LAKE SIMCOE AND GRAND RIVER:
Watersheds Under Stress

PLUS

IN THE SPOTLIGHT:
CAROLE SEYSMITH
OPERATOR PROFILE:
JENNA PORTER
2010 RECAP
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Cover image: Wilkes Dam stretches across the Grand River in Brantford - © Ralanscott

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T H I N K  G R E E N
n this edition of INFLUENTS, you will be reading about watershed management. Watershed management goes hand-in-hand with source water protection. Essentially, watershed management deals with identifying potential problems in a watershed. For example, these could be impairment of ecosystem and loss of wildlife habitat, reduction in quality and quantity of freshwater, urbanization and non-point source pollution. Source water protection has a narrower scope and deals with managing an identifiable area that influences the quality and quantity of an existing or potential source of drinking water.

We have made tremendous strides over the past 30 years in watershed management in Ontario. Among many accomplishments are:

- upgrades or additions of secondary treatment to all but a few municipal wastewater facilities, and the remaining few are undergoing or planning upgrades;
- more stringent treatment requirements for industrial direct dischargers, particularly the pulp and paper, mining and minerals, chemical and petroleum industries;
- more widespread use of urban storm water retention and treatment technology;
- requirements for treatment and handling of combined sewer overflows;
- better and more reliable control of landfill leachate;
- protection of sensitive watersheds such as the Oak Ridges Moraine; and
- a better understanding of the science and economics of watershed management.

We can only hope that the developing world can learn from our lessons about the importance of watershed management. As Ontario developed over the past 100 years, our abundant natural resources were compromised by urbanization, as well as activities in the forestry, mining, and manufacturing industries that needed the support provided by abundant freshwater. The economic cost of restoring our natural resources has been significant, but there is a silver lining in every cloud --- the solutions to these problems have created a vibrant wastewater industry that, in turn, created and supports WEAO. Many of our members are engaged in work in developing countries as scientists, consultants, equipment suppliers, constructors, advisors, educators, and, indeed, as representatives of charitable organizations such as Engineers Without Borders and Water For People.

Enjoy this edition of INFLUENTS. We look forward to your feedback.

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Traditionally, this column is meant to update members, to ask for assistance in initiatives that promote WEAO to the public and government, and to provide a contact for questions or concerns with which the WEAO Board and staff can assist. As Executive Director, I have a number of responsibilities that lie outside those of the Board, committees or Executive Administrator.

One of the initiatives we have been involved in is the review and comments on the proposed Federal Regulation for Municipal Wastewater under the Fisheries Act. There has been much discussion with Environment Canada through the Canadian Water and Wastewater Association (CWWA) and Federation of Canadian Municipalities (FCM) on the comments initially made. Environment Canada has been listening, although there are still issues related to Combined Sewer Overflows (CSOs) that they may be unable to change, but are of concern to municipalities. For a complete update, please refer to the WEAO website and the CWWA website (www.cwwa.ca).

WEAO has been working with the Ministry of the Environment to establish a Wastewater Practitioner’s Group, similar to the Air and Noise Practitioner’s Group. It has been very useful for the industry and we hope such will be the case with the WW Practitioners Group. ANYONE INTERESTED IN PARTICIPATING SHOULD CONTACT ME (416-410-6933 x2). THE PARTICIPANTS SHOULD BE TECHNICAL, FRONT LINE FOLKS WORKING IN WASTEWATER/STORMWATER. This Group will be arm’s-length from the Ministry of the Environment and provide a forum for discussion on technical issues.

The Long Range Planning Committee has been busy confirming conference venues for the next 5-7 years. As agreed with OPCEA, WEAO is aiming for one year in the GTA and one year out on a rotating basis.

The Ontario Coalition for Sustainable Infrastructure (OCSI) (www.on-csi.ca) has not been as active as perhaps it could be. This is in part due to the busy schedules and responsibilities of the executive. A new proposal has been developed for the governance structure and will be discussed with the WEAO Board shortly.

Continued on page 8.
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The Government Affairs Committee has been busy reviewing and providing comment on proposed policy and legislation through the EBR, as well as items that come directly from government and/or federal and national groups. We have provided comments to the federal and provincial government on the need for extension to stimulus funds deadlines, the proposed Canadian Council of Ministers of the Environment (CCME) Biosolids policy on management of Biosolids across Canada, the proposed Water Opportunities Act, and associated changes to legislation to facilitate water conservation. For the latter, we have made a presentation to the Standing Committee on General Governance.

Several requests have come to WEAO requesting meetings with Chinese and Mexican businesses related to wastewater. We invited OPCEA to attend a meeting with a Mexican delegation set up by the Ministry of Economic Development and Trade. This was interesting and informative and a valuable contact for some of our members. Mexico plans on building 92 facilities in the next two years.

We often find that, when we attend events with the WEAO booth or go to schools and public venues, we do not have any WEAO branded materials. Staff has been working on developing factsheets intended for the general public and schools. They are currently being reviewed by the committee chairs and, hopefully, will be available by year’s end. We have not reinvented the wheel, but have been using information readily available, but not pulled together under the WEAO banner. We are looking for photos of facilities, storm water ponds, equipment, etc. that we can use in future factsheets. Anyone willing to provide photos and the permission to use them should contact Anne Baliva (admin@weao.org).

I attended a meeting with the Environmental Commissioner, his staff and a variety of industry stakeholders in early November to discuss his latest report that focuses on conservation. There was a considerable section related to wastewater and biosolids. This meeting is an annual gathering to provide the Environmental Commissioner of Ontario (ECO) with comments on his report as well as suggest areas of interest for the upcoming year. The ECO report can be found at www.eco.on.ca.

These are some of the activities in which I have been engaged the past few months. I encourage you to follow up on some of the sites listed, and always welcome your input on issues of concern to WEAO members.

This issue of INFLUENTS is focused on watersheds (Grand River and Lake Simcoe). WEAO concluded the project undertaken for the Lake Simcoe Clean-up Fund, and the report has already been referred to by a number of municipalities and conservation authorities. As a point of interest, a project funded through the Lake Simcoe Clean-up Fund has resulted in a website providing stakeholder information on the lake and its watershed, as well as a book produced by a group concerned with the area (http://www.georginamaps.ca/).

I welcome your thoughts and any input on issues that you would like me to pursue on WEAO’s behalf.
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IN THE SPOTLIGHT

CAROLE SEYSMITH SPEARHEADS COORDINATION AND COLLABORATION IN STEWARDSHIP

As the Lake Simcoe Stewardship Program Specialist with Ontario’s Ministry of Natural Resources (MNR), Carole Seysmith brings together diverse members of the community to share information and develop solutions for protecting and rehabilitating the Lake Simcoe Watershed. This collaborative approach seeks to engage everyone with a stake in the region: from national organizations to small volunteer-run grassroots environmental groups, scientists to land developers, businesses to the recreation sector, universities and colleges to youth organizations—and the list goes on. “We recognize that everyone has a role to play,” says Seysmith, adding that mutual respect and understanding of each group’s perspective will strengthen their united effort towards common watershed protection goals.

The 40-plus representatives who showed up at the first meeting of a new Lake Simcoe Stewardship Network this past June certainly demonstrated their interest in learning from one another. At the same time, they gained an appreciation for the objectives and priorities of the provincial government’s new Lake Simcoe Protection Act and Plan. Along with colleagues from the Ontario Ministry of the Environment (MOE), the Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA), the MNR and the Lake Simcoe Region Conservation Authority (LSRCA), Seysmith is part of an inter-ministerial team responsible for implementing numerous stewardship-related policies under the Plan, including the establishment of the watershed-wide Stewardship Network.

Part of the Network’s interests lie in supporting youth education and involvement programs. “Stewardship is really about shifting attitudes and developing an understanding of environmental issues,” notes Seysmith.

“If you can create the right perspective early on, it is something that will stay with people for the rest of their lives.” She speaks from experience. As a first year student at the University of Toronto in the late 1980s, Seysmith was not sure how to apply her interest in science. Then, in second year, she stumbled upon an Environmental Factors course. “I remember being almost dumfounded at what I was learning about human impacts on the environment,” she recalls. “I suddenly saw how science connected to the real world and knew I had to do something.”

At that point, she redirected her studies toward environmental science, incorporating courses in Environmental Ethics, Canadian History and Aboriginal Culture. Explains Seysmith: “It gave me a good understanding of not only ecological science, but also the socio-economic context that influences the decisions we make and how they impact our natural environment.”

After graduating with a BSc degree as a zoologist specialist, with a biology major and botany minor, she was hired through a youth employment program to work for a small, non-governmental organization with a focus on urban tree-planting. The experience provided early exposure to community engagement and capacity building. “That is where all the pieces started to fall into place,” says Seysmith. “I was given a lot of creative freedom in that job. I always had an interest in education and realized that I liked sharing scientific information and knowledge, while engaging and encouraging people to participate in environmental projects.”

Seysmith had found her calling. After finishing her contract and then working for four years in the Ministry that delivered the youth program, she returned to the non-governmental sector in the mid-90s to coordinate a Watershed Stewardship Program for a provincially significant marsh east of Toronto.

By that point, she had a better understanding of what stewardship involved: catching people’s attention to make them aware of how they can contribute to protecting the environment; fostering a passion or understanding of why action is necessary; empowering them to realize they can make a difference; and, then, engaging them to take action.

“For me, it has always been about developing relationships to engage the community in actions,” she explains, “identifying priorities together and then working with the scientific information to identify what work can be done where and how.”

In 1999, the Ministry of Natural Resources would give her the opportunity to do just that. MNR hired Seysmith to coordinate the Durham Land Stewardship Council, one of 46 such entities across the province that operate as part of the Ministry’s Ontario Stewardship Program. As a volunteer-based group, the Stewardship Council included rural and urban landowners, farmers, school teachers, naturalists and representatives from local community organizations and fish and game clubs.

The Stewardship Council helped identify local priorities and opportunities for environmental stewardship action. As an MNR employee, Seysmith’s role involved providing guidance, securing funding for programming, linking the Council with other partners and programs, and implementing projects. Projects organized by the Council included hosting educational workshops for landowners on a wide variety of topics such as managing woodlots and controlling invasive species. The Council also offered a number of programs that included providing tree seedlings to landowners for reforestation projects, restoring degraded streams and organizing youth education events.

In 2007, the Government of Ontario announced its intent to pass the Lake Simcoe Protection Act. The Act enabled the development of a plan of action and a whole suite of policies. Although MOE was the lead in developing the Lake Simcoe Protection Plan, the Ministry worked in collaboration with MNR, OMAFRA, LSRCA, and various other ministries and agencies.
In June 2008, MNR brought Seysmith on board as part of the inter-ministerial team involved in the policy development process. “The opportunity to take what I had learned all those years and provide stewardship-related input was very rewarding,” recalls Seysmith.

A little less than half of the land in the Lake Simcoe Watershed is zoned agricultural. Thanks to a long history of stewardship programming in Ontario’s farm community, there were several programs already in place that have been enhanced with OMAFRA’s support under the Plan. The rest of the watershed consists of urban, rural and developing areas. Because of its proximity to Toronto, the Lake Simcoe area has a large population base, with many community members and organizations already engaged in stewardship roles.

“It was clear that we did not need to start from scratch,” explains Seysmith. “Our goal is to bring those organizations together to enhance and build on efforts that collectively contribute to the objectives and priorities for the Lake Simcoe Watershed.”

An inter-ministerial stewardship working group, which she currently chairs, also includes the LSRCA which, like its Conservation Ontario counterparts across the province, has both a regulatory and stewardship role. Since the 1950s, the LSRCA has played a key role in the restoration and protection of the environmental health and quality of Lake Simcoe and its watershed through planning, research and conservation activities. “We are working closely with them to identify and enhance opportunities for stewardship and collaboration,” says Seysmith.

The two entities already work together on various education and incentive programs for landowners interested in doing certain projects that help to reduce phosphorus, one of several priorities identified in the Plan. One example includes the Lake Simcoe Community Stewardship Program, launched by Seysmith and her MNR colleagues in partnership with OMAFRA and various other community partners. The program, which currently receives financial support from provincial and federal government sources, offers educational workshops and a stewardship planning guide for non-agricultural landowners that helps them assess their property and identify activities or conditions that may have negative environmental impacts. Landowners are then encouraged to make changes and are directed to sources of technical and financial assistance, like those offered by the MNR, LSRCA and other partners.

Many program participants have been inspired to plant buffer strips along their lake and river shorelines. These corridors of vegetation not only help to stabilize shorelines and reduce the erosion of soil particles that can carry phosphorus and bury fish habitat, they are equally important in filtering water run-off and providing habitat for fish and wildlife.

“We collaborate with many organizations,” says Seysmith. “The more we are all communicating, the better we are able to allocate our resources effectively and achieve results.”

She foresees that, in the future, there will be a greater appreciation for “ecological goods and services,” a term referring to the value, in economic terms, of the services that natural systems provide. For instance, a wetland naturally provides a number of services, including flood attenuation, water filtration and water quality improvement.

“The concept is that, if you lost that wetland and had to replace the services it provides with hard infrastructure, there would be economic costs,” explains Seysmith. “It is one way to begin to place more value on what, in some ways, we take for granted.”

This kind of thinking attracts more people to participate in the stewardship process. This concept, along with the need to educate and empower youth, the need to make ‘stewardship’ a household word in the Lake Simcoe Watershed, and many other intriguing topics will continue to appear on future agendas of the new Lake Simcoe Stewardship Network. Following the first meeting last June, Seysmith has been busy finalizing the Network’s Charter, preparing for the next meeting, and hoping to eventually make these cross-collaboration sessions at least a twice-yearly event. She is delighted to see the list of interested parties continuing to evolve. But then, for Seysmith, this ongoing evolution is nothing new. “My work is never the same,” she says. “I look forward to every day because each one brings a new opportunity to make a difference. There is always something new to learn, a new partner to engage, or a new way to share the stewardship vision. It is part of why I love what I do.”
ONTARIO’S GOT TALENT!
WEAO-SPONSORED STUDENT DESIGN TEAM SCORES SECOND PLACE AT WEFTEC FOR SECOND CONSECUTIVE YEAR

Rafiq Qutub, M.Eng., P.Eng., AECOM, Student Design Competition Sub-Committee Chair

or the second consecutive year, a WEAO-sponsored student team participated in the Student Design Competition (SDC) that was held as part of WEFTEC, the Annual Water Environment Federation Technical Exhibition and Conference. We are pleased to announce that the Ryerson University team scored second place in the Wastewater Design stream. In addition, another team from the University of Waterloo participated for the first time in the Environmental Design stream and scored fourth place. Congratulations to all involved!

The SDC is an annual event intended to promote ‘real world’ design experience for students interested in pursuing a career in water and wastewater engineering. Many WEF member associations hold annual design competitions within their chapters, and the New Professionals Committee of WEAO inaugurated the first WEAO SDC in fall of 2008. In order to provide a valuable learning experience for participants, WEAO arranges for a real design project in collaboration with a city or regional municipality in Ontario.

Students are given the design challenge as though they were consultants working in the industry. Site visits are typically arranged in order to allow participants to experience how designs are implemented in the real world and learn from facility operators.

Earlier this year, the Ryerson University team won first place at the 2nd Annual WEAO SDC that was held as part of the 39th Annual WEAO Technical Symposium and OPCEA Exhibition in London, Ontario. WEAO sponsored the Ryerson team to participate in the WEF SDC and compete against winners of design competitions at the member association level across the United States.

The 83rd Annual WEFTEC was held in New Orleans, Louisiana from October 2-6, 2010. The WEF SDC was held on Sunday, October 3, 2010 and consisted of the Wastewater Design stream and the Environmental Design stream. The Wastewater Design stream includes designs of conventional and advanced wastewater treatment projects. In the Environmental Design stream, projects include environmental remediation technologies such as watershed protection, water reuse and constructed wetlands.

The Ryerson University team competed in the Wastewater Design stream against six other teams. The team’s design project was the expansion of the Port Darlington Water Pollution Control Plant which services the Bowmanville urban area. The design challenge was generously provided by the Regional Municipality of Durham as part of the 2nd Annual WEAO SDC. The challenge involved the preliminary design of Phase 1 expansion to increase the existing plant capacity from approximately 14,000 m³/day to 27,300 m³/day, as well as provide conceptual design for Phase 2 expansion to increase plant capacity up to 40,500 m³/day average daily flow. In addition, the design required increasing the level of treatment to meet discharge limits for ammonia and phosphorous as well as expanding the biosolids treatment facility.

In addition to completing engineering design calculations, participating teams had the opportunity to interact with equipment suppliers and learn about the available technologies in the industry. Each team had an academic advisor and a consultant advisor to provide guidance to the students. Ryerson University team's academic advisor was Dr. Manuel Alvarez–Cuenca, Professor...

Ryerson University team wins second place at the Student Design Competition that was held as part of the 83rd Annual WEFTEC on October 3, 2010. (L-R) Jim Clark, Former WEF President and Vice President of Black & Veatch; and team members Kirill Cheiko, Nancy Afonso, Dr. Manuel Alvarez–Cuenca (Academic Advisor), Ruston Bedasie and Andrew Lammatteo.

