



CCE Awards Phase 3

City of Owen Sound | Owen Sound Wastewater Treatment Plant





CONTENTS

A.	<i>INTRODUCTION</i>	01
B.	<i>COMMUNITY CONTEXT</i>	01-02
C.	<i>IMPORTANT INNOVATIONS</i>	03-04
D.	<i>UNEXPECTEDLY COMPLEX</i>	04
E.	<i>SOCIAL AND ECONOMIC IMPACT</i>	05
F.	<i>ENVIRONMENTAL ADVANTAGE</i>	06
G.	<i>ADDRESSING OWNER'S NEEDS</i>	07
H.	<i>CONCLUSION</i>	07

A. INTRODUCTION

Project:	Owen Sound Wastewater Treatment Plant	Construction Cost:	\$45M
Client & Owner:	City of Owen Sound	Start Date:	2012
Prime Consultant:	J.L. Richards & Associates Limited	Completion Date:	2018

The City of Owen Sound recently upgraded its primary wastewater treatment plant (WWTP) to add secondary treatment and significantly improve the quality of the treated effluent that the plant discharges into Georgian Bay. J.L. Richards & Associates Limited (JLR) was the prime consultant for this extensive single-infrastructure project, providing design services and construction contract administration. This project allowed the City to construct a state-of-the-art facility that meets all provincial standards and contributes to the continued health of the water resource, including the local aquatic environment.

B. COMMUNITY CONTEXT

The City of Owen Sound is a community of approximately 21,000 citizens located in southwestern Ontario. Situated on an inlet of Lake Huron's Georgian Bay, the City also sits at the mouth of two local rivers.

Understanding Owen Sound

Until recently, the City was one of only a few remaining municipalities in Ontario without secondary wastewater treatment infrastructure in place. The City's existing WWTP did not produce a treated effluent quality consistent with current standards and was in need of a significant upgrade. Due to Owen Sound's proximity to several important water resources, it was critical that this project be undertaken expeditiously.

The Problem with Primary Treatment

Primary treatment is an important part of an effective wastewater treatment and management system. However, primary treatment is essentially a physical process. It treats wastewater by removing solids, but lacks the advanced level of biological treatment needed to achieve a consistently non-toxic effluent. Wastewater that has undergone only primary treatment is likely to still contain soluble and colloidal contaminants.

At the outset of this project, the effluent produced by the existing facility was not consistent with current legislative requirements and may, on occasion, have been acutely toxic due to the presence of high ammonia levels and other contaminants. To improve effluent quality and address the environmental impact of its existing wastewater treatment infrastructure, the City of Owen Sound saw the necessity of adding secondary treatment to its WWTP.

Proven Experience

The City retained JLR, in association with GHD, to undertake the design of a major upgrade to the WWTP. The main goal of this upgrade project was to add secondary wastewater treatment infrastructure to the facility, although the opportunity was also utilized to address several other significant issues. As a multidisciplinary engineering, architecture, planning, and project management firm with extensive experience in WWTP projects, JLR offered the City expertise and support throughout the process of selecting and incorporating secondary treatment infrastructure into an existing operational facility.

B. COMMUNITY CONTEXT *CONT.*

Major Mandates

There were several key project mandates that the City identified in the conception phase of this project. The first, of course, was the implementation of a secondary treatment process. The second was the need to renew much of the existing WWTP infrastructure and improve operability, overall facility conditions, and building efficiency. In addition, it was necessary that the project be completed without any interruptions to the existing facility operations. Finally, it was imperative that the facility upgrades be completed within the established timeline and without exceeding the City's budget for the project.



A Partnered Approach

When JLR joined the project at the preliminary design stage, the firm worked closely with GHD and the City of Owen Sound to develop a productive, partnered approach to this complex project.

Early on, JLR, GHD, and the City established a non-binding or voluntary arrangement through which protocols were established for conflict resolution, leveraging each partner's knowledge in the City's best interest, and working in a spirit of cooperation for the purpose of getting the job done efficiently and successfully. Once construction started, the Contractor was brought into the partnering approach.

As Prime Consultant, JLR provided environmental, structural, mechanical, and process engineering services, as well as architectural, planning, project management, and contract administration support for the Owen Sound WWTP plant project. JLR was supported by GHD, who provided civil, instrumentation and controls, and electrical process design for improvements to the existing infrastructure.

C. IMPORTANT INNOVATIONS

In order to appropriately address the insufficiencies of the City's existing WWTP and meet the additional mandates of this project, several important innovations were incorporated.

