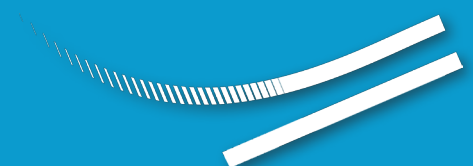




AMHERST

WASTEWATER TREATMENT FACILITY

SUBMISSION BY:



DILLON
CONSULTING

DETAILS

Location: Fort Lawrence,
Nova Scotia

Year Completed: October 2012

Dillon's Role: Lead Engineer

Project Leaders:

- **Scott Kyle**, P.Eng., Project Manager, Dillon Consulting Limited
- **Ben Pitman**, P.Eng., Director Transportation & Public Works, Town of Amherst
- **Bryan Naugle**, President, Brycon Construction Limited

Contacts:

- **Mark Hunter**,
416.229.4647, ext. 2347
MHunter@dillon.ca
- **Scott Kyle**,
902.450.5015, ext. 5014
SKyle@dillon.ca

SUMMARY

The Town of Amherst's commercial, industrial and institutional sources generate, on average, approximately 75 L/s (1.4 million igpd) of untreated municipal wastewater that was discharged wastewater without treatment to nearby watercourses. Consistent with the marsh setting of the WWTF, Dillon designed the development to include extensive engineered treatment wetland, incorporating both surface and subsurface flow components; energy conservation includes heat recovery, variable frequency drive blowers and the incorporation of a wind turbine.



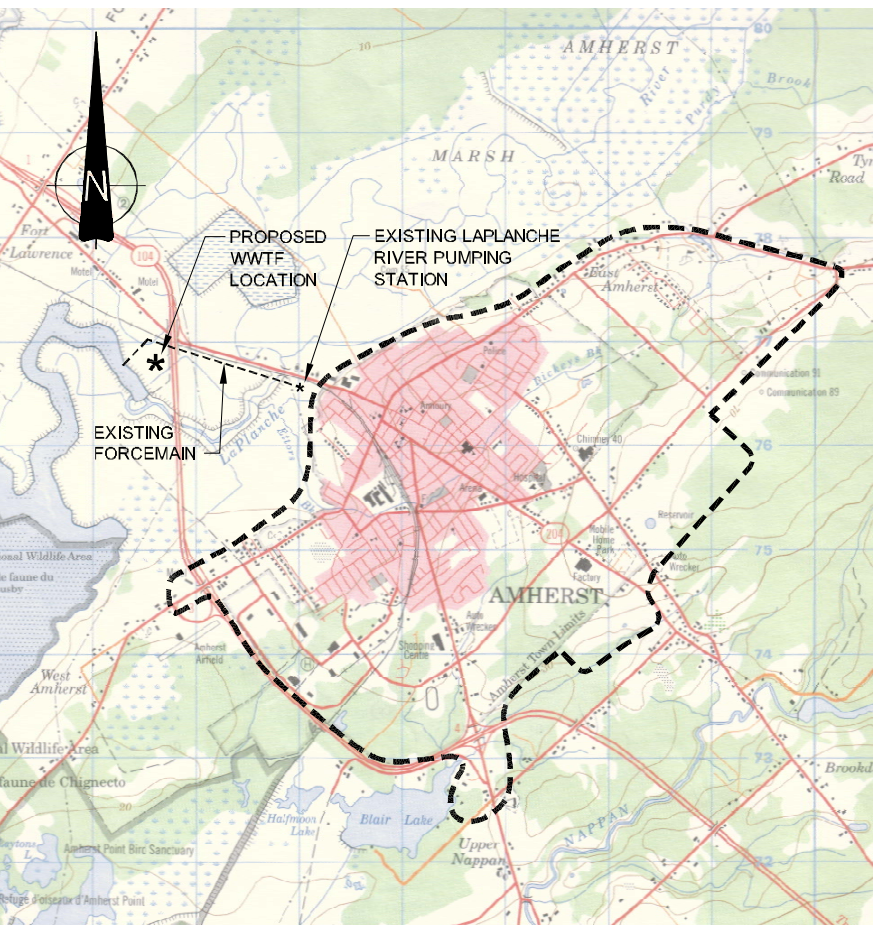
Beginning with its founding in 1764, Amherst, like many Canadian communities, discharged its municipal wastewater untreated to nearby watercourses. For many years, the town's raw sanitary effluent discharged to a series of outfalls along the Amherst Marsh, with the flow proceeding to the LaPlanche River and ultimately the Bay of Fundy. Efforts to address the town's wastewater treatment requirements extend back to 1979 with the completion of a regional sewerage study by H.J. Porter and Associates Limited, a Halifax-based firm that subsequently merged with Dillon Consulting Limited (Dillon). Founded on the recommendations of two follow up Dillon evaluations in 1989 and 1993, the town completed several capital projects to consolidate wastewater flows and acquire property in advance of the construction of a centralized treatment facility.