The Ryerson University team won first place at the WEAO Student Design Competition that was held as part of the 39th Annual WEAO Technical Symposium and OPCEA Exhibition on April 18, 2010. (L-R) Mark Rupke, WEAO Past-President; and team members Nancy Afonso, Kirill Cheiko, Ruston Bedasie and Andrew Lammatteo.
Winners of the Wastewater Design stream at the 2010 WEFTEC® Student Design Competition

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<tr>
<th>University</th>
<th>Project Title</th>
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<tr>
<td>First Place</td>
<td>Southern Methodist University Settler’s Village Wastewater Treatment Plant Expansion</td>
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<tr>
<td>Second Place</td>
<td>Ryerson University Port Darlington WPCP Expansion Proposal</td>
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<tr>
<td>Third Place</td>
<td>Colorado State University Assessment of Future Treatment Strategies for the Denver Water Department</td>
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<tr>
<td>Fourth Place</td>
<td>University of South Florida Design of a Waste Treatment Solution for the Colcaprhina Municipal Matadero</td>
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Winners of the Environmental Design stream at the 2010 WEFTEC® Student Design Competition

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<th>Project Title</th>
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<tr>
<td>First Place</td>
<td>University of Florida Green Infrastructure Design for Pollutant Control from Transport Systems Crossing Land-Water Interfaces - A Bridge too Far?</td>
</tr>
<tr>
<td>Second Place</td>
<td>University of Illinois - Urbana Champaign Removal of Waterborne Viruses Using Iron-Amended Biosand Filters</td>
</tr>
<tr>
<td>Third Place</td>
<td>University of North Dakota Membrane Brine Reuse</td>
</tr>
<tr>
<td>Fourth Place</td>
<td>University of Waterloo Portable Self Cleaning TiO2 Water Filter</td>
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Winners of the WEAO Student Design Competitions

<table>
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<tr>
<th>First Place Winner</th>
<th>Team Members</th>
<th>Project</th>
<th>Sponsoring Municipality</th>
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<tbody>
<tr>
<td>Third Annual SDC (2011)</td>
<td>Competition will be held on Sunday April 10, 2011 at the 40th Annual Weao Technical Symposium and Opcea Exhibition at the Westin Harbour Castle in Toronto. The event is open to all conference registrants.</td>
<td>Expansion of the Acton Wastewater Treatment Plant, Halton Hills</td>
<td>Halton Region</td>
</tr>
<tr>
<td>Second Annual SDC (2010)</td>
<td>Ryerson University Nancy Afonso, Ruston Bedasie, Kirill Cheiko and Andrew Lammatteo</td>
<td>Port Darlington Water Pollution Control Plant Expansion</td>
<td>Durham Region</td>
</tr>
<tr>
<td>First Annual SDC (2009)</td>
<td>University of Toronto Sherif Kinawy, Luccia Gafarova, Rafiq Qutub and Tony Tsui</td>
<td>Rosebank Sanitary Sewage Pumping Station Replacement</td>
<td>Durham Region</td>
</tr>
</tbody>
</table>

of Chemical Engineering at Ryerson University. The consultant advisor was Gisselly Anania, Associate Project Manager at CH2M HILL Canada.

The New Professionals Committee would like to sincerely thank all the academic advisors and consultant advisors of all participating teams in the SDC. Their guidance and commitment to student development is greatly appreciated.

With their second place win, the Ryerson University team received a monetary award of $1,000 in addition to recognition certificates and a recognition plaque. More important, team members gained real world design experience and networking opportunities with various firms in the water environment industry.

This year marks the second year in which a WEAO-sponsored team competed at WEFTEC®. Last year, the University of Toronto team was the first Canadian team to participate at WEFTEC® with the design of a replacement sewage pumping station. They scored second place as well.

WEAO is proud to showcase the talents of its prospective young professionals in the water environment industry. Ontario is uniquely positioned to have a leadership role in the water environment industry not only in Canada, but throughout North America. Ontario has world-class educational institutions and companies and has a rich and diverse talent pool. In addition, Ontario is home to precious water resources including the Great Lakes. It is the intent of the WEAO SDC to promote leadership among students and to promote the water environment industry among prospective graduates.

Currently, the WEAO SDC Sub-Committee is organizing the 3rd Annual SDC. The design challenge has been generously provided by the Regional Municipality of Halton. The challenge involves the preliminary design of the Phase 1 expansion of the Acton Wastewater Treatment Plant to meet projected demand to 2021, as well as the conceptual design of the Phase 2 expansion to meet the projected capacity requirement of 7,000 m³/day average daily flow by 2031. A unique aspect of the design challenge is meeting strict nitrogen and phosphorus discharge limits to the environmentally-sensitive Black Creek, which is classified as a cold water fishery.

The WEAO SDC Sub-Committee welcomes sponsorships and support from engineering consulting firms as well as equipment suppliers and vendors in the water environment industry. The SDC offers a great opportunity for students to network with professionals in the water environment industry and help them bridge the gap between school and the real world. The SDC also offers a great opportunity for consultants and suppliers to interact with the brightest students from Ontario universities and colleges who are keenly interested in the industry. Indeed, Ontario’s got talent!

For more information on this year’s competition, please visit the SDC website at www.weao.org/sdc. You can also contact Rafiq Qutub directly at (rafiq.qutub@aecom.com) for information on sponsorship opportunities.
SCLF 2010: INSPIRING THE FUTURE WATER INDUSTRY LEADERS

Alvin Pilobello, E.I.T., AECOM, WEAO NP Communications Coordinator

The 3rd Annual Student Chapter Leadership Forum (SCLF) was held on Saturday, August 28, 2010, at the University of Toronto’s St. George campus. Jointly organized by the WEAO New Professionals (NP) and OWWA Young Professionals (YP) committees, this invaluable event helps to clearly communicate the fundamentals of managing student chapters and acts as a springboard for short-term and long-term chapter planning.

A total of 29 students attended the event, representing 12 different WEAO and/or OWWA student chapters from colleges and universities across Ontario. The specific objectives of the SCLF are to bring together student chapter leaders to make connections, brainstorm, and exchange ideas for potential chapter events, communications, and strategies. Students also gain a better understanding of the ins and outs of running a student chapter, including the benefits of being a member of WEAO and OWWA.

Don Kemp (President, WEAO) and Glenn Powell (Director of Communications, OWWA) offered words of welcome to the attendees and highlighted the goals and functions of WEAO and OWWA. The enthusiastic emcees of the SCLF event were Kathleen Hum (Student Chapter Program Manager, WEAO) and Monique Waller (YP Committee Vice-Chair, OWWA).

A fun icebreaker allowed everyone in attendance to engage in one-on-one, three-minute, speed networking sessions. Through this new icebreaker approach, students improved their networking skills by efficiently making genuine connections, actively listening, and using that information to transition their conversations to related topics.

Darla Campbell (President, Amo- navi Consulting Group Inc.) gave an inspiring keynote speech on volunteer motivation. She engaged the students to generate ideas and also presented tips on volunteer recruitment, and equally important, member retention. She challenged the student chapter leaders to answer the question: “volunteering: what’s in it for me?” in order to properly motivate and retain their volunteer members. To answer this question, leaders needed to be clear about their chapter’s purpose, establish a clear leadership succession plan, and inspire the next leaders to do the same. In Darla’s words, “Your success as a leader is measured by your succession.”

Kathleen and Monique presented important details on the management of student chapters: logistics, membership benefits, sign-up procedures, organizational structures, and resources available to student chapters. Nathan Pray (YP Student Chapter Expense Manager, OWWA) and Germana Nunes (NP Committee Treasurer, WEAO) outlined important guidelines on chapter expenses and reimbursement. Alvin Pilobello (NP Committee Communications Coordinator, WEAO) presented information on the OWWA and WEAO conferences, and shared his personal experiences from these networking opportunities. Alvin also encouraged students to contribute articles to INFLUENTS and Pipeline, the quarterly magazine publications of WEAO and OWWA, respectively.

Bill White (Student Chapter Program Advisor, WEAO) promoted the Student Design Competition, encouraging chapters to continue in the footsteps of the past two-years’ winning Ontario teams, that went on to place second at the annual WEF Conference (WEFTEC®). Monique also discussed a number of water-related academic scholarships.

The main body of the SCLF afternoon was filled with presentations from the leaders of the student chapters themselves. The chapters outlined their current achievements and the outlook for the academic year, providing very insightful ideas on the kinds of events that can be run, and how. They also presented ‘lessons learned,’ sharing advice with their fellow chapter leaders on what to watch for in running a chapter. The enthusiasm and energy from each presentation was evident in the ambitious, but achievable goals they have set for the 2010-2011 academic year.

Breakout sessions allowed each individual chapter to apply the information presented and brainstorm plans for the upcoming year, while getting feedback from the members of the NP and YP committees that were in attendance. Erin Longworth (Chair, NP Committee) and Mark Ortiz (Chair, YP Committee) presented even more potential activities that student chapters can run.
including plant tours, seminars, webcasts, films, and socials.

Finally, June Garcia-Becerra (Asset Management Committee Liaison, NP Committee) presented on her experience as a Water For People World Water Corps volunteer, giving the students a different perspective on the industry, especially in terms of applying their technical skills to aid communities to obtain access to safe drinking water and sanitation.

The SCLF Organizing Committee would like to thank Don Kemp, Glenn Powell, Darla Campbell, June Garcia-Becerra, and the University of Toronto OWWA and WEAO student chapters for hosting the event. The Organizing Committee would also like to thank OWWA, WEAO, Amonavi Consulting Group, H2FLOW Equipment, CH2M HILL, and AECOM for helping to make this year’s Student Chapter Leadership Forum a resounding success. Last, but not least, the student chapter leaders should be applauded for setting aside a beautiful Saturday in the summer to participate in (and travel to and from) this year’s SCLF and all of their volunteer efforts throughout the year. We wish all of the student chapters continued success in their efforts to become the future leaders of the water and wastewater industry!

Also published in OWWA Pipeline magazine, winter 2010 issue.

FALL NP/YP MEET & GREET

By Michelle Walters, Hatch Mott MacDonald

On September 24, 2010, new professionals (NPs), young professionals (YPs), students and industry veterans alike gathered for the annual YP Meet & Greet in Toronto for an evening of networking, socializing and animated discussion centered on the water and wastewater industries. All sectors of the industry were represented, including consultants, suppliers, academia and government.

This year’s event took place at Spacco Restaurant and Bar in the Yonge and Eglinton neighborhood, which boasted eight pool tables and an open, airy ambiance. Whether chatting over glasses of wine and pints of beer or competitively dueling in a game of pool, everyone had a memorable time.

The event was jointly hosted by the Ontario Water Works Association’s (OWWA) Young Professionals and the WEAO New Professionals. A few of the attendees included Monique Waller of CH2M HILL (YP Vice-Chair), Erin Longworth of AECOM (NP Chair), and George Lai of the Ministry of the Environment (former WEAO President).

A special thanks goes to Preya Balgobin of R.V. Anderson Associates Limited for organizing this event.
G.E. BOOTH WASTEWATER TREATMENT FACILITY: AN IN-DEPTH LOOK

Dale Jackson, ACG Technology Ltd., WEAO New Professionals Vice Chair

The G.E. Booth (Lakeview) Wastewater Treatment Plant (WWTP) was host to the latest WEAO NP (New Professionals) Committee facility tour held on the morning of Saturday, October 23. The Lakeview WWTP is located on the shore of Lake Ontario in Mississauga near the border of Etobicoke. Lakeview is comprised of three plants processing wastewater from homes and businesses in the Region of Peel, east of the Credit River and north to Caledon. This also includes Brampton and Mississauga and some parts of Etobicoke. The plant has a total design capacity of 318 MLD, is owned by the Region of Peel, and operated by the Ontario Clean Water Agency (OCWA).

The tour began with a look at the headworks facility which includes six, 6 mm perforated plate screens followed by mechanical vortex grit removal. Tour participants then proceeded to the area in the plant where ferrous chloride is stored and distributed to the primary inlet and/or aeration inlet main headers, and/or aeration basins final pass outlet. When ferrous chloride is applied to the aeration tank, it is oxidized to ferric, which enables phosphorus to precipitate out in the final clarifiers.

In the biosolids receiving area, participants had a chance to see primary clarifiers that are operated by travelling bridges as well as the aeration tanks for plant three. The biosolids storage area receives approximately 20 truck loads of biosolids weekly from the neighbouring Clarkson WWTP, which is then pumped to incinerators. The tour then proceeded to the secondary clarifiers of plant three which are operated by chain and flight mechanisms, followed by a view of the beginning of the outfall where sodium hypochlorite is dosed.

Because of the large flow capacity of Lakeview, the site does not allow for a chlorine contact chamber to be used because of the amount of area it would take up. Instead, the first two thirds of the 1.4 km outfall pipe is used as a contact chamber. After that point, sodium bisulphate is injected into the pipe through a diffuser ring to consume the remaining chlorine prior to discharge to Lake Ontario. Participants had the opportunity to view a simulator that was designed to pump a sample of chlorinated effluent, taken before it reaches the outfall pipe, through a sample line that mimics the length of the outfall. The double loop system of the simulator is designed to control the amount of sodium bisulphite and sodium hypochlorite dosed, such that the effluent is non-toxic.

The tour then proceeded to Lakeview’s centrifuge room where a total of 10 centrifuges thicken waste activated sludge (WAS), and dewater a blend of primary sludge and thickened waste activated sludge (TWAS) sludge. The first five centrifuges produce around 5% solids (TWAS), which is then blended with primary sludge. The remaining five centrifuges dewater the blended sludge to approximately 26% solids, which are then incinerated by four hot wind box fluid bed (HTFB) incinerators.

Tour participants had a chance to see the four incinerators, two of which are in service at any time to dispose of approximately 150 tonnes of dry sludge per day. The Lakeview WWTP has an incineration capacity of 400 dry tonnes per day, making it one of one of the largest municipal sludge incineration plants in the world. The HTFB consists of three zones: a wind-box, a sand bed, and a freeboard. The term ‘fluid bed’ refers to the violent boiling action of the sand bed, which occurs when air is blown through from below.

To ensure that the air passes evenly through the sand, it must first pass through the windbox and a refractory arch distributor, where special alloy tuyeres ensure even distribution of the air. A tuyere is a tube, nozzle or pipe through which air is blown into a furnace or hearth. To fully take advantage of the turbulent mixing, dewatered sludge is introduced directly into the bed, where combustion begins at the 700 °C bed temperatures, and is completed as the cake travels up the incinerator freeboard. Final exit temperature is 850 to 900 °C. As combustion gas and evaporated water flow upward into the teardrop-shaped freeboard, the bed material (olivine sand) is disengaged and falls back to the bed level. The teardrop-shaped freeboard provides a gas residence time of minimum 6.5 seconds. Operating at 850 °C, the freeboard provides sufficient residence time to polish the gas and to complete the combustion. The turbulence, time, and temperature make fluid bed incineration the most economical and environmentally sound method of sludge disposal. The remaining product is an inert ash that is pumped to two ash lagoons.

Before seeing the ash lagoons, tour participants had an opportunity to see the SCADA system at Lakeview WWTP, from where all of the plant’s daily operations can be controlled, and also view the two ash lagoons and pond. The ash lagoons are clay and membrane lined. The pond is clay lined. The ash slurry from the thermal oxidation scrubbers is pumped to the lagoons where the ash settles very quickly. The lagoon overflow, which is mostly water, is pumped back to the plant downstream of the headworks. When a lagoon is full of ash to its capacity, the ash is moved to the pond via dredging or earth moving equipment for permanent onsite storage.

The last stop on the tour was to see the integrated fixed film activated sludge (IFAS) pilot study, which was initiated by KMK Consultants (now AECOM) and Black & Veatch in recent years. The IFAS media is meant to encourage floc growth in an effort to concentrate biomass in the tank. The tank can then treat more influent BOD than a conventional aeration tank of the same size. The application is most useful in small plants, where either there is no footprint to build more or larger tanks, or where the municipality does not have the funding for capital expansion. The increased amount of biomass means the tank can treat more flow, or flow with higher BOD than a regular tank.

A special thank you goes out to Nevin McKeown, South Peel Wastewater System Manager from OCWA. Nevin conducted the tour in its entirety, answering many questions with his great knowledge and expertise conveying all information in a clear and concise manner. Thanks also go out to the 30 young professionals and students that attended.
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LAKE SIMCOE AND GRAND RIVER:
Watersheds Under Stress

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Achieving Low Effluent Phosphorus with Low Chemical Use ............................................................ 43
Lake Simcoe is the fourth-largest lake wholly in the province, after Lake Nipigon, Lac Seul, and Lake Nipissing. It is one of the world’s largest freshwater lakes to freeze over completely in the winter.

At the time of the first European contact in the 17th century, the lake was called Ouentironk (‘Beautiful Water’) by the Huron natives. It was also known as Lake Taronto until it was renamed by John Graves Simcoe, the first Lieutenant-Governor of Upper Canada, in memory of his father.

The lake is bordered by Simcoe County, Durham Region, and York Region. The City of Barrie is located on Kempenfelt Bay, and Orillia is located at the entrance to Lake Couchiching. The watershed draining into the lake contains a population of roughly half a million people, including the northern portion of the Greater Toronto Area.

The town of Georgina lies along the entire south shore of Lake Simcoe and consists of smaller residential towns and communities, including Keswick on Cook’s Bay, Sutton, Jackson’s Point, Pefferlaw, and Udora.

