Rocky Mountain Chapter, planning is under way for educational jobsite visits, young professionals and outreach committee events, sporting clays tournaments and our annual conference this fall in Colorado. Look for these events and more in the near future. As always, the chapter is looking for new volunteers and members and would love to see YOU get involved!

South Central

The South Central Chapter of NASTT is in the process of preparing the first annual publication of the chapter, titled "Texas and Oklahoma Trenchless Report," to be released mid-2018. This will be the only regional publication dedicated exclusively to trenchless technology in the South Central United States and will serve to educate local governments, utilities and other end-user groups on the benefits and practice of utilizing trenchless technology. The new magazine will also highlight member achievements and promote the NASTT South Central Chapter throughout Texas and Oklahoma. For those interested in for information regarding this inaugural publication, please contact Justin Taylor at justin.taylor@cciandassociates.com or call 832-210-1032.

Southeast

The Southeast Society for Trenchless Technology (SESTT) recently held successful Trenchless Technology, SSES and Buried Asset Management seminars in Raleigh, N.C. and New Orleans, La. The guest presenter in Raleigh was Aaron B. Brower, P.E., assistant public utilities director for the Public Utilities Department for the City of Raleigh with the presentation "Trenchless Technology in Raleigh." Pablo San Martin of Jefferson Parrish was the guest presenter in New Orleans. SESTT published the *SESTT Journal of Trenchless Technology* in December of 2017. For more information, visit sestt.org.

Western

The Western Chapter (WESTT) continues its educational outreach. In October 2017, WESTT hosted the 13th annual Western Regional No-Dig Conference and Exposition in Walnut Creek, Calif. The conference was a huge success with near record turnout by local municipal engineers, consultants and manufacturers. Planning for the 14th annual conference is already in the early planning stages and will be held in Phoenix, Ariz., in the fall. WESTT is excited that this year's national No-Dig Show will be held within its western region in Palm Springs, Calif. To celebrate and show appreciation for our western regional members, WESTT is holding a member's reception at Eight4Nine Restaurant and Bar on Monday, March 26, from 8 to 10 p.m. All members attending the conference are welcome to enjoy great food, drinks and comradery with fellow WESTT members while attending the conference.



Going Trenchless in the City of Hamilton

SOME PROFESSIONALS INVOLVED in the management of mainline sewers are very interested to hear how asset management in the City of Hamilton, Ontario, Canada, makes decisions on cured-in-place pipe (CIPP) lining rehabilitation. That is because Hamilton has lined pipes that most utility owners would consider as replacement candidates instead. The City of Hamilton first experimented with CIPP lining starting in 1990 with one-off installations, and since 2001 has continued with a full \$10 million per year program.

To date, the City of Hamilton has renewed more than 320 km of mainline sewer using CIPP technology and has realized cost avoidances of approximately \$200 million. That is a significant value considering the cost of a small diameter (200 mm to 450 mm) sewer replacement during a local road reconstruction project of approximately 2 km in length can run up to anywhere from \$2 million to \$2.5 million.

Hamilton staff have gained extensive knowledge on pipe failure modes and causes, as well as CIPP product properties and installation methods. Pipes generally fail because of poor design and installation methods, infiltration and soil loss around the pipe, and because of internal degradation of material caused from effluent conveyed and internal atmospheric conditions (i.e. temperature, acidity, hydrogen sulphide).

Condition assessment of sewer mains is traditionally achieved by observing and qualifying visible internal pipe defects such as holes, cracks, fractures, ovality, etc. Relating cause of failure to external factors, such as types of soils, water tables, live loading and internal factors such as effluent and atmospheric conditions, allow for a more educated decision on whether to replace or rehabilitate. A newly installed pipe experiences all the live and dead loads it was designed for immediately after installation, a severely failed pipe may be in a state of equilibrium with external factors providing an opportune and favourable time for CIPP rehabilitation.

Early on, the City of Hamilton realized the importance of site inspection and quality control. The entire team involved with the CIPP lining program is well educated and experienced on installation methods, design standards and sample testing.

