summary

The City of Dawson Creek faced an increasing frequency of drought conditions and was challenged to supply truck filling stations with potable water to support hydraulic fracturing demands. Urban Systems worked with the City to create an innovative reclaimed water facility in partnership with Shell Canada. Treated sewage, once thought of as waste, now supplies Shell’s operations, among other uses, decreasing demand on potable water systems while creating a revenue stream for the City.

innovation

The City of Dawson Creek (CODC) Reclaimed Water Facility began with the realization that water scarcity is a global issue that must be solved locally through collaboration between industry and the public. Extreme drought conditions were limiting CODC’s ability to supply truck filling stations with potable water to support hydraulic fracturing demands. The solution arose from a simple question: why is sewage considered a waste rather than a resource that can be utilized by hydraulic fracturing operations in a manner that is beneficial for society, the economy and the environment? Urban Systems first tested this idea by applying engineering first principles to determine industrial hydraulic fracturing water quality and quantity needs, and exploring treatment technologies most suitable to a northern climate. Environmental and social issues were also considered for the industrial use of reclaimed water. Extensive industrial consultation was undertaken to learn about opportunities for hydraulic fracturing while moving through preliminary feasibility studies and identifying potential treatment technologies. The outcome of this work was presented to industry and the public, and was found to be so compelling that four proponents submitted proposals to partner with the CODC, each offering significant financial contributions to the project. Shell Canada and the CODC ultimately partnered on the project which consisted of a unique treatment process for a northern environment, LEED design criteria, a municipal reclaimed water truck filling station, a Shell Canada owned and operated pump station, and a 48 kilometer pipeline to transport the water to Shell’s field operations.

While there are many reclaimed water projects in Canada, this project is unique in its application of hydraulic fracturing information, treatment technology, imagination, and team initiative to transform a waste into a resource. This would not have been possible without the industrial and public consultation that created the joint venture and public support to finance the project. The final solution not only satisfied CODC’s specific needs, but is replicable at an economic cost that has inspired other communities to take the same approach. Partnerships that follow the CODC project will benefit from
complexity

This project utilized a treatment technology that was new to a northern environment for treating wastewater for use in the hydraulic fracturing operations. Special consideration had to be given to how well this technology would perform over the lifecycle of the facility, the finished water quality and potential interactions with additives that are used in hydraulic fracturing operations, and the potential for water quality to deteriorate during transport in the 48 kilometer pipeline. Close collaboration with Shell Canada was required to ensure the treatment facility was fully integrated with the Shell pump station, transmission line and field storage. The facility was designed to meet LEED objectives, adding further complexity to the design process.

While developing an innovative wastewater treatment process for hydraulic fracturing operations was challenging in itself, creating a long term agreement that met both the needs of the municipality and Shell Canada required careful consideration and public consultation in order to secure project financing.

As the project progressed, special consideration had to be given to the uses of the reclaimed water, how it would be handled in the field, and also how it would be handled in the event of a spill. Given that the reclaimed water represented a significant reduction in the discharge to Dawson Creek, consideration was also given to commissioning and how the wastewater discharge to the creek would be reduced to ensure fish and their habitat were not put at risk.

social & economic benefits

The reclaimed water facility is designed to treat 4000 cubic meters per day (m³/d) and has significant economic benefits to the community and industry. 3400 m³/d is allocated to Shell Canada and 600 m³/d is allocated to the City of Dawson Creek bulk truck filling station. If Shell doesn't take the full 3400 m³/d, or if the facility produces more than
4000 m3/d, the City can sell the surplus reclaimed water. The City received the majority of funding from Shell Canada to support the design and construction of the facility for Shell’s secured access to the reclaimed water for 10 years. The City sale of the bulk reclaimed water could generate over $5.5 million dollars in revenue over the same 10 year period. Local industry will benefit from a stable water supply even during drought conditions when restrictions are imposed.

The reclaimed water supports Shell’s Groundbirch venture which includes five natural gas processing plants, over 300 wells and a gas collection system. The operation is currently producing enough natural gas to meet the needs of approximately 400,000 Canadian homes. Piping the water to Groundbirch rather than trucking it means a reduction in traffic, noise and dust, which are among the top concerns of local landowners. The pipeline option is expected to eliminate three million kilometers a year in truck trips over the course of full gas field development. The Groundbirch venture and the reclaimed water infrastructure that was built to support the venture created significant economic activity in the area.

environmental

Sustainable communities recognize the value of making the most of what they have and ensuring that consumption of resources is reduced or eliminated. To successfully achieve this, the community’s environmental, economic, political and social drivers must be well understood and balanced. It was recognized at the outset, that for this project to be successful public and industrial consultation would need to occur in parallel with an understanding of the economics of reusing wastewater for hydraulic fracturing and the environmental considerations of such a unique project.

