CANADIAN CONSULTING ENGINEERING AWARDS 2023

KLUSKUS VILLAGE DOMESTIC WATER SYSTEM IMPROVEMENTS

LOCATION: KLUSKUS VILLAGE, BC
CLIENT/OWNER: LHOOSK'UZ DENÉ NATION
CONSULTANT: ASSOCIATED ENGINEERING
OTHER CONSULTANTS: RESEAU CMI, FIRST NATIONS HEALTH AUTHORITY, INDIGENOUS SERVICES CANADA

ASSOCIATION OF CONSULTING ENGINEERING COMPANIES CANADA
CANADIAN CONSULTING engineer
Associated Engineering

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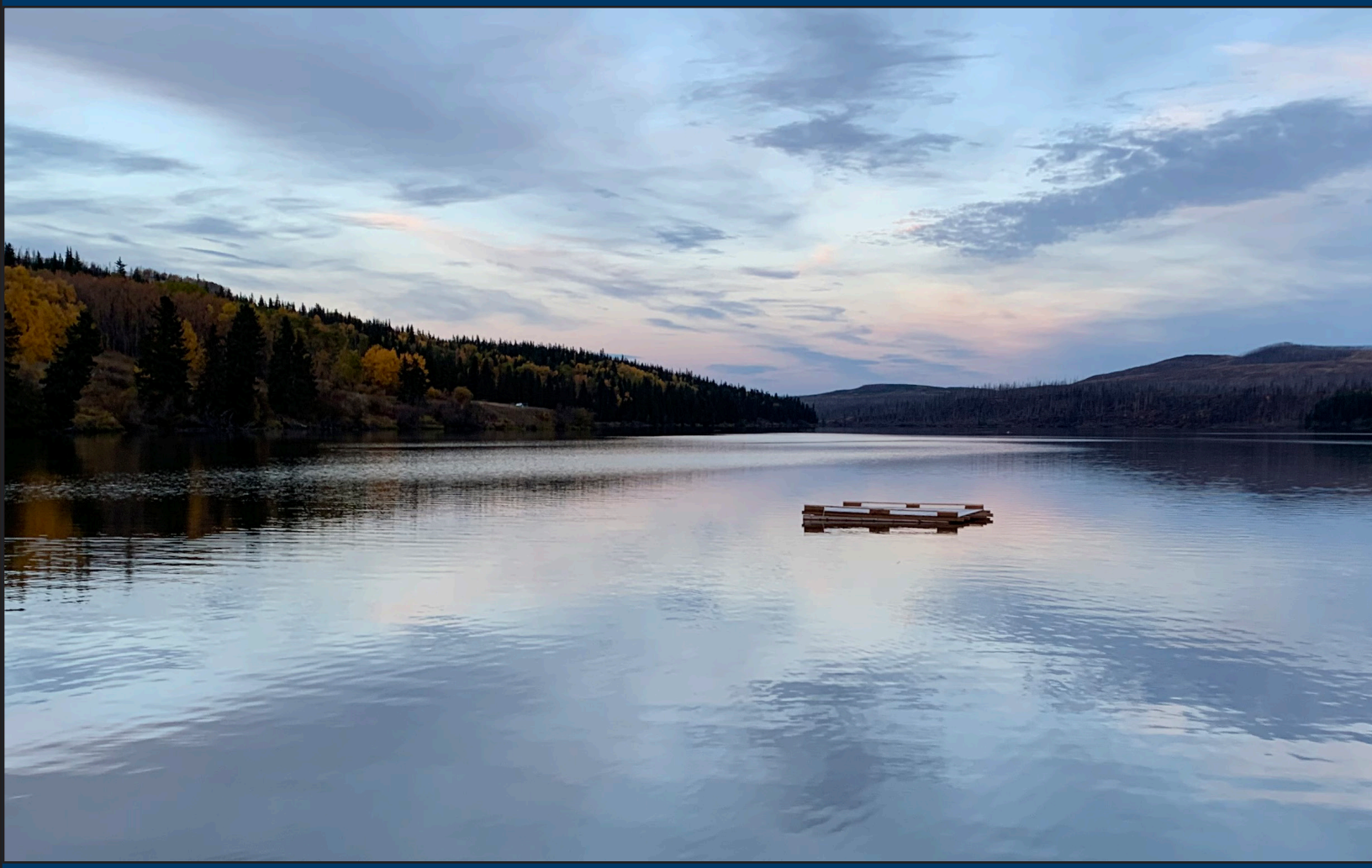

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PROJECT SUMMARY

The Associated Engineering team adopted a Community-Circle Approach to develop a safe and reliable domestic water system for Kluskus Village in BC. Through open dialogue, collaboration, and knowledge sharing with all members of the community, the team achieved honest and respectful engagement to fully understand the their concerns and needs for siting and designing the domestic water system improvements. In 2021, Kluskus residents confidently drank water from their taps for the first time!

COMPLEXITY

Located on Lhoosk'uz Dené Nation's (LDN) traditional territory west of Quesnel, BC, the Village of Kluskus is only accessible by forestry roads, making year-round road access difficult, especially during winter and spring thaw.

The community had been without a trusted source of drinking water since the 1990's. A shallow well was developed when the community was founded; however it was susceptible to turbidity and bacterial contamination, making water unpalatable and unsafe to drink.

In 2008, two shallow wells were installed and served as the water supply source. Unfortunately, the wells were positioned close to traditional burial grounds and a wastewater septic field. Raw water quality data did not show any issues with nitrates, but the locations caused the community to distrust the water supply. Residents were also reluctant to use the water for bathing because of taste and odour issues due to iron and manganese.

Previous attempts to provide drinking water only considered engineering objectives; limited effort was made to consult community members. Not considering community input meant that the siting of infrastructure and options for water supply was problematic. Long-term operations and maintenance issues were also encountered with the wells and treatment system.

Committed to Canada's Truth and Reconciliation Commission's Call to Action, the project team (Associated Engineering, LDN, RESEAU, and Indigenous Services Canada) adopted a "Community-Circle Approach". This developed a respectful and collaborative relationship from the beginning as weekly project meetings, coupled with in-person community meetings, ensured the project team, Elders, operator, and community members were involved in planning, design, procurement, and construction. Establishing relationships and building trust helped to identify and resolve questions, issues, and concerns. Community members were engaged and felt their unique needs and insights were heard, in particular for siting the new groundwater wells.

Special measures also needed to be addressed because of the remoteness of the community. The team recommended a treatment process using cartridge filtration and ultraviolet (UV) disinfection that is easy to operate and maintain. A design-build approach for the water treatment plant (WTP) reduced the chances of problems during construction and commissioning; the treatment system was built into a standard shipping container for ease of transport and tested in factory before delivery. The design incorporated six-days of reservoir water storage in case of temporary power outages at the WTP. Training was provided to the operator at the factory. The Community-Circle approach ensured a solution that suited the community's long-term needs.

MEETING CLIENTS NEEDS

The team adopted a Community-Circle Approach to deliver the project, embracing open dialogue and idea sharing with members of the Kluskus community, Elders, rights and title holders. The team acknowledged engineers, contractors, regulators, and client representatives have important skills and knowledge, they do not typically engage with each other or with Indigenous communities throughout a project. The local knowledge held by community members is generally under-valued and/or not considered. The key to long-term success required that this local knowledge was incorporated.

The Community-Circle approach brought everyone to the table to make decisions based on a deeper understanding of the issues, leading to a positive experience and community acceptance. The approach focused on team-based dispute and conflict resolution and emphasized culture-based perspectives and the natural environment, resulting in solutions and innovation rooted in reconciliation and sustainability. As a result, the community helped to identify a culturally appropriate site for the groundwater wells to provide a sufficient and safe water supply and gave residents confidence in the drinking water system.