In 2004, with support through FCM's Green Municipal Environmental Fund, Dillon completed an updated review of the preferred treatment technology recommendations made in the 1993 Pre-Design Study; secondary treatment using aerated lagoons along with engineered wetlands. Within the 2004 report, the Town identified its design objectives for the WWTF as follows:

- Specific consideration of new, "leading-edge" methods, acknowledging the unique marshlands context of the selected treatment facility site.
- Development of a management strategy, emphasizing the importance of generator education, industrial/commercial user audits, source control (including pollution prevention) responsibility, by-law development/enforcement and long-term sustainability.
- Establishment of a successful "best-practices" integrated wastewater management approach to be used by similar-sized municipal units in Nova Scotia and throughout Canada, regardless of selected treatment technology.

Following the preparation of the detailed design and tender documents by Dillon and the selection of Brycon Construction Limited as the general contractor, development of the \$11M facility was initiated in June 2010. Commissioning was completed over a two month period with the official opening taking place in October 2012.

There were a number of unique attributes to this project, not the least of which was the town's determination to complete a project that was over 30 years in the making. In addition, the use of tire-derived aggregate rather than clear stone media was used for the first time in this type of application in Eastern Canada. The vast size of the active treatment wetlands allowing for 50% reduction on the burden of the machinery and the use of heat recovery to heat the facility showed the town's and Dillon's innovative approach to providing a sustainable solution to the residents.



COMPLEXITY

RELOCATION OF THE LAPLANCHE RIVER ABOITEAU

A key attribute supporting the selection of the Amherst WWTF site was the ability to discharge to a tidal environment on the saltwater side of the existing LaPlanche River aboiteau. After design was underway, the town was informed by the NS Department of Agriculture (NSDA) that it intended to relocate the aboiteau three kilometres downstream from the current location. This necessitated expedited design of a pumping station/forcemain to direct effluent from the planned outfall to the new location. The Province completed the relocation, however it was destroyed during a 2008 storm. Nonetheless, the design remains ready for a future relocation effort.

AVAILABLE SITE SIZE REDUCTION

The town purchased the WWTF property after the completion of the 1993 options review. The initial design for the WWTF was based on standard setback allowances. After design efforts were underway, NSDA requested a further 100 m setback from the LaPlanche River dyke, making the site undevelopable. Through negotiations, the setbacks were reduced, but a reconfiguration of the design and layout was required.

MANAGING MARSH SOILS

The silty composition of marsh soils (marine clays) leads them to be slow draining and prone to structural failure. Settlement of the building compound proceeded slowly, impacting the construction schedule. More significant were the above average rainfalls that continued throughout the construction period. Two lagoon slope failures occurred during site development, leading to the definition of repairs and updating of lagoon geometry and hydraulics.

SOCIAL and/ or ECONOMIC BENEFITS

Through discussions involving the town, NS Environment, Dillon and Brycon Construction, a significant adjustment to the treatment train, focusing on disinfection and the use of engineered wetlands, was identified. All agreed that engineered wetlands would introduce fecal coliforms associated with birds and other marsh species into the treated effluent stream. Further, the tidal marine discharge location served to mitigate immediate concerns related to coliforms. It was decided that while a dedicated room/channel and connecting infrastructure for a UV system would be included in the Control Building, the actual UV unit would not be installed as part of the initial establishment of the facility. NS Environment defined a monitoring program for the initial years of operation to determine if installation of the UV unit was necessary. This practical refinement, which acknowledged the unique design and context, reduced the initial capital cost of the facility by approximately \$400,000 with a power cost reduction of approximately \$30,000 per year.

