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The Official Magazine of the North American Society for Trenchless Technology



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SUMMER 2023
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The Official Magazine of the North American Society for Trenchless Technology

SUMMER 2023 – VOLUME 13, ISSUE No. 2

NASTT 2023 NO-DIG SHOW GREENS PORTLAND!

Spring excitement was in the air as the world's largest trenchless technology conference gathered at the Oregon Convention Center during a warm sunny week in Portland. Over 1700 attendees enjoyed a busy fast-paced week of, networking events and a wealth of new information about the latest in innovative trenchless products and services. The NASTT No-Dig show is one of the must-attend underground construction conferences in North America.

18



FEATURES

10 Q&A: Drew Sparks, Laney Directional Drilling

After a decade in geotechnical engineering, NASTT Board Member Drew Sparks first became involved with the trenchless technology industry in 2004. This perfect combination of geotechnical engineering and trenchless design has positively shaped his career. Drew serves as Vice Chair of the Technical Program Committee for 2023 - 2024.

32 NASTT Celebrate Trenchless Awards 2023

The NASTT No-Dig Celebrate Trenchless Awards recognize the significant contributions made by professionals to developing trenchless technology and fostering its success. There are three annual Awards: Chair Award for Distinguished Service, Ralston Award for Young Trenchless Achievement, and NASTT Volunteer Award. The three recipients are profiled.

36 NASTT 2023 Abbott Innovative Product Award Winners

The Abbott Innovative Product & Services Award celebrates companies with a state-of-the-art product or service making a significant impact in advancing the trenchless industry in Rehabilitation or New Installation. The two award winners and eight finalists are profiled.

50 The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

This paper was selected as Outstanding Paper – New Installations, from all the presentations at the 2023 NASTT No-Dig Show in Portland OR. The paper describes the geo-pilot bore concept and its application in determining the feasibility of a drillpath using two examples of long HDD crossings in mountainous terrain.



DEPARTMENTS

- 6 Executive Director's Message
- 8 Welcome from NASTT Chair
- 14 Morty's Trenchless Academy
- 42 Trenchless Rising Stars
- 44 No-Dig Show 2024 Preview
- 46 Eye on Industry
- 61 Events Calendar
- 63 Index of Advertisers

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WELCOME TO THE SUMMER 2023 EDITION OF TRENCHLESS NORTH AMERICA!

This issue focuses on the very successful 2023 No-Dig Show in Portland, OR where it was great to see so many people from the trenchless technology world showcasing the latest products, innovations and award-winning projects. We would like to thank over 1,700 attendees, exhibitors, sponsors, presenters, and volunteers that made it such an energized event, and in particular the incredible team of NASTT staff and contractors who made the show possible. The Pacific Northwest has many large trenchless technology projects, and this was reflected in the packed presentations and record engagement in the NASTT Municipal & Public Utilities Scholarship Program.

The scholarship awards full conference places and hotel accommodation to those working for municipalities and public works owners that have an interest in utilizing trenchless technology. Since 2013 over 1,500 individual places have been awarded for the No-Dig Show and the program is now in operation for No-Dig North as well. This is funded from previous investment in the events and allows those owners who are part of the decision-making group to be at the conference learning firsthand on the capabilities and benefits of the no-dig process to enhancing underground utility networks. The application process for the 2024 No-Dig Show in Providence, RI will be open soon and we look forward to receiving and accepting as many scholarship recipients as possible.

This issue also celebrates our Award winners, including profiles on the Abbott Award for Innovative Products & Services winners for Rehabilitation and New Installation. The quality and range of applications this year reflected the high level of innovation and growth within our industry. Thank you to all who participated and congratulations to the winners!

Through the summer months work is continuing on new editions of the NASTT Good Practices Guideline for Horizontal Directional Drilling (HDD) and also the Cured-in-Place Pipe (CIPP) which will be ready to roll out at the 2024 No-Dig Show in Providence, RI. Also coming up, we are looking forward to No-Dig North (www.nodignorth.ca) in Edmonton, Alberta in October as well the International No-Dig Show (www.no-digmexico.com) taking place in Mexico City in October. Registration is open for both these events which means there is plenty happening between now and late Fall.

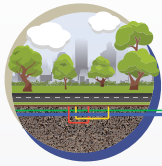
Over the next few months NASTT will be undertaking the development of the next Strategic Plan. This important document lays out the direction and objectives of the organization and we will be seeking your ideas and comments. Please look for further information regarding our Membership Survey and have your say in our future!

Finally, please take time to update your membership record (and renew your Membership if due!) through our new Association Management System at www.nastt.org. We are expanding our products and benefits to members through the website with a new look and features, coming soon!

To all of you who volunteer and contribute to making us better, thank you.

Enjoy your read!

Matthew Izzard, Executive Director
North American Society for Trenchless Technology (NASTT)
mizzard@nastt.org



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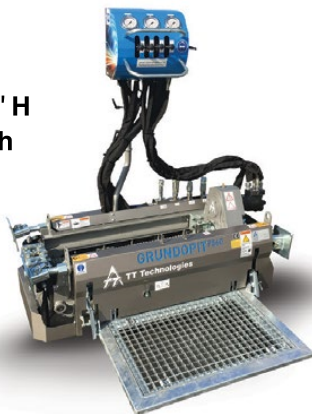
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THE TRENCHLESS INDUSTRY EXCELS AT INNOVATION

NASTT's 2023 No-Dig Show held in Portland this past April was an exciting event full of industry-leading networking and educational opportunities. Take a look throughout this issue for a recap and overview of the 2023 show and make sure to mark your calendars so you can join us in Providence, Rhode Island in April 2024 when we head to the Northeast United States for the first time.

With over 1,700 attendees, it was a busy and fun week for all, including the university students from our Student Chapters and Municipal Scholarship recipients from all across North America. Thank you to our Technical Program Committee Members and the 2023 No-Dig Show Planning Chair, Joe Lane of Aegion for all your time and efforts. Our volunteers are the backbone of this society, and we are grateful and appreciative of everyone's contributions to making NASTT what it is today.

One of the highlights of the No-Dig Show is the Abbott Award for Innovative Products & Services. This year each finalist was given the opportunity to present during a forum dedicated to innovation in the trenchless industry and the winners were recognized at the Ribbon Cutting Ceremony when the exhibit hall was officially opened. Innovation is the cornerstone of this industry and advancement and growth are achievements for us all to be proud of. Check the section in this issue where we celebrate the winners and finalists of the 2023 Abbott Award for Innovative Products & Services in New Installations and Rehabilitation.

We look forward to the coming months and the events we have planned to bring the underground infrastructure community together. This fall we hope you will join us in Edmonton, Alberta for the 2023 No-Dig North Conference, October 23-25. No-Dig North is hosted by the Canadian Chapters of NASTT and offers three full days of training, education, and networking. This is a must-attend event for trenchless training and networking in Canada. Visit www.nodignorth.ca for details!

In keeping with our mission of education and training, we regularly review and update our training materials and offerings and are excited to roll out updated educational resources this year along with more frequent opportunities for both in-person and virtual education. For the latest information on upcoming events, visit our website at nastt.org/training/events.

Be sure to save the date for the NASTT 2024 No-Dig Show in Providence, RI, April 14-18. The city of Providence is a perfect location for our industry to come together to celebrate and educate with the theme, **Green Above, Green Below**. It is important that our industry is a steward of our precious natural resources, and we welcome the opportunity to provide a forum to learn about the latest in innovative trenchless products and services.

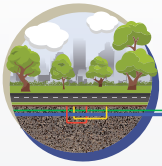
This year we are excited to offer a new track during the technical program at the No-Dig Show. As the push for renewable energy continues to grow and gain popularity across North America, trenchless technology is undoubtedly playing a vital role in the development and execution of offshore wind projects and other onshore renewable projects. In response to this increasingly important segment of the trenchless industry we are excited to introduce the Renewables Track at the 2024 No-Dig Show.

For more information on our organization, committees, and member benefits, visit our website at www.nastt.org and please feel free to contact us at info@nastt.org.

We look forward to seeing you at a regional or national conference or training event soon!

Matthew Wallin

Matthew Wallin P.E., Chair
North American Society for Trenchless Technology (NASTT)



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with
Drew Sparks

*After a decade in geotechnical engineering, Drew Sparks first became involved with the trenchless technology industry in 2004. This perfect combination of geotechnical engineering and trenchless design has positively shaped his career. Serving on the NASTT Board of Directors since 2021, Drew is currently enjoying his role as Vice Chair of the **Technical Program Committee** for 2023 - 2024. He is also a mainstay of the Education Committee, believing the future of the industry hinges on educating young engineering professionals on the viability and importance of trenchless methods. Drew shares his informed perspective on the current and future state of the industry.*



What first inspired you to become interested in construction & engineering field, particularly underground construction?

I decided to go into engineering when I was in high school. While driving home from a school field trip, we passed a highway approach ramp supported by a mechanically stabilized earth wall. My friend told me that his dad designed it. I thought that was really cool and I started thinking about going into engineering. As a kid, I always liked being outside and getting my hands dirty. When deciding which engineering field to enter, I did not want to drive a desk my entire work career, so I decided to specialize in geotechnical engineering. After graduating with a master's degree, I worked in the field doing geotechnical engineering and construction observation for the first five years. I was able to see some amazing earth structures being built and gained some invaluable experience. After a few years, I was encouraged to spend less time in the field and more time managing projects. That was a hard transition, but I was able to implement some of the field construction experience into making my designs more constructible.

Outline your experience of first being introduced to trenchless technology methods and applications.

After spending about a decade in geotechnical engineering, I joined a trenchless engineering group in 2004. There, I learned trenchless engineering design and was able to share my knowledge of geotechnical engineering. We had an amazing team of trenchless professionals that pushed the industry

forward in many areas. The combination of trenchless design and geotechnical engineering was a perfect combination to shape the rest of my career.

How did you first get involved with NASTT? What are some of the goals and initiatives you would like to see NASTT pursue?

When I joined the trenchless engineering group in 2004, I was just beginning to understand what trenchless technology was and the benefits of trenchless methods. I learned about NASTT and the No-Dig Show and I soon realized that the trenchless industry had its own association, similar to ASCE, only focused solely on trenchless engineering and construction. Even though NASTT was a great resource for information, I didn't feel like I had much to contribute until 2011 when I wrote my first paper and presented it at the No Dig Show. At that point, I knew that I wanted to be more involved and contribute to the community. After writing a few papers for the No-Dig show, I decided to become more involved, and I volunteered to be on the technical program committee and was a moderator at the conference for a few years. I enjoyed getting to know people in the trenchless industry. My position on the NASTT National Board was pretty much an accident. A colleague asked me in the fall of 2020 if I would mind if he volunteered me to be on the NASTT Board. I had no idea what it really was and what it would require, but I'm always willing to help whenever I can. I figured it was a long shot but told him I'd be happy to do what I can. A few weeks later, I was surprised to find out that I was a finalist for one of the open board positions and that I needed to campaign

to try to win the position. I was very busy with work duties at the time and didn't know how to go about campaigning since I didn't really know that many people other than my colleagues. Since I was a long shot to begin with, I figured I'd let the chips fall where they may.

To my shock, a few weeks later I received a call from NASTT Executive Director Matthew Izzard that I was voted by my peers and fellow members of NASTT to be on the board. I still had no idea what that really meant, but I was happy to be able to serve. After attending my first board meeting a few months later, my eyes were opened, and I gained a new understanding of the goals of NASTT to serve its members and push trenchless technology forward. I also learned what a great privilege I had to work with other board members and the NASTT staff. As Bob Ross was famous for saying, "There are no mistakes, just happy accidents".

The two things that I would like to see NASTT continue to pursue are education and professional development. Recently, there has been a concerted effort to increase NASTT's involvement in education of the young professionals in the university programs. To date, some of the student chapters are well organized and active, while others are not well supported and have few students. I would like to see NASTT continue

"I did not want to drive a desk my entire work career"

to focus on involving students and university professors who do not have an established program in order to help students become contributing young professionals to our industry. In my daily work, I often see engineering designs from professionals who clearly do not have the knowledge or experience to produce high-quality, constructable designs. I would like to see a renewed effort in educating engineering professionals to increase the knowledge and design skills to produce better designs.

I would also like to see NASTT work to dispel common myths or misperceptions related to the environmental impacts of trenchless technologies. There are some people who believe that the trenchless industry damages the environment. For example, the non-hazardous drilling fluids used in our industry every day are still considered by many to be hazardous materials. I think NASTT could be an effective voice to educate the general public and permitting agencies.