The team understood to meet the community needs, it would require many in-person and virtual community meetings, where rights and title holders could develop relationships with the team, build trust, and ask questions. The operator was engaged during design and was invited to participate in testing and commissioning, and ask questions about operation and maintenance.

The Community-Circle approach not only led to the successful design and construction of the WTP, but also pride and ownership of the facility by the Kluskus Nation.

ENVIRONMENTAL BENEFITS

Associated Engineering understood the importance of engaging with Elders and community members to ensure that the location of the wells and the WTP respected traditional cultural and Western values and the natural environment. Siting of the facilities considered existing burial grounds, vegetation, surface water, and aquatic and animal life. Water system infrastructure was located to minimize tree clearing, while maintaining enough sun exposure at the WTP to take advantage of natural melting and to reduce the need for snow clearing. The WTP and wells are located across the river from the main village, reducing the visual impact on residents. Archaeological sites were identified by the community and professionals monitored work in environmentally sensitive areas.

Addressing the impacts of climate change was also a key consideration. Following several years of rising temperatures, the impact of summer heat on operations staff was a concern. Proper HVAC was installed in the WTP to ensure safe working conditions for staff. The community had been significantly impacted by forest fires, significant snowfalls, flooding, and landslides, isolating them until roads could be re-established. Knowing that these events are likely to increase, the team provided additional storage in the treated water reservoir as backup for when the water treatment system had to be paused for service, concurrent with an extreme weather event. The reservoir also provides additional water supply for fire fighting.

INNOVATION

The new water system includes two groundwater wells, a WTP, transmission main, and a new reservoir cell. The treatment process employs filtration, ultraviolet disinfection, and chlorine disinfection.

COVID pandemic restrictions meant that the design and construction team could not stay in the Village and had to travel three hours to-and-from Quesnel daily. The team recommended a design-build package WTP to provide some assurance regarding concerns about delays during construction and commissioning. Having the system pre-built and pre-tested off-site reduced the potential for lost time due to untimely deliveries, sourcing parts, and/or solving construction problems on site in the remote village.

The team developed a three-room design for process equipment, which fit within the footprint of a shipping container. The facility complies with ISC design standards, was easily transported to site and commissioned, and is straightforward for staff to operate and maintain without specialist skills or expensive materials, equipment, and chemicals.

Remote access to the water treatment system's programmable logic controller (PLC) was provided using a radio system connected to the internet at the local school, as there was no internet or cellular access available anywhere near the building. Information is transmitted to the band office in Quesnel, where it is stored and can be accessed remotely. This allows the manufacturer to assist with troubleshooting any issues from a distance. WiFi was also installed in the WTP to facilitate troubleshooting from within the facility, without having to leave for another location.

SOCIAL/ECONOMIC BENEFITS

The Kluskus community distrusted the government and consultants and their ability to deliver a safe and reliable drinking water system. The Community-Circle approach helped the team to better understand the village's needs and gain the confidence of residents.

The team developed a simple treatment process to minimize operation and maintenance costs. The treatment process incorporated filtration, ultraviolet (UV) disinfection, and chlorine disinfection. UV disinfection was added to the process, which significantly reduced the amount of chlorine required for disinfection and alleviated residents' concerns about the taste and odour of chlorine.

To reduce costs for transportation of equipment, materials, and skilled construction labour to the remote village, the team recommended that the equipment be installed in a shipping container and tested at the manufacturing facility. The container was then transported to the village.

The team also identified areas where increasing the capital cost could reduce the long-term operations and maintenance costs. For example, installing a dedicated water transmission main increased the efficiency of chlorine disinfection, improved water turnover in the reservoir, and helped minimize stagnant water in the water distribution system.

The village marked the official opening of the WTP with a community celebration. All team members were invited, signifying the strong trust and respectful relationships that the community had developed with the team.

Residents gathered to taste the first sips of safe, drinking water obtained directly from their taps. For the first time the residents of Kluskus have a domestic water system they trust.


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BAV-330
BAV-202
CV-3
F-210
F-310
BAV-224
BAV-222
BAV-212
Parker