Dillon's support to Amherst in reaching their wastewater management objectives was not limited to infrastructure design. As a precursor to WWTF construction, Dillon worked with town staff to educate residents in treatment requirements and options and to develop a practical sewer use bylaw. The provision of plentiful and clean drinking water and natural gas has been a catalyst for economic development in Amherst; establishment of a full wastewater management capability will further enhance the town's ability to attract new industries and investors into the community.



ENVIRONMENTAL BENEFITS

OVERALL TREATMENT BENEFIT

Based on design calculations, the WWTF will reduce annual BOD loading to the LaPlanche River by approximately 350 000 kg and discharged suspended solids by 325 000 kg.

“ACTIVE” TREATMENT WETLANDS

Engineered wetlands often address a final “polishing” requirement instead of serving as a significant contributor to the treatment process. Our objective was to make the engineered wetlands substantial treatment contributors. As a result, the electrical requirement for the aeration blowers was reduced significantly versus a “lagoon only” configuration. Design of the subsurface flow wetlands incorporated a subgrade aeration piping network, allowing for improved treatment during winter and enhanced ammonia nitrogen removal. Finally, the wetlands were developed using local plants, harvested during the initial stages of construction.

VFDs AND HEAT RECOVERY

Acknowledging that incoming effluent strength and the treatment capabilities of the engineered wetlands will vary by season, the lagoon blowers' variable frequency drives allow for automated or manual adjustment of blower effort/energy consumption. To utilize heat in the effluent, the building's air system incorporates Heat Recovery Ventilators, contributing to a reduced energy requirement.

TIRE-DERIVED AGGREGATE

During the early stages of site development, an opportunity to utilize a “made in Nova Scotia” construction product in the engineered wetlands was identified. Halifax C&D Recycling Limited suggested the town replace the clear stone media of one of the subsurface flow wetlands with a select grade of tire derived aggregate (TDA). Agreement was reached that 3500 m³ of TDA would be used to replace the clear stone component of one of the wetlands.



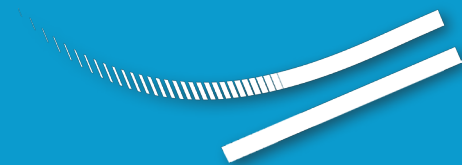
MEETING CLIENT'S NEEDS

The discharge of untreated sewage has long been an issue of concern for Amherstonians. Founded on the long-standing objective of effectively treating wastewater generated by its residents and businesses, the Town of Amherst had four primary goals to guide WWTF development:

1. Consideration of sustainable treatment methods, acknowledging the high-visibility, marshlands location of the facility site.
2. Establishment of a comprehensive wastewater management strategy, incorporating user education, bylaw development and generator responsibility.
3. Serving as “best practice” wastewater management system for similar-sized Canadian municipalities.
4. Staying within cost thresholds developed during earlier design phases.

With the official opening of the Amherst WWTF in October 2012 and more than 18 months of successful operation, it is clear that all four objectives were met. To the knowledge of the design team, the WWTF offers the largest engineered treatment wetland component of any facility of its type in Canada. This project is consistent with the desire of the town to be an environmentally-responsible municipal leader in Atlantic Canada.

Through a collaborative effort of the town, Dillon, NS Environment and the contractor, practical opportunities to stay within budget limits were identified and implemented. After nearly 30 years of sustained, determined effort by town staff and successive municipal councils, the Amherst wastewater management program now serves as a template for other mid-sized Canadian communities.



DILLON
CONSULTING

28 April 2014

Ms. Bronwen Parsons
Editor
Canadian Consulting Engineer
80 Valleybrook Drive
Toronto, Ontario
M3B 2S9

*Canadian Consulting Engineering Awards – 2014
Amherst Wastewater Treatment Facility Submission*

Dear Panel Members,

We are pleased to submit our client's project for your consideration.

This submission accurately reflects our role in the project. The names and respective roles of other consultants and contractors involved in this project appear on the Title/Data Page and they have been informed.

The Association of Consulting Engineering Companies Canada may utilize any and all submitted materials for the purposes of promoting the awards program; publicizing winning entries and other participants; promoting and enhancing the image and prestige of the Association of Consulting Engineering Companies Canada members and the consulting engineering sector as a whole; and otherwise advocating on behalf of the Association of Consulting Engineering Companies Canada and its members.