Source: www.wikipedia.org

Four decades of scientific review and research has identified phosphorus as a key contaminant resulting in significant stress on the Lake Simcoe basin, necessitating a phosphorus reduction strategy to better control and limit the impact of phosphorus loading to the lake and its ecosystem. The Lake Simcoe Protection Plan and the Phosphorus Reduction Strategy (MOE, 2010) are aimed at reducing overall phosphorus loading from all sources to the Lake Simcoe watershed.

The purpose of this study (XCG, 2010), which was funded by the Lake Simcoe Clean-Up Fund and managed by WEAO, was threefold:
1. to review the current design, performance and associated costs of phosphorus removal at each of the 14 sewage treatment plants (STPs) discharging to the Lake Simcoe watershed;
2. to develop conceptual level designs and order of magnitude costs to achieve enhanced levels of phosphorus removal at these plants; and
3. to compare the order of magnitude costs to achieve enhanced levels of phosphorus removal at the 14 STPs in the Lake Simcoe watershed with the conceptual level costs to achieve reduced phosphorus loadings from rural and urban non-point sources.

HISTORICAL PHOSPHORUS REMOVAL PERFORMANCE
Table 1 identifies the 14 municipal STPs (11 mechanical plants and three lagoon-based systems) that were included in this review. Of the 11 mechanical plants, nine facilities currently provide or are in the process of implementing tertiary treatment for phosphorus removal.

Figure 1 presents the 2006-2008 average effluent phosphorus loading from each of the 14 STPs discharging to the Lake Simcoe watershed as a percentage of the total phosphorus (TP) loading from STPs. The total TP loading over this period averaged 5,315 kg.

Over the period from 2006-2008, approximately $5.4 million (M) in plant operating and maintenance (O&M) costs was spent to remove approximately 544 tonnes of phosphorus. The unit removal costs for each STP ranged from about $5.85/kg TP removed to $45.72/kg TP removed.
Recently completed upgrades to the Schomberg WPCP and the upgrades in progress at the Keswick and Barrie plants will change the distribution of loadings shown in Figure 1. It is anticipated that the total annual TP loading to Lake Simcoe from STPs will decrease to approximately 4,325 kg, representing a net decrease of about 20%.

**TABLE 1: STPs Discharging to the Lake Simcoe Watershed**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Ownership</th>
<th>Treatment Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uxbridge Brook WPCP</td>
<td>The Regional Municipality of Durham</td>
<td>• extended aeration&lt;br&gt;• automatic backwash filters</td>
</tr>
<tr>
<td>Beaver River # 1 WPCP</td>
<td>Sunderland</td>
<td>• seasonal wastewater stabilization lagoon system</td>
</tr>
<tr>
<td>Lake Simcoe (Beaverton) WPCP</td>
<td></td>
<td>• extended aeration&lt;br&gt;• tertiary solids contact clarifier&lt;br&gt;• automatic backwash filters</td>
</tr>
<tr>
<td>Beaver River # 2 WPCP</td>
<td>Cannington</td>
<td>• facultative seasonal discharge lagoons</td>
</tr>
<tr>
<td>Schomberg WPCP</td>
<td>The Regional Municipality of York</td>
<td>• extended aeration&lt;br&gt;• continuous backwash sand filters</td>
</tr>
<tr>
<td>Sutton WPCP</td>
<td></td>
<td>• sequencing batch reactor&lt;br&gt;• continuous backwash sand filters</td>
</tr>
<tr>
<td>Holland Landing WPCP</td>
<td></td>
<td>• facultative seasonal discharge lagoons</td>
</tr>
<tr>
<td>Keswick WPCP</td>
<td></td>
<td>• extended aeration&lt;br&gt;• tertiary membrane ultrafiltration (1) (being installed)</td>
</tr>
<tr>
<td>Mount Albert WPCP</td>
<td></td>
<td>• extended aeration&lt;br&gt;• continuous backwash sand filters</td>
</tr>
<tr>
<td>Barrie WPCC</td>
<td>The City of Barrie</td>
<td>• high purity oxygen (UNOX) secondary treatment&lt;br&gt;• tertiary nitrifying rotating biological contactors (RBC’s)&lt;br&gt;• automatic backwash filters</td>
</tr>
<tr>
<td>Bradford WPCP</td>
<td>The Corporation of the Town of Bradford West Gwillimbury</td>
<td>• parallel extended aeration and SBR secondary treatment processes&lt;br&gt;• continuous backwash sand filters</td>
</tr>
<tr>
<td>Innisfil WPCP</td>
<td>The Corporation of the Town of Innisfil</td>
<td>• extended aeration&lt;br&gt;• automatic backwash sand filters&lt;br&gt;• continuous backwash sand filters</td>
</tr>
<tr>
<td>Orillia WTCC</td>
<td>The Corporation of the City of Orillia</td>
<td>• conventional activated sludge</td>
</tr>
<tr>
<td>Lagoon City STP</td>
<td>The Corporation of the Township of Ramara</td>
<td>• extended aeration</td>
</tr>
</tbody>
</table>

**Notes:** Currently, the Keswick WPCP is equipped with dual media, automatic backwash filters for tertiary treatment.

**FIGURE 1:**

**Average Annual Effluent TP Loading to Lake Simcoe by Treatment Plant**

Recently completed upgrades to the Schomberg WPCP and the upgrades in progress at the Keswick and Barrie plants will change the distribution of loadings shown in Figure 1. It is anticipated that the total annual TP loading to Lake Simcoe from STPs will decrease to approximately 4,325 kg, representing a net decrease of about 20%.

**ACHIEVING EFFLUENT TP CONCENTRATIONS OF 0.10 MG/L**

The conceptual level upgrades and associated costs to achieve an average effluent TP concentration of 0.10 mg/L at all of the STPs discharging to the Lake Simcoe watershed are presented in Table 2. These upgrades would result in a reduction in annual TP loading of 2,547 kg/yr. Over 25 years, this amounts to 63,650 kg TP. The 25-year life cycle cost (LCC) to achieve this reduction is $40.5M, resulting in an overall unit removal cost of about $636/kg TP.
The conceptual level upgrades and associated costs to achieve an average effluent TP concentration of 0.05 mg/L at all of the STPs discharging to the Lake Simcoe watershed are presented in Table 3. These upgrades would result in an overall reduction in annual TP loading of 5,423 kg/yr as compared to the operation of the existing facilities at the CoFA rated capacities. Over 25 years, this amounts to 135,595 kg TP. The 25-year LCC to achieve this reduction is $197.8M, resulting in a unit removal cost of $1,459/kg TP.
Due to the large reduction in phosphorus loading and the low 25-year LCCs, the implementation of BMPs to agricultural lands would result in the lowest overall cost per kg of TP removed at $170/kg TP. Comparatively, phosphorus reduction as a result of retrofits of the stormwater system in existing urban areas would come at a unit removal cost of $1,678/kg TP. This is a more expensive option on a unit removal basis by an order of magnitude.

Similarly, upgrade of the STPs to 0.05 mg/L TP is more expensive than agricultural BMPs by a factor of 8.5. Treatment of the Holland Marsh polder water and STP upgrade to 0.10 mg/L are more comparable options at $483/kg TP and $636/kg TP, respectively.

Comparison of the unit removal costs for agricultural BMPs, Holland Marsh polder water treatment and urban runoff with the STP upgrades for the individual facilities brings to light the variation in unit TP removal costs.
Due to the economy of scale, the larger STPs benefit from lower unit removal costs than many of the smaller STPs. Similarly, for the agricultural BMPs, Holland Marsh polder water treatment and urban runoff alternatives, the unit removal costs are significantly lower than for upgrades to most of the smaller STPs, due to the larger potential phosphorus loading reductions. Only a small number of the upgrades at select STPs are less costly on a unit removal basis than the most costly non-point source alternative.

REFERENCES
2. Ministry of the Environment (June 2010), Lake Simcoe Phosphorus Reduction Strategy, PIBS 7633e.
4. XCG Consultants Ltd. (2010), Review of Phosphorus Removal at Municipal Sewage Treatment Plants Discharging to the Lake Simcoe Watershed.

Guidance Manual for Optimization of Sewage Works

The Ontario Ministry of the Environment, in collaboration with the Water Environment Association of Ontario and Environment Canada, has developed an updated Guidance Manual for Optimization of Sewage Works. The purpose of the Guidance Manual is to provide sewage works owners, managers, designers, process engineers, and operators with a source book that describes specific monitoring, testing, and optimization approaches that can be used to evaluate and optimize sewage works.

The Guidance Manual provides a description of optimization approaches than can be applied to all components of the sewage works, namely: the sewage collection system, the liquid train treatment processes, and the solids process treatment train. In this regard, the Guidance Manual recognizes that all parts of the system must be optimized before the performance, capacity and capability of the works can be considered to be fully optimized.

The Guidance Manual provides direction to the user regarding setting the objectives of the optimization program, developing a detailed work plan for the project, ensuring that all participants are aware of the scheduled activities, and reporting the findings. The Guidance Manual also contains numerous case history examples that illustrate the benefits of sewage works optimization. Case histories that demonstrate the approaches used and the benefits realized from optimizing individual unit processes are also presented.

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Municipalities and industries that discharge treated wastewater to the environment are facing more stringent restrictions for effluent phosphorus (P) concentration. Several jurisdictions in North America have imposed total phosphorus (TP) discharge limits of < 0.1 mg/L, with others considering limits as low as < 0.05 mg/L, including the Lake Simcoe watershed. Driving forces for such stringent requirements include mass loading restrictions to receiving water bodies and strict water reuse criteria.

Some degree of phosphorus removal from wastewater is achieved in conventional biological treatment processes through biological assimilation – incorporation of phosphorus as an essential element in biomass. To remove additional phosphorus in excess of that which can be removed via biological assimilation, municipal sewage treatment facilities have widely applied chemical precipitation by the addition of metal salts. More recently, enhanced biological phosphorus removal (EBPR) processes that promote luxury phosphorus uptake by phosphorus accumulating organisms have received significant attention as an alternative to chemical precipitation. This is mainly due to the potential for chemical savings.

Since the effluent phosphorus concentration from a wastewater treatment plant is significantly influenced by the effluent total suspended solids (TSS) content, solids-free effluent is required to achieve effluent TP objectives of < 0.05 mg/L. Conventional clarification and filtration processes are limited in their ability to reliably sustain such low effluent TSS concentrations. Membrane ultrafiltration (UF), either in a membrane bioreactor (MBR) or tertiary filtration configuration, has proven to be a reliable technology in producing solids-free effluent and, therefore, becoming a popular means to address stringent effluent phosphorus requirements.

PHOSPHORUS REMOVAL WITH MBR
The MBR process can be configured to remove phosphorus by chemical phosphorus removal, enhanced biological phosphorus removal, or a combination of the two. In an MBR process, the solids retention time and hydraulic retention time are decoupled, therefore, the technology allows maximum flexibility in biological process selection for the designer. Current practice is for designers to optimize the biological process design for an MBR based on the wastewater characteristics and specific treatment objectives. In cases where enhanced biological phosphorus removal is not preferred, for instance for plants with anaerobic digestion, MBR systems can be designed for chemical phosphorus removal and be assured of complete retention of the suspended solids by the membrane filtration system. Table 1 provides a selection of GE’s MBR experience with stringent phosphorus removal requirements.

<table>
<thead>
<tr>
<th>Plant Location</th>
<th>Phosphorus removal method</th>
<th>Commissioned</th>
<th>Capacity, average day flow (MLD)</th>
<th>TP discharge requirement/ objective (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port McNicoll Ontario, Canada</td>
<td>Chemical removal</td>
<td>2001</td>
<td>2.4</td>
<td>&lt; 0.25</td>
</tr>
<tr>
<td>Cauley Creek Georgia, USA</td>
<td>EBPR + chemical removal</td>
<td>2002</td>
<td>19</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Broad Run Virginia, USA</td>
<td>EBPR + chemical removal</td>
<td>2007</td>
<td>42</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>London Oxford Pollution Control Plant Ontario, Canada</td>
<td>Chemical removal</td>
<td>2008</td>
<td>13.6</td>
<td>&lt; 0.65</td>
</tr>
<tr>
<td>Spokane County Washington, USA</td>
<td>Chemical removal</td>
<td>2011 *</td>
<td>32.2</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

* Anticipated start-up date based on current design and construction schedule

PHOSPHORUS REMOVAL WITH UF TERTIARY FILTRATION
In some circumstances, it is preferred to add a tertiary unit operation to polish phosphorus from existing secondary treatment rather than modifying the secondary process to an MBR. In these cases, the application of UF membranes in combination with chemical addition has been demonstrated to achieve limit of technology effluent phosphorus concentrations. As with an MBR, the advantage of UF tertiary filtration is the absolute retention of all particulate

<table>
<thead>
<tr>
<th>Plant Location</th>
<th>Capacity, average day flow (MLD)</th>
<th>TP discharge requirement/ objective (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashland Oregon, USA</td>
<td>15</td>
<td>&lt; 0.06</td>
</tr>
<tr>
<td>F. Wayne Hill Georgia, USA</td>
<td>189</td>
<td>&lt; 0.07</td>
</tr>
<tr>
<td>Keswick Ontario</td>
<td>18</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Innisfil (pilot) Ontario</td>
<td>N/A</td>
<td>&lt; 0.024</td>
</tr>
</tbody>
</table>

* Anticipated start-up date based on current design and construction schedule
matter and small plant footprint versus alternative tertiary treatment processes. Since the treatment mechanism with UF filtration is particle size exclusion, extremely low phosphorus removal can be achieved with the addition of metal salts only and without the need for other costly specialty chemicals (e.g., polymers). A selection of GE’s tertiary filtration experience with stringent phosphorus removal requirements is summarized in Table 2.

UF tertiary filtration technology has been evaluated by a number of municipalities in the Lake Simcoe watershed. A brief summary of two cases is provided below.

**KESWICK WATER POLLUTION CONTROL PLANT**
Expansion of the Keswick Water Pollution Control Plant requires the facility to reduce its discharge TP concentration to comply with requirements for the Lake Simcoe watershed. The existing facility consists of an extended aeration secondary treatment process followed by shallow bed granular media filtration for tertiary treatment. With anticipated TP concentration limits of 0.15 to 0.20 mg/L and an objective of 0.05 mg/L, it was determined that the existing granular media filters would not be suitable to consistently meet the objectives for the new flow conditions. A pilot study was conducted in 2007 to demonstrate the ability of UF membrane filtration to meet the TP treatment objectives. Two membrane technologies were tested, including GE’s ZeeWeed® 1000 UF membrane. The membrane systems consistently met the effluent TP objective of 0.05 mg/L, including when exposed to conditions that simulate a solids carryover event from the secondary clarifiers.

Following the successful pilot and a competitive pre-selection process, GE was awarded a contract for the supply of a full-scale UF tertiary filtration solution for the Keswick Water Pollution Control Plant. The tertiary filtration system is designed for an average daily flow of 18 MLD and a peak hour flow of 64 MLD with the ability to further expand to 24 MLD average and 85 MLD peak. Secondary effluent from the existing extended aeration system will be treated with GE’s ZeeWeed® 1000 UF membrane system to remove residual TSS, including particulate phosphorus species. Prior to the UF membranes, the secondary effluent will pass through a fine screen and be dosed with alum. The design influent TP concentration is 0.5 mg/L average and 2.0 mg/L maximum with a treatment objective of 0.05 mg/L.

The UF tertiary filtration system at the Keswick Water Pollution Control Plant is currently in design and anticipated to be ready for commissioning and start-up in 2012.

**INNISFIL LAKESHORE WATER POLLUTION CONTROL PLANT**
The Innisfil Lakeshore Water Pollution Control Plant consists of an extended aeration activated sludge system followed by sand filtration. The 14.4 MLD plant adds alum in the process to achieve an effluent TP concentration of 0.09 mg/L on average. Based on a projected future plant expansion and the anticipation of more stringent discharge phosphorus limits consistent with similar experience in the Lake Simcoe area, the town evaluated technology solutions for reducing the effluent TP concentration from the existing plant.

In 2009, a pilot study was performed at the Lakeshore Water Pollution Control Plant to evaluate alternative tertiary filtration processes, including GE’s UF membrane filtration technology. The treatment objective was a total phosphorus concentration of 0.024 mg/L, with an ultimate target of < 0.01 mg/L.

**FIGURE 1: Innisfil Lakeshore Water Pollution Control Plant Tertiary Filtration Pilot Study UF Tertiary Filtration Influent and Effluent Total Phosphorus Concentrations**
A GE ZeeWeed® 1000 pilot system was used for this study. The pilot consisted of an inline strainer, an inline static mixer, a flocculation tank equipped with a mixer and a membrane tank with one ZeeWeed® 1000 membrane module. The flocculation tank was hydraulically linked with the membrane tank. Secondary effluent from the wastewater treatment plant was pumped to the flocculation tank through the 0.5 mm inline strainer, where alum was added prior to the inline mixer. The membranes were operated in deposition mode, with the membrane tank fully drained at a predetermined filtration interval based on a target water recovery.