Selecting a Secondary Treatment

The most significant upgrade to the Owen Sound WWTP completed as part of this project was the addition of a secondary treatment process. The secondary treatment process that the design team ultimately developed was a Biological Aerated Filtration (BAF) system. In this system, wastewater flows through a specialized tank containing floating media. This submerged media has a very high specific surface area, which allows for a very large population of microorganisms within a relatively small area. These microorganisms break down the soluble and colloidal contaminants in the wastewater, resulting in significantly improved effluent quality that can be safely discharged without negatively impacting the aquatic environment of the receiving water.

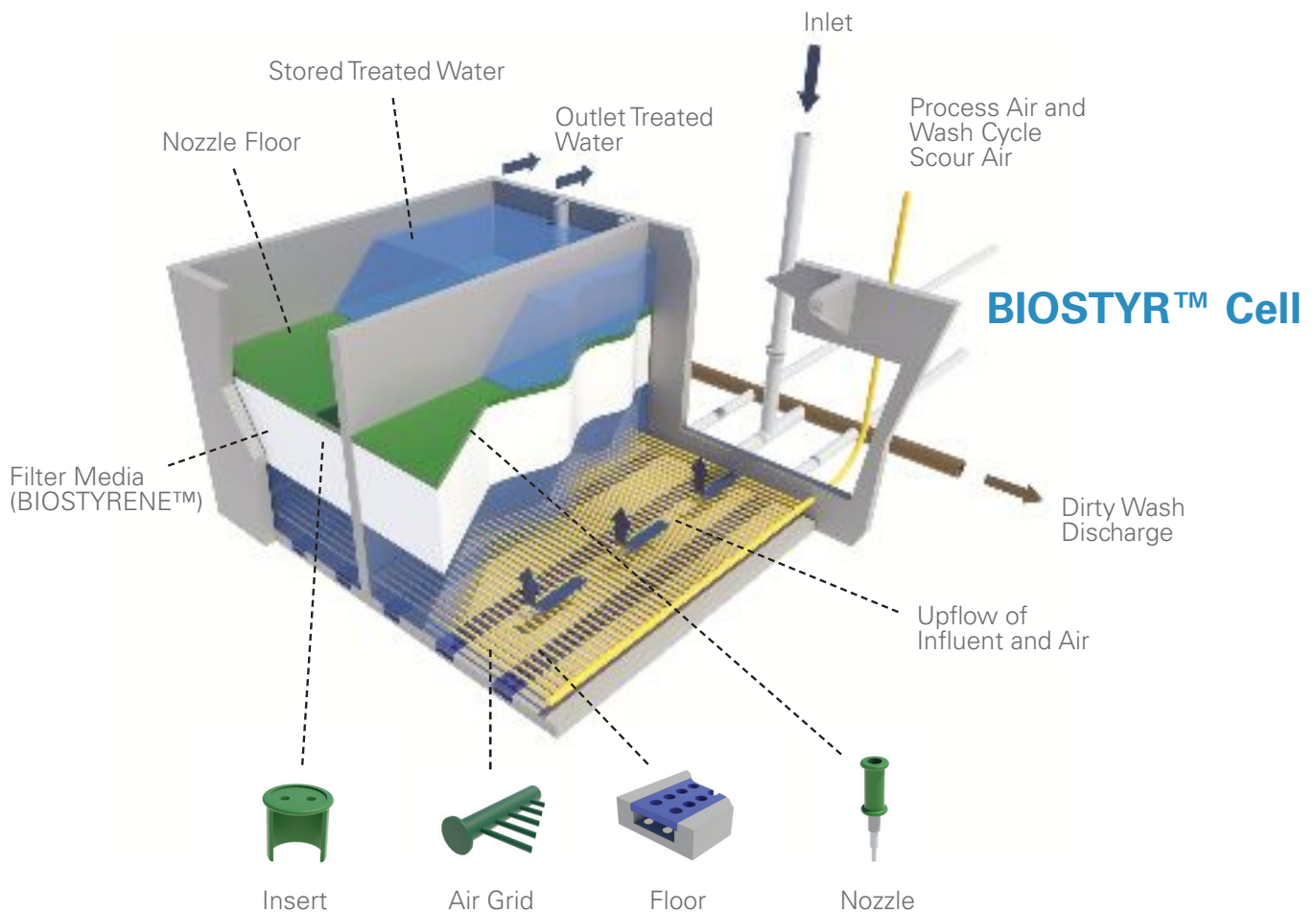


Image courtesy of Veolia Water Technologies.

C. IMPORTANT INNOVATIONS CONT.

Avoiding Expansion

This BAF system was selected in part because it is a relatively compact process, which allowed the City to dramatically enhance its wastewater treatment capabilities without expanding the WWTP site footprint. To accomplish the addition of this secondary process, a new, customized BAF complex was designed. This complex incorporates a primary effluent pumping station; all BAF process equipment and components; provisions for a future UV disinfection system; administration facilities, including a laboratory; a modern control room; meeting and conference rooms; support offices; and other building support functions in one multipurpose facility.

Improving Infrastructure

Other plant upgrades included new biosolids storage facilities; new gas/biogas heating systems; upgraded screening facilities; new chemical storage and feed systems; a new outfall; site-wide upgrades to existing buildings; new structural elements; new civil works; complete landscaping of the site; a new primary electrical feed system, new standby power systems; and complete integration of the site and processes into a SCADA system.

D. UNEXPECTEDLY COMPLEX

Two sets of extraordinary circumstances arose over the course of this project that required careful coordination to overcome.

Geotechnical Challenges

The first of these circumstances related to the original planned location for the secondary treatment complex. In the original environmental assessment, a specific location had been selected for the secondary treatment infrastructure. Upon further investigation during the initial design phases, the design team realized that this location presented a source of risk that could result in significantly more cost due to existing geotechnical conditions. Through a value engineering exercise, the project team was able to identify a solution that involved combining the secondary treatment building and the facility's administrative building into one building at a location on the site with significantly more favorable geotechnical conditions. This solution not only resulted in lower costs and less risk during construction, but also significantly enhanced the overall administrative functions and the aesthetics of the WWTP complex.

Sunken Ship

The second extraordinary circumstance that affected this project occurred during the construction phase. Part of the plans for improving the WWTP involved installing a new underwater outfall within the receiving water. In the process of preparing for the installation of the new outfall infrastructure, workers came across a 61-metre-long sunken wooden-hulled ship that the owner and project team were previously unaware of. It sat within five metres of the existing outflow pipe and six metres below the surface of the water. To address this unforeseen issue, JLR, GHD, and the contractor quickly collaborated to develop an effective and cost efficient solution that involved some design modifications to avoid disturbing the sunken ship.





E. SOCIAL AND ECONOMIC IMPACT

This WWTP upgrade project is, to date, the largest single infrastructure project undertaken in the City's history. It represents a considerable financial investment for the community, and provides significant social and economic benefits for the City and its residents.

Investing in Owen Sound

The Owen Sound WWTP treats an average of 24.5 million litres of wastewater per day. Once fully processed, the effluent treated within this facility is discharged into Georgian Bay. By enhancing the City's wastewater treatment infrastructure and capabilities, this project has resulted in significant improvements to the treated effluent quality now being discharged. By executing this upgrade, the City has improved the overall health of a very important natural water resource and ensured its continued protection.

Enhancing Enjoyment

Not only has this important water resource and aquatic habitat been preserved for the enjoyment of many generations to come, new social infrastructure has also been implemented in the surrounding area adjacent to the WWTP for residents to make use of. Between the WWTP and the Sound, an enhanced pathway system, bridge, and landscaping have been installed for citizens of Owen Sound to utilize. This added infrastructure allows community members to enjoy stunning lakeside views and take in the beautiful landscaping surrounding the plant complex.

A Learning Opportunity

An added feature of the pathway system constructed adjacent to the WWTP is that it presents a learning opportunity for citizens who want to know more about the important wastewater treatment infrastructure at work in their city. Walking these pathways, Owen Sound residents can observe wastewater treatment processes in action and learn about how this new facility is serving their community.

Spotlight on Local History

Another unique and unexpected advantage of this project is the extent to which it has drawn attention to a lesser-known piece of local history. By encountering the sunken ship in the waters near the WWTP, this project has inadvertently sparked a series of investigative and informative publications shedding light on local lore. As though this discovery didn't already infuse enough intrigue into this project, it was discovered a short time later that two additional wrecks sat within 90 metres of the original find.

F ENVIRONMENTAL ADVANTAGE

From improvements to wastewater treatment infrastructure to the importance of utilizing locally sourced materials, the sustainable focus and positive environmental impact of this project cannot be overstated.

Improved Effluent

Prior to this upgrade project, the effluent discharged to Georgian Bay from the Owen Sound WWTP did not meet modern secondary treatment level standards and, in some cases, would have been potentially toxic to the aquatic habitat.

The addition of a secondary treatment process did more than simply eliminate the toxicity of the treated wastewater, it also thoroughly enhanced all of the other effluent monitored parameters to well below prescribed provincial standards. In addition, the specialized secondary treatment process selected for this site required a relatively small physical footprint, eliminating the need to expand the project area and ensuring that the upgraded facility would not encroach further into the natural spaces surrounding the complex.

Extended Facility Life

The addition of the secondary treatment step was not the only way that this project enhanced its environmental impact. JLR, GHD, and the City also seized the opportunity to retrofit the existing infrastructure, reuse and maintain existing processes, and implement a centralized controls system to improve the City's ability to monitor and facilitate efficient plant operations. These upgrades resulted in significant energy savings and extended the life expectancy of the facility, reducing overall lifecycle costs.

Smart Sources

Finally, the design team was able to add to the sustainability and environmental impact of this project through conscientious material choices. JLR worked closely with the City to identify and incorporate locally sourced exterior masonry finishes. In addition, JLR made use of recycled materials from demolition of the WWTP's former administrative building to create landscaping features and berms.



G. ADDRESSING OWNER'S NEEDS

By the conclusion of this upgrade project, a plethora of improvements had been made to the Owen Sound WWTP. Most importantly, however, each of the key mandates identified by the City at the outset of this project were successfully addressed.

Enhanced Treatment

The addition of secondary treatment processes to this facility fundamentally changed how the City treated wastewater, and allowed Owen Sound to make enormous strides in the reduction of contaminants and improvement of the effluent quality. By the project's conclusion, it was clear that the addition of a secondary treatment process did more than simply eliminate the toxicity of the treated wastewater; it also thoroughly enhanced all of the other effluent monitored parameters to well below prescribed provincial standards.

Uninterrupted Operations

The City made it clear at the outset of this project that there could be no interruptions to the existing facility operations. While this presented a challenge, our team was able to develop a comprehensive solution to ensure this could be achieved. In the project's early stages, JLR undertook extensive 3D modelling of the facility. This provided the design team with an in-depth understanding of the WWTP, how it was configured, and how construction could be staged to maintain facility operations. Ultimately, the facility was designed with continuous operations in mind, and a detailed set of construction sequencing steps and constraints specifications were developed to provide clear guidance to the contractor. The project was successfully completed without any operational disturbance.

Below Budget

Due to the locally unprecedented scale of this project, the City emphasized the importance of maintaining prescribed budgets. To accommodate budgetary constraints, JLR and GHD worked closely with City staff to develop a high quality tender package. The result of this exercise was that tender prices that were all within 4.8% of each other, with the two low-bidding contractors providing a bid at exactly the same price—an extremely rare circumstance, particularly for a \$45M+ project. Through appropriate legal consultation and discussion with the two low tenderers, an agreement was eventually reached that saw the successful low bidder identified by the result of a coin toss.

Constant Improvement

This WWTP treats an immense quantity of wastewater, releasing the treated effluent into Georgian Bay. Without effective wastewater treatment infrastructure in place, the aquatic environment surrounding the facility would be at risk of extensive and sustained damage, requiring costly environmental remediation efforts to mitigate. By preserving existing infrastructure and addressing protection of the local water resource, this upgrade has allowed the Owen Sound community to maximize the benefits of this project.

H. CONCLUSION

Today, the Owen Sound WWTP is not just a facility that the City can be proud of; it is also a successful project that will continue to contribute to the improvement of the health of the local water resource for years to come.



OTTAWA

864 Lady Ellen Place
Ottawa ON Canada
K1Z 5M2
Tel: 613 728-3571
ottawa@jlrichards.ca

KINGSTON

203-863 Princess Street
Kingston ON Canada
K7L 5N4
Tel: 613 544-1424
kingston@jlrichards.ca

SUDBURY

314 Countryside Drive
Sudbury ON Canada
P3E 6G2
Tel: 705 522-8174
sudbury@jlrichards.ca

TIMMINS

834 Mountjoy Street S, PO Box 10
Timmins ON Canada
P4N 7C5
Tel: 705 360-1899
timmins@jlrichards.ca

NORTH BAY

200-175 Progress Road
North Bay ON Canada
P1A 0B8
Tel: 705 495-7597
northbay@jlrichards.ca

HAWKESBURY

372 Bertha Street
Hawkesbury ON Canada
K6A 2A8
Tel: 613 632-0287
hawkesbury@jlrichards.ca

GUELPH

107-450 Speedvale Ave. W
Guelph ON Canada
N1H 7Y6
Tel: 519 763-0713
guelph@jlrichards.ca



ENGINEERS · ARCHITECTS · PLANNERS



JLR Logo is a Registered Trademark © 2009, all rights are reserved

www.jlrichards.ca