Yours truly,

Gary J. Komar, P.Eng.
President



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Toronto, Ontario
Canada
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Fax
416.226.1707

**Dillon Consulting
Limited**



ENTRY CONSENT FORM CANADIAN CONSULTING ENGINEERING AWARDS 2014

INSTRUCTIONS

This Entry Consent form must be signed by someone from the entering firm(s) and also by the client and/or owner of the project.
The completed form must be attached at the front of the Project Entry Binder.

PROJECT NAME & LOCATION Amherst Wastewater Treatment Facility, Fort Lawrence, NS

1. TO BE COMPLETED BY AN INDIVIDUAL SIGNING ON BEHALF OF THE ENTERING COMPANY (COMPANIES)

I (We) confirm that this entry complies with the contest rules and that the information submitted is accurate.

I (We) also agree to accept as final the decision of the panel of jurors.

Name Mark Hunter

Position Director, Marketing and Communications

Company Dillon Consulting Limited

Address 235 Yorkland Blvd, Suite 800

City Toronto Province ON Postal Code M2J 4Y8

Tel. 416.229.4647 ext. 2347 E-mail mhunter@dillon.ca

Signed

Date

Apr 29/14

2. TO BE COMPLETED BY PROJECT OWNER

I (We) agree with and support the entry of the above project into this awards program, and the release for publication of the information supplied.

Name Greg Herrett

Position Chief Administrative Officer

Company or Organization Town of Amherst

Address P.O. Box 516

City Amherst Province N.S. Postal Code B4H 4A1

Tel. 902 687 3352 E-mail gherrett@amherst.ca

Signed

Date

Apr 30/14



ENTRY CONSENT FORM (continued)
Canadian Consulting Engineering Awards 2014

3. TO BE COMPLETED BY ENTERING FIRM'S CLIENT (If not the same as the Project Owner)

I (We) agree with and support the entry of the above project into this awards program, and the release for publication of the information supplied.

Name Greg Herrett

Position Chief Administrative Officer

Company or Organization Town of Amherst

Address P.O. Box 516

City Amherst Province Nova Scotia Postal Code B4H 4A1

Tel. 902 667 8352 E-mail gherrett@amherst.ca

Signed [Signature] Date Apr 30/14

4. TO BE COMPLETED BY ENTERING FIRM, PROJECT OWNER, ENTERING FIRM'S CLIENT

PERMISSION TO PUBLISH THE PROJECT ON CCE'S WEBSITE

After the awards have been announced, would you be willing to have *Canadian Consulting Engineer* magazine publish your entire Project Entry in an archive on its publicly accessible Web site www.canadianconsultingengineer.com? (Publication on this CCE archive would be for all entered projects, not just the winners.)

ENTERING FIRM	PROJECT OWNER	ENTERING FIRM'S CLIENT
<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes Signed <u>[Signature]</u>	<input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> Yes Signed <u>[Signature]</u>	<input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> Yes Signed <u>[Signature]</u>

PLEASE ATTACH THIS SIGNED FORM IN THE FRONT OF THE PROJECT ENTRY BINDER.

Send Project Entry Binders to:

Bronwen Parsons, Editor, Canadian Consulting Engineer,

80 Valleybrook Drive

Toronto, Ontario, M3B 2S9

Tel. 416 510-5119, bparsons@ccemag.com

Fax 416 510-5134

PRINT

From: <entryForm@bizinfogroup.ca>
Date: Wed, Apr 30, 2014 at 9:48 AM
Subject: CCE Entry Form – Amherst Wastewater Treatment Facility, Fort Lawrence, NS-- DO NOT REPLY
To: mhunter@dillon.ca

Project Name: Amherst Wastewater Treatment Facility, Fort Lawrence, NS
Project Location: 21207 Highway #2, Fort Lawrence, NS
Completed By: 0 2012
Category: C. Water Resources
Entering Firm Name: Dillon Consulting Limited
Firm Address: 235 Yorkland Blvd., Suite 800, Toronto, ON M2J 4Y8
Project Role: Project Manager
Member of the (ACEC)?: Yes
Contact 1 Name: Mark Hunter
Contact 1 Tel: 416.229.4647 ext 2347
Contact 1 Email: mhunter@dillon.ca
Contact 2 Name: Scott Kyle
Contact 2 Tel: 902.450.4000 ext. 5014
Contact 2 Email: skyle@dillon.ca
Contact 3 Name: Scott Kyle
Contact 3 Tel: 902.450.4000 ext. 5014
Contact 3 Email: skyle@dillon.ca
P.Eng: Yes

Summary:

The Town of Amherst's commercial, industrial and institutional sources generate, on average, approximately 75 L/s (1.4 million igpd) of untreated municipal wastewater that was discharged wastewater without treatment to nearby watercourses. Consistent with the marsh setting of the WWTF, Dillon designed the development to include extensive engineered treatment wetland, incorporating both surface and subsurface flow components; energy conservation includes heat recovery, variable frequency drive blowers and the incorporation of a wind turbine.