The six-week pilot study was conducted in three phases. Phase I focused on demonstration of the ability to achieve the target effluent TP concentration with diurnal influent flow conditions. Phase II was a trial to evaluate if the effluent TP concentration could be sustained with a reduced alum dosage. In Phase III, the alum dose was increased to achieve the ultimate TP target of < 0.01 mg/L. Total phosphorus concentration results for the UF tertiary filtration system influent and effluent are presented in Figure 1. In spite of the significant variability in influent flow, the effluent TP concentration was maintained at less than 0.024 mg/L, with an average TP concentration in the range of 0.015 to 0.02 mg/L.

SUMMARY
There is a trend in a number of jurisdictions in North America, including Ontario, toward lower discharge phosphorus concentrations from wastewater treatment plants. UF membrane technology, applied in either an MBR or tertiary filtration configuration, has been demonstrated, at pilot and full scale, to reliably achieve the most stringent TP discharge requirements. For many plants that need to achieve TP limits somewhere between 0.015 and 0.2 mg/L, membrane technology is often the best solution.

GE Water & Process Technologies is represented in Ontario by ProAqua, Inc. Please contact Scott Lenhardt, P.Eng.

REFERENCES


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The Grand River watershed is the largest watershed in southern Ontario. It includes over 6,800 km² of mostly rural lands, as well as the cities of Guelph, Kitchener, Waterloo, Cambridge and Brantford. It has a population of almost one million people. The Grand originates on the Dundalk Till Plain, and picks up its major tributaries – the Conestogo, Nith and Speed/Eramosa rivers – as it winds through the central gravel moraines until it reaches Brantford, when it flows onto the Haldimand Clay Plain, where turbidity increases. In all, the river flows for about 300 km until it discharges into Lake Erie at Port Maitland (Figure 1).

The geology of the watershed sets the natural limits on the water quality in the river. However, land use and land management practices, including extensive agricultural production and fast-growing urban centres, contribute to the high levels of nutrients and suspended sediments seen throughout the watershed. Generally, high levels of phosphorus and nitrogen are endemic with the exception of a few, less developed areas (e.g., Upper Grand, Eramosa River) (Cooke, 2006). Groundwater discharge also plays a significant role in surface water quality in the central region of the watershed, moderating water temperatures and providing, in general, high quality water to local streams and rivers.

Water quality management in the Grand River is a balancing act. Four communities are dependent on the river system for municipal water supply. There are 30 communities that use the river or its tributaries to assimilate treated wastewater. The river is home to the best-recognized tailwater fishery in North America, which provides substantive economic benefit to local communities (Ontario Ministry of Natural Resources, 2004). Active and passive recreation opportunities that enhance the quality of life for many residents are found throughout the watershed. The watershed also has some of the most productive agricultural lands in the province and supports vibrant, growing urban communities. Land use pressures will remain as the Ontario Government’s Places to Grow and Greenbelt policies will cause population growth from the Greater Toronto Area to leapfrog directly into the Grand River watershed. Further, climate change will undoubtedly impact river water quality by altering river thermal and runoff regimes. Collectively, the pressures on the Grand River, now and into the future, will be immense. Therefore,
conventional approaches to managing water quality may not be enough to ensure a healthy, resilient river ecosystem into the future.

**HISTORY OF THE GRAND RIVER**

Water quality in the Grand River has improved a great deal since the early 1900s, when the river was considered an ‘open sewer.’ At first, primary and then secondary wastewater treatment was the general standard in the larger communities across the watershed throughout the 1960s and 1970s. However, a few smaller communities still lacked basic treatment. The implementation of municipal wastewater treatment started to reduce the tremendous organic load to the river (Ontario Treasury Board, 1971). Chemical addition for phosphorus removal started in the early 1970s at most of the major plants and, in some cases, nitrification was also implemented. During the same time period, phosphates in laundry detergents were reduced substantially. Many wastewater treatment plants have upgraded to include tertiary filtration to further reduce total phosphorus loading. These combined actions have resulted in a dramatic improvement in river water quality since the 1960s (Figure 2). Over the past 30 years, an investment in more advanced wastewater treatment has proven very successful in improving water quality in the watershed, specifically for very sensitive receivers. The City of Guelph’s wastewater treatment plant is a case in point (Figure 3). The city’s continual investment in advanced wastewater treatment since the late 1970s facilitated the recovery of the Speed River from having ‘depleted oxygen levels at night’ and ‘gross organic contamination’ in the 1960s and early 1970s (Sandilands, 1971; Ontario Treasury Board, 1971) to consistently meeting the provincial dissolved oxygen guideline for warmwater fish by the early 2000s. Elsewhere in the watershed, however, wastewater treatment has not kept pace with the pressures of increasing watershed population. Dissolved oxygen levels in the central Grand River during the summer, for example, have tended to be below the provincial objective of 4.0 mg/L, especially during very hot, low-flow periods. Further, water quality impairments from non-point sources still play a prominent role in the watershed, especially as it relates to annual pollutant loads to Lake Erie. Advanced wastewater treatment will be part of the solution to improve water quality in the central portion of the Grand River. However, as we look to the future, more novel approaches may be needed.

**MODELING THE GRAND RIVER**

Innovative decision support tools have helped, and continue to help, guide water quality management decisions in the watershed. To evaluate water quality management options for the Grand and Speed rivers, a dynamic in-river dissolved oxygen model was recommended by the Ontario Treasury Board in 1971 (Recommendation No. 6; Ontario Treasury Board, 1971) and developed by the Ministry of the Environment as part of the Grand River Basin Study in the late 1970s (Willson et al. draft (1982)). It was based on the mathematical model developed for the Thames River (Thames River Simulation Model (MOE 1975)), which allowed for evaluating the effects of multiple factors such as population, rainfall, streamflow, temperatures, and nutrients and their effects on algal growth, on river water quality (Willson et al. 1982). The model has undergone many improvements over the years and is still used today to assist with water quality management decisions.

The Grand River Simulation Model (GRSM) is a dynamic, non-steady state water quality model that is capable of simulating in-stream processes affecting the concentration of dissolved oxygen (Figure 4). Since the Basin Study, the model has been upgraded to include improved sub-routines on nutrient limitation relationships, temperature-algal growth response, light attenuation (Heathcote and Humphries 1997; Humphries 1998) and nitrogen transformations (Stantec 2010).

GRSM is unique in that it was built specifically for the Grand River, although the basic algorithms are applied in many in-river dissolved oxygen models. For example, the model simultaneously predicts the growth of three aquatic plant species commonly found in the Grand and Speed rivers. It also evaluates the cumulative inputs from both point and non-point sources to the Grand River, from Fergus to
below Brantford, and the Speed River, from above the City of Guelph to the confluence with the Grand River. The model continues to be used to evaluate point (e.g., wastewater treatment plants) and non-point source management scenarios in the context of increasing population growth or other watershed pressures such as climate change. Most recently, the model was used to evaluate wastewater effluent requirements for the Region of Waterloo’s Kitchener wastewater treatment plant (see Perone et al. in this edition).

In addition to providing technical expertise and leadership in evaluating cumulative impacts to the river, the Grand River Conservation Authority has a strong history in collaborating with partners to provide advice and programming to help manage non-point sources. Several programs have been developed over the years to assist farmers and rural landowners in the watershed to implement best management practices, including the Rural Water Quality Program (RWQP). The RWQP is a voluntary initiative developed in conjunction with watershed municipalities, provincial and federal governments, the farming community and environmental associations to improve rural water quality.

As we look to the future, water quality management in the Grand River watershed will require multiple, concurrent actions in priority areas to maintain or even improve river water quality, as population continues to grow and the watershed has to deal with the effects of a changing climate. Currently, the Grand River Conservation Authority, along with many partners, are collaboratively updating the Water Management Plan. The new ‘Plan for the Grand’ will be drafted by 2012 and it will help guide water management, including water quality decisions in the watershed.

Given the demands on the Grand River – waste assimilation, municipal drinking water supplies, valued aquatic habitat and resources for area residents, to list a few – leading-edge and creative approaches will be required to ensure a healthy river system into the future. As the adoption of advanced wastewater technology may not be economically feasible, other, more creative
options will have to be considered to maintain or improve water quality in the watershed. These may include the enhancement or restoration of natural river functions through more naturalized river channel design, removal of run-of-the-river dams, restoring headwater streams, improved/innovative stormwater management, and protecting critical groundwater recharge areas that sustain groundwater discharge to the river.

BEST PRACTICES BY ALL WILL HAVE TO BE COMMONPLACE

Similar to the adoption of best management practices by the agricultural community, all water managers will have to ensure best practices are in place to protect water quality. Enhancing performance of existing infrastructure in wastewater treatment plants is not only environmentally beneficial, it is economical. One initiative currently hosted by the GRCA, in partnership with the City of Guelph and Haldimand County, is a Watershed-wide Wastewater Optimization Pilot (WWOP). The WWOP is promoting enhanced performance of existing wastewater treatment plants to further improve effluent quality across the watershed. Optimization using the Composite Correction Program has been implemented successfully by the City of Guelph (see Influents winter 2008 article entitled Cameron Walsh helps Guelph meet its needs and prepare for future challenges) and is currently being undertaken at several plants in Haldimand County.

As we move forward, the collective challenge is to prioritize actions that will have the largest positive effect overall, and work with partners to implement priority actions with the goal of continual improvement. One agency cannot do it all. Partnerships and collaborations will be the mechanism to move forward. One key success factor is for the GRCA to continue to provide a forum for partners to discuss watershed or transboundary municipal issues. In this way, water management decisions are not made in isolation and the collective or cumulative effects of these decisions can be evaluated, either through the use of decision support tools like GRSM or through effective discussion, to understand the limitations or trade-offs with each decision made.

FOOTNOTE

1. A run-of-the-river dam is built across a river for the purpose of impounding water. The flow passes over the whole width of the dam and the water level is below the banks of the river.

REFERENCES


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Historically, the quality of the Grand River and its tributaries has been a significant water management issue. The Grand River Conservation Authority (GRCA) and municipalities in the basin have encountered water quality degradation associated with urban growth, agricultural activity and low flow conditions. Over the last 20 years, the Region of Waterloo (Region) and other municipalities constructed new or expanded wastewater treatment plants (WWTPs) to improve the water quality conditions in the watershed, and implemented other abatement measures to address point and non-point source pollution. Although the water quality of the Grand River has greatly improved, upgrades to WWTP facilities to incorporate new technology are necessary to address policy requirements, increased wastewater flows, and potential impacts to aquatic ecosystems.

The 2007 Region of Waterloo Wastewater Treatment Master Plan (WWTMP) incorporated upper tier government policy and directives, current population growth projections, past and projected WWTP flows and effluent quality characteristics for the years 2016, 2031 and 2041. The plan also identified upgrades to the 13 WWTPs in the Region, including modifications to the Kitchener and Waterloo WWTPs to replace aging equipment, improve process efficiency, mitigate odours, and improve the quality of the effluent being discharged to the Grand River. Improvements to the Kitchener WWTP were considered a priority, given the age and performance of the plant, as well as agency concerns regarding downstream dissolved oxygen (DO) and predicted un-ionized ammonia (UIA) toxicity in the effluent mixing zone. A 26-year, $300 million program was recommended for the Kitchener WWTP, and, although the facility is not being expanded, the Ministry of the Environment (MOE) required that the Region undertake an assimilative capacity study (ACS) of the Middle Grand River for the Kitchener upgrades.

The overall objective of the ACS was to determine the appropriate effluent design criteria for the Kitchener WWTP (Figure 1), such that, when the upgrades are implemented, the water quality and the ecological health of the Grand River downstream of the Kitchener WWTP outfall will be improved. The application of a water quality simulation model enabled the simultaneous consideration of many watershed characteristics and inputs.

**STUDY AREA**

The study area for the ACS was defined as the reach of the Grand River extending from Bridgeport to Glen Morris (Figure 2). The rationale for the study area definition was based on the known extent of DO impact zones along the Grand River.
However, to address concerns related to the levels of total ammonia and nitrates at the City of Brantford Water Supply Intake, components of the ACS also investigated river conditions between Glen Morris and the City of Brantford.

Historical water quality data were obtained and synthesized from stations located along the Bridgeport to Village of Glen Morris reach of the Grand River (Figure 2). This data includes GRCA grab sample results, as well as transect grab sample results from the Region’s archives. The data compiled also include grab sample results from the MOE’s Provincial Water Quality Monitoring Network (PWQMN) stations. Continuous sampling data for DO collected from 2004 to 2009 at three continuous monitoring stations (Bridgeport, Blair and Glen Morris) were also analyzed.

**POLICY STATUS**

As part of the Kitchener WWTP ACS, the policy status of the receiver (the Grand River) was determined. In accordance with MOE protocol, the policy status for each parameter of concern, namely, total phosphorus (TP), UIA, and DO were investigated. All other parameters considered do not have a PWQO. However, it is recognized that a Canadian Water Quality Guideline (CWQG) exists for nitrate (NO₃). Therefore, nitrate concentrations were also considered.

**Dissolved Oxygen**

The continuous monitoring of data for the summer season demonstrates DO concentrations upstream of the Kitchener WWTP remain above 4 mg/L, approximately 99.6% of the time during the summer period. The effects of the Kitchener WWTP discharge are clearly indicated in DO concentrations downstream of the outfall, since DO concentrations in the main channel of the Grand River at Blair show summer DO levels above the PWQO approximately 79.8% of the time. Further downstream at Glen Morris, the DO concentrations recover to above the PWQO approximately 98.9% of the time. Therefore, the Grand River was deemed a Policy 2 receiver downstream of the Kitchener WWTP.

**Nutrients**

Nutrients, which stimulate aquatic plant growth, are ubiquitous in the Grand River, and applicable PWQOs or CWQGs for TP and NO₃ are exceeded at many locations within the study area. Water quality data demonstrate that the Grand River is a Policy 2 receiver for TP at virtually every monitored location within the study area, and all four monitoring seasons. Spring nitrate-N 75th percentile concentrations are above the CWQG at most Grand River monitoring stations and fall within a narrow concentration band of 3.4 to 4.7 mg/L. Furthermore, winter nitrate-N 75th percentile concentrations are above the CWQG at most Grand River monitoring stations, and at an elevated range (5.0 to 7.7 mg/L) relative to spring concentrations.

During summer and fall, 75th percentile UIA concentrations are above the PWQO of 0.0165 mg N/L downstream of the Waterloo WWTP and downstream of the Kitchener WWTP (at Schneider Creek and Blair). The monitoring data suggest that the Grand River is a Policy 1 receiver for UIA directly upstream, but Policy 2 immediately downstream of the Kitchener WWTP. Furthermore, exceedences of the PWQO for UIA are directly related to WWTP discharges.

**GRSM MODELING**

The Grand River Simulation Model (GRSM) is a water quality model of the Grand River applied by scientists,
engineers, and planning staff to understand how proposed changes to the Grand River watershed might impact the quality of water in the Grand River. The GRSM focuses on DO as the most important indicator of river water quality, because DO levels play a large role in determining the level of stress on fish communities and diversity of the fishery in the river.

The GRSM was applied as a modeling tool for the ACS. The model was modified to include a new nutrient modeling capability and new input data were generated based on recent river and effluent quality sampling. The model was calibrated and validated using existing data.

The GRSM was applied to a number of scenarios to assess the performance of alternative wastewater treatment with respect to the water quality of the Middle-Grand River under different seasons and low flow conditions. Key water quality parameters such as DO, UIA, nitrate and TP in the Grand River were assessed using the GRSM. The GRSM provided predictions of water quality characteristics at over 60 locations in the GRSM model structure, which extends from the Shand Dam to Ohsweken on the Grand River, and along the Speed River from the Guelph Dam to the confluence with the Grand. For all future model run scenarios, the Kitchener WWTP discharge was set to 123,000 m$^3$/day, which reflects the rated capacity of the WWTP. (A workshop on the GRSM will take place on March 8, 2011. Check the calendar of events on the WEAO website for the link to the workshop provider).

### TABLE 1. Kitchener WWTP effluent treatment scenarios (mg/L)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NH$_3$–N</th>
<th>NO$_3$–N</th>
<th>TP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1: Nitrification and moderate P reduction</td>
<td>2</td>
<td>18.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Scenario 2: Nitrification, denitrification and moderate P reduction</td>
<td>2</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Scenario 3: Nitrification and enhanced P reduction</td>
<td>2</td>
<td>18.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Scenario 4: Nitrification, denitrification and enhanced P reduction</td>
<td>2</td>
<td>3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

### TABLE 2. Recommended effluent criteria for the Kitchener WWTP upgrades

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Objective$^1$ (mg/L)</th>
<th>Monthly average concentration (mg/L)</th>
<th>Annual average loading (kg/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBOD</td>
<td>10</td>
<td>15</td>
<td>1840</td>
</tr>
<tr>
<td>TSS</td>
<td>10</td>
<td>15</td>
<td>1840</td>
</tr>
<tr>
<td>NH$_3$–N</td>
<td>2 (5)$^3$</td>
<td>4 (7)$^3$</td>
<td>490 (860)$^3$</td>
</tr>
<tr>
<td>TP</td>
<td>0.2</td>
<td>0.4</td>
<td>50</td>
</tr>
<tr>
<td>pH</td>
<td>6.0–8.5</td>
<td>6.0–9.5</td>
<td>-</td>
</tr>
<tr>
<td>E. coli (org/100 mL)$^4$</td>
<td>100</td>
<td>200</td>
<td>-</td>
</tr>
</tbody>
</table>

1 Objective limits are intended targets for plant design and operation and include a factor of safety to reflect variability of treatment performance.
2 Compliance limits are legal limits that the treatment plant must meet. Otherwise the MOE can take legal steps to enforce improvements.
3 Winter limits are defined as when stream temperatures are 5°C or less, normally from December 1 to April 30.
4 Measured as monthly geometric mean density.

The Bathurst Water Treatment Plant (WTP) expansion in New Brunswick wins the 2010 Atlantic Canada Water & Wastewater Engineering / Environmental Project of the Year Award.

R.V. Anderson Associates Limited provided engineering services for expanding the WTP capacity by 150%. Work included retrofitting the existing building envelope; upgrading the existing filters; removing the clarifiers and integrating a new technology for water treatment in the Actiflo process; installing a new low lift pump and variable frequency drive; electronic actuation of all valving; and a new SCADA system.

A key feature of this project’s success was keeping the treatment plant in service throughout construction and commissioning.
EFFLUENT TREATMENT SCENARIOS

To address water quality issues in the Grand River related to the effluent discharge from the Kitchener WWTP, future (2041 design horizon) effluent loading scenarios for the Kitchener WWTP incorporating various potential treatment options were considered for total ammonia-N (NH₃-N), NO₃-N and TP removal. Four basic future treatment scenarios were run for the Kitchener WWTP, with the projected median effluent quality (representing the effluent objective) highlighted in Table 1.

The key findings of the ACS are as follows:

- under current conditions, the summer and fall seasons show the lowest DO river concentrations corresponding to greater frequency of PWQO non-compliance periods (Figure 3);
- the most notable decreases in DO levels occur downstream of the Kitchener WWTP;
- under current conditions, summer and fall UIA concentrations downstream of the Waterloo and Kitchener WWTPs are elevated above the PWQO;
- TP is the only parameter of concern that shows elevated concentrations throughout the study area;
- nitrification and enhanced P removal at the Kitchener WWTP significantly reduce the downstream frequency of DO non-compliance with PWQOs (Figure 4), eliminate elevated UIA concentrations, and reduce the Kitchener WWTP loading of TP to the Grand River; and
- nitrification of NH₃-N results in increases in NO₃-N concentrations in the receiving water, a condition more pronounced in the winter season, but this can be partially mitigated by implementing denitrification.

GRSM model results demonstrate that adoption of the criteria for NH₃-N will ensure that UIA levels will remain below the PWQO of 0.0165 mg N/L downstream of the Kitchener WWTP. Therefore, the Grand River will be a Policy 1 receiver for UIA upstream and downstream of the Kitchener WWTP. Furthermore, even at the rated capacity of the Kitchener WWTP, the new criteria will result in lower downstream TP concentrations than currently experienced. Therefore, the new TP criteria will comply with Policy 2 objectives.

GRSM results demonstrate that nitrification of NH₃-N at the Kitchener WWTP will lead to considerable increases in nitrate-N immediately downstream of the plant, but only slight increases in nitrate-N further downstream at the Brantford intake, where concentrations remain well below the Ontario Drinking Water Standard of 10 mg/L. Furthermore, GRSM results demonstrate that implementing denitrification at the Kitchener WWTP will not improve downstream DO concentrations, and, therefore, will not yield immediate benefits to the Grand River. The proposed effluent criteria for the Kitchener WWTP upgrades to address the MOE Policy Framework are provided in Table 2.

Based on the above results, and in light of the considerable capital program at the Kitchener WWTP, the Region is planning to design the upgrades to the Kitchener WWTP to significantly enhance current performance, with the provision of nitrification and tertiary phosphorus removal to achieve the objectives and criteria recommended in the ACS. Continued monitoring of the water quality in the Middle Grand River coupled with modeling will help improve understanding of the relative contribution that various sources make to the level of nitrate and other nutrients in the Grand River. A comprehensive approach that incorporates the linkages of the key components (sources, controls, water quality impacts, and water quality management decisions) remains central to improving river water quality.
INTRODUCTION

The Regional Municipality of Waterloo initiated a Surface Water Quality Monitoring Program on the Grand and Speed Rivers in 2004 as part of the Region’s Wastewater Treatment Master Plan, initially working with a consultant and later with the Grand River Conservation Authority (GRCA); LGL Limited began work on the Program in May 2009. The program is designed to provide a comprehensive assessment of the water quality in the Grand, Speed and Nith Rivers, upstream and downstream of wastewater treatment plants owned by the Region. As the ultimate receptor of treated wastewater effluent, the Grand River watershed is subject to increasing stress, not only from agricultural runoff, but also from increasing amounts of discharge from wastewater treatment plants associated with population growth in Kitchener-Waterloo, Guelph, and Brantford.

The Program includes four WWTPs that discharge into the Grand River (Waterloo, Kitchener, Preston, and Galt), one WWTP that discharges into the Speed River (Hespeler), and three WWTPs that use the Nith River as their receiving waters (Wellesley, New Hamburg and Ayr). Accordingly, the Region intends to build a long-term water quality database that will allow for efficient monitoring and continual assessment of the impacts of planned wastewater treatment upgrades on receiving water quality over time.

The Program involves collection of composite water samples at three stations in the vicinity of each WWTP, one upstream (reference), one directly downstream of the outfall (near field), and one further downstream where effluent is mixed with surface water (far field) (Figure 1). Samples are collected six times per season over four seasons. Water quality monitoring includes water chemistry analysis as well as an investigation into the in-situ river conditions to investigate the presence of wastewater plumes. Due to the presence of a distinct plume downstream of several wastewater treatment plants, an additional discrete sample from the plume was added to the 2010 sampling program.

The biological communities in the vicinity of these treatment plants are also monitored. The benthic community at each water quality station is monitored using a modified Environmental Effects Monitoring protocol. The fish community at the reference and near field stations is monitored using a boat electrofisher.

2009 RESULTS

GRAND AND SPEED RIVERS

The in-situ data (dissolved oxygen, pH, conductivity, and temperature) gathered from the vicinity of four of the WWTPs along the Grand and Speed rivers showed evidence of a plume downstream of the treatment plants in both the summer and fall seasons. These effluent plumes hugged the bank adjacent to the WWTP outfalls in Waterloo, Kitchener, Preston and Hespeler, impacting water quality at the near field stations. This circumstance was taken into account in future water chemistry sampling efforts in the vicinity of the Grand and Speed river WWTPs and a discrete sample of water in the plume is now collected at these stations.

Phosphorus and nitrate levels in the Grand and Speed rivers were relatively high, independent of the effects of WWTP effluent. Phosphorus levels exceeded the provincial water quality guideline of 0.030 mg/L more than 50% of the time at the locations upstream of WWTPs. The upper reaches of the central Grand exceeded the federal guideline for nitrate (2.93 mg/L) approximately 20% of the time; while the lower reaches, influenced by the Speed River, exceeded the guidelines in more than 40% of the samples taken upstream of the treatment plants (Figure 3). The receiving waters downstream of the Waterloo and Kitchener WWTPs revealed higher levels of phosphorus, chloride, nitrite, un-ionized ammonia and total Kjeldahl nitrogen, as compared to the upstream observations, suggesting potential degradation in water quality. With the exception of chloride, all of these parameters exceeded provincial or federal water quality objectives at the downstream stations on a regular basis (Figure 3). Various metrics and indices (such as species richness, percent tolerant species, and the Hilsenhoff Index) used to evaluate water quality based on the benthic communities confirmed this finding of reduced water quality downstream of these two WWTPs.

The Hespeler WWTP discharges into the Speed River. Of the parameters tested, only nitrite appeared to be significantly higher downstream of the Hespeler WWTP. Chloride levels were relatively
high in the Speed River, independent of the WWTP, however, downstream of the treatment plant, the concentrations of chloride increased to levels that exceeded the guidelines on several occasions. These relatively high levels of chloride and nitrite persisted downstream of the Grand and Speed rivers confluence, at the Preston upstream station. Water quality indices resulting from the benthic community surveys also suggested a reduced water quality downstream of the Hespeler WWTP.

The Preston and Galt WWTPs appeared to have a minimal impact on water quality in the Grand River. Only chloride and total phosphorus levels were significantly higher downstream of WWTPs, when compared to upstream conditions in the summer months of 2009. Water quality indices calculated from the benthic and fish community data showed likewise that water quality downstream of the WWTPs was similar to that upstream.

**NITH RIVER**

The in-situ data gathered from the vicinity of the three WWTPs along the Nith River showed no evidence of plumes downstream of the treatment plants. Several station locations along the Nith were added to the program or changed in 2009, therefore, not all stations were included in all analyses.

Overall, the water quality in the Nith River appears to be less affected by WWTP effluent than in the Grand and Speed rivers. For example, most parameters tested were similar upstream and downstream of the Wellesley WWTP in 2009. While chloride, un-ionized ammonia and nitrate did show significant increases in concentration downstream of the treatment plant in the summer, none of these parameters showed increases in the fall months or in the pooled 2007-2009 data. Downstream of the New Hamburg WWTP, chloride levels were elevated significantly for both summer and fall sampling seasons and for all of the 2007-2009 data. Concentrations of total suspended solids were found to increase downstream of the treatment plant in New Hamburg in the summer months. All chemical parameters tested were similar upstream and downstream of the Ayr WWTP in 2009. Water quality indices calculated from the fish and benthic community data from the Nith River showed conditions upstream and downstream of the WWTPs to be similar in most cases.

**CONCLUSION**

Through the examination of water chemistry, in-situ conditions and biological communities, water quality in the Grand, Speed and Nith rivers has been characterized seasonally for the 2009 sampling season. When compared to previous years’ data, collected by the GRCA and others, results showed little change over time. The Region of Waterloo continues to collect this data with the intention of building a long-term database, to allow for efficient monitoring and continual assessment of the impacts of planned wastewater treatment upgrades on receiving water quality over time. As more data becomes available, trends in water quality will be further analyzed and compared to previous years’ data to determine how these upgrades are influencing the receiving waters of the Grand, Nith and Speed rivers.

**Definitions**

**BENTHIC**

The benthic zone is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers. Organisms living in this zone are called benthos.

**ELECTROFISHER**

An electrofisher is a device used to produce an electric current in electrofishing. Electrofishing is a kind of fishing that uses electricity to stun the fish before they are caught, often used in scientific surveys so that the fish can be studied and returned to the water alive.

**THE HILSENHOFF INDEX**

The Hilsenhoff Index was developed in 1977 by Dr. William Hilsenhoff of the University of Wisconsin - Madison to assess low dissolved oxygen caused by organic loading in streams. Aquatic arthropods and a few other select macroinvertebrates are used to evaluate water quality with a numerical index that allows quantification and assessment of water quality. These organisms appear to be ideally suited for this purpose because they are common in essentially all streams, are easily collected, are not very mobile, are relatively easy to identify, and have life cycles up to a year or greater. Because they are continually exposed during their life cycles to extremes in the environment, they can serve as effective indicators of environmental changes.
The Region of Waterloo began embarking on a plan to upgrade its two large plants, serving the City of Waterloo and the City of Kitchener, respectively. While both plants have adequate rated capacity for projected growth within the community, the age and condition of the plants, the commitment to protect Grand River water quality, the need for reliable biosolids management, and newly-issued legislation for non-toxic effluents all were drivers in the need to spend approximately $450 million in upgrading these two plants.

**WATERLOO WWTP**

The Waterloo Wastewater Treatment Plant (WWTP) provides wastewater treatment for the City of Waterloo. The facility is a conventional activated sludge process with chemical phosphorus removal, anaerobic sludge digestion and chlorine disinfection, with a rated design capacity of 72,730 m³/d. The plant influent is screened and then split into two parallel independent streams, referred to as Stage I and Stage II, with rated capacities of 27,270 m³/d and 45,460 m³/d, respectively. Stage I, commissioned in 1966, is nearing the end of its useful life and is only operated at a nominal flow rate of approximately 15,000 m³/d.

The Waterloo WWTP discharges to the Grand River. The existing Certificate of Approval specifies phasing in for more stringent effluent criteria, such that upgrades to achieve a high level of nitrification are required once the plant flow reaches 54,600 m³/d. Currently, the plant is operating at approximately 47,000 m³/d and growth projections suggest that the Phase II Certificate of Approval flow (54,600 m³/d) will not be reached for more than 20 years.

In light of the condition of the existing Stage I components and the significant environmental benefits of expediting upgrades to full nitrification, the Region initiated a project to upgrade the Waterloo WWTP. This project will provide a capacity of 57,500 m³/d at the Waterloo WWTP. It will provide capacity for more than 25 years, based on current growth projections in the service area. With the upgrades, compliance for effluent ammonia-nitrogen will be 2 mg/L in the summer and 4 mg/L in the winter.

Key components of the project include:
- new administration facilities;
- construction of a new, integrated headworks and raw wastewater pumping station;
- provision of facilities to provide flexibility for chemically enhanced primary treatment (CEPT);
- decommissioning of Stage I and upgrading the Stage II aeration tanks to provide a high level of year-round nitrification;
- installation of a UV disinfection system to replace the existing chlorine disinfection facility;
- effluent pumping station;
- retrofit of the Stage II secondary digester to operate as either primary or secondary digester; and
- construction of new biosolids handling systems consisting of waste activated sludge (WAS) thickening, biosolids dewatering and truck loading facilities.

**FIGURE 1: Process flow schematic of Waterloo WWTP secondary treatment upgrades**
The new centrifuge dewatering system being installed as part of this upgrade will produce a high strength centrate which will require treatment either separately or combined with the primary effluent at the plant. Due to the unique characteristics of centrate, which includes high temperatures (30 to 35 °C) and very high ammonia concentrations (typically 15-20% of plant loading), there is opportunity to utilize this stream to produce an enhanced nitrifier population to ‘bio-augment’ the conventional activated sludge system and reduce the overall footprint of the upgraded plant.

The preferred strategy to manage centrate and bio-augment the nitrification performance of the secondary plant involves installation of a new return activated sludge (RAS) re-aeration cell upstream of the Stage II aeration tank. The cell will blend centrate with RAS and provide adequate air and retention time to degrade the majority of the ammonia in the centrate prior to blending with primary effluent for treatment in the Stage II aeration tanks. Flexibility is provided in the design to direct a portion or all of the primary effluent into the RAS reaeration tank.

To improve settling characteristics and enhance opportunities for step-feeding during wet weather, the upgrade also includes a retrofit to the existing Stage II aeration tanks to a 3-pass plug flow design, by incorporating a third-pass in the distribution channel between parallel aeration tanks. This provides approximately 40% additional aeration volume compared to the existing tankage.

The project is being constructed under four separate contracts. Contract 1 included the new administration building and is complete. Contract 2 includes the new UV disinfection facilities and blower building is under construction, scheduled for completion in summer 2011. Contract 3 (headworks and biosolids) has recently been tendered and Contract 4 (secondary treatment and digestion) is scheduled to tender in April 2011. Figure 2 shows the overall site plan of the upgrades. It is expected all plant upgrades will be completed by August of 2013.

**FIGURE 2: Waterloo WWTP upgrades site plan**

**KITCHENER WWTP**

The Kitchener WWTP is a conventional activated sludge plant with anaerobic digestion, and provides treatment capacity to a population of 220,000. The first phase of the plant, including the Plant 1 aeration tanks and clarifiers, was constructed in 1963, and the second phase, including new headworks and Plant 2, was constructed in 1977. Since that time, the plant has been maintained and operated well; however, there have been no major upgrades in the last 30 years. The current rated capacity is 122,800 m³/d, and the plant is operating at approximately 60% of its capacity.

The Kitchener WWTP is located in a valley on the Grand River, and surrounded by a residential community around the plant and across the River. The Region historically stored liquid biosolids from the Kitchener WWTP and other Regional plants in large seasonal storage lagoons located on the site, drawing the attention of the community particularly during warmer weather, due to odours. During the EA process for the construction of the biosolids storage lagoons in the late 1980s, it was recommended that biosolids from other plants be received in the lagoon from a receiving station approximately 3 km away, located at Manitou Drive, in a predominantly industrial area, and biosolids were pumped from the lagoons to the receiving station, from where they were hauled for disposal. This was practiced for a number of years, but, in 2008, the Region changed the overall management of biosolids in order to minimize odours from the biosolids storage lagoons. Currently, only biosolids generated at the Kitchener WWTP are stored in the lagoons. Biosolids generated at other plants are either dewatered and hauled to a landfill or applied directly on to agricultural fields when conditions are favourable.

In the last three years, the Region initiated the following projects to address more demanding concerns:

- A new biosolids dewatering facility is being constructed at the receiving station located at Manitou Drive, so that the liquid storage lagoons will not need to be used in the future.
- The Region is upgrading Plant 2, so that the additional ammonia load from the dewatering centrate will not increase ammonia in the effluent discharged to the Grand River. The Plant 2 retrofit includes modifications to turn the complete mix tanks into a plug flow reactor with a RAS re-aeration and anoxic zones, removal of the mechanical aerators, and replacement with a fine bubble aeration system, similar to the process being proposed for the Waterloo WWTP.
- A new UV system is being installed to eliminate chlorine from the effluent.
- A new effluent pumping station to allow for more efficient operation during periods of high influent flows/and or high river water levels.
While the development of these projects was ongoing, the Region initiated an assimilative capacity study of the Grand River to determine what the effluent limits would be for the next major upgrade phase. Based on the results of that study, it has been recommended that the plant be upgraded to achieve 0.2 mg/L phosphorus in the final effluent and year round ammonia removal achieve objectives of 5 mg N-NH₄/L (ammonia) during freezing periods and 2 mg N-NH₄/L during non-freezing period. Potential requirement for denitrification will be evaluated after the upgrades are complete, based on continued seasonal sampling of water quality in the Grand River and update of the assimilative capacity study at that time (see Renzetti et al, page 38 of this edition).

Given the age and condition of Plant 1, this plant will be decommissioned. In addition, in light of the new effluent ammonia criteria and the higher peak factor than the original plant design, Plant 2 capacity will be down-rated to approximately 45,000 m³/d, compared to the original capacity of 62,000 m³/d. A new 78,000 m³/d Plant 3 will be constructed. This will provide the remaining necessary secondary capacity. In addition, a tertiary phosphorus removal process will be constructed.

The technologies and design approach for the new upgrades are currently being developed through the preparation of a Site-Wide Facility Plan. That plan will identify technologies, layouts, design concept and cost for all of the upgrades that will occur at the Kitchener WWTP, and include:

- decommissioning of the biosolids storage lagoons;
- a new headworks facility, including screens, grit removal, grit and screenings handling and odour control;
- a new secondary treatment plant to achieve complete nitrification, which is also compatible with potential future upgrading for denitrification;
- a new tertiary phosphorus removal process;
- a new waste activated sludge (WAS) thickening process;
- upgrades to the anaerobic digester structures, heating and mixing, and upgrades or new processes to address the current capacity limitation; and
- other plant upgrades to address deficiencies in Plant 2, to maintain Plant 1 in operation during construction, and to provide overall site security, communication, SCADA and health and safety.

There are a few key goals that will help to shape the plan for this new significant upgrade of the Kitchener WWTP site, including:

- minimizing disruption and aesthetic impacts to the community during construction and long-term operation, and, in particular, controlling odours during lagoon decommissioning;
- maximizing sustainability, considering technologies for energy and resource recovery, and implementing features to minimize carbon footprint; and
- providing an integrated facility that blends existing and new processes into one plant that will provide reliable and effective service to beyond 2041.

The Site-Wide Facility Plan is scheduled for completion in spring 2011, and the pre-design will be completed in spring 2012. Detailed design and construction through several contract packages is planned to be completed by 2017.

FIGURE 3: Aerial photo of the Kitchener WWTP
(Photo courtesy of Stantec, Middle Grand River Assimilative Capacity Study - 2010, Region of Waterloo)
INTRODUCTION
On Thursday, October 14, 2010, there was a grand opening and ribbon-cutting ceremony at the Plummer, Idaho wastewater treatment plant (Plummer WWTP). This completely new plant replaced an old lagoon plant for a small town (see Figure 1). Upon startup, the plant is achieving <0.050 mg/L total phosphorus, with a chemical dose of only 10 mg/L iron for the entire plant.

Plummer, Idaho arrived at a total phosphorus limit of <0.050 mg/L to protect water quality in the river that flows through town and makes its way into Lake Coeur d’Alene. This low-phosphorus discharge concentration was agreed upon through cooperation with the United States Environmental Protection Agency (EPA), the Idaho Department of Environmental Quality, and the local Coeur d’Alene Tribe. The entire Lake Coeur d’Alene, Idaho and Spokane River, Washington watershed area is a region heavily impacted by nutrient loading, particularly phosphorus (from both point and non-point sources?). The same impact can be seen in the Grand River and Lake Simcoe Watersheds.

SYSTEM DESIGN
The new WWTP is a packaged biological nutrient removal (BNR) plant, with sequencing aeration and continuous clarification, including an anaerobic selector. The secondary system is intended to lower phosphorus to <1 mg/L biologically. This is followed by tertiary reactive filtration for phosphorus removal and UV disinfection. Final future design flow for the plant is 1200 m³/day.

The tertiary reactive filtration system consists of two continuous backwash, upflow filters, with hydrous ferric oxide (HFO) coated sand for adsorption of phosphorus (commercially known as Blue PRO®, Blue Water Technologies, Inc.) arranged in series. The reject streams from both filters are recycled to the secondary system that allows for the uptake of phosphorus by the excess adsorptive capacity leftover in the HFO waste particulates. The final fate of the HFO particulates is in the waste solids.

Performance testing at the plant was complete in October, 2010, with results at 0.020-0.024 mg/L total phosphorus in the final effluent. Additionally 24-hour composite testing for seven consecutive days produced an average result of 0.036 mg/L total phosphorus. As plant operations stabilize, the effluent concentration is expected to drop further.

In the reactive filtration system, ferric sulfate or ferric chloride is dosed in front of the filters to allow the continuous regeneration of the HFO coated sand. At Plummer, this iron dose is 6 mg/L as Fe in the first filter, and 4 mg/L as Fe in the second filter. Besides this 10 mg/L Fe, there is no other phosphorus removal chemical dosed in the system, and no pH adjustment is necessary.

CHEMICAL DOSING
Traditionally, phosphorus removal to low levels has been accomplished through dosing of chemicals based on a molar ratio of the metal coagulant to phosphate. This led to the generally accepted premise that large chemical doses were required to reach low phosphorus concentrations, often in several chemical addition points throughout the plant, and the final concentration was limited by the solubility constant of the metal-phosphorus precipitate. Consequently, chemical sludge production at the plant would be considerable. This multi-point chemical addition scheme is depicted in Figure 2 (Metcalf and Eddy, 2003).

With reactive filtration, the system relies on adsorption as the removal mechanism. The chemical dose is based on coating the sand, not on a stoichiometric relationship. Diffusion limitations are overcome by using the sand bed to force contaminants into contact with reactive media surfaces, unlike bulk solution chemical dosing. Equilibrium limits are overcome with the adsorption column effect — as the water...
FIGURE 2: A typical alum multi-point dosing scheme for phosphorus removal, showing aluminum to phosphorus molar ratios.

FIGURE 3: Chemical dosing for reactive filtration at the Plummer, Idaho WWTP, with a whole plant effective molar ratio of 0.7 Me:P.

FIGURE 4: Annual phosphorus removal chemical costs (C$), per 1000 m³/day
For three different treatment technologies and several total phosphorus discharge targets.

FIGURE 5: Annual chemical sludge production, in 1000 kg dry sludge per 1000 m³/day
For three different treatment technologies and several total phosphorus discharge targets.
moves up through the bed, the solution concentration is decreased, driving equilibrium in the system’s favor. For all of these reasons, reactive filtration can achieve extremely low total phosphorus concentrations with a low metal salt dose across the entire plant (Leaf and Johnson, 2006; Newcombe and Hart, et al., 2008; Newcombe and Rule, et al., 2008; Sutton and Schraa, et al., 2009). At the Plummer WWTP, the effective molar ratio for the whole plant is 0.7 Me:P (see Figure 3).

Since reactive filtration only requires chemical dosing to the tertiary system, an appropriate comparison with other technologies would look at chemical dosing used throughout the entire plant, and the corresponding phosphorus removal across the system and chemical sludge production at the plant. These effects are rarely analyzed in pilot projects for low level phosphorus, which usually focus exclusively on the tertiary treatment step. Recently, a study on chemical dosing across wastewater plants has been completed, including doses to reach various effluent phosphorus concentrations and the resultant sludge production. The results are summarized in two charts, Figures 4 and 5.

The first chart (Figure 4) shows the cost of chemical addition for phosphorus removal to various targets with three different treatment options: 1) dosing alum into an existing secondary system; 2) multi-point dosing of alum across a plant (primary, secondary, and tertiary); and 3) reactive filtration. The second chart (Figure 5) shows the chemical sludge production for each of the three treatment scenarios; the sludge produced by chemical addition can add significantly to the overall cost of treatment at a plant. These examples include neither the cost of polymer addition for sludge handling nor the cost for pH adjustment, which may be necessary for systems using alum. Note that 0.3 mg/L P was considered the cutoff for requiring tertiary treatment – the costs shown do not include the capital cost of tertiary equipment for the 0.1 and 0.036 mg/L P scenarios. For the reactive filtration system, a single-pass filtration system was used for phosphorus targets down to 0.1 mg/L. For the 0.036 mg/L P target, a series system was assumed with conservative doses of 10 mg/L Fe per filtration step; this is roughly twice the optimized chemical dose being used at the Plummer WWTP.

Since the iron chemical dose for reactive filtration is low, UV disinfection may be installed for alternative disinfection. The iron effluent concentration is similar to the natural background level for some waters, at 0.1-0.3 mg/L Fe. Diffusivity for UV light is not interrupted, and the quartz sleeves are not unduly fouled. UV disinfection adds the benefit of no disinfection byproducts.

**SUMMARY**

The Plummer, Idaho WWTP is an example of a straightforward solution to an advanced wastewater treatment problem. The modular reactive filtration technology can easily be scaled to larger flows with no loss in treatment efficacy; a plant with 44,000 m³/day peak flow is currently under construction in Massachusetts. It is important to understand all of the costs of a potential advanced treatment technology, and to consider all of the chemical dosing at a plant when making comparisons. Excellent water quality is attainable at low operating and maintenance expense.

**REFERENCES**


Figures and photograph courtesy Blue Water Technologies, Inc. For more information, visit www.blueh2o.net.
Introduction

In 1993, Environment Canada, along with Health and Welfare Canada, published a **Priority Substances List Assessment Report** concerning chlorinated wastewater effluents. They concluded that chlorinated wastewater effluents were toxic, as defined under paragraph 11(a) of the **Canadian Environmental Protection Act (CEPA-1999)**. In 1999, inorganic chloramines and chlorinated wastewater effluents were officially added to the List of Toxic Substances, Schedule 1 of **CEPA (1999)**.²

Subsequent to this declaration, a **Notice Requiring the Preparation and Implementation of Pollution Prevention Plans for Inorganic Chloramines and Chlorinated Wastewater Effluents** was published in 2004 by the Federal Minister of the Environment. This Notice applied to any person who owned and operated a wastewater system at the time of publication of the **Notice**, where the effluent released during either 2004 or 2005 was greater than or equal to 5000 m³ per day, based on an annual average. As well, in order for the **Notice** to apply, the concentration of total residual chlorine (TRC) in the effluent released to surface water needed to exceed 0.02 mg/L in any sample during the same period, based on representative sampling.

The risk management objective for this **Notice** was to achieve and maintain a concentration of TRC that is less than or equal to 0.02 mg/L in the effluent released to surface water by December 15, 2009.

Cobourg facilities

The Town of Cobourg owns and operates two municipal wastewater treatment facilities, known as Water Pollution Control Plant No. 1 (WPCP#1) and Water Pollution Control Plant No. 2 (WPCP#2). WPCP#1 is a Conventional Tertiary Treatment Activated Sludge Process and WPCP #2 is a Conventional Secondary Treatment Activated Sludge Process.

During the period from May 15-November 15, the effluent is disinfected with chlorine gas. In 2004, the average flow rate of the effluent was 9047 m³/day and 6047 m³/day for WPCP#1 and WPCP#2, respectively. The maximum TRC observed at WPCP#1 in 2004 was 2.20 mg/L and 1.88 mg/L at WPCP#2, with the Certificates of Approval requiring a minimum TRC of 0.5 mg/L.

Due to the above activities, the Town of Cobourg was required to prepare and implement a pollution prevention (P2) plan with respect to inorganic chloramines and chlorinated wastewater discharged from the wastewater treatment plant. The objective of this P2 plan, as it applied to the Town of Cobourg, was to significantly reduce or eliminate the quantity of inorganic chloramines and chlorinated wastewater discharged from the wastewater treatment plant.

The Town of Cobourg installed Severn Trent Services Sulfur Dioxide (SO₂)-based dechlorination systems at both facilities that were operational by December 15, 2009. The pre-dechlorination and post dechlorination total residual chlorine levels were determined on a spectrophotometer, the HACH DR4000.

The post-dechlorination TRC results obtained at both treatment facilities during 2008 and 2009 showed random and inconsistent high readings, resulting in non-compliance of the <0.02 mg/L TRC limit in the **Notice**.

In order to determine the cause of this and to show compliance with the **Notice**, an in-house method validation was performed on the DR4000. A method validation is a quality assurance process that provides a high degree of assurance that a method performed on a particular analytical instrument accomplishes its intended requirements by meeting the stated manufacturer method detection limit (MDL). The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte (chlorine) concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.³ The DR4000 spectrophotometer has a manufacturer stated MDL of 0.01 mg/L.¹

**Instrumentation – spectrophotometry**

A spectrophotometer is a device for measuring light intensity as a function of the light source wavelength. The DR4000 model is a single-beam spectrophotometer that measures the relative light intensity of the beam before and after a test sample is inserted. It is a direct-read instrument, where the level of light intensity read at a certain wavelength correlates to the concentration of a certain analyte (chlorine) based on preprogrammed calibration curves.³
For HACH Method #8167, Total Chlorine DPD (N, N-diethyl-phenyl-enediamine), the chlorine present in a sample immediately reacts with the DPD indicator to form a pink colour, with the intensity of the colour being directly proportional to the chlorine concentration. The method validation for the HACH DR4000 consisted of running eight spiked de-ionized water samples. The samples were spiked with a purchased low-range voluette chlorine standard that was prepared by generating and dissolving chlorine gas in slightly alkaline, high-purity water of zero chlorine demand. Eight blank samples were also analyzed, with the average blank measurement subtracted from each sample measurement. Through a statistical analysis of the sample results, the standard deviation was determined as well as the one-sided t-distribution. The t-distribution was multiplied with the calculated standard deviation to determine the MDL. The in-house MDL was determined to be 0.037 mg/L and, therefore, did not meet the required level <0.02 mg/L for the Town of Cobourg.

After much discussion with other municipalities and extensive research of residual chlorine analysis techniques, the Town of Cobourg decided to purchase a HACH AutoCAT9000 amperometric titrator on a conditional basis. The condition being that, if the instrument, under in-house conditions, met the stated factory detection limit of 0.0012 mg/L or the <0.02 mg/L limit required in the Notice, then the unit would be purchased; if it did not it would be shipped back to the manufacturer.

**Instrumentation – amperometric (forward) titration**

The Town of Cobourg adds chlorine to their effluent as a gas (Cl₂), where it rapidly hydrolyzes or splits into hypochlorous acid (HOCl), also known as free chlorine:

\[ \text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{H}^+ + \text{Cl}^- + \text{HOCl} \]

Amperometric titration requires the presence of two substances in a liquid solution; one that can be oxidized at the anode (a titrant solution) and one that can be reduced at the cathode (chlorine). A small current is applied across these two oppositely charged electrodes in the solution and a reducing agent or titrant (phenylarsine oxide or PAO) is slowly added. If there is a chlorine residual, there will be a current across the cell. However, as the titrant is added, chlorine is reduced at the cathode as the PAO is oxidized from the +3 valence to +5 valence at the anode, as shown in this equation:

\[ \text{PAO} + \text{Cl}_2 + 2\text{H}_2\text{O} \rightarrow \text{PAO(OH)}_2 + 2\text{Cl}^- + 2\text{H}^+ \]

In a forward titration, the measured current starts at a high initial value. As long as there is free chlorine present in the sample being titrated, the current flows across the electrodes, albeit in lower and lower amounts. When the free chlorine has all reacted, the rate of current change across the electrode is zero (the current is constant) and the end point of the titration is reached. Since the amount of PAO used in the titration process to the end point is proportional to the original chlorine concentration in the sample, it is possible to calculate the chlorine concentration.

The free chlorine also reacts readily in wastewater with ammonia (NH₃) to form combined chlorine, referred to as chloramines:

\[ \text{NH}_3 + \text{HOCl} \leftrightarrow \text{NH}_2\text{Cl} \text{ (monochloramine)} + \text{H}_2\text{O} \]
\[ \text{NH}_2\text{Cl} + \text{HOCl} \leftrightarrow \text{NHCl}_2 \text{ (dichloramine)} + \text{H}_2\text{O} \]
\[ \text{NHCl}_2 + \text{HOCl} \leftrightarrow \text{NCl}_3 \text{ (trichloramine)} + \text{H}_2\text{O} \]

To titrate and analyze for combined chlorine (chloramines) residuals with the amperometric technique, it is necessary to convert the chloramines to an equivalent amount of triiodide, I₃⁻. The end point is reached when the triiodide is reduced to iodide 3I⁻. The method validation for the HACH AutoCAT9000 consisted of running seven spiked samples. An analysis of blank samples was not required, as this method does not utilize a blank value. The same statistical analysis of the sample results was applied here as for the DR4000, and the MDL was determined.

The in-house MDL was determined to be 0.0017 mg/L and well within the range needed to meet the required level in the Notice of <0.02 mg/L.

The proven <0.02 mg/L capabilities of the AutoCAT9000 will now allow the Town of Cobourg to collect a chlorination/dechlorination season’s worth of data to be submitted to Environment Canada, showing compliance with the proposed regulation.
In response to Environment Canada’s Notice that inorganic chloramines and chlorinated wastewater effluents were defined as toxic under CEPA (1999), the Town of Cobourg installed dechlorination systems at both of its treatment plants to reduce or eliminate the levels in their effluent.

