Stantec

Wandering River Pipeline and Reservoir Design Build

Athabasca County | Wandering River, Alberta

Canadian Consulting Engineering Awards 2014 • Category C - Water Resources

Design with community in mind

Background of Completed Project

The Wandering River Regional Waterline extends from Boyle to Wandering River via Grassland in Athabasca County and includes a new potable water reservoir at Wandering River and reservoir modifications at Grassland. The project provides secure and reliable potable water to the two communities through an extension of the existing Aspen Regional Water System to the south. Wandering River is located in northeastern Alberta, 95 km from the Town of Athabasca and 200 km from Fort McMurray (Figure 1). Despite Wandering River being a community of only approximately one hundred people, its relative remoteness along Highway 63 makes it of strategic importance to the 11,000 vehicles that travel to and from the Alberta Oilsands region daily.

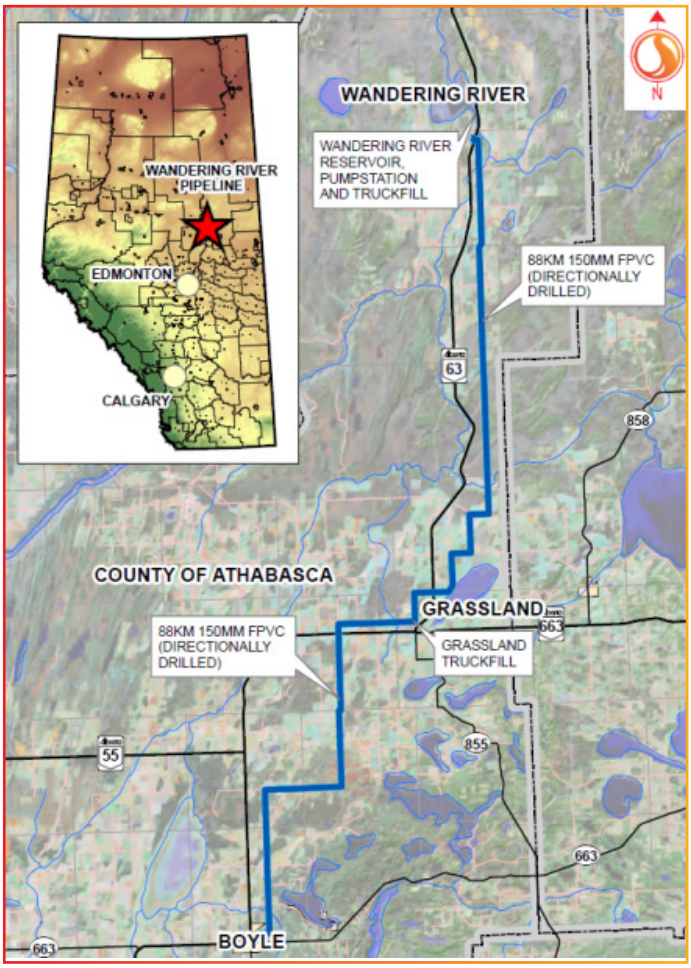


Figure 1: Overall Project Location Plan

Wandering River's existing water treatment plant was scheduled for demolition by the end of 2012 to accommodate the Highway 63 widening, thus necessitating a new potable water supply source for the community. Athabasca County and Alberta Transportation (AT) determined that a regional potable water supply would be the most appropriate replacement water source due to a combination of factors, including the quality of the water available through the recently constructed Aspen Regional Water system, the remoteness of the community relative to the population, high demand for qualified Water Treatment Plant operators, future demand projections for the community, and changing standards for drinking water quality in Alberta.

In addition to being a net benefit to the community of Wandering River, a regional water system extension carried the added benefit of enabling a connection to the community of Grassland 55 km to the south, as well as the farming community and acreage owners along the proposed system, many of whom received water service connections.

Like Wandering River, Grassland is a community of approximately 100 people along Highway 63 that is expected to grow as a service center within the Alberta Energy Corridor for the oil and gas sector, as well as the large local forestry industry. Although expansion of Highway 63 would not conflict with the community's existing filter plant or well water source, AT and the County elected to connect Grassland to the Wandering River regional waterline in order to enhance the quality of water provided to the community and ensure a sufficient water supply to meet the growth needs of the community. Similarly, the County and AT agreed that capacity would be included in the system to allow for the future connection of all existing residences along the waterline route and that tee-off locations would be provided roughly every 3.2 km for future rural water co-operatives located off of the alignment.