CATEGORIES A-F

Innovation:

Beginning with its founding in 1764, Amherst, like many Canadian communities, discharged its municipal wastewater untreated to nearby watercourses. For many years, the town's raw sanitary effluent discharged to a series of outfalls along the Amherst Marsh, with the flow proceeding to the LaPlanche River and ultimately the Bay of Fundy. Efforts to address the town's wastewater treatment requirements extend back to 1979 with the completion of a regional sewerage study by H.J. Porter and Associates Limited, a Halifax-based firm that subsequently merged with Dillon Consulting Limited (Dillon). Founded on the recommendations of two follow up Dillon evaluations in 1989 and 1993, the town completed several capital projects to consolidate wastewater flows and acquire property in advance of the construction of a centralized treatment facility. In 2004, with support through FCM's Green Municipal Environmental Fund, Dillon completed an updated review of the preferred treatment technology recommendations made in the 1993 Pre-Design Study; secondary treatment using aerated lagoons along with engineered wetlands. Within the 2004 report, the Town identified its design objectives for the WWTF as follows: • Specific consideration of new, "leading-edge" methods, acknowledging the unique marshlands context of the selected treatment facility site. • Development of a management strategy, emphasizing the importance of generator education, industrial/commercial user audits, source control (including pollution prevention) responsibility, by-law development/enforcement and long-term sustainability. • Establishment of a successful "best-practices" integrated wastewater management approach to be used by similar-sized municipal units in Nova Scotia and throughout Canada, regardless of selected treatment technology. Following the preparation of the detailed design and tender documents by Dillon and the selection of Brycon Construction Limited as the general contractor, development of the \$11M facility was initiated in June 2010. Commissioning was completed over a two month period with the official opening taking place in October 2012. There were a number of unique attributes to this project, not the least of which was the town's determination to complete a project that was over 30 years in the making. In addition, the use of tire-derived aggregate rather than clear stone media was used for the first time in this type of application in Eastern Canada. The vast size of the active treatment wetlands allowing for 50% reduction on the burden of the machinery and the use of heat recovery to • Establishment of a successful "best-practices" integrated wastewater management approach to be used by similar-sized municipal units in Nova Scotia and throughout Canada,

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Complexity:

Relocation of the LaPlanche River Aboiteau A key attribute supporting the selection of the Amherst WWTF site was the ability to discharge to a tidal environment on the saltwater side of the existing LaPlanche River aboiteau. After design was underway, the town was informed by the NS Department of Agriculture (NSDA) that it intended to relocate the aboiteau three kilometres downstream from the current location. This necessitated expedited design of a pumping station/forcemain to direct effluent from the planned outfall to the new location. The Province completed the relocation, however it was destroyed during a 2008 storm. Nonetheless, the design remains ready for a future relocation effort. Available Site Size Reduction The town purchased the WWTF property after the completion of the 1993 options review. The initial design for the WWTF was based on standard setback allowances. After design efforts were underway, NSDA requested a further 100 m setback from the LaPlanche River dyke, making the site undevelopable. Through negotiations, the setbacks were reduced, but a reconfiguration of the design and layout was required. Managing Marsh Soils The silty composition of marsh soils (marine clays) leads them to be slow draining and prone to structural failure. Settlement of the building compound proceeded slowly, impacting the construction schedule. More significant were the above average rainfalls that continued throughout the construction period. Two lagoon slope failures occurred during site development, leading to the definition of repairs and updating of lagoon geometry and hydraulics.