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“Doctors get to bury their mistakes, but trenchless professionals have to bury their successes!”

What are your thoughts on the current state of the trenchless industry? What areas do you see evolving in STEM education and post-secondary academics?

With a continued increase in state and federal regulations, I only see that the use of trenchless technology will be more valuable in maintaining our aging infrastructure and installing new utilities. It seems like all the easy routes have been taken and we are left with sites with more congestion and difficult conditions. These challenging conditions make trenchless solutions so valuable for future infrastructure development and maintenance. Like many professional fields, I think we are at risk of experiencing a significant brain drain in the trenchless industry. Relatively few students are choosing to enter the trenchless field and we could lose much of the knowledge gained over the last 50 years without a proper succession plan for the next generation. I appreciate NASTT’s efforts to work with student chapters to encourage more students to join the ranks of trenchless

professionals. That is part of the reason why I volunteered to work on the education committee at NASTT.

Is the trenchless industry generally doing a good job of attracting young professionals? What do you think can be done to better engage students and young professionals in the trenchless industry?

While NASTT, other associations, and engineering schools have made great efforts to attract young professionals, it seems that there are never enough young people interested in the trenchless industry. I think the solution to attracting more young professionals is to inspire young kids to enter STEM fields before they enter high school. While not everyone has a natural affinity toward math and science, many don’t choose STEM fields because they think engineering is too hard.

Biggest challenges facing the trenchless industry today? Has acceptance and understanding of trenchless technology improved?

I don’t think there is much resistance to accepting trenchless construction methods, but I do think that knowledge of its existence is the primary obstacle to its acceptance. For example, I recently had lunch with several professors at a local university to talk about trenchless engineering and construction and how we might be able to help educate their students on what it is and increase their interest. I was surprised when none of them knew much about what it was or how it can benefit the society and the environment. While we live in the trenchless world, we, as the industry, must realize that most of the people have no idea what we do. To borrow from a common quote about successes and failures. Doctors get to bury their mistakes, but trenchless professionals have to bury their successes. Our work is often unseen and overlooked, but it does not make them less valuable. We just need to be better at educating people about the benefits of burying our best work.

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

Because I started my engineering career in geotechnical engineering, I have really enjoyed the integration with trenchless engineering and solving complex trenchless engineering and construction problems. While I’ve had several opportunities to move into management positions, I find my greatest joy in engineering. I’d rather solve a technical problem than deal with a people problem which explains why I went into engineering instead of business management. Recently, I’ve enjoyed becoming closely involved in the construction engineering side of the trenchless industry. After spending 20 years in consulting engineering, I decided to work in the construction engineering side. Over the last 5 years, I’ve learned to take a more integrated approach in engineering while considering the needs and limitations of construction. It has made me a better engineer and certainly a better advocate for the trenchless industry.

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Clean Solutions for Omaha with a Trenchless Focus

Using project-specific contracting mechanisms to control cost and risk

By: Kyle Friedman PE, Brierley Associates

BRIERLEY ASSOCIATES
Creating Space Underground



1300 Linear feet, 96-inch microtunnel crossing within a residential area

The City of Omaha, Nebraska, like hundreds of other U.S. Cities, is in the process of decreasing the combined sewer overflows that are a major cause of water pollution in adjacent streams and rivers. Approximately 43 square miles of Omaha east of 72nd Street house the remnants of a combined sewer system dating back to the 1800s. Prior to the Environmental Protection Agency's consent decree, approximately 3.7 billion gallons of raw sewage mixed with stormwater overflowed annually into the Missouri River and Papillion Creek. In 2006, the city created the Clean Solutions for Omaha (CSO) program to address combined sewer overflows and to improve the quality of the local waterways. The three goals of the program are:

(1) regulatory compliance of enacting a long-term control plan was enacted to capture 85 percent of combined sewer overflows generated in an average year;

- (2) economic affordability to minimize the financial burden on rate payer and customers; and
- (3) community acceptance to facilitate open dialogue with the public on program timing and project information (City of Omaha).

Currently, 56 projects are planned to help achieve and maintain the City's long term clean water goals by 2037.

One of these Omaha CSO projects is the Forest Lawn Creek Inflow Removal and Outfall Storm Sewer project. Located in the Minne Lusa Basin, this project is intended to separate the stormwater and sanitary flows in the project area and remove and/or reduce inflow into the existing combined sewer system. Stormwater flows from Forest Lawn Creek will be directed to the Missouri River during all rain events. This will provide additional capacity in the local collection system and reduce the potential for street flooding and



96-inch microtunnel crossing was successfully completed in June 2023

back-ups into basements. Sanitary sewer flows will be directed to the conveyance sewers and then routed to the Missouri River Water Resource Facility for treatment. The Forest Lawn project includes 13,000 linear feet of new storm sewer and 7,500 linear feet of new sanitary sewer winding through a residential area.

Along Weber Street within the residential neighborhood, a trenchless method was selected to install a section of the storm sewer that, due to grade requirements, would have required open cut trenches up to 40 feet deep. A 96-inch diameter HOBAS™ pipe was specified for the trenchless installation.

During the design process, a detailed risk register was created to collectively identify, analyze, and address potential issues associated with the trenchless crossing. The use of the risk register allowed the design team to fully understand the factors that could affect cost and schedule of the project, and to help in development of a geotechnical baseline report and specifications which were not overly conservative, and project specific. During this process, it was determined that some of the greatest risks associated with this crossing were related to uncertainties in the artificial fill, the potential for oversized materials, and mixed face conditions within the native soils.

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Morty's Trenchless Academy



RMNASTT sponsored tour of the microtunnel construction

Artificial fill was known to exist above the trenchless crossing from derived re-workings of the Peoria Loess and existing utility installations. The samples collected indicated the fill was undocumented and contained glass, slag, and brick fragments. Based on this uncertainty, obstruction quantities and sizes were baselined. This meant the contractor had to properly select a cutter head configuration that could ingest and break down these types of obstructions.

The native soils in the project area include the Peoria Loess. The Peoria Loess is a very fine grained material which is known to vary in consistency along the alignment from weight of hammer to 20 blows per foot. These mixed face conditions could potentially cause MTBM steering issues along the alignment. Multiple strategies were implemented within the Contract Documents to address this, including baselined levels for mixed face conditions, requirements in the specifications for experienced operators, specifying survey intervals, and steering correction criteria.

The specifications set clear experience levels with a minimum of 10 years of experience of operating jacking projects and a minimum of 5 projects of similar size, length, and ground characterization to that baselined. These requirements ensured an experienced contractor and operator could handle these tough ground conditions and know how to properly make corrections, as needed. Specific survey intervals were also specified to ensure the single pass installation stayed within the project tolerances of 1 inch on grade and 3 inches on line.

Steering criteria were also implemented to ensure that hard steering corrections were not utilized that could increase jacking forces or ultimately create a stuck machine. The criteria allowed 1 inch of corrections with 25 linear feet of tunneling. Prior to construction, CM staff met with the MTBM operators to discuss the expected ground conditions and how the machine might



Successful completion of the trenchless crossing within project specifications

behave during tunneling. This exercise proved to be a useful tool to manage expectations of ground conditions and response.

These measures were successful in balancing the risk of the trenchless crossing between the Owner and the Contractor and also created a fair and reasonable bidding environment that resulted in uniform and realistic bids and decreased the cost of the trenchless portion of the project ensuring the second goal of the CSO program: affordability. The 96-inch microtunnel crossing was successfully completed in June 2023 by J.W. Fowler and Roloff Construction without issue. The Forest lawn project was also featured for a site tour by the Rocky Mountain Chapter of NASTT allowing Owners and engineers to see trenchless in action.



Kyle Friedman, PE, is a Project Engineer for Brierley Associates specializing in the design and construction of trenchless installations. Kyle is on the executive committee of the Rocky Mountain Chapter of NASTT (RMNASTT).



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NASTT 2023 No-Dig Show **Greens Portland!**

Preserving Our Natural Resources: **Green Above, Green Below**

Spring excitement was in the air as the world's largest trenchless technology conference and trade show swung into action again during warm sunny days in beautiful Portland Oregon. Held April 30 – May 4 at the expansive Oregon Convention Center, the NASTT 2023 No-Dig Show showcased numerous environmentally friendly trenchless solutions and cost-saving opportunities that municipalities and utilities can utilize to benefit their communities.

Over 1700 attendees, including university students from NASTT Student Chapters and Municipal Scholarship recipients, enjoyed a busy fast-paced week of fun, networking events and a wealth of information about the latest in innovative trenchless products and services. With six tracks of peer-reviewed, presentations, nearly 200 informative trade exhibits and multiple networking opportunities, the NASTT 2023 No-Dig Show solidified its position as one of the premier must-attend underground construction conferences in North America.

The NASTT 2023 No-Dig Show in Portland demonstrated beyond question that trenchless technology offers both innovative rehabilitation and technically advanced replacement options for communities and utilities looking for cost effective, non-disruptive and greener infrastructure solutions. It displayed the resilience, resourcefulness and innovative foundations of the trenchless industry, and the people who pursue it with a passion.

As preparations begin for the NASTT 2024 No-Dig Show in Providence, RI, April 14 – 18, the trenchless technology industry remains at the forefront as a key environmental steward offering an impressive toolbox of methods and ideas which help preserve our natural resources. Exemplifying the theme of “Green Above, Green Below”, NASTT looks forward to continuing to further develop its role as the go-to resource for knowledge, networking, education, and training in trenchless technology all across North America.

“I am always amazed at the positive energy that No-Dig Show builds in creating real opportunities for everyone.”

– Matthew Izzard, NASTT Executive Director



Opening Breakfast - Welcome to No-Dig 2023!



Monday morning opened with the Opening Breakfast which featured peer networking, awards, a full breakfast and inspirational entertainment to set the tone for the week!



Attendees were treated to fascinating stories from Chad Pregracke, Founder of Living Lands & Waters. Chad is the internationally named 2013 CNN Hero of the Year, founder and president of Living Lands & Waters; a nonprofit river cleanup organization, author and professional public speaker. He is proof one person can make a difference. Named "America's Hardest Working Person" by Mitchum, Chad's enthusiasm, sense of humor and passion amplifies his story and entertains audiences. Ultimately, his message inspires people to believe they can make a difference.

NASTT 2023 No-Dig Show



The NASTT Chair Award for Distinguished Service recognizes trenchless professionals that have provided both NASTT and the trenchless industry with meritorious, prominent and long-standing service. One NASTT member each year is chosen at the discretion of the NASTT Chair. The 2023 Distinguished Service Award recipient is Craig Vandaele, Vice President Trenchless Preconstruction Services at Michels Corporation. Craig was recognized during the Opening Breakfast and is shown here with NASTT Chair, Matthew Wallin



International Society for Trenchless Technology (ISTT) Chair Keh-Jian (Albert) Shou, Ph.D, addresses the breakfast audience. Dr. Shou is a driving force in the development and promotion of trenchless technologies in Taiwan



“Trenchless Technology” magazine Person of the Year: Dr John Matthews, Trenchless Technology Center, Louisiana Tech University, awarded by “Trenchless Technology” magazine Publisher Kelly VanNatten and Trenchless Ambassador Dan Sisko of Benjamin Media



“Trenchless Technology” magazine awards their Trenchless Project of the Year in Rehabilitation and New Installations each year during the NASTT No-Dig Show Opening Breakfast. Awards were presented by Sharon Bueno and Michael Kezdi of Trenchless Technology magazine

Ribbon Cutting & Exhibit Hall



A major highlight of the NASTT No-Dig Show is the ready access to industry exhibits featuring innovative new technologies, and a wealth of trenchless expertise and knowledge



Capable volunteers smoothly handled the busy registration area



Conference delegates eagerly awaited the opening of the 2023 Exhibit Hall, signified by the ceremonial ribbon cutting

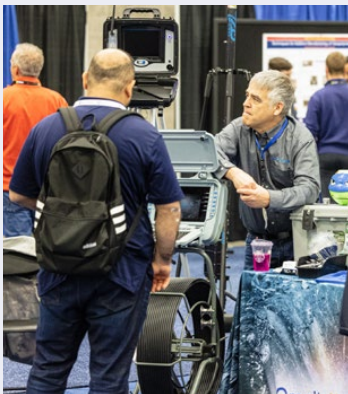


The annual ceremonial ribbon cutting opens the exhibit hall and welcomes sponsors, exhibitors, attendees and guests to the NASTT No-Dig Show!
L-R: NASTT Board Past Chair, Alan Goodman (HammerHead Trenchless); NASTT Board Secretary, Babs Marquis (Delve Underground); No-Dig Show Planning Committee Chair, Joe Lane (Aegion); NASTT Board Chair, Matthew Wallin (Bennett Trenchless Engineers); and NASTT Executive Director, Matthew Izzard (NASTT)

NASTT 2023 No-Dig Show



Networking and education are always top of mind during the NASTT No-Dig Show. The exhibit hall is buzzing with the latest innovations in the trenchless industry with product and equipment demonstrations and lively technical discussions. Exhibitors offer raffles, food and beverages give-aways and more in their booths for attendees to explore and enjoy



Ribbon Cutting & Exhibit Hall



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North American Society for Trenchless Technology
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Technical Sessions & Forums



A core feature of the NASTT No-Dig Show is the unparalleled technical schedule which spans six tracks over the course of three days. Over 130 sessions on all aspects of trenchless technology were presented and also included panel forums with industry experts offering topic discussions where audience Q&A and participation is encouraged! Registrants are able to earn Continuing Education Units to support their professional development with their attendance to the technical sessions



Technical Sessions & Forums



Educational Fund Auction



Morty the Tunnel Rat always leads the pack as the most prestigious highest-bid item at the Auction



NASTT members always outdo themselves with hilarious creative costumes, and this year was no exception!



Tiffanie Mendez, NASTT Board Officer, brings passion and joy to her demanding role as Chair of the NASTT Student Activities Committee, engaging bright young engineering students across North America



There were over 100 scholarships awarded in the past year thanks to generous supporters of the NASTT Educational Fund

NASTT 2023 No-Dig Show



Educational Fund Auction



The NASTT Annual Educational Fund Auction helps raise funds for targeted trenchless training and courses to the industry. The Educational Fund Auction also assists with the publication of resource manuals and sponsoring university students' attendance to the NASTT No-Dig Show as well as awarding Municipal & Utility Scholarships. Theme of the 2023 Auction was "Get Outdoors" in the great Pacific Northwest. There were some wild costumes including a hiker, lumberjack, tree hugger, bear wrangler and a great ape! A fun evening, enjoyed by all!



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Casino Royale & NASTT Awards



Long time NASTT member and recognized authority on trenchless and tunneling methods, Steven R. Kramer, PE, FASCE, Senior VP Tunnel at COWI, was inducted into the 2023 NASTT Hall of Fame. Shown here receiving his award from NASTT Executive Director Matthew Izzard



Kevin Miller, Senior Adviser at the Miller Pipeline Corporation receives his induction into the 2023 NASTT Hall of Fame from NASTT Executive Director Matthew Izzard. NASTT and the Miller Pipeline Corporation would not be where they are today without Kevin's contributions



NASTT Hall of Fame Inductees (left) Steven R. Kramer, PE, FASCE, and (right) Kevin Miller, with Craig Vandaelle, recipient of the 2023 NASTT Chair Award for Distinguished Service



A champagne toast kicked off the evening's festivities at the new NASTT Casino Royale



Casino Royale attendees dressed to impress for a festive evening including cocktails, delicious hors d'oeuvres, socializing, laughter and networking with industry friends and colleagues - pay your money and take your chances!





CELEBRATE TRENCHLESS AWARDS



NASTT Celebrate Trenchless awards honor the growth and advancements in the trenchless industry. NASTT recognizes the many ways that these individuals contribute significant time, energy and intellect to developing trenchless technology and fostering its success.



Chair Award for Distinguished Service

Recognizing trenchless professionals that have provided both NASTT and the trenchless industry with meritorious, prominent and long-standing service. One NASTT Member each year is chosen at the discretion of the NASTT Chair.



Craig Vandaele

Vice President, Trenchless Preconstruction Services at Michels Corporation

NASTT's Board of Directors Chair, Matthew Wallin, P.E. and Immediate Past Chair, Alan Goodman, have chosen Craig Vandaele as the recipient of the 2023 Chair Award for Distinguished Service. Craig is the Vice President, Trenchless Preconstruction Services and Michels Corporation. Craig has more than 20 years of experience in the North American tunneling and trenchless technology industries. His vast experience includes design, inspection, construction and construction management of trenchless projects throughout North America.

Craig has a deep understanding of the complexities of trenchless projects. In his eleven years at Michels, he 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, EPBTBM, 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. He is active in many industry organizations, including North American Society for Trenchless Technology Northwest Chapter (Past Chair), Tunnel Association of Canada (TAC) and of course NASTT. Craig has co-authored papers for several No-Dig conferences. NASTT Chair, Matthew Wallin shared, "In the transition year between outgoing Chair Alan Goodman and incoming Chair Matt Wallin, it made sense to make a joint decision on the recipient of this year's Chair's Award. As Alan and I discussed, the obvious choice was Craig Vandaele. Craig came to the Chair position in 2019 with lots of energy and lots of plans for moving the Society forward. And then in the middle of his tenure, COVID stopped

everything in its tracks. In that challenging time when many were floundering to adapt to a new normal, Craig's leadership was pivotal in guiding NASTT through our first year without a No-Dig Show in three decades. By keeping the Board focused on finding innovative ways to continue our mission of trenchless education, while protecting our financial foundation, Craig led us through those uncharted and difficult seas. Through the end of his chair term, and continuing as a strong Immediate Past Chair, Craig has helped forge an improved NASTT that is in a very strong and exciting position to continue as the premier organization for trenchless professionals. So, Alan and I offer this award to Craig Vandaele in appreciation of his years of exemplary service to NASTT!"

Thank you for your leadership and strength, Craig! We congratulate you! The Chair Award for Distinguished Service presentation will take place during the Casino Royale celebration event in Portland, OR at the NASTT 2023 No-Dig Show on May 2. Join us!

NASTT Staff Selects 2023 Volunteer Award Recipient

The Volunteer Award recognizes members who exemplify the mission, vision and core values of NASTT and make an impact in the trenchless industry through their dedication, leadership and volunteer contributions to NASTT during the past year. Recipients are chosen at the discretion of the NASTT Staff.



Please join NASTT in celebrating the 2023 recipient:

Kate Wallin, Senior Scientist at Bennett Trenchless Engineers.



Kate Wallin

Senior Scientist, Bennett Trenchless Engineers

Michelle Hill, NASTT Program Director said of Kate, "It's such a pleasure to work with Kate as a Track Leader and Planning Committee member for the No-Dig Show. She is a volunteer that I can depend on to not only raise the bar and complete tasks in a timely manner, but to come up with great ideas along the way. I've told her on a few occasions if she gets tired of being an incredible engineer she should look into a career in event planning! Thank you Kate for sharing your great energy and talents with us."

Jessie Clevenger, NASTT Business Development Manager expressed the following, "What makes Kate such a great volunteer for NASTT? Great question! I'd love to tell you. Kate believes in the mission of NASTT and is constantly looking for ways to expand the outreach and education of trenchless technology. Whether that is through her efforts as Chair of the WESTT Regional Chapter, outreach with our student program as well as growth of new student chapters or coming up with innovative ideas to continue the

growth of NASTT and the No-Dig Show. Kate is always such a wonderful support person and full of amazing energy and ideas. It's always a pleasure to work with Kate, and I am so thankful for her time as a volunteer!"

Kari Webb, NASTT Education Manager explains why she chose Kate as this year's recipient, "I have been lucky enough to work with Kate not only as a Good Practices course instructor, but also as a member of the Student Program Committee. Kate, your dedication to growing our organization and making a true impact never goes unnoticed. You have been a sounding board for new ideas, and I always appreciate the input and value you bring to our mission and values. Thank you so much for all you do, looking forward to working on new projects with you!"

Thank you Kate! The entire NASTT Staff appreciate your efforts. Kate was recognized at the NASTT 2023 No-Dig Show in Portland, OR, April 30 - May 4 as well as at the Western Regional No-Dig conference November 7 – 8 in Hawaii.

NASTT Selects 2023 Ralston Young Trenchless Achievement Award Recipient

Applauding savvy members under 36 who have demonstrated excellence early in their career by making valuable contributions to the trenchless technology industry, achieving noteworthy professional success, and actively participating in NASTT or its regional or student chapters. With their talent and ability, these impressive people are the future of trenchless.



Please join NASTT in celebrating the 2023 recipient: Marya Jetten, P.Eng. at Jacobs in Toronto, Ontario.



Marya Jetten. P.Eng

Global Technology Leader for Condition Assessment and Rehabilitation Solutions, Jacobs

Young Trenchless Achievement Award Selection Committee Chair, Chris Sivesind, Territory Manager at Akkerman and NASTT staff made a surprise call to Marya to share the news. "We had an impressive group of candidates. Marya made immeasurable contributions to the NASTT community, especially the Canadian chapters." Chris said. Marya, was thrilled to hear the news with her four-month old in her arms. "It is a privilege to be recognized for my passion for all things trenchless", she said, acknowledging the inspirational careers of previous recipients, some of whom are now her mentors and colleagues.

In Marya Jetten's 12 years as an Engineer, she has gained in-depth experience in a wide variety of trenchless technologies for conveyance installation and renewals. "NASTT has provided me with a robust industry network and continuous education in trenchless technology," she said. "I am honored to be recognized by NASTT for my contributions to the trenchless community."

Marya is regular presenter and attendee at well-established Canadian, North American & Global conferences, where she expands her network and builds her knowledge on rapidly changing industry standards, available and applicable products for various applications and the ever-expanding boundaries being pushed for installation methods. She shares this knowledge with her Jacobs peers as the Jacobs Global Technology Leader for Condition Assessment and Rehabilitation Solutions.

"Marya's communication skills help maintain cohesiveness within the team, recruit new members, and elevate the overall level of excellence in delivery," said Daniel Buonadonna, Senior Technologist at Jacobs, who was thrilled to nominate Marya. "Marya uses her leadership influence to raise awareness of trenchless technologies and enable project success across the continent."



Marya Jetten accepts her award with NASTT Young Trenchless Award Committee Chair, Chris Sivesind

Noteworthy Trenchless Technology Leadership

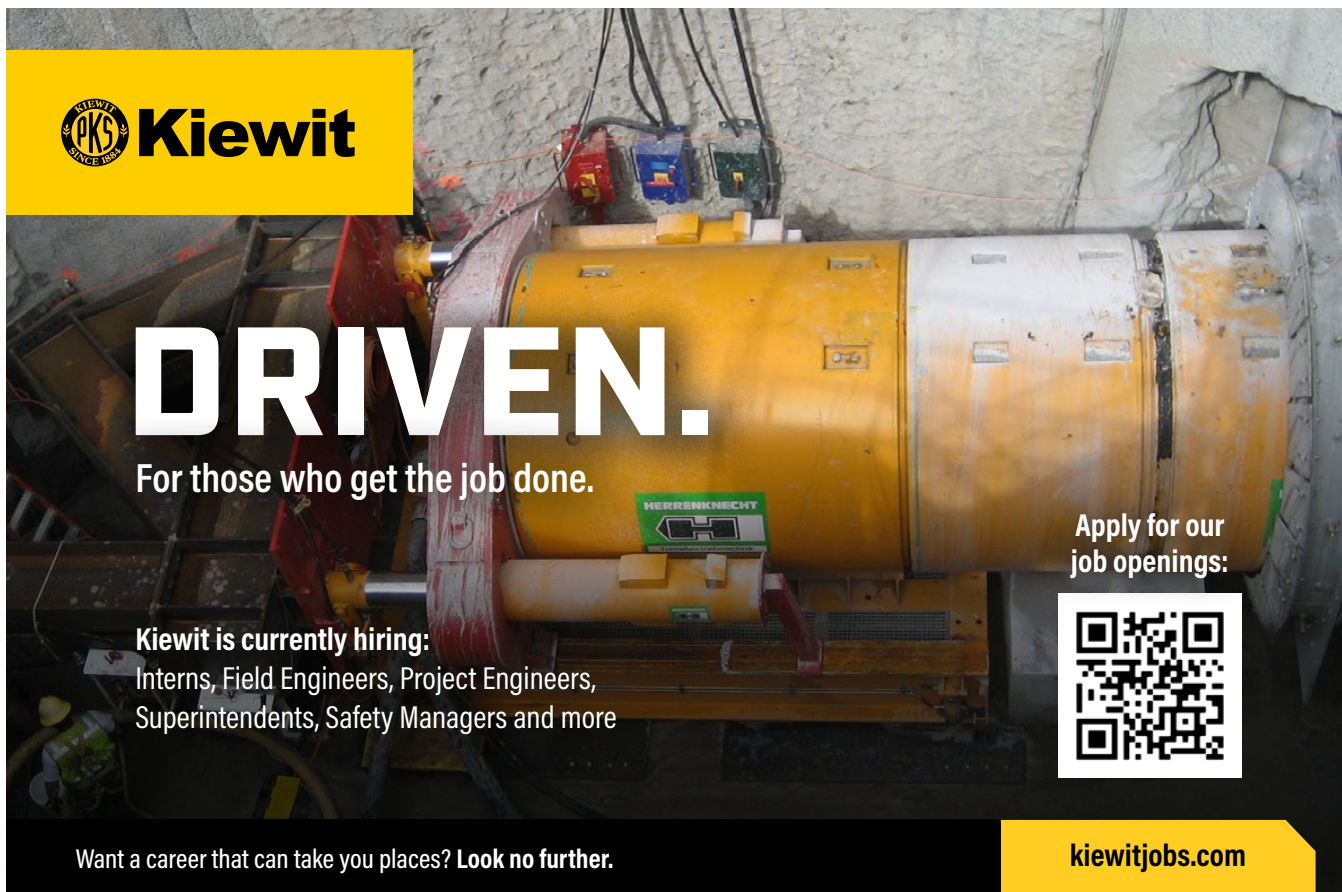
Marya served as the Co-Chair of the Technical Program Committee for No-Dig North 2022, after volunteering for the conference in 2021. Bruce Yao, Vice President of Testing at Paragon Systems Testing who also served as Co-chair noted that her extensive project management experience was instrumental in the conference's success. “


Her positive can-do attitude also made her a joy to work with as a team; she brought the most out of the people working around her.” Gerald Bauer, Principal Water at Stantec Consulting Ltd. Was also a No-Dig North volunteer. “She worked tirelessly in her role...doing an amazing job to make the conference a huge success,” he said. Marya also serves as the GLSLA Chapter Vice-Chair.

In addition to her chapter and committee activities, Marya has been an author and presenter at both the NASTT No-Dig Show and No-Dig North. Her six technical papers are available through the NASTT technical paper library.

Matthew Izzard, NASTT Executive Director, thanked Marya for her NASTT involvement and enthusiasm and for being among the best of the best of young trenchless professionals. Special recognition of Marya took place at the NASTT No-Dig Show in Portland.

Celebrate Trenchless Award recipients are recognized at the NASTT No-Dig Show and promoted through NASTT communication outlets which may include nastt.org, social media, NASTT E-News, and NASTT's Trenchless North America. Find out how you can become a NASTT award recipient at www.nastt.org/awards.




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North American Society for Trenchless Technology Announces



NASTT Abbott Innovative Product Awards Celebrate Transformation

The Abbott Innovative Product & Services Award celebrates companies with a state-of-the-art product or service making a significant impact in advancing the trenchless industry in the areas of rehabilitation or new installation.

The selected winners met the highest-level of standards for each category. Products were judged on Innovation (concept, method, development); Value (need, advantages, cost); and, Impact (sustainability, social/environmental responsibility and potential). The Innovative Product & Services Award is a testament to trailblazers whose skill, ingenuity and vision impact underground infrastructure development and improvement techniques, promote sustainability and protect the environment.

Presentations about each product were made at the Innovative Products Forum at the NASTT 2023 No-Dig Show and are available online at <https://youtube.com/@nastt>.

To learn more about NASTT awards, visit nastt.org/awards.

“Testament to trailblazers whose skill, ingenuity and vision impact underground infrastructure development”



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NASTT Abbott Award - New Installation



Jeff Davis, HDD Product Manager accepts the award from Cindy Preuss, NASTT Innovative Products Selection Committee Chair



DITCH WITCH - AT120 ALL-TERRAIN HORIZONTAL DIRECTIONAL DRILL

In the category for New Installation, the award was given to Ditch Witch for its AT120 All-Terrain Horizontal Directional Drill. Built to boost jobsite uptime. The AT120 gives underground construction operators the power and stability needed to push through tough ground conditions, streamlining fiber, pipeline and utility installation projects. As the largest AT drill in the world, the AT120 improves jobsite efficiency for previous mid- and maxi-size drill owners, as it uses less drilling fluid, resulting in decreased jobsite waste, minimized cleanup and reduced environmental impact. Jeff Davis, HDD Product Manager, explained, "In the current marketplace, make-up and breakout of tool joints are controlled by float sensors. While float sensors have been in use for decades, our system provides more uptime by removing error-prone components of the process."

The drill operator's cabin allows drivers to work with their preferred style of operation, which means less time training and more time drilling. Plus, the cabin's maximized view provides an unrestricted view of the drill components and the job site. The AT tooling and drill pipe technology comes with a new Rockmaster housing derived from direct customer feedback. "The heart of this new housing features a patented grease compensated bearing system, that extends the rebuild interval to 125 hours as compared to 25 hours of its predecessor – saving customers time and money," Davis shared.

For more information, contact Jeff Davis, HDD Product Manager at jdavis@ditchwitch.com or visit ditchwitch.com.

NASTT Abbott Award - Rehabilitation



Ladd Gould, National Strategic Customer Manager (center) displays the award with the Sunbelt team



SUNBELT RENTALS - PUMPSENTRI

In the category for Rehabilitation, the award was given to Sunbelt Rentals for PumpSentri, an advanced standalone bypass monitoring system that can fully integrate into a bypass pumping system. PumpSentri Remote Monitor allows for continuous real-time pumping system information to be sent to a cloud-based platform for data logging system pressure, suction vacuum, wet well surcharge, flow, vibration, and all the engine telematics. This new technology allows for remote monitoring, and the ability to see what cannot be seen in a bypass system, in order for the crew to precisely dial in to bypass operations and mitigate any potential issues before they occur.

Ladd Gould, National Strategic Customer Manager, says Sunbelt felt that while the marketplace has many different types of telematics offerings, none provide the full suite

of pump specific sensors to give customers the complete picture of the pumping system. “We came to realize this platform allows the end user more transparency on the Pump’s performance than by visual observation alone. Essentially, PumpSentri has given Sunbelt and our Customers the ability to view the full picture – saving Sunbelt maintenance costs and the down time for our customers.” While reducing risk and increasing performance was the primary goal of participating in the competition, Gould says Sunbelt is humbled and honored to win the award whose namesake is a “legend” in the pump world.”

For more information, contact Ladd Gould, National Strategic Customer Manager at ladd.gould@sunbeltrentals.com or visit sunbeltrentals.com.

NASTT also honors the finalists in each category:

AWARD FINALISTS - New Installation



Vermeer Corporation: Vermeer D550 HDD

The 550,000-lb (249,275.8-kg) Vermeer D550 HDD is equipped with advanced telematics, smart onboard technology and diagnostic information. With 100,000 ft-lb (135,581.8 Nm) of torque, the D550 is a crawler-mounted drill designed to help crews efficiently install large-diameter products such as oil, gas and water pipelines, and high-voltage electrical transmission lines. The D550 features ultra-slow speed technology to deliver precise thrust control, so the operator can regulate weight-on-bit pressure for optimal cutting action and maximum tooling life. It has three different auto drilling operating modes: rotation, thrust and speed. It has a full travel vise that can be positioned up and down the rack to assist with making and breaking tooling joints and optimizing efficiency during casing installation. The drill's hydraulic transmission delivers the peak amount of torque at high rotational speeds while system pressures remain low to help maximize component life. When working in urban areas, the D550 runs quietly to keep jobsite noise levels down and reduce the need for sound barriers. www.vermeer.com

AWARD FINALISTS - Rehabilitation



Trusted technologies.
Innovative solutions.

CPM Pipelines: BulletLiner System™ FFRP

The BulletLiner System™ FFRP is an innovative technology for the trenchless rehabilitation of pressure pipelines suitable for water, wastewater, gas and oil. The liner is flexible, foldable and light with the material strength of a steel pipeline. Due to the extreme flexibility, it opens up a variety of rehab applications without having to trench and remove pipeline around your city or commercial property. Installation requires two small excavation pits or access points for rehabilitating a deteriorated section of pipe. This reduces the conventional pipeline replacement noise, traffic disturbances, time-consuming reconstruction as well as environmental and economic impacts to surrounding landscape and businesses. NSF 61 approved and suitable for the transportation of various liquids including potable water, reclaimed water, wastewater; with drinking water approvals in numerous countries. cpmpipelines.com



Trusted technologies.
Innovative solutions.

CPM Pipelines: Acquaint's Acquarius

With UT circumferential scanning sensor and Internal Mapping Unit, the Acquarius is a multi-diverse in-line inspection tool designed to use in different types of pipes and materials. Acquarius' sensors record the condition of many miles worth of transport, pressure or sewer pipelines in a single run without shut down, recording and sending measurement data to the cloud platform. Designed to provide high-quality, accurate data in a wide range of applications, service conditions and pipeline environments. Collected data offers insight into the condition, risks and remaining lifetime for all of the pipes in the network. This ultraflexible, pipe friendly and reliable tool provides wall thickness measurements, ID changes, pipe geometry, joint gap width and AC leaching (degradation of asbestos cement). Predict, prioritize and act: Set maintenance and management priorities based on the latest data. Predict and repair damage before it occurs. cpmpipelines.com

North American Society for Trenchless Technology Announces

AWARD FINALISTS - Rehabilitation (cont'd)

HAMMERHEAD® **TRENCHLESS**

HammerHead Trenchless: **HydraSlitter™**

HammerHead® Trenchless brings you the ideal solution to replace lead pipe services without digging them up. Using our exclusive Same Path® Technology installation method, HammerHead Trenchless developed the HydraSlitter™ system to minimize the impact to a property owner's landscaping and hardscaping such as decks and driveways, while providing a new pipe that delivers drinking water free of lead. This innovative and low-cost solution addresses the lead lateral service market for ½" to 1" pipe which the U.S. banned in 1986. The time has never been better with local and state requirements to remove lead from service using available government funding. hammerheadtrenchless.com

HAMMERHEAD® **TRENCHLESS**

HammerHead Trenchless: **RS BlueLine System**

As CIPP celebrates over five decades of success in trenchless rehabilitation, the majority of the technological enhancements have been made in the pursuit of water, storm, and sanitary sewer renewal. Although another 50 years of rehabilitating these assets is very much needed, other assets, such as fire mains, continue to fail at an incredible rate with significant ramifications to hotels, condominiums, manufacturing / distribution facilities, airports, and the like. FM Global is the largest and most recognized risk mitigation company and insures 1/3 of the world's fortune 1000 companies. Until 2022, CIPP was never recognized as an FM Approved technology for the renewal of fire mains. The RS BlueLine System by HammerHead Trenchless is the first and only FM Approved CIPP System for the renewal of these critical, life saving assets due in large part to the highly sophisticated engineering design and testing laboratory in Lake Mills, WI. hammerheadtrenchless.com



QuakeWrap, Inc.: **StifPipe®**

StifPipe® is a composite pipe and pipe lining system made of carbon fiber, glass fiber, a proprietary core layer, and engineered resins. It has the highest strength to weight ratio in the industry. It is highly inert to chemical corrosion and can be used as a long-term solution (50+ years) in sewer and water lines. It utilizes the sandwich structure of FRP materials commonly used in the aerospace industry. It's extremely light weight makes it an ideal choice for particularly large diameter water transmission main and sewer interceptor rehabilitation. It has been used in several high-profile projects to date including a 100-foot stormwater tunnel in Minneapolis, MN and a 16-foot diameter sewer interceptor rehab in Detroit, MI (installation in progress), which is likely the largest made of its kind to date. StifPipe® can be installed either with the sliplining method as a prefab pipe or with the wet layup (cured-in-place) method as applied layer by layer on the existing pipe wall. Made of the strongest materials used in the construction industry, StifPipe®'s minimal wall thickness (typical dimension ratio is approximately 100) and smooth surface enables maintaining the hydraulic capacity of the host pipe and occasionally even improving it. quakewrap.com

AWARD FINALISTS - Rehabilitation



SAERTEX multiCom LP: SAERTEX-LINER® H2O

Offering superior mechanical characteristics, and NSF-61 approved, Saertex-Liner H2O is a true innovation in trenchless rehabilitation of potable water pipes using the UV-CIPP process. This pull-in place pipe liner is suitable for pressures up to 30 bar (435psi), fully structural, and is available in diameters from 10"-48". Saertex-Liner H2O is custom designed, manufactured, and wet-out in our ISO approved facility. Project support is provided from beginning to end, including engineering services, feasibility studies, structural calculations, practical training, and continued technical support from our application engineers.

saertex.com



Sewer AI Corporation: Sewer3D

SewerAI's unique in-house photogrammetry technology leverages GoPro MAX (360) videos to render detailed textured 3D models of manhole (MH) structures enabling accurate measurement for verification of MH rim to invert, pipe diameters, and for estimating exact quantities of materials for MH rehab. In addition, advanced tools in SewerAI's PIONEER cloud platform are provided for 360 video playback, virtual pan tilt zoom, vertical distance, and clock position orientation means industry professionals can efficiently complete MACP Level 2 condition assessments. Digital Twins can enable scenario planning for weather events as well as flow and deterioration modeling. In addition, this data can now be captured using camera equipment that is far more affordable than what has previously been available, drastically lowering the cost to stand up inspection crews by a factor of at least 10x or more. sewerai.com



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MAB Publications

Trenchless Rising Stars Represent the Future of the Profession



BY: Carolyn Hook, NASTT Membership Outreach & Database Manager

The North American Society for Trenchless Technology is looking to discover early career professionals who are already making impressive strides in the trenchless industry and have great potential to impact the future of the profession. NASTT sees these young professionals as Trenchless Rising Stars.

Trenchless Rising Stars are young professionals whose record reflects ongoing and exceptional growth in their contributions to the profession and increasing levels of leadership, responsibility and sphere of impact. These early career professionals have a track record that reflects a strong career trajectory and the potential to reach the highest levels of achievement in the profession.

NASTT has been given a sneak peek at the future of profession – and here's who we see making a difference.

“Here’s who we see making a difference!”



Chao Kang, PhD., P.Eng.

Geotechnical Engineer
ParklandGEO Ltd

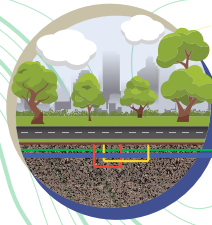
Chao has a bachelor’s degree in hydrology and water resource engineering, a master’s degree in geological engineering from Lanzhou University, China, and a Ph.D. degree in geotechnical engineering from the University of Alberta, Canada. His coursework covered a wide range of engineering and geology-related topics providing a solid background and understanding in solving interdisciplinary problems, such as drilling fluid and trenchless technology. Chao has published more than twenty-nine journal papers, contributed to one book chapter, and is in the process of publishing six papers and two textbooks.



Max Silva

Senior Project Manager
A&W Coatings, LLC

Max started his career in the epoxy industry after graduating from Boston University with a degree in Business Administration. He began working at Warren Environmental (Warren) and its sister company, A&W Coatings (A&W), where he trained under its founder and inventor. Today, Max partners with owners and engineers to educate them on coating products' capabilities and trenchless technologies to help them identify solutions for their rehabilitation and protective coating needs. To date, he has helped manage over \$21 million worth of epoxy coating projects in 19 states. He has won several awards include 2021 Project of the Year Rehabilitation and has authored multiple publications.



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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.

NASTT 2024 No Dig Show Preview

Welcoming North America’s Underground Infrastructure Community to the Populous Northeast!



“Be a part of the excitement as a presenter, sponsor and exhibitor!”

The North American Society for Trenchless Technology Chapter looks forward to hosting the 2024 No-Dig Show in Providence, Rhode Island April 14-18. Hosting North America’s premier trenchless educational and networking event in the Northeast for the first time, presents a golden opportunity for the Northeast Trenchless community to showcase the progress it has made in utilizing trenchless applications as the preferred method for underground infrastructure construction in the Northeast.



Within an easy day’s drive from most cities in the populous northeast – Providence is just a few hours’ drive from Portland ME, Philadelphia, PA, NY, NJ, VT and CT – the 2024 NASTT No-Dig Show promises to draw significant attention from top infrastructure decision-makers across the Northeast including municipal authorities, utilities, engineers, contractors, suppliers and policy-makers. The 2024 NASTT No Dig Show motto “Green Above, Green Below” exemplifies the trenchless industry’s position as an important steward of our environment and natural resources, utilizing approaches that have significant environmental and social benefits. Trenchless Technology is at the forefront of ongoing efforts to reduce GHG emissions.

As our planning kicks into high gear, check the website www.nodigshow.com for updates and further information. Additional details are provided in future editions of Trenchless North America as we get closer to the event.

Join us for the 2024 No-Dig Conference in Providence, RI is April 14 - 18. The excitement and anticipation is building – be a part of the excitement as a presenter, sponsor and exhibitor!



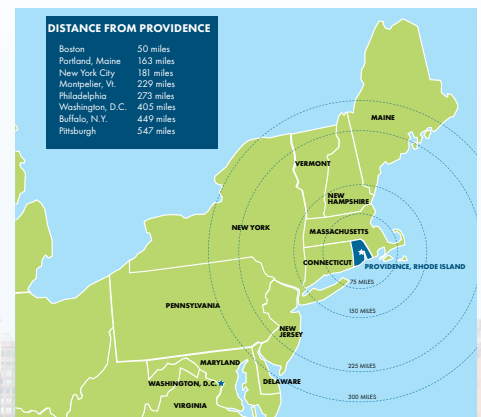
The NASTT No-Dig Show is being hosted in the Northeast for the first time

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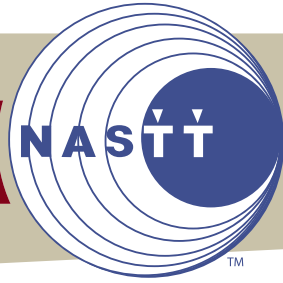
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ARA Participates in Construction on the National Mall

The American Rental Association (ARA) highlights the role of rental at the Celebration of Construction on the National Mall event. The festival was held Sunday, May 14 through Tuesday, May 16 in Washington, D.C. The ARA was one of 17 partnering organizations that joined forces to tell the construction industry story.

In partnership with the Association of Equipment Manufacturers (AEM), ARA leadership, members and construction companies from across the nation joined together to bring construction equipment to the nation's capital and speak with federal representatives about what's important to the construction industry.

"Representing ARA members at AEM's Celebration of Construction on the National Mall event helps the rental industry solidify its place as part of the broader construction industry for federal legislators," says Josh Nickell, ARA vice president, equipment segment. "This is critical now that more than 50% of equipment on a construction job site is rented versus owned.

"It also allows us to speak about issues impacting our members, remind legislators that we are a more sustainable solution than ownership and help the construction industry better react to market cycles like we are currently experiencing."

To bring awareness to the industry's sustainability initiatives, participating AEM members showcased cutting-edge innovations, including alternative powered equipment, autonomous systems with live demonstrations and an array of other tools that are enabling the industry to sustainably build the infrastructure that makes modern society possible. Exhibits were open to the public and focused on workforce development, worker safety, sustainable materials and environmental stewardship.

Through participation in the event, ARA leadership was able to engage with members of Congress, regulators and staff about the importance of the construction sector, innovation and sustainability impacts and the sector's positive effect on the American economy.

About ARA: (www.ARArental.org) The American Rental Association, Moline, Ill., is an international trade association for owners of equipment and event rental businesses and the manufacturers and suppliers of construction/industrial, general tool, and event rental equipment. ARA members, which include more than 11,000 rental businesses and more than 1,000 manufacturers and suppliers, are located in every U.S. state, every Canadian province, and more than 40 countries worldwide. Founded in 1955, ARA is the source for information, advocacy, education, networking, and marketplace opportunities for the equipment and event rental industry throughout the world.



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Sunbelt Rentals Selected as 2023 CIO 100 Award Winner

Foundry's CIO 100 Award recognizes enterprise excellence and innovation in IT

Sunbelt Rentals, a global leader in the equipment rental industry, is pleased to announce that it has been selected by Foundry's CIO as a 2023 CIO 100 Award winner. For more than 30 years, the CIO 100 Awards have recognized innovative organizations and their technology leadership worldwide that exemplifies the highest level of strategic and operational excellence in IT. CIO 100 selected Sunbelt Rentals based on its strategic three-year business initiative, Sunbelt 3.0.

“With the support of our committed and dynamic team, Sunbelt 3.0 has achieved a remarkable level of digital business transformation,” said JP Saini, executive vice president, chief digital and technology officer at Sunbelt Rentals. “Our goal is to enhance our customers’ experiences while improving the platforms our team members use to support our customers. By leveraging enhanced technology, Sunbelt Rentals is increasing our global presence and enabling our business to expand to new market segments and enter the broader industrial service sector. I am proud of the entire team at Sunbelt Rentals who are contributing to this transformation.”

Central to the success of Sunbelt 3.0 is the advancement of technology in the platforms that serve and support customers and team members, including modernizing sales, service, point-of-rental and logistics tools, accelerating global growth plans and generating increased profit across the U.S., UK and Canada through operational efficiencies. Under Saini’s leadership, the company has been able to level up its technology and business ecosystems, accelerating the competitive advantages behind the unprecedented growth of recent years.

Sunbelt 3.0 has led to a new omnichannel e-commerce platform with modern and intuitive digital channels to

streamline the customer experience. This platform has transformed sales, logistics, service and point-of-rental capabilities and tools used by employees across more than 1,175 locations. Working across the company, the organization recently redesigned sunbeltrentals.com and delivered a new consumer mobile app. Customers now have extensive self-service capabilities, improved inventory visibility and checkout, and powerful project site management tools. With these enhancements, customers have access to the entire equipment catalog and full transparency on pricing no matter where they engage with Sunbelt Rentals – in stores or online for pickup or delivery.

These initiatives exemplify the criteria set forth for the annual CIO 100 Awards. These awards celebrate 100 organizations and their teams for the innovative use of IT to deliver value. The awarded companies use IT strategically to improve customer relationships, grow and optimize their businesses and create a competitive advantage.

About Sunbelt Rentals

With a passionate global team of 24,000 rental experts, a growing network of more than 1,175 locations, and an extensive equipment fleet that exceeds \$13 billion, Sunbelt Rentals helps professionals and do-it-yourselfers get things done. With a highly diversified offering of equipment, solutions, and services available, we assist customers to extend their capabilities, complete projects on time, and handle times of crisis. No matter if you are in construction, commercial, industrial, residential or municipal industries, we are constantly advancing the idea of what an equipment company can do for its customers. Visit sunbeltrentals.com to find out what we can do for you.



Robbins Single Shield completes Canada's Largest Outfall

TBM bored at record rates below Lake Ontario



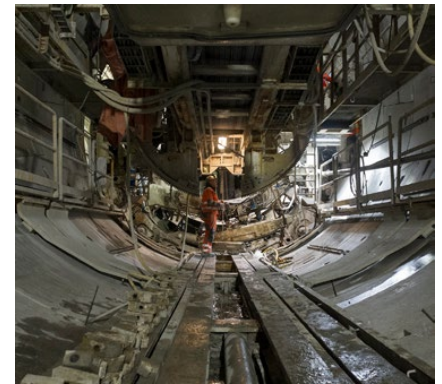
Robbins, Southland, and other personnel celebrate the completion of tunneling at the Ashbridges Bay Outfall Tunnel in early March 2022.

On March 3, 2022, a 7.95 m (26.1 ft) diameter Robbins Single Shield TBM completed a record-setting run below Lake Ontario. The machine, for the Southland/Astaldi JV, bored 3.5 km (2.2 mi) in sedimentary rock for the Ashbridges Bay Outfall in Toronto, Ontario, Canada.

The machine launched in March 2021 from an 85 m (280 ft) deep, 16 m (53 ft) diameter shaft and began its bore in predominantly shale, with limestone, siltstone and sandstone. During its excavation, the TBM and its experienced crew bored a city-wide record of 30 rings in one day, or about 47 m (154 ft) of advance. The machine and crew surpassed a previous best day of 21 rings at a project with similar specifications. "We are proud to have completed another successful tunnel with Robbins and greatly appreciate their field service support," said Joe Savage, Project Manager for Southland.

"This is a wonderful type of geology for our machines. During the entire excavation, a total of 7 cutters were changed. The wear behavior is incredible, between 2 and 5 mm, and everyone is amazed by the cutter performance," said Alfredo Garrido of Robbins Field Service.

The crew had been operating the machine in two shifts of 12 hours from Monday to Friday. A Robbins continuous conveyor system including vertical conveyor transported muck behind the machine. "Every 25 machine cycles, it was necessary to stop the excavation to probe drill hole in front of the cutterhead to check for possible water. This drilling was done basically every day, stopping the machine for a few hours, but it was very necessary," said Garrido.



During tunneling in predominantly shale, the Robbins TBM and its crew bored a city-wide record of 30 rings in one day, or about 47 m (154 ft) of advance.

The last kilometer of tunnel, bored below a series of 50 risers under Lake Ontario, was challenging but ultimately successful. "The team really worked together to overcome some tough ground conditions and high water inflows in the tunnel," said Savage.

The success of the TBM is just one cause for celebration. The project won accolades from the Tunnelling Association of Canada (TAC) in late 2021 for its all-remote machine acceptance enacted due to the Covid-19 pandemic. The machine acceptance, the first of its kind, enabled communication and confirmation between the machine's assembly location in Mexico, suppliers in the U.S. and those involved in Canada. "It was a challenge for all the people involved due the pandemic travel restrictions; however, due to good planning and communication we were able to go through the Acceptance Test successfully. I think this might become quite common in the near future," said Robbins Project Manager Javier Alcalá.

The completed outfall will connect to the 50 in-lake risers to enable efficient dispersion of treated effluent over a wide area of the lake, making it the largest outfall in the country. The project for the City of Toronto will improve the city's shoreline and Lake Ontario's water quality by replacing a 70-year-old existing outfall.

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 2023 No-Dig Show
 Portland, Oregon
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TM-T2-03

The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

James Murphy, M.Eng. P.Eng., Universal Pegasus International, Calgary, Alberta
 Dan Costello, M.Sc. (Hons), P.Geo., PMP, BGC Engineering Inc., Vancouver, BC
 Marty Zaleski, M.Sc., P.Geo, CEG, LEG, BGC Engineering Inc., Vancouver, BC

• **ABSTRACT**

Within the Trenchless Program for the Trans Mountain Expansion Project almost 50 Horizontal Directional Drills (HDDs) as well as all the other trenchless methods were utilized. However due to severe topography and access constraints, there were locations where a geotechnical investigation with a normal number of boreholes would not be able to provide sufficient geotechnical information and even a limited number of holes would be cost prohibitive. Boreholes in some cases would have been hundreds of meters deep with difficult access and site preparation. Also, from a design standpoint, engineering would primarily be interested in whether there are fractures that would be major fluid loss zones or there would be fractures or faults that would produce water that would likely fail the HDD. Therefore, for two long 'potential' NPS 36, HDD crossings in mountainous terrain, Universal Pegasus offered up the potential for doing 'geo-pilot bores' to confirm the feasibility of using HDD in these locations. From a regulatory perspective, a geo-pilot bore following the HDD design profile is considered part of the geotechnical program provided it does not exit and stops short by 50 metres or more. Exiting the bore would constitute "construction" which has significant restrictions and reporting issues.

A successful geo-pilot bore approximately 1,700 m (5,600 ft) long confirmed the feasibility of the first HDD crossing at Dry Gulch in August of 2021 and a second geo-pilot bore for the



THE USE OF A GEO-PILOT BORE TO CONFIRM HDD FEASIBILITY

AUTHORS



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This paper was selected as Outstanding Paper – New Installations, from all the presentations at the 2023 NASTT No-Dig Show in Portland OR. NASTT No-Dig Papers are available for download, free to members, at www.nastt.org

geotechnical program provided it does not exit and stops short by 50 metres or more. Exiting the bore would constitute "construction" which has significant restrictions and reporting issues.

A successful geo-pilot bore approximately 1,700 m (5,600 ft) long confirmed the feasibility of the first HDD crossing at Dry Gulch in August of 2021 and a second geo-pilot bore for the Mountain Crossing #3 HDD crossing, approximately 1,600 m (5,300 ft) long HDD was completed in 2022. This paper describes the design, thinking, and construction challenges behind the geo-pilot bore concept with these two examples.

The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

INTRODUCTION

The Trans Mountain Expansion Project (TMEP) is the largest most technically challenging pipeline project ever constructed in Canada and possibly in North America and is currently valued at over 30 billion (CAD). This project consists of 987 km (613 miles) of NPS 36 and NPS 42 pipeline, 11 pump stations, three marine berths, addition of 19 petroleum storage tanks, and elevation changes not normally designed for in a liquids pipeline. The challenges are many and diverse. With similar challenging projects like Keystone XL being cancelled, TMEP stands out in that this challenging project is under construction now with completion planned for late 2023.

The pipeline runs from Edmonton, Alberta to Burnaby, British Columbia, carrying dilbit (diluted bitumen) to the port of Vancouver in Burnaby. For the most part, the route follows the existing



Figure 1. Location of the Trans Mountain Expansion Project

Trans Mountain Pipeline (TMPL) route other than a few relatively short sections such as along the Coquihalla River where TMEP follows a different route to avoid geohazards or other constraints. Figure 1 shows the TMEP route.

Construction of the original TMPL was completed in 1953, connecting the Edmonton refineries and terminal to the

offload point at Kamloops BC, Sumas BC and the Westridge Terminal in the Burrard Inlet, a total of approximately 1,150 km (715 miles). This pipeline was constructed as an NPS 24 line to carry approximately 300,000 barrels per day (bpd).

TMEP will result in the looping (or twinning) of the existing TMPL system



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The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

between Edmonton and Burnaby terminals with about 987 km (613 miles) of new buried pipeline. Most of the existing pipeline, along with two reactivated pipeline segments, will become Line 1. The proposed new pipeline segments, along with several existing active pipeline segments, will become Line 2. The Project will increase the capacity of the existing TMPL system from 47,690 m³/day (300,000 bpd) to 141,500 m³/d (890,000 bpd) of crude petroleum and refined products.

GEOGRAPHY

The pipeline route begins in Edmonton and traverses west through the Alberta Plains (Figure 2). The Alberta Plains are characterized by low topographic relief with glaciolacustrine and till sediments overlying poorly lithified sedimentary bedrock. The pipeline crosses three different mountain ranges, the Rockies, Columbia, and Cascade mountains. They are characterized by high topographic relief with colluvial, till and bedrock exposures on the valley walls and thick sequences of fluvial and glaciofluvial sediments in the bottom of valleys. Between the Columbia and Cascade mountains, the pipeline traverses the extensive Interior Plateau. The Interior Plateau is characterized by moderate topographic relief with colluvial, fluvial and glacial sediments overlying metasediment and volcanic bedrock. Finally, the route spans the lowlands of the Fraser River Valley before ending at the Westridge Terminal in Burnaby, BC. The Fraser Valley is characterized by low topographic relief with fluvial and glacial sediments.

The TMEP pipeline elevation profile is shown in Figure 3 with the approximate location of the two sites identified. Starting out at an elevation of 680 m (2,231 ft) at KP 0.0 (Baseline Road HDD) in Edmonton, the pipeline rises to an elevation of 1,229 m (4,032 ft) at KP 350 (near Hinton AB and the Hardisty Creek Geohazard HDD) before dropping to the central plateau with an elevation of

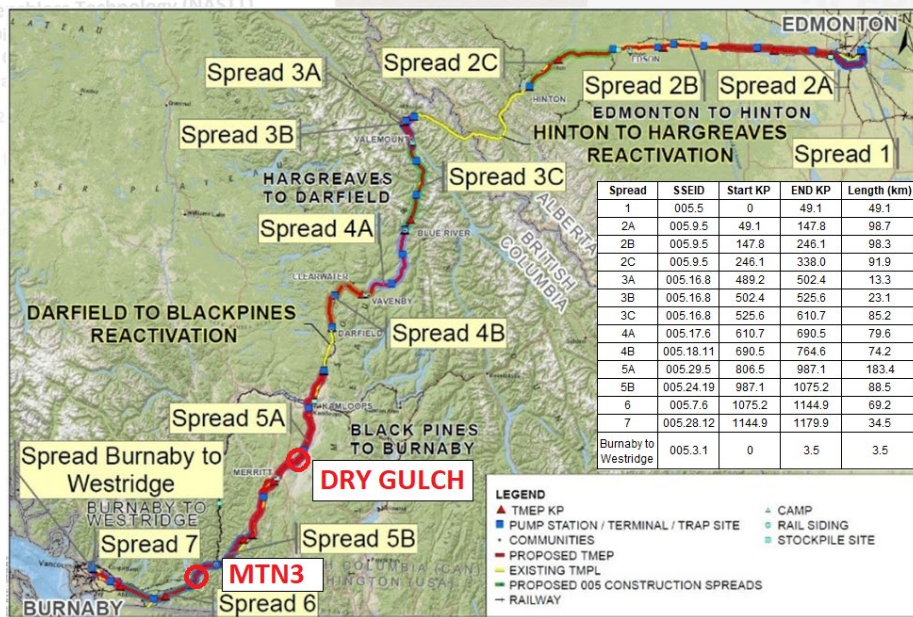


Figure 2. TMEP Route Map

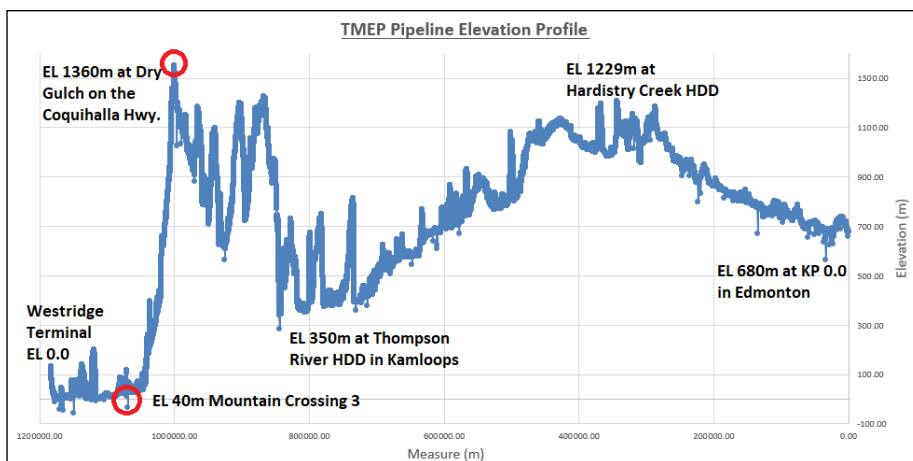


Figure 3. Pipeline Profile KP 0.0 to Westridge Terminal

approximately 400 m (1,312 ft) at KP 840 (Kamloops BC and Thompson River HDD) and then rising again to a peak elevation of 1,360 m (4,462 ft) at approximately KP 1000 (Dry Gulch HDD) then finally dropping to sea level at the Westridge terminal at the termination of the Burnaby Pipeline Tunnel.

This geography has presented numerous challenges which have been solved in many cases with the use of trenchless construction methodologies. Two of the more challenging crossings are the Dry Gulch and Mountain Crossing 3. Both

underwent significant review with various options being considered.

Dry Gulch HDD

The options considered for the Dry Gulch crossing shown in Figure 4 were, HDD, Open Cut, and Raise Boring. Some of the many challenges for the Open Cut and Raise Boring are primarily the crossing geometry and the hard bedrock as well as practical access down to the bottom of the gulch and through the crossing. Ultimately the HDD option was considered to be the most acceptable construction methodology.

The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

Within the Trenchless Program for the Trans Mountain Expansion Project almost 50 Horizontal



Figure 4. Dry Gulch at Highway and Pipeline Crossing

One major and possibly limiting consideration of an HDD at Dry Gulch was a technical need for extra heavy wall (EHW) pipe due to the depth of the HDD profile. On the Project, EHW pipe is only required on certain crossings for specific reasons, therefore a request for almost 1,800 m (5,906 ft) of additional EHW pipe was not going to be met. The project would not have this much contingency EHW pipe in inventory and the lead time for manufacturing and delivering this pipe would not have met the schedule. However, the idea of relocating EHW pipe originally scheduled for one of the other crossings was floated. This particular crossing was allotted the EHW pipe due to profile depth considerations. Once the pilot hole for the other crossing was completed and was an acceptable profile depth for the normal heavy wall (HW) pipe, the EHW pipe was able to be reallocated to the Dry Gulch crossing making the HDD a viable alternative for Dry Gulch.

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The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

Mountain Crossing 3 HDD

The primary options considered for Mountain Crossing 3 (approximately 2,300 m / 7,546 ft in length), were a major reroute, a Drill and Blast tunnel, and an HDD. Ultimately the HDD was considered to be the preferred methodology.

Geo-Pilot Bore Methodology

The concept of a geo-pilot bore was first proposed by the author for challenging HDD crossings on the 1,177 km Enbridge Northern Gateway Project (Edmonton AB and to Kitimat BC). This project also had numerous potential HDDs in mountainous terrain. The author proposed doing geo-pilot bores to prove the feasibility of some HDDs and to use these bores as pilot holes if the crossing was considered feasible. Similar to the TMEP, a limited number of traditional geotechnical boreholes would not have been sufficient to provide a definitive HDD feasibility. The general concept for geo-pilot bores was accepted by the project team but the project was ultimately cancelled in 2014, and as such, the geo-pilot concept was not tested.

TMEP provided another opportunity to consider geo-pilot bores to prove feasibility. Both Dry Gulch and Mountain Crossing 3 are in very mountainous terrain. In both cases, consideration was given to the need for geotechnical information to assess the feasibility of construction options

and BGC Engineering Inc (BGC), the geotechnical Engineers of Record for the project, wrote geotechnical feasibility assessment reports based on the expected geological conditions. It was expected that the primary construction concerns would be the influx of ground water and fractures that would cause significant drilling fluid circulation problems. It was also considered that traditional boreholes to investigate the middle of the profiles would need to be hundreds of metres deep and would only provide information regarding the potential for fluid loss or water ingress at the specific location of the borehole, which perhaps would not intersect critical features along the profile. Additionally, access and workspace for the drill rig would have been very challenging and expensive.

As an alternative to drilling multiple high-cost geotechnical boreholes, the author proposed doing geo-pilot bores along the planned HDD profiles/alignments. The benefit would be that the geo-pilot bores would provide a direct indication of HDD feasibility and could ultimately be utilized as the pilot holes for the crossing. The plan for these geo-pilot bores was to stop at a point where the required information was obtained, but the bore was at least 50 m short of the proposed HDD exit point. Stopping the geo-pilot bores before the exit point was a regulatory requirement of the Canadian Energy

Regulator (CER) to demonstrate that construction has not commenced. There was a three-month notification period in place prior to start of construction of any HDD crossing. Since the feasibility of the methodology had to be confirmed prior to construction start, the geo-pilot bores needed to stop short otherwise construction would have been considered 'started' by the CER.

One other complication in the design of the geo-pilot bore was the expectation that these two HDDs will be intersects. As such, a reasonable amount of straight tangent needed to remain to allow for an intersect. This was not too much of a problem on the Dry Gulch as it was drilled south to north with the north side having a long tangent. However, this was not as easy on the Mountain Crossing 3 as it was a longer HDD and the team wanted to intersect on the long horizontal tangent. Ultimately it was decided to plan for an intersect around the 1500-1600 m mark on the south side of the crossing.

GEOLOGY AT THE TWO CROSSINGS

To assist with the technical feasibility evaluation, rigorous and detailed desktop geological reviews were carried out for these crossings. These were done to assess if there were any potential faults along the alignment that might prove to be show stoppers.

Dry Gulch

Dry Gulch is located within the Coquihalla Range of the Cascade Mountains physiographic region (Holland, 1976). The Cascade Mountains are composed of folded and metamorphosed Paleozoic and Mesozoic sedimentary and volcanic rocks intruded by Mesozoic granitic batholiths (Journeay et al., 2000; Monger, 1989).

Dry Gulch forms a tributary valley to Coquihalla River, near its headwaters. Both Dry Creek and the section of



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The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

Coquihalla River to which it reports form steep-walled canyons flanked by bedrock cliffs, talus, and colluvium, with minor till.

Near Dry Gulch, Coquihalla River flows southwest and follows the right-lateral Coquihalla fault, which offsets and is therefore younger than the nearby, Eocene-aged Needle Peak pluton (Monger, 1989). Near the crossing, it offsets mid-Cretaceous granite (Unit MKgr on Figure 5), Middle to Late Jurassic diorite (Unit MLJdr), and Late Jurassic granodiorite, gneiss, and tonalite (Unit LJto) of the Eagle Plutonic Complex (Monger, 1989; Ray, 1990; Cui et al., 2013). An older, northwest- to north-trending fault forms the contact between diorite and tonalite, passing about 200 m west of the northern head of Dry Gulch. The HDD will pass through granite and tonalite, crossing a contact between the two about midway along its proposed bore path.

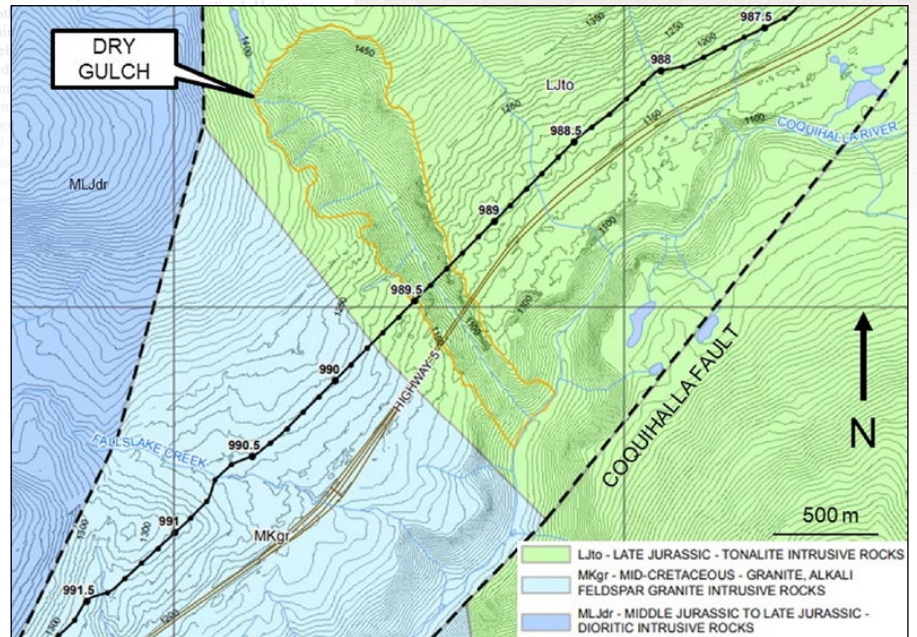
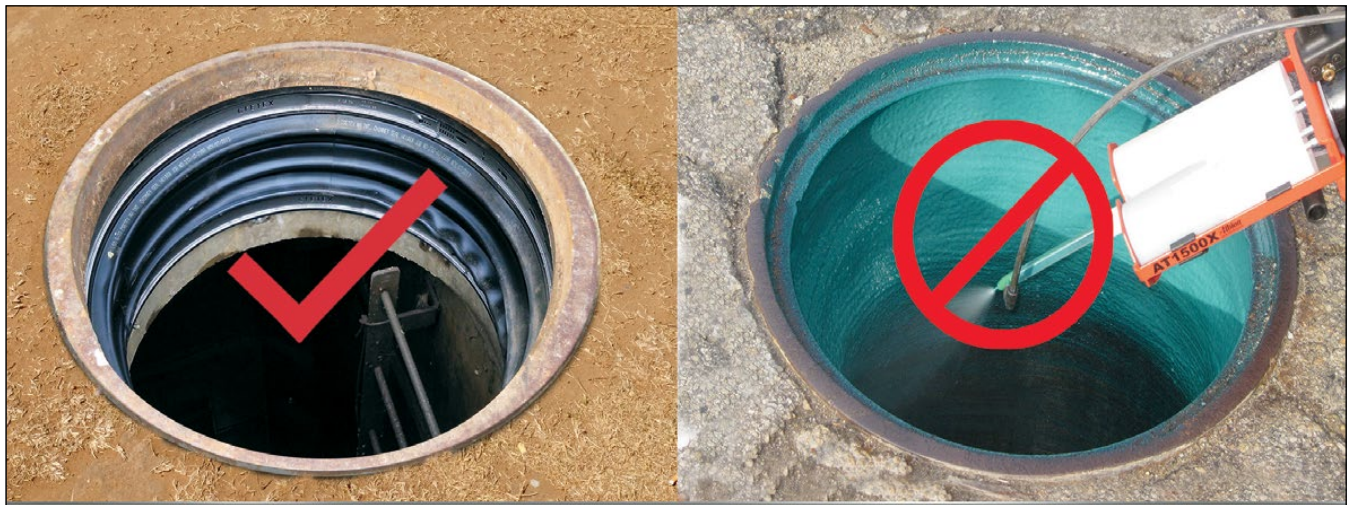


Figure 5. Dry Gulch Geological Setting

Dry Gulch forms an anomalously deep ravine in otherwise moderately-sloping upland terrain, despite an absence of a

clear structural control. It is interpreted as having been formed by a subglacial outburst flood during the last glaciation,



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The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

i.e., a jokulhlaup. The outburst flood produced over-steepened walls in a deeply incised ravine, which have been subject to rock slides and falls since deglaciation, producing coarse talus that mantles the slopes and lies at an approximate angle of repose (near 35°).

Mountain Crossing 3

Mountain Crossing 3 is located within the Skagit Range of the Cascade Mountains physiographic region (Holland, 1976). The topography is characterized by rugged mountain ranges, steeply incised tributary valleys, wide U-shaped main valleys, relict glacial landforms, terraces, fans, cones, steep slopes, fluvial plains and small basins. Steep upper slopes are rock-dominant with colluvium or till mantling the mid and lower slopes. Debris flows occur on many of the fans that infill the valley floors (Trans Mountain, 2013).

The Cascade Mountains are composed of folded and metamorphosed Paleozoic and Mesozoic sedimentary and volcanic rocks intruded by granitic batholiths (Journeay et al., 2000; Monger, 1989). Bedrock mapped by Cui et al. (2013) indicates that the bedrock along the HDD crossing consists mainly of greenschist-grade mafic to intermediate volcanics of the Slollicum Schist Formation. Granodiorites of the Mount Barr Batholith are also mapped in the area.

Regional- and local-scale faulting, gravity deformation, and exfoliation jointing (particularly in the plutonic rocks) dominate the structural regime in this area (Savigny, 1991; Monger, 1989). The most prominent local faulting is expressed at the surface as a set of distinct lineaments, prominent faces, gulleys, and steep-sided creek valleys up to several kilometres long, crossing the main mountain massifs. These major discontinuities are near-vertical, striking approximately northeast-southwest (striking within 45 degrees of the borepath alignment), and form a strong

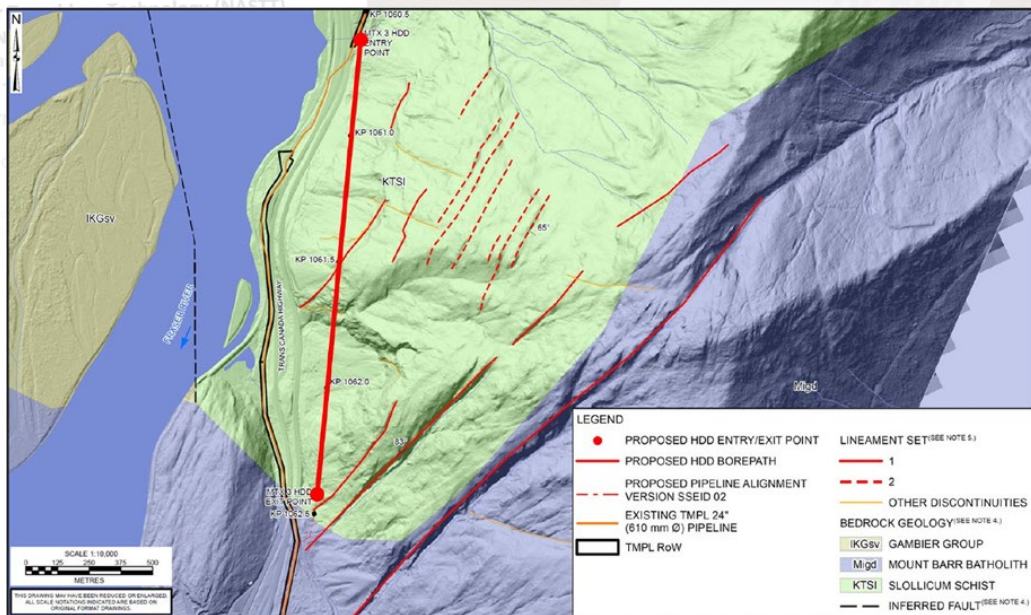


Figure 6. Mountain Crossing 3 Bedrock geology and prominent structural lineaments

control on the topography and terrain (Set 1, Figure 6). These discontinuities are expected to persist to depths at or below valley-bottom elevation, and may be related to regional faulting, the presumed orientation of which aligns with the valley wall and borepath (e.g. the Vedder fault; Savigny 1991). We expected that at borepath depth, these discontinuities are characterized by decimetre to metre-scale zones of fractured and altered bedrock, which could provide preferential flow paths for groundwater. The discontinuity sets were traced along their intersection with the ground surface and measured in three-dimensions, using a 3D surface model generated from lidar data.

Less prominent discontinuities (Set 2, Figure 6) on the slope include those associated with gravity deformation on the ridge above the proposed HDD. These are expressed as transverse antisllope scarps, and are expected to persist to depths below surface of 20 m to 50 m. Other minor lineament sets are evident in the lidar, although none are expected to be present at depths greater than a few tens of metres below surface.

Minor flowing artesian pressures were recorded at the exit point, however due to the geometry of the borepath, high depth of cover (approximately 250 m) and surrounding topographic relief, groundwater pressures are expected to be higher along the borepath than at the entry and exits (>100 m above the borepath in places). Groundwater inflows are expected to be significant, particularly in fault and fracture zones. Faults have the potential to host high groundwater pressures due to the potential for direct hydraulic connection to the ridgetop elevation approximately 1,200 m above the borepath elevation. The potential for significant lengths of high groundwater inflow from obliquely intersecting adverse structure, combined with an imbalanced bore profile raise concerns with groundwater management and possible borepath instability in high hydraulic conductivity fault zones.

These studies demonstrated the need for geo-pilot bores that could prove feasibility for the crossings. The go ahead was received from the project to proceed with the proposed geo-pilot bores.

The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

CONSTRUCTION OF THE GEO-PILOT BORES

The drilling of the geo-pilot bores was considered to be very challenging and costly due to the challenging terrain and the necessity to prepare costly entry sites for the geo-pilot bores. The consideration was that the cost would be

appropriate knowing that, if successful and feasibility is proven, this cost would be necessary in any case, to complete the HDD.

Dry Gulch

The Dry Gulch was the first geo-pilot bore to be drilled. Rig set up was

completed in late August, 2021, and the exploratory geo-pilot bore was completed about a month later. The bore was also investigated using the gamma tool to see if additional information was obtainable. Gamma Ray logs can be used for identifying lithologies and for correlating zones. However, it was found that the formation was very consistent.

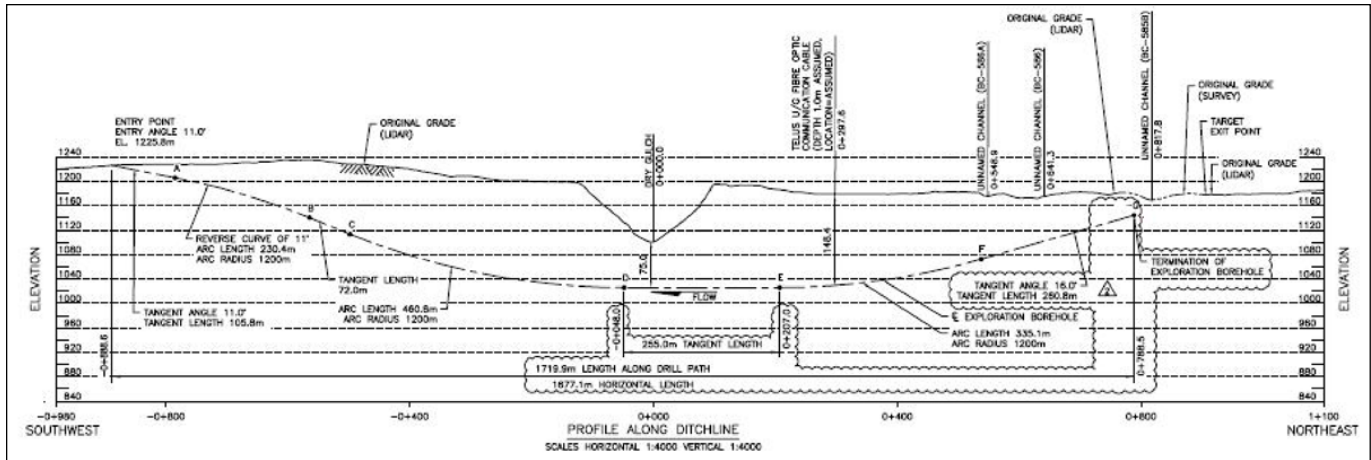
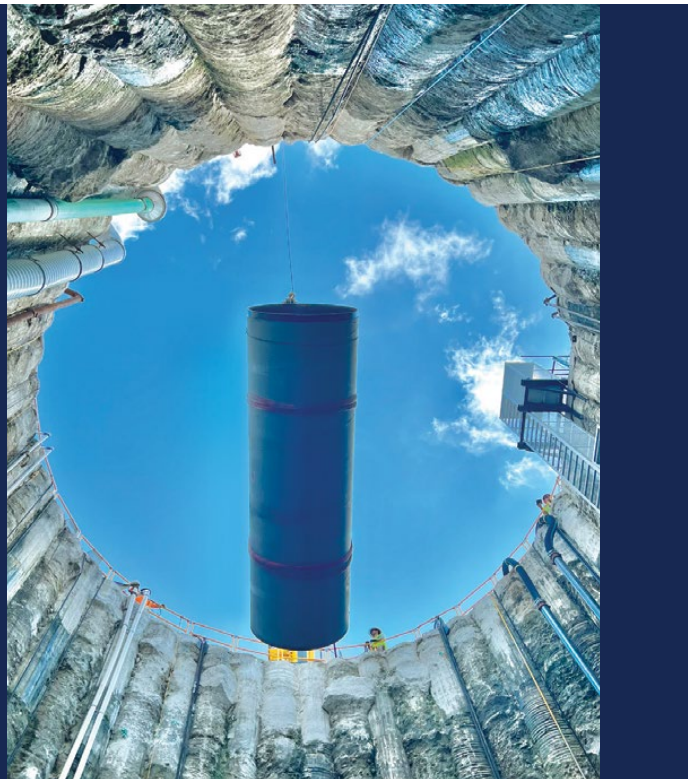


Figure 7. Dry Gulch Geo- Pilot Bore Profile

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The primary role of the geo-pilot bore was to determine if a loss zone was present and whether ground water flow was present. The geo-pilot bore was relatively uneventful with a total length of just over 1,700 m. The bore was completed using a TCI 12 V* inch tri-cone drill bit using a DD 440 drill rig. As seen in Figure 7, the bore was drilled from the high side for reasons of access primarily. No groundwater influx was encountered during the geo-pilot bore and no fluid loss zones were encountered. Spoils during the drilling process were very consistent with fine crushed rock.

The successful completion of the geo-pilot bore proved the feasibility of the Dry Gulch HDD along the profile planned. This was a major undertaking and the completion of this HDD will be a major challenge. Casing installation on the crossings encountered large boulders, as expected, and confined space entry for drill and blast operations was required on numerous occasions. The geo-pilot bore is just the first step in construction of the Dry Gulch HDD. The geo-pilot bore drill rig is shown in Figure 8. The challenging pipe lay down area for the 1800m of pipe, is seen in the background. Many challenges are awaiting the team in 2023 as completion of the Dry Gulch HDD is planned for mid-2023. Five reaming passes are planned to achieve a 48 inch reamed hole due to the hard nature of the bedrock. The whole process, up to pipe installation, could take upwards of a year or more.



Figure 8. Geo-Pilot bore rig (during reaming) with pipe lay down area in the background



Figure 9. Mountain 3 Geo-Pilot Bore Entry Site with casing

Mountain Crossing 3

Mountain Crossing 3 was the second geo-pilot bore to be drilled and was considered successful in the summer of 2022. This geo-pilot bore presented many water influx related challenges. When water influx was encountered, drilling stopped while grouting of the section of bore was carried out. Since the pilot bore is the best, and possibly only, opportunity for grouting, the grouting effort was extensive and time

consuming and was performed a number of times and in some cases was repeated at the same location. It was clear that the best time to grout was during the drilling of the geo-pilot bore. It was necessary to determine if grouting would be successful at cutting off the flow of ground water. Although considered successful a small amount of flow still

persisted. But the time spent during the pilot bore drilling would pay off in the long run during the numerous slow reaming passes.

Due to the coarse nature of the overlying soils, an extensive casing was required. This included boulders that had to be dealt with during the 60 inch diameter

The Use of a Geo-Pilot Bore to Confirm HDD Feasibility

casing installation. A total of 84m of 60 inch casing was needed to reach and be seated in the bedrock.

As seen in Figure 9, site construction had to deal with a number of constraints. The site is situated between a major 4 lane highway, the slope of the mountain and the power lines. In addition, the existing NPS 24, TMPL line 1 runs adjacent to the site. One will rarely see such a complex entry site.

During the drilling of the geo-pilot bore, the length was extended a couple of times to ensure that sufficient length was achieved to prove feasibility and to efficiently deal with the planned intersect. Originally planned for a length of about 1950 m, the ultimate length of the geo-pilot bore ended up at 1600 m. The shorter length kept the intersect point on the horizontal tangent rather than on the exit tangent. Considering the limited alternatives available for the crossing, it was determined that

the water influx, in the locations encountered, was something that would be manageable during the drilling and reaming process, after high pressure grouting during the pilot bore, although it is expected to be quite costly. This influx of groundwater created excess diluted drilling fluid which needed to be managed in accordance with project requirements. Ultimately, the plan has now included contracting a company to treat the water, close to the site, for the reaming and pipe installation phase of the project.

HDD CONSTRUCTION

Now that both of these crossings were confirmed feasible for the HDD trenchless construction methodology, completion of the pilot holes and reaming of the bores to the planned 48 inches, commenced in 2022. Completion of these HDDs is planned for second quarter of 2023. Every aspect of these crossings is complex from access to

intersect, lay down area, drag section construction, and pipeline installation. Considering the lengths of these installations and the importance to the Project of the successful installations, both of these crossing installs will include Herrenknecht thruster assist which further complicates the pullback arrangement. The laydown area itself, in tight constraints and mountainous terrain, requires extensive earthworks. For the dry gulch pull back plan, a detailed stress analysis was carried out to ensure that the forces on the pipe and equipment was fully understood and accounted for. In addition, a detailed execution plan for the pull back is required by TMEP. Completion of these crossings will be covered in future papers and presentations.

CONCLUSIONS

Based on the results obtained at the Dry Gulch and Mountain Crossing 3 crossings, the concept of a geo-pilot



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bore was likely the only practical means for determining the feasibility of the HDD methodology. The geo-pilot bores in these locations were extremely expensive, in the multi millions of dollars, but considering they demonstrated the feasibility of the HDD methodology and that they were drilled on the planned HDD profile, the majority of the cost would have been required in any case. The fact that the pilot bores and the necessary site preparations were constructed, the overall crossing schedules for these crossings were positively impacted. For future HDDs we would recommend the use of geo-pilot bores for proving HDD feasibility in certain specific circumstances. These would be where typical geotechnical investigations are challenging to carry out and likely not going to produce adequate results.

REFERENCES

Cui, Y., Katay, F., Nelson, J.L., Han, T., Desjardins, P.J., and Sinclair, L. (2013). British Columbia Digital Geology. British Columbia Geological Survey, Open File 2013-04, Release 2.1.

Holland, S.S. (1976). Landforms of British Columbia: a physiographic outline. Bulletin 48, The Government of the Province of British Columbia.

Journey, J.M., Williams, S.P., and Wheeler, J.O. (2000). Tectonic assemblage map, Vancouver, British Columbia GSC Open File 2948a. Geological Survey of Canada.

Monger, J.W.H. (1989). Geology Hope Open File 41-1989. Geological Survey of Canada.

Ray, G.E. (1990). The geology and mineralization of the Coquihalla gold belt and Hozameen fault system, southwestern British Columbia. Mineral Resources Division, Geological Survey Branch, Bulletin, ISSN 0226-7497; 79.

Savigny, W. (1991). Engineering Geology of Large Landslides in the Lower Fraser River Valley Transportation Corridor Southwestern Canadian Cordillera. Geological Engineering Program, Department of Geological Sciences, University of British Columbia, Vancouver.

Trans Mountain Pipeline ULC. (2013). Trans Mountain Expansion Project Application to the National Energy Board. Volume 4A - Appendix I: Route Physiography and Hydrology, dated November 28, 2013.



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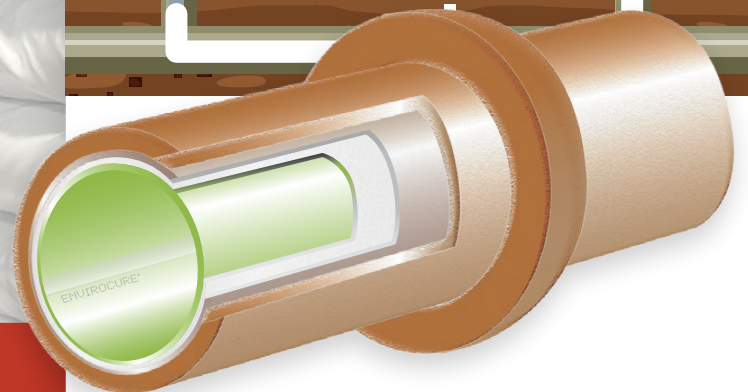
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