Design-Build Team

The County and AT elected to proceed with development of the system through a Design-Build delivery model – the first of its kind in Alberta - in order to achieve cost and schedule certainty on this time and budget sensitive project. This project was also seen as a test case for the application of the Design-Build process towards the development of future regional water systems in Alberta.

Through a five month process that included Pre-Qualification, submittal of Proposals by Design-Build Proponents, interviews and due diligence, Athabasca County selected Graham Design Builders of Edmonton, Alberta, along with its key partners of Stantec Consulting Ltd. (Engineering and Environmental Services Consultant) and M. Pidherney's Trucking Ltd. (pipeline installation Subcontractor). The Design-Build Team was awarded the

project in late July 2011 and started pipeline construction in early September of that year, with a contract mandated completion of December 2012.

Stakeholder Management

As with most major projects, numerous stakeholders were impacted to varying degrees. Due to the design-build nature of the job the contractors and sub-contractors assumed a larger than normal share of the cost related risks and as such were key stakeholders (even during the design period). Early in the project the Major Stakeholders were identified and included the following:

- Athabasca County and their consultant, Associated Engineering;
- Alberta Transportation and Alberta Environment;
- Aspen Regional Water Services Commission;
- The Design-Build Team; Stantec Consulting Ltd, Graham Construction and Engineering, a JV, M. Pidherney's Trucking;
- Subcontractors; Schendel Mechanical Contracting Ltd., Vector Electric and Controls Inc.;
- The communities of Athabasca, Boyle, Collinton, Grassland and Wandering River;
- Franchise Utilities and CN Rail; and
- the General Public.

Stakeholder input was sought during the entire project in various capacities and particularly during the design phase. Most major stakeholders were also well represented at the ongoing project meetings. The general public was kept informed of the project through newspaper ads and the Athabasca County website. A toll free hotline was set up once construction began to facilitate communication and address public concerns.

Concept and Scope Development

With a 16 month design and construction period for the 88 km pipeline, a new reservoir/pump house and retrofits to an existing reservoir/pump house, the project was split into three segments with separate internal deadlines for each segment. The first segment consisted of a 33 km pipeline from Boyle to Grassland and the second segment made up the remaining 55 km of pipeline from Grassland to Wandering River. The Wandering River reservoir/pump house made up the final segment of the project. The owner's engineer, Associated Engineering, supplied the Terms of Reference for the project which aided in streamlining the design process.

Key Team Members at the Grand Opening

The Terms of Reference included several key parameters for the project, including:

- An alignment that extended primarily along municipal road allowances, with an additional 5 m right-of-way added to each side of the road;
- System supply pressures, ranging from 98 to 560 kPa;
- A minimum waterline internal diameter of 155 mm;
- A minimum line pressure of 98 kPa at any point in the system;
- A pipeline design flow of 2.5 L/s for Grassland and 1.5 L/s for Wandering River;
- A 520 m^3, two cell reservoir at Wandering River, with peak hour distribution pumping capacity of 2.34 L/s and a distribution system ranging in pressure from 350 – 550 kPa; and
- Truckfill systems at Grassland and Wandering River, each with a capacity of 14 L/s.

Reservoir Commissioning with the majority of Stakeholders represented

Pipeline Installation Method

The Design Build Team decided to directionally drill the entire system based on a combination of factors including: the reduced environmental impact which in turn reduced regulatory approvals required in comparison to open cut trenching; ease of construction in the Owner's established alignment primarily along a developed gravel surface road; and reduced clean up needs following construction. A 150 mm diameter fusible polyvinyl chloride (FPVC) Dimension Ratio 26 pipe was selected for the installation as it met the Owner's established minimum internal diameter of 155 mm, had suitable pull strength to achieve cost effective drill lengths, and was available at a competitive cost in comparison to High Density Polyethylene (HDPE) alternatives. The FPVC pipe was manufactured by IPEX at its plant in Edmonton, Alberta and delivered to the site over a four month period beginning in September 2011.

Grassland Fill Point

The Grassland Fill Point component of the project consisted of a retrofit of the existing Grassland Water Treatment Plant and potable water storage reservoir. The project included removal of existing water treatment plant equipment, addition of a metering run for water from the new regional system, a truck filling station, and ancillary SCADA and communications systems. The truck filling station addition involved the conversion of the plant's existing filter backwash pump into a truck filling pump.

Construction of the fill point occurred in January and February of 2012. With the completion of commissioning of the regional waterline between Boyle and Grassland at that time, the first phase of the project was put into service just five months after design was initiated, enabling the Grassland distribution system to receive potable water via the regional water system, and the shutdown the existing well water supply system.

In May of 2012, the Owner approached the Design Build team about the addition of a chloramine booster station within the Grassland Fill Point. The booster was desired primarily to increase the active chorine residual in the new water line between Grassland and Wandering River, a distance of approximately 55 km, with an estimated travel time in the order of two weeks under average day demand conditions. This change presented substantial design challenges due to the high pressure in the system (>700 kPa) at the injection point, the low flow in the line and the required additions of both chlorine and ammonia at Grassland to achieve a higher chloramine concentration. The low ammonia dosing was especially problematic as ammonia solutions were not commercially available in concentrations low enough to accommodate the low system flows.

Ultimately, it was determined that the most operationally efficient and cost effective method to achieve the desired level of chloramine dosing in the system was to mix the desired concentration of ammonia solution onsite using ammonia in a powder form. The solution is stored in distribution containers and provides in the order of two weeks' worth of dosing. These new systems were designed to be located within the footprint of the unused water treatment plant clarifiers and filters and as such, the pre-existing package water treatment plant had to be cut into pieces and removed from the building.

Wandering River Reservoir

The new Wandering River Reservoir was designed to meet the minimum requirement of 500 m^3 of active storage with a two cell configuration which provides the capability to isolate a cell for cleaning or other maintenance without disrupting operations. Also included in the reservoir design was a truck fill system, a lab, a standby generator, three distribution pumps designed to provide 25 year peak flow demands, a standby pump, and space allocation for a future fire pump, should Wandering River's distribution system be upgraded in the future to enable fire flow delivery through the community.

New meter run at Grassland

Grassland WTP new truck fill

Additional future planning was incorporated into the design with the addition of pipes to allow for a twinning of the reservoir should the community grow beyond its 25 year design horizon population.

System Flushing

In addition to the design, construction and commissioning of the new regional water system extension and facilities at Grassland and Wandering River, the project included the flushing of all communities receiving water from the Aspen Regional Water Services Commission, including Athabasca, Boyle, Collinton, Grassland and Wandering River. The system flushing was implemented to facilitate the conversion from the Water Treatment Plant's chlorine disinfection system to a chloramine disinfection system. Due to a limited transmission capacity in the Aspen Regional Water system from Athabasca to Boyle and limited excess flow availability for the regional system as a whole, the flushing operations had to be scheduled for a period of approximately 2 weeks and consisted of incremental isolation and flushing in each community's distribution system beginning at Athabasca, and working downstream towards Wandering River.

Safety

The entire Design-Build Team was committed to providing and maintaining a healthy and safe workplace for this project. Each of the partners (Stantec, Graham and Pidherney's) hold high standards for safety and have their respective safety programs which where adhered to. A key component in reducing safety incidents is ensuring that staff are properly trained for their roles and aware risks and hazards onsite. During construction, daily tailgate meetings were held to ensure all personnel onsite were aware of potential hazards and equipped to deal with them. Over the entire project, there were zero lost days due to safety incidents.

Sustainability

At the inception of this project the Envision rating system for sustainable infrastructure was still under development, and the Stantec design team did not yet have any personnel credentialed by the Institute for Sustainable Infrastructure. Since the completion on the project, one of the team members has undergone the training to become an Envision Verifier, and another is currently undergoing training to obtain status as an Envision Sustainability Professional.

Based on the training received, Stantec is considering having the Wandering River Pipeline and Reservoir project evaluated though the Envision program retroactively. This project exhibits the following criteria which are evaluated through the Envision rating system:

Quality of Life

Improve Community Quality of Life

» Reliable, clean and safe drinking water is one of the key factors in the health of a community. This project improved the quality of the drinking water for 2 communities and 70+ residences along the alignment.

Stimulate Sustainable Growth and Development

» The availability of services such as sewer and water can impact the ability of community to support sustainable growth. The new waterline and reservoir will provide the communities of Grassland and Wandering River the water resources they require to develop.

Enhance Public Health and Safety

» The switch from chlorinated water to cloraminated water provides a longer lasting disinfectant which reduces health risks to the public; Especially in the case of rural truckfill users who supply their residences with cisterns.

Leadership

Foster Collaboration and Teamwork

» The nature of the design-build project encouraged creative thought and innovative problem solving between the client, consultant and contractor. The project's success was vital to the success of the team.

Provide for Stakeholder Involvement

» As addressed earlier, stakeholder input was sought out early on in the project, and key stakeholders were invited to attend monthly meeting to ensure their needs were being met.

Improve Infrastructure Integration

» This project connected to a pre-existing water treatment plant and regional line. The new system had to be integrated into the existing infrastructure, and significant coordination was required.

Resource Allocation

Reduce Net Embodied Energy

» By utilizing a smaller diameter FPVC pipe which met the hydraulic requirements of the system, instead of the more common HDPE, the team was able to effectively reduce the embodied energy of the pipe required for the project.

Use Regional Materials

» The pipe for the system was supplied by IPEX out of Edmonton.

Reduce Excavated Materials Taken off Site

» By utilizing the HDD method instead of the traditional open cut method of installation, the need for disposing of unsuitable fill materials was essentially eliminated.

Natural World

Preserve Prime Habitat

» Early in the project environmental assessments such as a rare plant study, wetland evaluation, soils study and aquatic assessment were undertaken to assist in developing an alignment that minimized impact to environmentally sensitive areas while optimizing the overall length.

Protect Wetlands and Surface Water

» Directionally drilling the pipeline minimized the impact to wetlands, creeks, streams and rivers. A monitoring program was also employed for the river crossings to provide an alert should construction activities result in an increase in turbidity, and an action plan was determined.

Maintain Wetland and Surface Water Functions

» See above

Preserve Prime Farmland

» Use of county road right-of-ways for the pipeline alignment reduced the amount of prime farmland impacted on this project, and directionally drilling the entire project kept the impacted areas to a minimum.

Innovation, Technical Excellence and Advancement of Technology

The Wandering River Regional Waterline project is unique for various reasons. The selected method of installation was directional drilling for over 95% of the 88 km length of the system. In addition, the system consists primarily of fusible polyvinyl chloride pipe (FPVC). The application of FPVC for this project represents the largest project by length of FPVC directionally drilled as well as the largest project by length of FPVC installed to date in the world. It is also the first regional water project in Alberta completed under a Design-Build delivery model.

The Design-Build delivery model was adopted by the Owner in order to facilitate condensed design and construction timelines. This approach allowed the owner to reduce the overall delivery timelines of the project by as much as 50%. Through close cooperation and teamwork by the Designers, Constructors, Owners and Regulators, the project was designed, constructed and put into operation in just 13 months; 3 months ahead of the completion schedule. As such, this project was evaluated on overall value and not direct costs alone. This required proponents to take an innovative approach to the project.

Horizontal directional drilling (HDD) was initially selected as the choice method of installation for this project due to the tight timelines. HDD greatly reduces potential environmental impacts through minimum disturbance during construction activities, and therefore is exempt from the requirement to obtain an approval under the Environmental Protection and Enhancement Act (EPEA). This exemption allowed for a reduction in the overall project timeline of up to six months.

While scheduling impacts was the driving factor in the selection of HDD installation, it was also recognized that this method added value to the project in other areas. HDD reduced disturbed lands by approximately 90%. This minimized top soil salvage, sub soil excavation, add-mixing of soils, re-vegetation, erosion and crop damage while preserving the natural habitat for wildlife. In cultivated areas it minimized crop damage, and reclamation required by private land owners. As a large portion of the waterline was installed within County road rights-of way, this approach also minimized disruption to motorists and limited the need for private lands.

Directional drill south of Grassland

Sea-Can configuration used for fusing in winter conditions

The selection of FPVC pipe was based on the hydraulics of the system. High density polyethylene (HDPE) pipe is used more commonly in HDD installations. However, in this case the larger internal diameter of PVC pipe allowed the use of 150 mm diameter pipe, while the greater wall thickness of HDPE pipe would have required the use of 200 mm diameter pipe. FPVC pipe was suitable for HDD installation and provided the hydraulics required for the system while offering a cost saving to the client by downsizing the pipe diameter.

The tight timelines on this project also inspired innovation in other areas. As construction of the pipeline began in September, fusing of the FPVC pipe was scheduled to continue through the winter months, which produced less than ideal fusing conditions. To address this issue, pipe fusing operations occurred inside of two pairs of retrofitted sea-cans set end to end to allow for a temperature controlled environment for fusing operations, pipe cooling, and digital data collection for quality control. Fusing was generally undertaken to remain one to two weeks in advance of pipeline installation, and the sea-cans were relocated along the alignment as needed throughout construction.

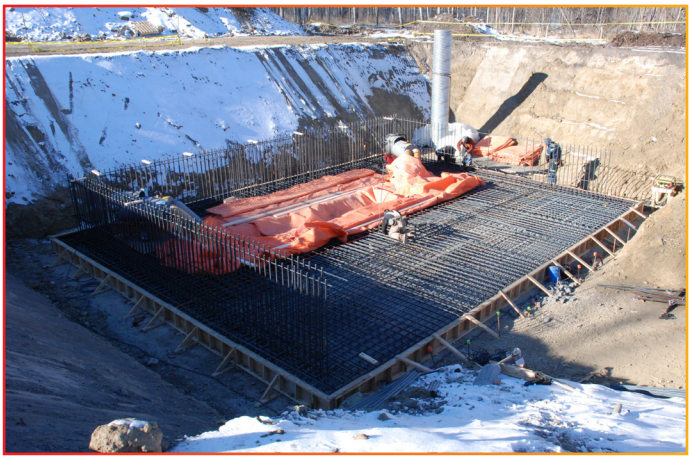
In addition to servicing the communities of Grassland and Wandering River, residents along the alignment were also given the opportunity to sign up for water service. As the waterline was designed as a transmission line first and a distribution line second, high line pressures had to be reduced prior to entering homes. To accomplish this, each rural service was installed with an HDPE Meter Vault complete with a pressure reducing valve. This allowed over 70 rural residents to benefit directly from the installation of the waterline.

Project Delivery

One of the unique characteristics of this project is that the pipeline was designed, constructed and put into operation in just 13 months. The quick turnaround between award and construction startup was attributable to a fast tracking of many of the design and regulatory approval activities. For example, many approvals for crossing of foreign highways and pipelines and powerlines, as well as environmental features were sought concurrently, and construction proceeded in areas where approvals were in place, even if approvals were still outstanding in nearby areas. This process led to several remobilizations across the alignment in the early months of construction while long lead time approvals trickled in; However, this approach was considered necessary to ensure the project timelines were met.

Overall, the directional drilling component of the project proceeded well ahead of schedule, finishing in April 2012 instead of the originally forecast drilling completion of June. Commissioning of the work was completed in segments, first with “bump tests” or short duration pressure tests undertaken in advance of system swabbing, full length pressure testing and disinfection activities. Commissioning of the first segment of the line (Boyle to Grassland) occurred over a six week period in January and February and was brought into service in mid-February. Commissioning of the second segment (Grassland to Wandering River) was completed in July 2012, five months ahead of schedule.

Warmer than average winter temperatures in January/ February 2012 allowed for construction of the reservoir to begin ahead of schedule. Construction proceeded smoothly though there were a number of small delays which are experienced in every project such as the delay in installation of the gas utility, temperature fluctuations during the leakage testing of the reservoir and a number of re-designs to the truckfill configuration. Despite the challenges, construction of the reservoir was completed and put into service in September 2012, three months ahead of schedule.



Reservoir construction begins

Management of Risk

Under the design-build delivery, the cost risk back to the owner was significantly reduced. The remaining major risks were summarized into schedule risk and quality risk. Based on the terms established in the Request for Proposal, the most significant risks on this project were related to the schedule.