Social & Economic Benefits:

Through discussions involving the town, NS Environment, Dillon and Brycon Construction, a significant adjustment to the treatment train, focusing on disinfection and the use of engineered wetlands, was identified. All agreed that engineered wetlands would introduce fecal coliforms associated with birds and other marsh species into the treated effluent stream. Further, the tidal marine discharge location served to mitigate immediate concerns related to coliforms. It was decided that while a dedicated room/channel and connecting infrastructure for a UV system would be included in the Control Building, the actual UV unit would not be installed as part of the initial establishment of the facility. NS Environment defined a monitoring program for the initial years of operation to determine if installation of the UV unit was necessary. This practical refinement, which acknowledged the unique design and context, reduced the initial capital cost of the facility by approximately \$400,000 with a power cost reduction of approximately \$30,000 per year. Dillon's support to Amherst in reaching their wastewater management objectives was not limited to infrastructure design. As a precursor to WWTF construction, Dillon worked with town staff to educate residents in treatment requirements and options and to develop a practical sewer use bylaw. The provision of plentiful and clean drinking water with town staff to educate residents in treatment requirements and options and to develop a practical sewer use bylaw. The provision of plentiful and clean drinking water and natural gas has been a catalyst for economic development in Amherst; establishment of a full wastewater management capability will further enhance the town's ability to attract new industries and investors into the community.

Environmental:

Overall Treatment Benefit Based on design calculations, the WWTF will reduce annual BOD loading to the LaPlanche River by approximately 350 000 kg and discharged suspended solids by 325 000 kg. "Active" Treatment Wetlands Engineered wetlands often address a final "polishing" requirement instead of serving as a significant contributor to the treatment process. Our objective was to make the engineered wetlands substantial treatment contributors. As a result, the electrical requirement for the aeration blowers was reduced significantly versus a "lagoon only" configuration. Design of the subsurface flow wetlands incorporated a subgrade aeration piping network, allowing for improved treatment during winter and enhanced ammonia nitrogen removal. Finally, the wetlands were developed using local plants, harvested during the initial stages of construction. VFDs and Heat Recovery Acknowledging that incoming effluent strength and the treatment capabilities of the engineered wetlands will vary by season, the lagoon blowers' variable frequency drives allow for automated or manual adjustment of blower effort/energy consumption. To utilize heat in the effluent, the building's air system incorporates Heat Recovery Ventilators, contributing to a reduced energy requirement. Tire-Derived Aggregate During the early stages of site development, an opportunity to utilize a "made in Nova Scotia" construction product in the engineered wetlands was identified. Halifax C&D Recycling Limited suggested the town replace the clear stone media of one of the subsurface flow wetlands with a select grade of tire derived aggregate (TDA). Agreement was reached that 3500 m3 of TDA would be used to replace the clear stone component of one of the wetlands.

Client Needs:

The discharge of untreated sewage has long been an issue of concern for Amherstonians. Founded on the long-standing objective of effectively treating wastewater generated by its residents and businesses, the Town of Amherst had four primary goals to guide WWTF development: 1. Consideration of sustainable treatment methods, acknowledging the high-visibility, marshlands location of the facility site. 2. Establishment of a comprehensive wastewater management strategy, incorporating user education, bylaw development and generator responsibility. 3. Serving as "best practice" wastewater management system for similar-sized Canadian municipalities. 4. Staying within cost thresholds developed during earlier design phases. With the official opening of the Amherst WWTF in October 2012 and more than 18 months of successful operation, it is clear that all four objectives were met. To the knowledge of the design team, the WWTF offers the largest engineered treatment wetland component of any facility of its type in Canada. This project is consistent with the desire of the town to be an environmentally-responsible municipal leader in Atlantic Canada. Through a collaborative effort of the town, Dillon, NS Environment and the contractor, practical opportunities to stay within budget limits were

identified and implemented. After nearly 30 years of sustained, determined effort by town staff and successive municipal councils, the Amherst wastewater management program now serves as a template for other mid-sized Canadian communities.

CATEGORY G - PROJECT MANAGEMENT:

Complexity:

Meeting Client's Needs:

Environmental:

Innovation:

Social &/or Economic Benefits:

CATEGORY H - INTERNATIONAL:

Social &/or Economic Benefits:

Technology Transfer:

Environmental Benefits:

Complexity:

Meeting Owner's Needs:

CATEGORY I - COMMUNITY OUTREACH & IN-HOUSE INITIATIVES:

Nature of the Project:

Effort and Complexity:

Social, Economic & Other Benefits: