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TransAqua

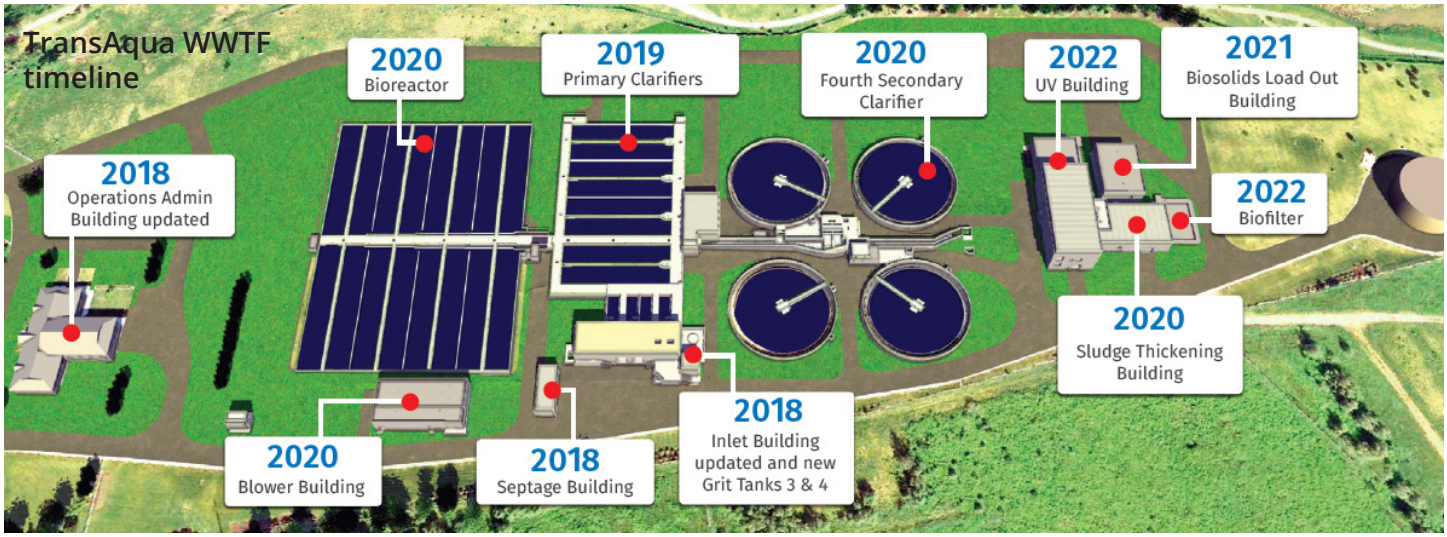
Wastewater Treatment Plant

Moncton, New Brunswick

Project Overview

Wastewater treatment for the municipalities of Moncton, Riverview and Dieppe is managed by TransAqua (a.k.a. the Greater Moncton Wastewater Commission). The TransAqua Wastewater Treatment Facility (WWTF) was originally constructed as a chemically enhanced primary treatment process. CBCL Limited was commissioned by TransAqua in 2014 to plan, design, and support the construction of secondary treatment upgrades necessary to meet new federal effluent guidelines. In 2014 the WWTF was regarded as one of the most advanced and well-maintained facilities in Canada. To continue this legacy, the WWTF would require preliminary and primary treatment upgrades and the addition of biological treatment, sludge thickening, and disinfection. Through the course of the projects improvements to the odour control system, centrifuge retrofits, and a new solids load-out building were also deemed necessary.

While keeping the existing plant in operation, new infrastructure was constructed beside, over, under, and sometimes through the existing plant components. More than 6 km of piping, 0.5 km of concrete channels, 1.5 km of asphalt roadway, and 30 pumps were installed on the site and in the underground tunnels. Five new buildings were constructed to house electrical equipment, aeration blowers, UV disinfection, and solids pumping, processing, and load out equipment. The project was constructed in phases for the budgeted cost of $90.4 million. With the upgrades the plant effluent meets recreational water quality discharge guidelines, an important milestone in restoring the Petitcodiac River.



Upgrades to nearly all systems across the site were constructed including:

- New screens and grit removal equipment in the Inlet Works Building
- A new septage receiving system and building
- Four new primary clarifier tanks,
- A new biological nutrient removal system and aeration equipment in a new building,
- A new secondary clarifier tank and retrofit of the three existing primary clarifier tanks to secondary tanks with new rakes and pumping equipment.
- Expansion of the dewatering building to include sludge tanks, VFA tanks, and sludge thickening equipment,
- A new ultra-violet disinfection system and building,
- A new sludge load-out building and odour control system, and
- A complete review and restructure of the plant electrical system.


New Screens in Inlet Channels


Finished Primary Clarifiers


Secondary Clarifiers after Retrofit

Turbo Blowers and Aeration Piping


Sludge Thickening Building Tank Construction


UV Channels and Equipment


Finished Bioreactor Tanks

Project Highlights

The main objective of the project was to develop a secondary upgrade to meet and exceed the required effluent objectives for the foreseeable future. This resulted in the selection of Biological Nutrient Removal (BNR) as the general process approach. With this selection, previously envisioned plant configurations were altered which meant re-thinking how the existing infrastructure on the site would fit into the new process configuration. With the main pumping station, headworks, primary clarifiers, and solids processing infrastructure already in place, the available site area and allowable tank water elevations to promote gravity flow through the new plant components, was fixed. As well, the facility had a well-developed system of underground tunnels that needed to be maintained and expanded to connect to any new infrastructure. Working within these constraints while not interrupting the existing treatment process was a significant engineering challenge. However, the completed facility is seamless in its integration of new into existing.

The owner was subject to a funding agreement that set limits on the funding and prescribed a timeline for the project. To meet the restrictions, a phased design and construction approach was required. The project was developed to be delivered in five phases including preliminary treatment, primary treatment, biological treatment, solids handling and disinfection.

The first two phases of the project utilized the conventional design-bid-build methodology and were completed in 2018. The initial project was impacted by delays and other negative items that were associated, in-part, with the implementation method.

To expedite project delivery and provide the owner with additional control over quality and schedule, subsequent phases were delivered utilizing the construction management method with the owner acting as construction manager.

Operations staff at the plant, the plant engineer and lead operator, undertook the construction management duties of the project for the construction of phases 3 through 5 which made about 80% of the construction cost. We modelled this approach after a construction management contract and CBCL issued trade packages for the owner to solicit bids and issue contracts. Certain portions of the work were contracted under a standing offer agreement for services to take some of the management burden off the construction management team.

CBCL Limited was able to pivot and support the client as a resource for the construction management team as opposed to the owner's representative in a traditional contract. While the change in roles mid-stream was somewhat challenging initially, by project completion the use of this methodology for future projects with this client would be fully supported.

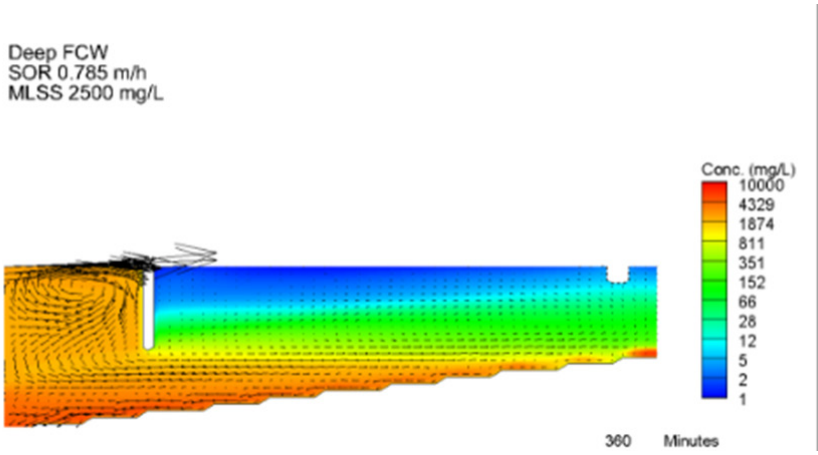
Innovation

The design objectives for the project included effluent parameters that created a requirement for biological nutrient removal. The presence of combined sewers results in large variations in flows and wastewater composition, as well as very low wastewater temperatures during the spring snowmelt period. In addition to the difficult influent conditions, the existing infrastructure was configured such that the footprint and hydraulic grade line for secondary clarification was already established.

With the low temperature conditions requiring a long sludge retention time that would elevate the necessary mixed liquor suspended solids concentration, solids loading on the secondary clarifiers become a key design constraint.

To overcome these challenges, step feed variations of the BNR process were investigated. Extensive process modelling was performed to determine if step feed would enable the use of retrofitted existing circular primary clarifiers (with a fourth clarifier added) as secondary clarifiers. While the modeling supported the use of the existing tanks purely on a kg/m^2 basis, the configuration of the existing tanks was also a concern. The existing tanks included a large diameter solid well in the center and other features more common to primary clarifiers. The conversion of these tanks to secondary clarifiers required an evaluation of how these features would impact the performance of the retrofitted secondary tanks.