Typical drill pit

Schedule Risk

Approvals

The largest impact on schedule for this project was the securement of all regulatory permits in advance of construction. By directionally drilling the project the approval requirements were minimized. For example, by keeping the surface disturbance length under 17 km (with a 150 mm diameter pipe), the need for a Conservation and Reclamation Plan approval was removed, although many of the component environmental studies remained. Similarly, directionally drilling fish bearing watercourses eliminated the need to conduct Fish Habitat Assessments on the streams, though full time onsite monitoring by an Aquatic Biologist was still required. Furthermore, directional drilling has become the industry standard method for pipeline crossings, and as such was integral to the successful and timely completion of the project along an alignment with many pipeline crossings.

In addition, Stantec's Environmental specialists identified features to be avoided so that drilling pits did not come into conflict with them and so that approval timelines were minimized. During the proposal process, Stantec researched foreign utility crossing requirements, as well as reviewed resource needs and timing constraints with the land agent and utility locating firms so that applications could be generated quickly upon award of the project.

Another significant risk recognized was that due to the Summer season and the rebound in drilling activity seen in 2011, not all foreign utility companies would be able to process the applications in a timely manner. As such, some of the crossings in the 2011 work program had to be skipped over and returned to near the end of the 2011 season. Because Pidherney's supplied the directional drilling services directly, the Team was able to react more effectively and to remobilize as needed due to delays in crossing approvals.

Material and Equipment Procurement

Several items related to both the pipeline and the reservoir had long delivery times. To mitigate this risk, Stantec worked closely with Graham and Pidherney's to ensure that key components were sourced, shop drawings reviewed and parts ordered during the design process. For example the distribution pumps required for the Wandering River Reservoir were selected and ordered by January 2012 even though the design for the reservoir was not finalized until March 2012. By utilizing this method the Team was able to avoid potential delays that would result in key components being delivered late.

Stantec Inspector and Process Engineer with the Wandering River Pumps

Design Time

This project was not awarded until July 2011 and the first 33 km of the pipeline was scheduled to be designed, constructed and commissioned by December 2011. Stantec recognized the impact of the six month schedule and put extensive effort into producing a substantial level of detail for the RFP submittal process. Besides mitigating risk back to the overall pricing component, this also allowed for quicker delivery of the 60% submission, thereby fast-tracking the overall project schedule.

Stantec moved to a staggered submittal process, submitting review packages for the pipeline segments separately and apart from the Wandering River Reservoir and Grassland Truckfill, as needed, to expedite the schedule and take best advantage of the remaining 2011 construction season.

Quality Risk

Although schedule risks were recognized to be the most critical risks to the project from the perspective of the Owner, it was also important to consider risks to quality in the development of the project.

Project Delivery

Prior to this project Stantec had designed many facilities similar to the Wandering River Reservoir and the standard design was well known. In addition Stantec specializes in linear infrastructure and is well known in the industry. Both Graham and Pidherney's are reputable contractors and have completed many successful installations in their respective fields. This meant that the mutual performance expectations were well known to the design build team, including the design parameters, quality expectations and the construction execution parameters. Starting with well-established expectations, and managing these expectations throughout the project was determined to be a fundamental component which enabled the design build team to meet and in some cases exceed the project success criteria.

IPEX Plant Tour (Material Supply)

Material Supply

From a materials perspective, the team negotiated with PVC pipe suppliers (IPEX) to ensure that materials could be stored at their facilities and delivered as needed rather than storing excessive quantities of material on site under potentially adverse conditions.

Winter Construction Activities

With standard trench and fill operations, settlement results in significant risk to the client in the short term, and long term. Some of these effects may not be realized until after the warranty period. Our methodology to directional drill significantly mitigated this risk.

Winter construction

In meeting the schedule requirements by working through the winter, quality risks were imposed to ensure that fusing was performed within specified temperature ranges. This risk was managed through our procedure to have a mobile heated fusing trailer to travel with the construction crews.

Along the selected alignment, north of Grassland, a significant muskeg was identified. By performing construction in those sensitive areas during frozen conditions, risk was reduced and constructability improved.