By balancing these sustainability drivers the community was able to partner with industry to create a win-win situation. Shell Canada was able to get a secured source of water that would be available even during drought conditions while supporting the community with funding to help build the facility. The water quality met the highest reclaimed water standard in British Columbia at the time of commissioning and a significant portion of the wastewater previously discharged to the environment is now being reused for beneficial uses, while generating a new revenue stream for the City.

Other environmental benefits of the project include eliminating the need for trucking water to Shell’s Groundbirch facility estimated at three million kilometers a year in truck trips over the course of the development, eliminating the need for using pristine water resources for the shale gas development, and the LEED designed treatment facility is demonstrating what is possible for other treatment facilities that are designed with environmental protection and energy conservation in mind.
treatment process

To ensure the treatment process was cost effective the team made use of the existing lagoon treatment system and added three Submerged Attached Growth Reactors (SAGR) cells. Using the SAGR process is unique to a northern environment and required a thick insulating layer of mulch on the cells as well as an aeration system design that allowed for improved treatment. Tertiary treatment is provided downstream of the SAGR cells with coagulation, disc filtration and chlorination for disinfection. The polished water is distributed to Shell’s Groundbirch facility via the Shell pump station and a 48 kilometer pipeline. The remaining reclaimed water is distributed by the new City truck filling station. Four drawings are provided to provide an overview of the treatment building site, the SAGR cells, the facility main floor process layout, and the system conceptual hydraulic design. More details are available upon request.

client needs

The City of Dawson Creek states on its website that it will be a visionary community that works together for innovative social, cultural, economic and environmental vitality. The City’s guiding principles are centered on trust and integrity, inclusivity, modern economy, creativity, health, environment, and lifestyle. Each of these guided the project to meet the City’s overall community objectives. It started with asking creative questions and having the vision to seek the answers. The public and industry consultation process was required to ensure inclusivity and to build the trust and integrity that would be needed later to ensure a successful agreement with industry could be developed. The project also recognized that a modern economy is not about going it alone, but rather partnering and collaborating with others. In this particular case the partnership was with Shell Canada, but this unique project has laid the ground work for others to follow.

Designing the facility with LEED principles ensured that the City was building a legacy in the built environment and a healthy workplace that is not only connected to the surrounding environment but also working to protect it. This facility creates a workplace that has a lifestyle component that is in keeping with the City’s vision for the community while setting an example for other buildings in the area.

Ultimately the project was about partnering with industry to help finance a reclaimed water facility to reduce potable water demand for non-potable uses. To that end the project was a resounding success.
1. COMPONENTS AS SHOWN HAVE BEEN DESIGNED TO SCALE AND ARE ACCORDING TO ANSI STANDARD DIMENSIONS.

2. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF DAWSON CREEK CONTRACTORS SPECIFICATIONS.

3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

4. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION.

5. REFER TO THE APPROPRIATE DRAWINGS AND SPECIFICATIONS FOR APPROVED MANUFACTURERS.

6. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIREMENTS.

7. REFER TO SPECIFICATIONS FOR STAINLESS STEEL GROOVED PIPE PIPING, SEE NOTE 10.

8. FLOCCULATION AND RAPID MIX TANKS SHALL BE INSTALLED WITH CAST INTO FLOOR SLAB.

9. ENSURE THAT TRUCK FILL COMPONENT SPACING, INCLUDING PUMP CENTERS IN RELATION TO EXTERIOR UNDER-SLAB WET WELL, MEETS BUILDING DIMENSIONAL INFORMATION. THE PROCESS SECTION SHOWN IN THE DRAWINGS IS THE PROCESS SECTION HAVING BEEN PARTIALLY SHOWN ON THE NORTH END OF THE BUILDING.


11. INSTALL 600x600mm CLEAR OPENING BILCO STYLE HATCHES FOR ACCESS TO METERING POINTS AND ACCESS STAIRS, SEE NOTE 9.

12. REFER TO DRAWING P13 FOR FLOCCULATION AND RAPID MIXER TANK OPERATING REQUIREMENTS.

13. ENSURE ALL CHLORINE AND TURBIDITY ANALYSIS INSTRUMENT OPERATING REQUIREMENTS.

14. CONNECT EMERGENCY EYEWASH DRAIN DIRECTLY TO LOW WATER LEVEL IN WORK AREA.

15. REFER TO DRAWING P13 FOR FLOCCULATION AND RAPID MIXER TANK OPERATING REQUIREMENTS.

16. INSTALL GROOVED PIPE COUPLERS AS PER MANUFACTURERS REQUIREMENTS.

17. INSTALL 150Ø SS TOTE 1 TOTE 2 WITH CAPACITY: 11,800 L.

18. REFER TO DRAWINGS P13 & P14 FOR COAGULANT CHEMICAL FEED PIPE LINE TYPE.

19. INSTALL 320Ø SS INLET PIPING FOR DISC FILTER No. 1 AND 300Ø SS INLET PIPING FOR DISC FILTER No. 2.

20. REFER TO DRUM P11 FOR ACCESS HATCH, SEE DETAIL 1.

21. REFER TO DRAWING P06 FOR CONTINUATION.