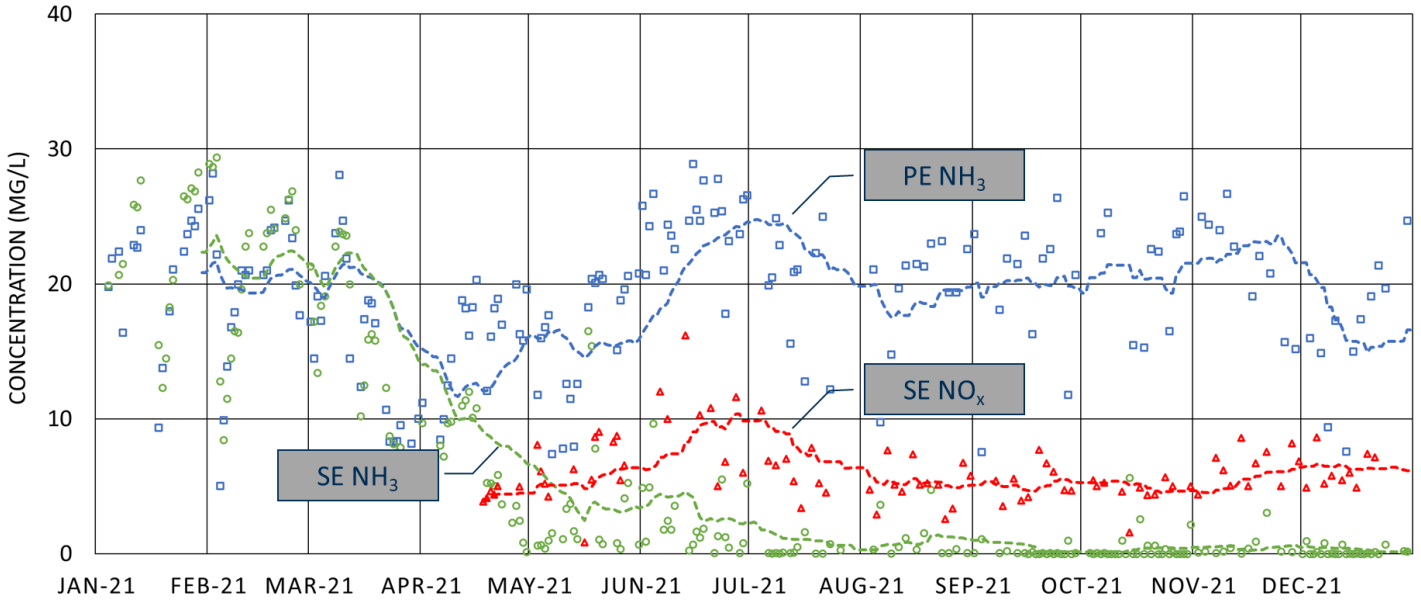
The clarifier retrofit was supported by Computational Fluid Dynamics (CFD) modelling to optimize the use of existing structures and optimize the diameter and depth of the floc well as well as determine the impact of energy dissipation inlet devices. The remainder of the design was then completed featuring septage receiving, fine screens, aerated grit removal, turbo blowers, selective foam wasting, rotary drum thickeners, and VFA collection from dewatering processes to allow for some seasonal biological phosphorus removal. Upon completion, the plant now operates as one of the few BNR plants in Atlantic Canada and is the largest secondary plant of any type in the region.



Environmental Benefits

Wastewater treatment projects, including the TransAqua project, improve public health through the removal of potentially harmful pathogens, metals and other organic and inorganic contaminants that deplete oxygen and promote other detrimental impacts to our water bodies. The TransAqua project goes one step further by enabling these benefits to the extent currently regulated and beyond.

Effluent from the TransAqua WWTF discharges to the Petitcodiac River. The Petitcodiac River was listed in 2003 as the most endangered river in Canada by Earthwild International. Removal of the causeway and restoration of the channel have been major accomplishments in restoring the river. Upgrades to the TransAqua WWTF further improve the health of the river, allowing wildlife in the river and recreation on the river to flourish.

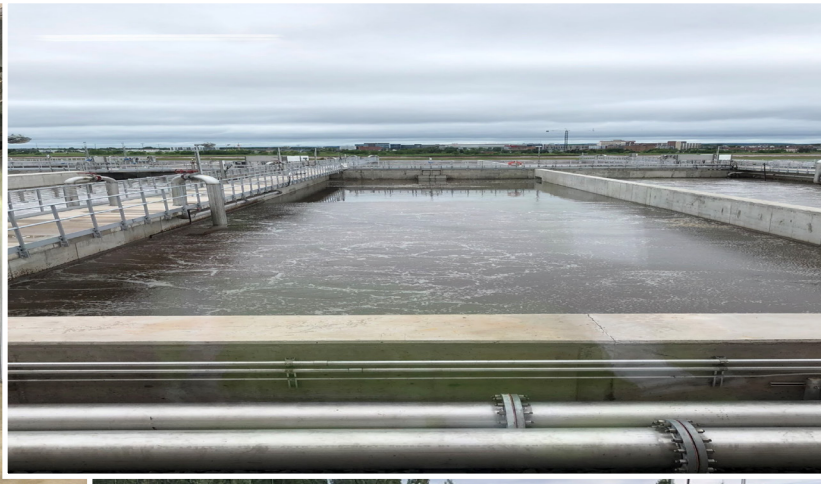


Economic Benefits

The TransAqua upgrade to biological treatment is the largest secondary wastewater treatment project ever undertaken in the Atlantic region. The local labour force has benefited greatly from the project. The projected created almost 500 person-years of employment during construction and will generate another 250 person- years during the next 25 years of its operation. The Greater Moncton Area is a vibrant tourism destination and a major commercial hub for New Brunswick and the other maritime provinces. Through public education, TransAqua will continue to promote responsible and sustainable wastewater treatment which will only increase confidence in the area to continue to attract residents, businesses, and visitors to the area.

Project Funding

Program:	Investing in Canada Plan
Agencies:	Federal Government
	Province of New Brunswick

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