Directional Drill Alignment

Directional drilling carried significant benefits in terms of flexibility to work in various conditions, as well had minimal impact environmentally to the landowners and their ROW. However, a risk with this methology was managing the alignment. This risk was mitigated by the use of GPS technologies in conjunction with the drilling head locator. Asbuilt depths and locations were picked up by GPS to accurately record the horizontal and vertical alignments and 3M Marker balls were used in all bell holes, bend locations and at all apparatuses' to provide accurate locate information. Furthermore quality control checks were made with the use of hydrovac to confirm the accuracy of the drilling head locator.

In developed road right-of-ways, the pipeline alignments are generally placed in the opposite ditch of the overhead power and 3 meters from the edge of the existing road to provide as much clearance from existing utilities as can practicably be achieved. Alta Gas and Telus alignment conflicts were also identified and separation from these utilities was designed to be 3 m where possible. In areas where conflict existed, the alignment was carefully reviewed and in some instances the alignment was moved to the shoulder of the road to mitigate potential future issues.

Directional Drilling Procedure

Because Pidherney's undertook the directional drilling for the project using their own forces and equipment, and fused the pipe in a controlled environment, the risks of improperly fused equipment or off-alignment or shallow drilling by a subcontractor were mitigated. Drilling fluids were selected to be environmentally friendly (not petroleum based) and a frac out procedure and mitigation plan were adhered to.

Degree of Difficulty

As discussed above, the tight schedule was the biggest source of potential difficulty on a project this size. The design-build team was able to overcome this challenge and exceed expectations though diligent planning, and close team work between the owner, designers and contractors.

Several project challenges were encountered and overcome as a result of directionally drilling the system. The most significant was the changing geotechnical conditions across the length of the alignment. For example, unexpected boulders and gravel areas were encountered in the southern portions of the alignment. Several were found when hit straight on by the drill head, whereas others at slight offsets were only discovered when the pipe was pulled into place and found to have been damaged or crushed. While it was a straightforward process to identify the straight on hits and remove the obstructing boulders, finding the rocks that had crushed the pipe became a trial and error exercise of exposing the buried pipe with an excavator and hydrovac and led to a few hundred meters of pipe needing to be replaced. In areas where the presence of rocks and boulders were particularly common at pipe depth, the Contractor shortened the drill lengths first from 500 m to 250 m, then to 150 m in order to minimize production losses from rock hits.

The next most significant geotechnical challenge was the presence of muskeg soils along an undeveloped portion of the alignment. Muskeg is very soft and construction equipment will often sink into it. As such, contractors typically avoid construction except during frozen conditions. Because of this, drilling through the muskeg area was timed to proceed in January and February, typically the coldest months of the year. While the winter had been warmer than normal, it was nevertheless cold enough for frost to penetrate the ground and for construction to proceed as planned.

A third significant geotechnical challenge on the project was the presence of sands and gravels at pipe depth at river crossings. In the worst case, at the Wandering River - a few kilometers south of the Community of the same name - the initial drill was unsuccessful due to sand extending well below the design pipe depth at the launch pit. This challenge was mitigated with the use of a conductor barrel to a depth in excess of 15 m and leaving it in place and grouting the FPVS in it.

Bolder hit and removed during drilling

Digging in soft area

Benefit to Society

With this project Alberta embarked on a significant new chapter in the construction of potable water systems. Stantec and the design-build team undertook this project with the understanding that success or failure here would directly impact future opportunities to carry forward the design-build methodology for municipal water systems. Through a committed team effort from the owners, operators, designers, contractors, sub-contractors and others this project was a huge success.

The innovative technologies employed in the completion of this project served to reduce costs, decrease construction timeline, minimize environmental impacts, and reduced disturbance for private land owners and motorists.

The reduced disturbance also improved community relations. HDD minimized inconvenience to the public and as a result there were few construction related complaints from community members. In fact, as the project was nearing completion, the owner shared with the design-build team the story of a local resident who was curious as to when construction was scheduled to commence. Inconvenience to the public had been minimized to such a degree that some local residents were not even aware that construction activities had taken place in their community.

The project was completed on budget and ahead of schedule. The Wandering River Pipeline/Reservoir provides a long term reliable solution for clean and safe drinking water to key communities along the Alberta Energy Corridor and the rural residents in between for many years to come.

Wandering River Reservoir Grand Opening