Site inspection staff are able to recognize potential technical problems in the field, from resin mixing, to impregnation and curing parameters. All this knowledge has come initially from custom internal development of a CIPP Lining Manual including training material and instruction sessions, to now continuing updates to the CIPP Lining Manual and external education through industry-provided training and workshops.

Inspection staff are also able to recognize and correct deficiencies in workmanship, such as host pipe preparation, proper installation methods, reinstatements of service laterals, cleaning and other back-to-service activities.

Introduction of new rehabilitation materials and methods are not fully adopted without education activities taking

place. Manhole rehabilitation using spray-on application is an example of a recent addition to the program. Hamilton is in the final phases of developing a comprehensive inspection guide and training program so that internal staff can efficiently manage both field installation activities and how to apply proper quality control and testing methodologies.

The sewer and water trenchless rehabilitation industry using CIPP lining is continually developing. Support and participation to the industry is a crucial factor for continuous development of the program. Hamilton key personnel are encouraged to participate in trenchless related conferences and workshop events and become members and actively contribute to professional associations and educational institutions. Hamilton staff continue to be involved with professional associations and research initiatives and have actively contributed to developing industry standards, such as the OPSS 409 Closed Circuit Television (CCTV) Inspection of Pipelines and the CSA PLUS 4012-10 Technical Guide Visual Inspection of Sewer Pipe.

Involvement have guided the industry to the development of new products and installation methods by outlining the needs and benefits of providing services that offering minimal social disruption, critical asset rehabilitation capabilities, and are cost effective. Fully trenchless lateral lining from the mainline and large diameter watermain rehabilitation are both examples of where Hamilton has steered the industry towards. Other similar initiatives include cost effective and non-destructive methods for watermain inspections and large diameter sewer inspections.

Product quality control is integrated to the CIPP lining program. Random samples are regularly taken from the field and tested by an independent laboratory. Sample results are used to determine if the properties of the product meet the design specifications. Hamilton monitors both individual results but also trends over time. Trends are used to determine historical product performance and provide early warning of any downward tendencies. There are many factors that can influence CIPP products during installation. Some of them can be humidity, ambient temperature, resin mixing and impregnation techniques, or simply a new or different installation crew involved.

The CIPP lining program has become part of the Capital Project Delivery process. Road reconstruction and rehabilitation capital projects are usually preceded by sewer and sometimes watermain lining activities if there are no needs for increased capacity and pipe size upgrades.

This article was contributed by the **CITY OF HAMILTON, ONTARIO, DEPARTMENT OF PUBLIC WORKS.**



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nastt chapters

NASTT has a network of 11 regional chapters throughout the United States and Canada. With a single NASTT membership, you're automatically enrolled in the national organization, the international organization (ISTT) and also in your regional chapter. Regional chapters offer valuable educational and networking opportunities in your local area. Share your ideas, network with colleagues and find solutions to your everyday challenges.



British Columbia

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

Chapter Contact

Kieran Field, **Chair**
Phone: (604) 990-4800
kieran.field@opusdaytonknight.com
Website: nastt-bc.org

Elected Officers

Chair - Kieran Field
Treasurer - Preston Creelman



Great Lakes, St. Lawrence & Atlantic

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

Chapter Contact

Kevin Bainbridge, **Chair**
Phone: (905) 304-0080
kbainbridge@rcii.com
Website: glsla.ca

Elected Officers

Chair - Kevin Bainbridge
Vice Chair - Anna Polito
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
rthomasson@arcadis-us.com
Website: 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
jeffboschert@ncpi.org
Website: mstt.org

Elected Officers

President - Jeff Boschert
Vice President - Chris Schuler
Secretary - John Milligan
Treasurer - Ryan Poertner



Northeast

The Northeast Chapter was established in 2015 by members in the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.

Chapter Contact

Ian Mead, **Chair**
Phone: (508) 754-2201
IMead@tigebond.com
Website: nastt-ne.org

Elected Officers

Chair - Ian Mead
Secretary - Marshall Gaston
Treasurer - Babs Marquis



Northwest

The Northwest Chapter was established in 1995 by members in the provinces of Alberta and British Columbia, Canada, and in Washington state. In 2005, the members in BC established the NASTT-BC Chapter. In 2009, members in Washington state established the Pacific Northwest Chapter and the Northwest Chapter adjusted the geographic area to include members in the provinces of Manitoba and Saskatchewan.

Chapter Contact

Craig Vandaele, **Chair**
craigvandaele@michelscanada.com
Website: nastt-nw.com

Elected Officers

Chair - Craig Vandaele
Vice Chair - Greg Tippet
Treasurer - Keith Moggach



Pacific Northwest

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

Chapter Contact

Brendan O'Sullivan, **Chair**
Phone: (503) 225-9010
brendan.o'sullivan@murraysmith.us
Website: pnwnastt.org

Elected Officers

Chair - Brendan O'Sullivan
Immediate Past Chair - Chris Sivesind
Secretary - Carl Pitzer
Treasurer - Dylan Davidson



Rocky Mountain

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

Chapter Contact

Joe Lane, **Chair**
Phone: (303) 619-5060
jlane@lanecg.com
Website: rmnastt.org

Elected Officers

Chair - Joe Lane
Vice Chair - Chris Larson
Secretary - Benny Siljeborg
Treasurer - Stephanie Nix-Wille
Past Chair - Bo Botteicher



South Central

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

Chapter Contact

Larry Johnson, **Chair**
Phone: (800) 856-7473
ljohnson@hobaspipe.com
Website coming soon!

Elected Officers

Chair - Larry Johnson
Vice Chair - Alan Goodman
Secretary - Luis Cuellar
Treasurer - Josh Kercho, PE.



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
jerry@mechanicaljobbers.com
Website sestt.org

Elected Officers

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



Western

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

Chapter Contact

Cindy Preuss
Phone: (925) 332-5221
cpreuss@hydroscience.com
Website westt.org

Elected Officers

Chair - Cindy Preuss
Vice Chair - Brian Avon
Secretary - Jennifer Glynn
Treasurer - Norman Joyal

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nastt student chapters

NASTT Student chapters are involved in a number of activities throughout the academic year including field trips, seminars and fundraisers. Members of student chapters also attend and participate in NASTT's No-Dig Show where they present trenchless research posters, participate in competitions and provide event support monitoring the technical paper sessions. There are many benefits for students who belong to a NASTT student chapter – scholarships, networking opportunities, education and career opportunities to name a few. To learn more about NASTT's 19 student chapters, visit nastt.org/student-chapters.

- 

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Bowling Green, Ohio
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Concordia University
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- Citizens Energy Group
- City and Borough of Sitka
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- Metro Wastewater Reclamation District
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- Moulton Niguel Water District
- Municipality of the County of Kings
- Nevada County
- North Davis Sewer District
- Northeast Ohio Regional Sewer District
- Norwich Public Utilities
- Orange County Sanitation District
- Pacific Gas and Electric
- Parker Water & Sanitation District
- Pinellas County Utilities
- Regional Municipality of Niagara
- Sammamish Plateau Water and Sewer District
- Sanitation District No. 1 of NKY
- Santa Barbara County
- Seattle Public Utilities
- Snyderville Basin Water Reclamation District
- Tahoe-Truckee Sanitation Agency
- The City of Calgary
- The Metropolitan District Commission
- The Regional Municipality of Peel
- Town of Devon
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- Washington Suburban Sanitary Commission



These organizations will be attending NASTT's 2018 No-Dig Show, March 25-29 in Palm Springs, California. Plan to join them by registering at nodigshow.com.

nastt.org

North American Society for Trenchless Technology
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Phone: 888-993-9935



The Devil in the Details



Kathryn Wallin

BENNETT TRENCHLESS ENGINEERS, FOLSOM, CALIFORNIA

David Bennett

BENNETT TRENCHLESS ENGINEERS, FOLSOM, CALIFORNIA

S MALL HDD PROJECTS ARE OFTEN ADVERTISED for bid with limited design. Owner agencies will sometimes rely heavily on the winning contractor to design the bore geometry, work areas, and pipe stiffness or thickness, all while acquiring permits and limiting impacts to the public. While contractor-designed projects have been successful, many have also led to significant change orders, claims, and litigation. Requiring the contractor to provide design services is ill-advised, unfair to the contractor, and often leads to costly issues and delays. Contractors typically do not employ professional engineers, do not provide design services, and may not fully comprehend the nuanced challenges and risks of the project. As subsurface infrastructure and surface facilities become more crowded, requiring a contractor to design a project in a low-bid scenario increasingly leads to conflicts during construction, resulting in costly delays and change orders.

This paper discusses common pitfalls encountered on small HDD projects and how these hazards can be addressed and mitigated during design. Topics discussed in the paper include geotechnical investigations, bore geometry, work areas, performance requirements, and early feasibility analysis of the project and constraints. Past HDD projects are cited to illustrate the topics discussed. Identification and mitigation of potential problems during the design phase can limit the number and severity of unexpected problems during construction. Discussion includes the issues that arise when the applications of HDD are taken for granted, HDD design is left until the end, and/or the design is left to the contractor to address. Many of the design elements discussed in the paper also have applications for large HDD projects, as well as other trenchless installations, such as auger boring, microtunneling and pipe ramming.

Geotechnical Considerations

A thorough understanding of the anticipated geotechnical conditions and behavior is a key element to proper trenchless design. Often, owners and designers are reluctant to allocate significant

resources to a thorough geotechnical exploration, especially for “small” HDD projects. The comparison of cost to value is not always apparent in the early stages of design, and sometimes the permitting effort for specialty borings can be daunting. However, a project that starts off with insufficient or misleading geotechnical information may encounter serious construction problems.

Insufficient Geotechnical Information

One common misstep in geotechnical investigations for HDD projects is widely-spaced borings, especially if it is a component of an open-cut project. The scope for the geotechnical program for open-cut projects may cover a large area with borings spaced 1,000 to 2,000 ft apart, and only to the depth of the trench invert. For open-cut installations, this level of effort may be appropriate as changes in geotechnical conditions can be more easily handled during construction. For HDD or other trenchless projects, unanticipated changes in ground conditions can result in serious impacts to production rates and can even prevent a project from being completed. In general, good practice dictates that HDD projects should have a minimum of one geotechnical boring on each side of the crossing feature, that extend to depths that are a minimum of 10 ft below the anticipated bore depth. For complex geology and long HDD bores, intermediate geotechnical borings are needed along the alignment at spacing not greater than 500 ft. If a desktop study has identified the likelihood of encountering challenging soils near surface (such as gravel or soft soils), the geotechnical borings should extend even deeper below the planned alignment to allow for flexibility in design of the bore profile. This is an especially important recommendation for projects with short delivery schedules because there may be insufficient time to acquire additional permits and remobilize drilling equipment for a second round of exploration if the initial investigation indicates adverse conditions at or near bore depth.

Another oversight is selecting non-representative locations for geotechnical borings, especially near wetlands or rivers. HDD is often the preferred trenchless method for small to medium diameter river crossings since the method is appropriate in high groundwater and does not require the additional expense of watertight shafts. However, ground conditions can vary greatly around waterways due to depositional history and manmade structures. For example, a road, railroad embankment, or levee built through a wetland area will likely have a foundation of compacted soils. The embankment loading will result in consolidation of the underlying foundation

soils, making them no longer representative of the native conditions. Conducting geotechnical borings through the embankment is convenient but will result in overestimation of strengths and stiffness, which can result in erroneous design recommendations. Disparate geotechnical conditions can also be encountered when road embankments have been raised and widened over several construction projects, using dissimilar fill materials between the new additions and the original embankment. Not only can the soils be different within the embankment, but old fill debris may be buried and hidden by the additional engineered fill. Severe changes in topographic relief also demand attention in the geotechnical investigation.

Underestimating Challenging Ground Conditions

Rock within an HDD alignment can present challenges. If rock is encountered in the geotechnical borings and anticipated throughout the bore, the contract documents should include provisions to ensure that the contractor is prepared with appropriate equipment and tooling. A thorough characterization of the rock properties during design is essential to confirm that the alignment is appropriate. Rock coring methods are required to accurately determine the rock quality, weathering, bedding, strength, and abrasivity, all of which can impact HDD construction. Extensive weathering or fracturing may lead to drilling fluid loss and the inability to remove spoil from the bore. Rock strength and abrasivity will impact production rates and tooling life. Incorrect characterization of the rock properties during design will result in inaccurate bids, which will likely lead

to change order requests and claims. For HDD projects, discovering that the rock characteristics are different than what was anticipated during construction can have serious repercussions. Fractured rock near the surface, or undulating rock contacts, may require that the bore be deepened or lengthened. If the original geotechnical investigation was too shallow, or used auger drilling and merely stopped at refusal, a supplementary geotechnical investigation will need to be conducted causing increased cost and delays, especially if permits are required to conduct the borings.

Contract Administration

A troubling but increasingly common approach to small HDD bores by owner agencies is to lump the burden of HDD design into the construction contract. Instead of investing effort into designing a defensible HDD project, owners leave the design of the alignment to the contractor, within broadly defined plan and profile criteria. Contractors then have to incorporate the cost for hiring an engineer to design and stamp the drawings into their bids. Very few contractors would (or competitively could) spend the money for engineering work during the bidding phase, and therefore are bidding on a vaguely defined scope of work. The low bidder is the contractor who makes the most optimistic assumptions, and may inadvertently allocate insufficient resources to engineering support. Disputes can and do arise after the project is awarded if the contractor's engineer identifies fatal flaws with the as-bid project that will require a longer, deeper bore, or more sophisticated methods than indicated by the contract documents. Leaving the design of the HDD bore geometry to the contractor may

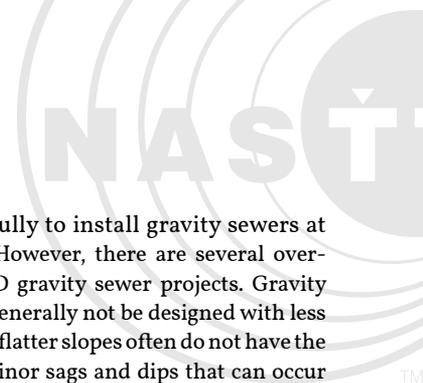
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result in a successful project; often, it does not.

Developing the bore design early, either through design-bid-build or design-build procurement methods, ensures that the owner gets a final project that has been adequately assessed by all stakeholders and that satisfies all project requirements. It is far better for owners to employ a qualified engineer with adequate time and resources to design an HDD bore, than to rely on a contractor to provide a design that may not have been fully evaluated due to schedule and budget restrictions inherent to a low bid situation. If the owner prefers for the contractor to bear the burden of design, the project should be administered under a design-build contract to ensure that all bidders have an equal understanding as to the scope of work and the allocated risk. For design-bid-build projects, HDD bores should be fully designed prior to bid, especially if the work areas are restricted, there are strict performance requirements, the anticipated geotechnical conditions are challenging, there are nearby overlying utilities, or the bore crosses beneath a sensitive feature.

Bore Alignment

A similar problem to no design is incorporation of inappropriate bore geometry, such as severe bend radii. The HDD Good Practices Guidelines (NASTT, 2008) provides recommendations for minimum bend radii based on diameter and pipe material. However, these recommendations are guidelines and should be used as a starting point from which to develop an alignment while taking into consideration all aspects of the project. For instance, poor steering response in weak or soft soils preclude a bore design with tight bend radii, even if the design limits are within standard guidelines. Similarly, designing a bore in rock with tight bend radii may cause undue stresses on the drill pipe and reamer which can lead to drill pipe failure and inability to complete the bore.

An HDD bore design in the Midwest resulted in a costly claim because the bore geometry as designed, was not constructible using HDD. The engineer showed a design profile for the HDD bores with 45-degree bends approximately 40 ft below ground surface within the HDD reach. The project work areas were tightly constrained, so the HDD bore could not be extended enough to create a vertical curve to accommodate the 45-degree bends. Rock was indicated and encountered at the elevation of the 45-degree bends, making the situation even worse. The site was adjacent to a river so dewatering and open-trench excavation to construct the 45-degree bends and launch the HDD bores from a deep shaft was not feasible. The contractor incurred costly delays attempting to complete the bores in accordance with the impractical design geometry. This problem could have been easily avoided by properly accounting for geometry constraints that are practical for the specified construction methods.

Another recent pipeline project called for HDD installation of 300 ft of 8-in. gravity sewer between two existing manholes. The drawings only showed the alignment between the two manholes, and did not propose any bore geometry for entry or exit. Numerous large utilities were present on both sides of the crossing at various elevations. The contractor was responsible for selecting a bore path that would thread the needle through a congested utility corridor. The resulting bore geometry required a 24-degree entry angle and a tight bend radius of 400 ft to avoid the existing utilities with a minimum clearance. The geometry constraints coupled with the lack of appropriate bore design resulted in a very challenging project with all of the risk assigned to the contractor. Although this project was successfully completed, it was a potentially costly gamble on the part of the owner and placed an unreasonable amount of risk on the contractor.

Gravity Sewers

HDD has been used successfully to install gravity sewers at various lengths and diameters. However, there are several oversights that are common for HDD gravity sewer projects. Gravity sewers installed by HDD should generally not be designed with less than 2 percent grade. Sewers with flatter slopes often do not have the hydraulic flexibility to tolerate minor sags and dips that can occur with HDD installations. Acceptance criteria regarding sags should also be carefully crafted to ensure satisfactory performance while recognizing the limits of achievable accuracy with HDD. A tolerance of one inch of sag is inappropriate for gravity sewers installed by HDD. In soft soils, it may be inadvisable to attempt a larger diameter gravity sewer as the reamer may sag, resulting in the reamed diameter not being centered on the pilot alignment. Increased pipe thickness/stiffness may be warranted to decrease severity of sags in the pipeline. In general, use of HDD to install gravity sewers should be completed with considerable evaluation regarding suitable ground conditions and hydraulic requirements.

Insufficient Clearance from Existing Utilities and Ground Surface

As with all trenchless projects, insufficient clearance from overlying utilities or structures can lead to a host of problems, and the same is true for small HDD projects. For open-cut construction, it may be appropriate to design a new pipeline with minimal clearance, but it is not considered good practice for HDD projects. Unlike pipejacking projects, the annular overcut for HDD projects is significantly larger, and must be considered when determining the required clearance beneath the existing utility. That is, the larger annulus both decreases the clearances and increases the estimated settlement magnitude. Similarly, the installation method, age, and condition of the existing utility should also be considered. If the existing utility was installed with HDD, there may be some uncertainty about the actual location and it should be potholed at the crossing location prior to construction. Extensive bedding beneath utilities or roadways can also cause issues with bore stability if the trench bedding material ravel into the HDD bore.

Insufficient clearance during an HDD bore can also create problems with ground deformations and damage to existing utilities. Collapse of the bore annulus can result in settlement of overlying utilities or the ground surface, potentially resulting in damage. Settlement issues are exacerbated in weak, flowing, and running soils. Settlement risk in these soil conditions can be mitigated by using conductor casings to support the bore during drilling, and annular grout after pullback to fill the void.

Hydrofracture or drilling fluid losses can also result from insufficient clearance. In some cases, minor hydrofractures can occur that would not be large enough to reach the surface on their own, but may encounter an existing utility and travel unimpeded along the utility through pervious bedding material.

HDD bores beneath waterways are particularly sensitive to fluid spills as drilling fluid can be detrimental to aquatic plants and animals. Insufficient clearance beneath rivers and creeks can result in drilling fluid loss by two mechanisms: hydrofracture and seepage. Hydrofracture occurs when the drilling fluid pressure within the bore exceeds the strength and confining pressure of the surrounding ground. Seepage occurs when drilling fluid escapes the bore through permeable or fractured ground, such as open-graded gravel and coarse alluvial soils common in creek beds.

Work Areas

Trenchless construction is often selected as the preferred pipe in-

stallation method to minimize disruption to residents, businesses, and traffic. Although HDD in particular can significantly decrease the impacts of construction, sufficient work areas are still required for a successful installation. Severely restricting work spaces for HDD projects can negatively impact production rates and result in higher costs and longer schedule durations. Impact mitigation to residents and businesses must balance not only the disruption itself, but the duration of the disruption. For example, consider the following options for work areas: maintain one lane of traffic through a residential area or completely close the road and significantly reduce construction duration. If the residential area has redundant access from both sides of the construction area and all driveways can be accessed, it may be preferable to close the road to increase work area and efficiency, thereby significantly reducing overall construction duration, as well as noise and dust impacts. It may be preferable to maintain a single lane of traffic to accommodate emergency response vehicles or if there is no redundant access for residents. In the single-lane scenario, contract provisions including either 24-hour flagging or an automated traffic control system can ensure safety.

Traffic Impacts

For projects that are located in residential or high traffic areas, designs should specifically define the allowable work area on the drawings. If an owner or stakeholder has specific requirements regarding traffic impacts, such as maintaining a minimum number of traffic lanes, access to driveways, or impacts to cross traffic, the design should include a predetermined traffic control plan. Allowable work areas should be clearly defined when specific performance requirements are required. If there is a stakeholder, other than the project owner, that needs to approve traffic control plans, such as in densely developed urban areas, these negotiations should be handled during the design phase. Establishing a traffic control plan that has acceptance from all involved parties prior to bid can identify conflicts early and reduce the need for redesign during construction. Forcing the contractor to navigate an onerous permitting process during construction can lead to delays and change orders due to vague or poorly defined contract requirements. When traffic control is required, especially in heavily travelled areas, it is recommended that the owner's design team develop an acceptable control plan simultaneously with the bore design to optimize performance of both elements and minimize complications and design changes during construction.

Design Considerations

Conductor Casing

Settlement and hydrofracture risks exist on HDD projects with low ground cover or weak soils. A common mitigation strategy for both of these issues is the use of conductor casing. Conductor casing can be extraordinarily helpful in maintaining bore stability and preventing drilling fluid loss in challenging geotechnical conditions if incorporated properly into a design. Conductor casings are typically installed by pipe ramming, which is an unsteerable and therefore imprecise installation method. If the conductor casing must be installed very precisely, such as passing beneath existing utilities with minimal clearance, a more accurate installation method may be required. Similarly, conductor casings should only be installed along the straight entry tangent of a bore; vertical curves should start at least one drill pipe beyond the end of the conductor casing. A common mistake when specifying the use of conductor casings is specifying a casing diameter that is insuffi-

cient for the anticipated reamer size. For instance, specifying the size of the casing to be only slightly greater than the reamer diameter can lead to severe problems with the reamer getting caught on the outside of the casing. For large diameter bores in weak soils, where conductor casings are often used, the heavy reamer may sag in the bore, increasing the risk that an outer part of the reamer may get caught.

Overly Prescriptive Specifications

In general, many owners prefer that specifications use performance-based language as opposed to language which is prescriptive with regard to means and methods. For most trenchless projects, the technical specifications have elements of both approaches. For example, a project may require that the contractor use HDD to install a pipeline, but not include requirements for specific reamer diameter or thrust and torque capacity. As trenchless projects become more complex and continue to push the limits of what is possible, some owners and engineers have been requiring more aggressive performance requirements. Several recent projects have required excessively tight line and grade tolerances throughout the bore for HDD projects in a range of sizes. While it is understandable that accurate installations are desirable, requiring extreme accuracy throughout the bore could result in either very high bid prices due to slower production rates, or in change orders from low bidders that assumed the tolerances would be relaxed once construction began. HDD designers should candidly evaluate their acceptable tolerances and specify deviation limits that will maintain the integrity of the project while still being reasonable for the given conditions.

Lessons Learned

Small HDD projects require adequate attention to detail, to avoid becoming big headaches. Installations of small diameter pipes or short bore lengths do not always result in quick, easy, or cheap projects. A thorough geotechnical investigation and understating of the anticipated soil behavior are the keys to success for any trenchless construction project, including HDD projects. The discovery of adverse soil conditions early during design allows the owner flexibility to alter the geometry, select an alternate alignment, or incorporate risk mitigation measures into the design. Delaying geotechnical investigations until late in design, or depending on a contractor to incorporate the cost of geotechnical borings in a low-bid scenario is short-sighted and can result in delays and significantly higher costs. For instance, if adverse geotechnical conditions require moving the HDD to an alternate alignment, easement acquisition and permitting efforts may need to be repeated. Projects with little to no geotechnical information often result in change order requests and claims due to differing site conditions, often with significant impacts to cost and schedule. To ensure a quality project that satisfies the owner's performance requirements, the burden of three designed by a team that thoroughly understands the performance requirements, as well as how the HDD portion incorporates into the larger project. The design team should thoroughly understility, evaluate risks, and optimize alignments prior to acquiring permits or easements, can ensure that small HDD crossings are successfully integrated into the larger project.

This paper was edited for style and space for publication in *NASTT's Trenchless Today*. To view the full version of paper MA-T2-02, please visit nastt.org/technicalpapers.



calendar

FUTURE NASTT EVENTS

March

25-29

NASTT's 2018 No-Dig Show
Palm Springs, California

25

NASTT's Trenchless Technology Short Course – New Installations
8:00 am - 12:00 pm
Palm Springs, California

25

NASTT's Trenchless Technology Short Course – Rehabilitation
8:00 am - 12:00 pm
Palm Springs, California

28

NASTT's Gas Industry Day
8:00 am - 6:30 pm
Palm Springs, California

28-29

NASTT's Cured-In-Place Pipe (CIPP) Good Practices Course
March 23: 2:30 pm - 6:00 pm
March 24: 8:00 am - 12:00 pm
Palm Springs, California

28-29

NASTT's Sewer Laterals Good Practices Course
March 23: 2:30 pm - 5:30 pm
March 24: 8:30 am - 12:00 pm
Palm Springs, California

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28-29

NASTT's Horizontal Directional Drilling (HDD) Good Practices Course
March 23: 2:30 pm - 6:30 pm
March 24: 7:30 am - 12:00 pm
Palm Springs, California

28-29

NASTT's Pipe Bursting Good Practices Course
March 23: 2:30 pm - 5:30 pm
March 24: 8:30 am - 12:00 pm
Palm Springs, California

28-29

NASTT's New Installation Methods Good Practices Course
March 23: 2:30 pm - 6:00 pm
March 24: 8:00 am - 12:00 pm
Palm Springs, California

[For more information visit nastt.org/calendar.](http://nastt.org/calendar)

locations

FUTURE NASTT'S NO-DIG SHOWS



NASTT's 2019 No-Dig Show
March 17-21
Donald E. Stephens
Convention Center
Chicago, Illinois



NASTT's 2020 No-Dig Show
April 5-9
Colorado Convention Center
Denver, Colorado



NASTT's 2021 No-Dig Show
March 27-31
Orange County Convention
Center
Orlando, Florida



NASTT's 2022 No-Dig Show
April 9-13
Minneapolis Convention
Center
Minneapolis, Minnesota

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