The total residual chlorine levels were determined on a spectrophotometer (the HACH DR4000). A method validation discovered that the in-house MDL was different than that shown in the manufacturer’s literature at 0.037 mg/L and, thus, did not meet the required level for the Town of Cobourg of <0.02 mg/L. In response to this discovery, a HACH AutoCAT9000 amperometric titrator, with a factory stated detection limit of 0.0012 mg/L, was conditionally purchased, validated and shown to achieve a lower limit of 0.0017 mg/L.

With this proven MDL, the Town of Cobourg will be purchasing a second AutoCAT9000 amperometric titrator, so that both WPCP#1 and #2 will have an instrument to collect a season’s worth of dechlorination data. Once the data is collected, an amendment to the previous report will be submitted to Environment Canada showing compliance with the 0.02 mg/L limit for TRC.

Conclusions

Historically, the two most common methods for determining TRC in wastewater effluent were the DPD method and the manual amperometric titration method. The DPD method is inexpensive and user-friendly, but prone to colourimetric interferences and resulting poor low-level sensitivity. The manual amperometric titration is more accurate and capable of the lower limits, but requires a higher level of training and skill to produce the required accuracy. The new automatic amperometric titrators are easier to use, allowing the operator to simply obtain a sample and automatically conduct the test. As well, the cost of some automatic amperometric titrators has decreased from $5000 to $3500 within the last five years, and is becoming more feasible for the smaller municipalities to purchase. With these advances in automatic amperometric titration technology and at a lower price, it will hopefully be more economical for smaller treatment facilities to obtain the instrumentation required to achieve the 0.02 mg/L limit for TRC, as it has proven to be for the Town of Cobourg.

### Summary

In response to Environment Canada’s Notice that inorganic chloramines and chlorinated wastewater effluents were defined as toxic under CEPA (1999), the Town of Cobourg installed dechlorination systems at both of its treatment plants to reduce or eliminate the levels in their effluent.

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### Table 1.0: DR4000 Spike Measurements

<table>
<thead>
<tr>
<th>Sample</th>
<th>Results (spike = 0.2632 mg/L)</th>
<th>Blank Correction (mg/L)</th>
<th>Deviation from the mean squared</th>
<th>% Recovery</th>
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<td>MDL (sd* t value n-1)</td>
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Note: the t-value for 7 degrees of freedom (n-1) is 2.998

### Table 2.0: AutoCAT9000 Spike Measurements

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<th>% Recovery</th>
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<tr>
<td>Standard Deviation</td>
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<tr>
<td>MDL (sd* t value n-1)</td>
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<td>0.001678387</td>
<td></td>
</tr>
</tbody>
</table>

Note: the t-value for 7 degrees of freedom (n-1) is 3.14

### End notes


The air operated diaphragm pump is superior to centrifugal and helical screw pumps for Clarifier and Thickener underflow. It works better than mechanically or hydraulically operated pumps because of its control simplicity and evenly distributed power transmission.

ICR Water Technologies Inc.
Orillia, Ontario
Phone/fax: 888-281-7774
www.icrwatertechnologies.com
Lots of reason to wave the Canadian flag

By Vincent Nazareth, WEF Delegate 2008-2011 and Tim Constantine, WEF Delegate 2009-2012

- More than 17,000 water professionals and over 900 exhibitors attended WEFTEC® 2010
- Cordell Samuels was elected WEF vice-president
- Quebec students win the Stockholm Junior Water Prize

WEFTEC®2010 drew a total of 17,515 water professionals and 984 exhibitors to the annual event held this year in New Orleans, Louisiana. Held at the New Orleans Memorial Convention Center in New Orleans from October 2-6, 2010, this year’s attendance is only marginally down from Orlando in 2009, in spite of the continuing turmoil in the US economy. However, the exhibition floor space registered a record-breaking 295,000 net square feet of exhibition space, exceeding the previous record set in 2008 in Chicago by some 5,700 square feet.

The well-attended opening general session featured author Steven Solomon, who also shared insights from his book, *Water: The Epic Struggle for Wealth, Power, and Civilization*. Specifically, Solomon called for a new paradigm of sustainable water management and recognized water professionals as leaders in the effort to avert an impending water crisis. “[Water professionals] are the vanguard drivers of this revolutionary business of inventing a new paradigm for the age of water scarcity,” he said. “You alone possess the expertise and everyone is looking to you for leadership and wise solutions.”

This year’s technical program had 112 technical sessions and 33 workshops, nine facility tours, and several high profile events. The opening general session on Monday featured keynote presenter Dr. Mike Magee, who gave an insightful presentation about the nexus between access to potable water and public health. Referencing his book, *Healthy Waters: What Every Health Professional Should Know About Water*, Magee highlighted the facts and figures about water and its enormous impact on quality of life and public health.

On Tuesday, October 5, outgoing president Paul Freedman ceremoniously ‘passed the gavel’ of Federation leadership to incoming president Jeanette Brown and inducted the 2010-2011 WEF officers and Board of Trustees.

WEF’s new vice-president is Cordell Samuels. Cordell has been on the Board of Trustees at WEF since 2007 and his nomination as vice-president was endorsed by the House of Delegates on Saturday October 2, 2010. This culminates a long history of volunteer work for Cordell that has included several positions for WEAO and WEF over the past 20 years. In Los Angeles (2011), Cordell will become president-elect, and will take the reins as president in 2012 in New Orleans.

If you have any issues or concerns that you would like to have raised with WEF, please contact either Vincent Nazareth (vnazareth@rvanderson.com) or Tim Constantine (tim.constantine@cb2m.com).

2010 WEAO Icebreaker Report

Michael Albanese, Co-Chair, Planning & Events Committee, michael@h2flow.com

This year’s icebreaker was held at the Court of Two Sisters in New Orleans. Julie Vincent picked this venue and I think she did well. The location featured a beautiful open courtyard with overhanging trees, tropical plants, fountains and a wishing well. It was a beautiful, warm evening and it was perfect weather.

Attended by over 275 people from all over Canada, the icebreaker was successful. It is the once a year occasion for everyone across the provinces to get together in our own private setting.

Special guests included WEF past-presidents Rhonda Harris and Michael Read.
I hope everyone took notice that we had more than one bar this year. We did not want to make the same mistake as in Orlando. In true Canadian style, it proved that one bar was not enough for this type of crowd.

Hopefully, everyone enjoyed the great selection of food on hand. I find it difficult to eat anything at these types of events, as everyone is busy talking to each other and getting caught up on things with people you have not seen in a while.

I know many people continued the party afterwards, as we saw plenty of familiar faces on Bourbon St. later in the evening (some in better shape than others).

Thanks for all the positive reviews we had from everyone. We can only hope to have a similar venue for the icebreaker when WEFTEC is in Los Angeles.

Operations Challenge  
– WEFTEC 2010 in New Orleans

The Water Environment Association of Ontario was represented by three teams at WEFTEC’s 22nd Operations Challenge, held in New Orleans, Louisiana October 2-6, 2010. Ontario Clean Water Agency’s (OCWA) Jets, The Region of Durham’s Sludge Hammers and the C’raptors all competed in the event. Another entry from Canada was Canadian Cross Connection, representing the British Columbia Water and Wastewater Association.

All three Ontario teams competed in Division 2 against 26 other teams from the United States and Argentina. Teams competing in Division 2 may be first-time competitors in the WEF Operations Challenge or have members that are new to the competition. Teams in Division 1 have previously placed first, second or third overall in Division 2, or first in any event Division 2.

Ontario’s OCWA Jets ranked 5th overall in the field of 26, moving up two spots from their 2009 placement. The Jets had a 2nd place finish in the new lab event which enabled them to take some hardware home with them. Both the Sludge Hammers and C’raptors excelled at the collection event placing 6th and 8th and finishing 14th and 20th overall, respectively.

Winners are determined by a weighted point system for five events: collection systems, laboratory, process control, maintenance and safety. The events are designed to test the diverse skills required for the operation and maintenance of wastewater treatment facilities, their collection systems and laboratories – all vital to the protection of public health and the environment.

The Virginia Water Environment Association had teams placing first in both divisions. Terminal Velocity won Division 1 (10 teams) and Team HRSD was the Division 2 champion.

Operations Challenge competition was held in conjunction with the Water Environment Federation’s 83rd annual technical exhibition and conference. It is the largest water quality event in North America and largest annual water quality exhibition in the world.

Congratulations go to the members of all teams representing WEAO:
• The Ontario Clean Water Agency’s OCWA Jets: Coach Dennis Rau, Marcel Misuraca, Tom Nicol, Michael Paola, and Alan Robdup;
• Sludge Hammers: Coach Jeff Lang, Jamie Gratrix, Andy Griffin, Wade Hunt, and Scott Meier; and,
• C’raptors: Patrick Coleman, Tyson Ferreira, Chris McDonald and Dave Smith.

Teams earned the right to compete in New Orleans by competing at the Ontario Operations Challenge competition held in London in April 2010. This year, the 21st year of the Operations Challenge in Ontario will be held as part of the 40th annual WEAO Technical Symposium and OPCEA Exhibition April 10-12, 2011 at The Westin Harbour Castle, Toronto.

To find out how to enter a team or volunteer to judge the events, please go to: http://www.weao.org/committees/operations_challenge/Operations_Challenge.html

Here you will find information, updates and contact information for the 2011 Operations Challenge Committee Chair Norma Linkiewicz. You can also email her at norma.linkiewicz@niagararegion.ca.
ONE WORLD.
ONE WATER ENVIRONMENT.

WEAO Technical Symposium
and OPCEA Exhibition

APRIL 10-12, 2011
THE WESTIN HARBOUR CASTLE
TORONTO, ONTARIO

40TH ANNIVERSARY
YEARS

THE LARGEST CANADIAN TECHNICAL CONFERENCE FOR THE WASTEWATER INDUSTRY
<table>
<thead>
<tr>
<th><strong>Conference AT A GLANCE</strong></th>
<th><strong>April 10-12, 2011</strong></th>
</tr>
</thead>
</table>

### Monday, April 11, 2011
- 8:00 a.m.-4:00 p.m. Conference Registration
- 7:30 a.m.-8:30 a.m. Morning Coffee
- 8:30 a.m.-9:30 a.m. Keynote Speaker
- 9:30 a.m.-10:00 a.m. Coffee Break
- 10:00 a.m.-3:15 p.m. PWO Workshop
- 10:00 a.m.-12:00 p.m. Technical Sessions
- 12:00 p.m.-2:00 p.m. Awards Lunch
- 2:00 p.m.-5:00 p.m. OPCEA Exhibition
- 2:00 p.m.-4:00 p.m. Ops Challenge - Process Control Exam
- 2:15 p.m.-3:15 p.m. Technical Sessions
- 3:15 p.m.-4:15 p.m. Coffee Break
- 4:15 p.m.-5:15 p.m. Technical Sessions
- 4:15 p.m.-5:15 p.m. Student Panel Discussion
- 4:00 p.m.-5:00 p.m. PWO Meet and Greet
- 5:00 p.m.-7:00 p.m. OPCEA Reception

### Tuesday, April 12, 2011
- 8:00 a.m.-1:00 p.m. Conference Registration
- 7:30 a.m.-8:30 a.m. Morning Coffee
- 8:30 a.m.-9:30 a.m. Technical Sessions
- 9:00 a.m.-5:00 p.m. OPCEA Exhibition
- 9:00 a.m.-3:00 p.m. Operations Challenge
- 9:00 a.m.-12:00 p.m. Operator Certification Exams
- 9:30 a.m.-10:30 a.m. Coffee Break
- 10:30 a.m.-11:30 a.m. Technical Sessions
- 11:30 a.m.-1:30 p.m. Lunch
- 1:30 p.m.-3:30 p.m. Technical Sessions
- 1:30 p.m.-3:30 p.m. Operator Certification Exam - Water
- 3:30 p.m.-4:00 p.m. Coffee Break
- 3:30 p.m.-4:00 p.m. Ops Challenge Awards
- 4:00 p.m.-5:00 p.m. Totally Wasted Game Show
- 6:00 p.m.-7:00 p.m. Pre-Banquet Reception
- 7:00 p.m.-10:00 p.m. Conference Banquet
EXCITING NEWS RELATING TO CORDELL SAMUELS AND CARRIE HUMPHREY (VINCENT)

A n important update regarding Carrie Vincent; you will remember Carrie as the administrative assistant with WEAO for six years and also the daughter of Julie Vincent, WEAO Executive Administrator. As many of you know, Carrie moved to Edmont on in June 2009 with her then-fiancé, Roger Humphrey, who was pursuing an excellent career opportunity. She has since secured an excellent position herself; working for the Edmonton Police Department in the Security Clearance Office.

Carrie and Roger were married on March 17, 2010 in a civil ceremony performed by the Mayor of Banff at the Banff Springs Hotel. At that time, only the couple’s parents, Carrie’s brother Stuart Clark, and his wife Shelly Clark, a.k.a. the maid of honour, were able to witness the ceremony. Carrie and Roger were unable to share their commitment to each other with as many friends and family as was their wish, but they knew in the back of their minds that all would be well, since Cordell Samuels had already graciously promised them that he would perform a blessing and renewal of their vows later in the year. Cordell is an ordained minister with The Church of God in Ontario. He attends the Agincourt Church of God in Toronto.

Cordell is well-known throughout WEAO, since he has been an exemplary member and a significant force in the association since 1993. He was instrumental in organizing the Operations Challenge competition in Ontario for many years. He then served WEF for many years in differing roles surrounding the organization of the international Operations Challenge competition held annually at WEFTEC. He has been an extremely dedicated volunteer for WEAO, serving as Water Environment Federation (WEF) delegate from 2002-2004, WEAO vice-president from 2004-2005, and president from 2005-2006.

After his year as WEAO immediate past-president, he did not rest. Cordell became a member of WEF’s Board of Trustees in 2007, has been elected to the position of WEF vice-president, and will serve as its president from October 2012-October 2013. Cordell was presented with the WEF Hatfield Award in 1995 and the WEF Bedell Award in 2008 and is a member of the SS Society.

So, on a beautiful late summer day, Cordell kept his word and Carrie Humphrey (nee Vincent) and her husband Roger pledged their commitment to each other in a blessing and vow ceremony performed by Cordell, with as many family members and friends as were able to attend. They came from England, the United States, New Brunswick and British Columbia, as well as Ontario. The day was truly blessed in so many ways.

CANADIANS WIN STOCKHOLM JUNIOR WATER PRIZE

T he 14th annual international competition for the Stockholm Junior Water Prize concluded with the final awards presentation. The winners were Alexandre Allard and Danny Luong from Canada who received the prize from H.R.H. Crown Princess Victoria of Sweden at a ceremony during World Water Week in Stockholm. Their winning research was on biodegradation of the plastic polystyrene.

According to the international jury in its citation, “Every year, more chemical debris is introduced in the environment and water bodies around the world. Research has shown that these chemicals can release toxics into the water, can be harmful for the environment, and can be deadly to life in water. Much of the debris in the world’s waterways is plastic, which is used for things like fast food containers, disposable cups, and packing material. To date, there is no natural solution to safely take care of this harmful substance. The winning project created a novel approach to breakdown these plastics using microorganisms and enzymes that are cost effective and readily available. This method could greatly reduce the amount of plastics that end up in the world’s waters.”

“Expanded Polystyrene (EPS) is a great threat to the environment since it contributes to the spread of toxins such as styrene and bisphenol A into our waters. We hope that our method will be widely used and consequently increase the water quality in the world,” said the winners after receiving the prize.

The international Stockholm Junior Water Prize competition brings together the world’s brightest young scientists to encourage their continued interest in water and the environment. Each year, thousands of participants in over 30 countries join national competitions for the chance to represent their nation at the international final, held during World Water Week in Stockholm, which celebrates its 20th anniversary this year. The international winner receives a $5,000 USD award and a prize sculpture. As a result of the competitions, thousands of young people around the
world become interested in water.

“We believe the Stockholm Junior Water Prize has the power to transform our industry by engaging students – the next generation of water leaders – to address critical water issues,” said Gretchen McClain, president of ITT’s Fluid and Motion Control group. “As water pollution and scarcity continue to threaten areas around the globe, the innovative research that this competition generates every year gives us confidence that we can rise above future global water challenges.”

About the Stockholm Junior Water Prize

The competition is open to young people between 15-20 years of age who have conducted water-related projects focusing on local, regional, national or global topics of environmental, scientific, social or technological importance. As a result of the competitions, thousands of young people around the world develop personal interests, undertake academic study, and often pursue careers in the water or environmental fields. H.R.H. Crown Princess Victoria of Sweden is the Patron of the Stockholm Junior Water Prize. The winner receives an award of $5,000 USD and a handmade blue crystal sculpture. The Stockholm International Water Institute administers the competition, which is sponsored globally by ITT Corporation. The official suppliers for the competition are Infobahn, Halebop, Hertz, People Travel Group and Trosa Tryckeri.

A WET ‘N WILD TIME AT THIS YEAR’S WEAO GOLF TOURNAMENT

Anthony Abbruscato, P.Eng., CH2M HILL, Vice-Chair, Promotions and Events Planning (PEP) Committee

On Thursday September 16, golfers of all caliber within our industry took part in the 12th Annual WEAO Scholarship Fundraiser Golf Tournament held at Shawneeki Golf Club in Newmarket. After last year’s great success with the shotgun start, this year’s event followed the same format. Despite the rainy weather and cold temperatures, people still came out and managed to get in a decent round of golf (well maybe only 13 holes after all the rain delays!). With great prizes for all participants, including the winning and losing teams and hole-sponsored prizes, this year’s tournament was another success!

This is WEAO’s biggest social event of the year and something that many really look forward to. Shawneeki always does a great job with the food and drink, as all in attendance can attest. Although the main event is golf, the real focus is helping out a great cause. Every year, the tournament raises money for the WEAO Scholarship Fund ($2,500 based on full attendance). Scholarships are given out by the WEAO Board to deserving students entering our profession. This ensures that the future of our industry is preserved, by helping today’s bright students become tomorrow’s future professionals. Despite the dampened weather, WEAO was still able to achieve this goal.

Sponsorship of each hole sold out quickly, with great prizes donated by all sponsors. Congratulations to this year’s winning team with the best score, and also to the most honest team (a.k.a. the worst score).

A big thank you to everyone who helped with the tournament, members of the Promotions and Events Planning (PEP) Committee who really worked hard to facilitate the event, staff at Shawneeki Golf Club for all their hard work, all sponsors who contributed to this year’s tournament, and, most of all, every participant who took part and really drove this event. Without you, none of this would be possible and a scholarship fund would not exist. We hope you all had a great (albeit wet) time, and we will see you again next year at the 13th Annual WEAO Scholarship Fundraiser Golf Tournament.”
On November 3, 2010, the Water Environment Association of Ontario (WEAO) and Wastewater Treatment and Technology Committee (WTTC) successfully hosted the specialty seminar ‘Energy Optimization and Sustainable Design’ at the Best Western in Milton, Ontario.

Attendees heard from the seminar’s eight speakers on topics that included the review of global trends toward targeting energy neutral facilities, carbon foot-printing and greenhouse gas accounting, present and future legislative framework, and energy recovery opportunities. An open panel discussion with all the speakers was held after the last presentation, where a number of relevant points were discussed to build on the preceding presentations. Thank you to our speakers: Jeremy Kraemer (CH2M Hill), Zeina Elal (RV Anderson), Stephen Graham (SGA Energy Ltd), Hugh Monteith (Hydromantis), Deborah Ross (AECOM), Brad Dobson (Region of Durham), Pat Coleman (AECOM) and Lynne MacLennan (XCG).

In total, 41 people attended the seminar, including the speakers, 17 WEAO members, and 12 new professionals and students. The workshop provided a good overview of current legislation and design guidelines, facilities that had already put into practice a sustainable energy consumption approach to plant operations, as well as future opportunities for sustainable design of projects in the wastewater industry.

The feedback received for the seminar was positive, and the WTTC considers this seminar a success. The participation in this seminar is also a good indicator of interest in a new path forward for the design and operation of wastewater treatment facilities.

Acknowledgements
Thanks to all speakers, and to Antony Aruldoss (AECOM) and Brian Gage (Aqua Technical Sales Inc.) from the WTTC for assisting with organizing and running the seminar. Also thanks to our sponsors: ACG Technology Ltd. for sponsoring the morning coffee break, Conestoga Rovers & Associates for co-sponsoring the lunch, and H2Flow Equipment for co-sponsoring the lunch and providing the proceedings. Finally, thank you to Julie Vincent and Anne Baliva of WEAO for securing the venue for the seminar and handling registrations. All of your assistance helped make this seminar a success.
uch has happened since our last edition of INFLUENTS; many of you had the opportunity to travel to New Orleans for WEFTEC2010 and to attend the Great Canadian IceBreaker. Our own Ian Smith, City of Toronto, rode his motor bike all the way on his own and was able to score some awesome photos for INFLUENTS magazine.

Ontario Clean Water Agency’s (OCWA) Jets, The Region of Durham’s Sludge Hammers and the C’raptors all competed in the operators challenge at WEFTEC. All teams did us proud; even down to looking good at the Ice Breaker.

On November 3rd, I was down at Greenway WWTP in London picking up the Enviroscape Educational Model from Gary Burrows when I was lucky enough to run into Perry Rose. Perry was all duded up in his orange jacket ready to meet students, including his daughter, coming for ‘Take Your Kids to Work’ day. The staff at London had done it up right, beginning with a tour of City Hall before the highlight, which was the WWT plant tour. In Toronto at Ashbridges Bay Ian Smith was able to take pictures of both this year and last year’s events by including a photo waiver in the permission form for the children. These great pictures really show the sincere interest of the visitors. Targeting students early on in their education is just one way we can meet the growing need for wastewater staff as well as show off just how neat-o the work can be.

‘Take Your Kids to Work’ day is one way to share the knowledge of wastewater treatment with your children; another is the Enviroscape Educational Model, which is available for loan to members from WEAO. It is a table top model which can be used in several different ways. The model has everything you need to demonstrate how our municipalities provide water and sanitary services, as well as biosolids land application, and it is all hands on. No worries though all product used in the demonstration is edible, e.g. rice, cocoa, etc. The 31st Scouts are top of my annual list for presentations since a demonstration of the model falls perfectly into the knowledge required by the Scouts to earn their environment badge. Training on the use of the unit is available and there is no cost associated with this training. So look for an opportunity to share the knowledge, local kids group, schools, etc.

The Geoffrey T. G. Scott Memorial Award recognizes an outstanding example of leadership and inspiration thereby advancing the mission of the water environment industry. A founding member of the Select Society of Sanitary Sludge Shovellers (5S), Geoff spent his career inspiring us all to reach the honourable pH7. Learn more about the history of Geoff Scott on the WEAO website at www.weao.org, where you will also find the nomination form. Nominations should be submitted to Julie A. Vincent, Executive Administrator at julie.vincent@weao.org or faxed to the WEAO office at 416-410-1626. The deadline for nominations is January 31, 2011 so get that nomination in today.

Louise and her bike

Where else but New Orleans would you find a steam calliope on top of a river boat, playing a noon concert (courtesy of Ian Smith)

Who knew that John had a side job (courtesy of Ian Smith)

Take your kids to work day at Ashbridges Bay WWTP (courtesy of Ian Smith)

Take your kids to work day at Ashbridges Bay WWTP (courtesy of Ian Smith)

New Orleans Water Front (courtesy of Ian Smith)
THE ROAD TO WINNING THE INTERNATIONAL STOCKHOLM JUNIOR WATER PRIZE

Ian Mcilwham, Region of Durham

The primary purpose of the Canadian Stockholm Junior Water Prize (CSJWP) competition is to select a candidate student (or group of students) on one project to represent Canada at the International Stockholm Junior Water Prize (SJWP) competition. The SJWP is the world’s most prestigious youth award for a water-related science project. The prize taps into the unlimited potential of today’s high school students, as they seek to address current and future water challenges. The competition is held annually in conjunction with World Water Week in Stockholm Sweden and took place September 4-10, 2010.

The competitions at both the national and international levels aim to encourage young peoples’ interest in issues concerning water and the environment. They also seek to inspire young people to a continued engagement for water and the environment. Both competitions are open to young people between the ages of 15 and 20 who have conducted water-related projects focusing on local, regional, national or global topics of environmental, scientific, social or technological importance. The international winner receives a $5,000 USD award and a crystal sculpture. As a result of the competitions, thousands of young people around the world become interested in water.

Event planning and judging at the national level, plus travel and accommodations for the winning student(s) for the international competition in Sweden are sponsored by the five Canadian Water Environment Federation (WEF) member associations (MAS) including Atlantic Canada Water Works Association, RESEAU environnement, Water Environment Association of Ontario, Western Canada Water Association, and British Columbia Water and Wastewater Association, as well as the Canadian Water and Wastewater Association, and ITT Water and Wastewater, Canada. In 2010 three companies from the wastewater industry in Ontario also chose to sponsor this event through the WEAO Sponsorship Program; thank you to Arlat Technology, Div. Of Price Schonstrom Inc., Eramosa Engineering Inc. and H2FLOW Equipment for their generosity. The 2010 CSJWP Planning Committee included Robert Gillis (ACWWA), Diana Qing (RESEAU), Cindy Toth (WEAO), Ian Mcilwham (WEAO), Brian Station (WCW), Jack Bryden (BCWWA), Duncan Ellison (CWMA) and Audrey Arisman (Executive Director, WCW).

The CSJWP is one of many special competitions held in conjunction with the annual Canada-Wide Science Fair (CWSF). The 49th CWSF was held May 15-23, 2010 in Peterborough, Ontario at Trent University.

The CSJWP invites students from Grades 11 and 12 to submit projects related to one or more of: water and wastewater quality, water resource management, water protection, water treatment or wastewater treatment. Up to three projects selected at the CWSF are invited to submit an essay summary of their projects. One winner is then chosen to represent Canada at the SJWP competition. The runner-up projects each receive a $300 CAD cash prize. The winner receives one all expense paid trip to Stockholm, Sweden to represent Canada at the international SJWP competition.

There were 14 projects that ’self-nominated’ for the CSJWP at the CWSF. Self-nomination is a process whereby the students request to have their projects considered for special interdisciplinary awards outside of their primary division. Students may nominate their projects for up to five of these awards. All projects were judged using a scoring template based on the United States Stockholm Junior Water Prize competition and took into account scientific thought and understanding, original creativity, the project report, the visual display and the oral presentation. Judging for the CSJWP was led by Cindy Toth (Town of Oakville), along with Peter Nundy (Region of Durham) and Dr. Jeremy Kraemer (CH2M Hill). The process was recorded by Ian McIlwham (Region of Durham), acting as secretary on the selection committee. Three finalists were selected for further competition.

The three finalists were requested to prepare a project report which was due shortly after the CWSF. The report requirements were based on the guidelines set for the international competition. All submissions were judged by the same selection committee that attended the CWSF. The national judging criteria included six categories: relevance, creativity, methodology, subject knowledge, practical skills, and the report.

The project details for the winner and the runners-up are as follows:

STUDENTS:
Alexandre Allard and Danny Luong

PROJECT TITLE: Novel Biodegradation of Expanded Polystyrene and Reduction of Toxicity in Polystyrene-Contaminated Environment via Microbial Adaptation

ABSTRACT: Excess of expanded polystyrene (EPS) is a rising environmental problem that threatens not only marine life, but also the general quality of water. Recent studies have shown that EPS is capable of leaching toxic molecules such as styrene or bisphenol A into water. Consequently, a novel biotechnological method was developed to biodegrade EPS in a liquid environment. Three strains of microorganisms, Streptomyces griseus, Pseudomonas putida and Pseudomonas fluorescens, were isolated and subjected to an enrichment procedure to select for an adaptation to EPS. The three strains were able to synergically and optimally biodegrade 69.5% of the mass of the EPS in two weeks by producing enzymes and biosurfactants. This novel method could be applied in water bioremediation or industrial enzymatic degradation to reduce the amount of EPS in rivers and oceans and to increase water’s drinkability.

BIOGRAPHIES: Alexandre: I live in Quebec City, where I am in my second year of studying natural sciences at Cégep Champlain-St. Lawrence. As a secondary school student (grade 7-11 equivalent) at Séminaire des Pères Maristes, I received numerous awards, including the best overall average for the five years and the McGill University science award. During those five years, I was captain of the...
improvisation team, and twice won the award as the best member of the team. I take piano lessons and spend time mixing music. I have worked for three summers as a counselor at Kéno day camp. This summer, I plan to be an assistant with senior adults. This is my third year participating in science fairs and my second at the Canada-Wide Fair. Last year, my project won a silver medal in biotechnology and pharmaceutical sciences as well as a research scholarship at the University of Ottawa. This year’s project won first prize at the regional fair, a bronze medal at the Québec provincial fair and was selected to participate in the MILSET International Science Fair (in Bratislava, Slovakia) in July 2011. Of course, it was also selected for the 2010 Canada-Wide Science Fair.

Danny: I am a student at Cégep de Sainte-foy in the natural sciences program. Microbiology and the environment have always interested me. By combining these two fascinating areas this year, we succeeded in showing that polystyrene can be degraded by a combination of microorganisms under a variety of optimal conditions. This project enabled us to win first prize at the regional fair, third prize in the senior category at the Québec provincial fair, and participation in the Canada-Wide and the MILSET International Science Fairs. A dedicated scientist and soccer player for the past 10 years, I push myself to do the best I can in everything I undertake. The various stages of science fairs have enabled me to discover my real passion in life – research. Thus, I plan to continue my studies in microbiology so that I can work in the field of research in the future.

STUDENTS: Sara Rehman and Humera Rehman

PROJECT TITLE: Mediator-less Microbial Fuel Cells

ABSTRACT: Mediator-less microbial fuel cells are currently being researched as potential energy sources. Using waste, these fuel cells are able to produce energy and water. Waste is currently an undepletable by-product that takes energy to process. The purpose of this study is to determine if MFC technology could allow waste to produce enough energy to make it a feasible resource in waste water treatment.

BIOGRAPHIES: Sara: I am an 18-year-old student attending Markville Secondary School. Skating is one of my favorite hobbies and I also enjoy writing. I write for the school newspaper and am graduating with honors. I plan on going to University of Toronto in September. The field that interests me most is engineering, specifically mechanical and materials engineering. This was my first time participating in a science fair. I am also the recipient of the $1000 University of Ottawa scholarship, which I received at the York Region Science Fair this year.

Humera: I am currently a student at Markville Secondary School, where I write for the school newspaper. Next fall, I hope to be studying either health sciences or engineering. This is our first year participating in the science fair, although my partner, Sara Rehman, and I have been researching MFCs for more than a year and a half.

STUDENT: Alyson Bell

PROJECT TITLE: Another Tale My Grandfather Told Me

ABSTRACT: Contamination of food and water supplies presents an ongoing problem for people in parts of the world. The findings of this project indicate that oregano shows strong antibacterial properties. These findings suggest that oregano could be used as a natural food preservative. An oregano filter was constructed which successfully killed bacteria in water making non-potable water potable. Third world countries could use this filter.

BIOGRAPHY: I enjoy school and out of school sports including rugby, volleyball, lacrosse and golf. I also enjoy school, although I do have to work hard for my marks. I play guitar, drums and piano. I enjoy camping, building brush shelters and doing outdoor activities, and spend a lot of time in my back woods. After high school, I would like to travel for a year and then attend Lakehead University to study environmental sciences. I am not sure what I would like to do after university, possibly become an outdoor teacher or work at a wilderness survival camp – anything to do with the outdoors or science.

At the time of this article, the complete list of winners for the 2010 CWSF had not been posted at http://www.ysf-fsj.ca/Competitions/CWSF/Yearbooks/. Check the website for complete results and other award information. For more information on how students can participate in the CJSWP, a list of past winners and sponsors of the competition, please visit http://www.sjwp.ca. More information on the International Stockholm Junior Water Prize competition can be found at http://www.siwi.org/stockholmjuniorwaterprize.

Next year’s Canada-wide competition will be in Toronto. If you hold a PhD or Masters Degree and are interested in judging, please contact lan.mcilwraith@durham.ca.
GET READY FOR AMERICANA 2011

Participate in the largest North-American multi-sectorial event of the environmental industry.

For the 9th edition, the International Environmental Technology Trade Show and Conference will offer an outstanding program focusing on innovations in drinking water and wastewater, solid and hazardous wastes, air quality and climate change, soils and groundwater, as well as future trends in energy, environmental management of large corporations and sustainable cities, among other topics.

The event will offer three full days of activities, including more than 200 conferences, panels and technical workshops, 350 exhibitors and 650 business meetings, not to mention the many opportunities for networking and cocktails.

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Up to nine knowledge tracks running concurrently during three days.

Take a look at the conference overview (http://americana.org/schedule)

TRADE SHOW

Reserve your booth and pay before January 15, 2011 to receive two free tickets for the opening plenary.

Five months before AMERICANA and 40% of the spaces have already been reserved. Consult the full list-

In 2011, the emphasis will be placed on the program’s international dimension, in line with the 2009 edition which brought together participants from over 45 countries. In this regard, for the first time, the event will host a country of honour. For this edition, France will hold this prestigious place at AMERICANA.

INTERNATIONAL BUSINESS MATCHMAKING FORUM (IBMF)

650 business meetings are scheduled during the AMERICANA trade show. Seize this international networking opportunity to develop your commercial activities and business partnerships.

IBMF registration at www.americana.org
JENNA PORTER

“IT IS A DIFFERENT CHALLENGE EVERY DAY,” SAYS JENNA PORTER OF HER WORK AS AN OPERATOR AT THE ONTARIO CLEAN WATER AGENCY’S WASTEWATER TREATMENT PLANT IN ORANGEVILLE, ONTARIO. WHETHER MONITORING THE FACILITY PROCESSES BY VISUAL INSPECTIONS OR BY LABORATORY ANALYSIS OF THE WASTEWATER, PORTER ENJOYS BEING DIRECTLY INVOLVED IN MAINTAINING EFFLUENT THAT MEETS COMPLIANCE REGULATIONS AND IS SAFE FOR THE ENVIRONMENT.

MAINTAINING THE BIOLOGICAL PROCESS NEEDED TO BREAK DOWN SEWAGE CAN BE PARTICULARLY CHALLENGING. “THE BACTERIA INVOLVED REQUIRE SPECIFIC ATMOSPHERES IN ORDER TO SURVIVE,” EXPLAINS PORTER. “IF THERE IS ANY CHANGE IN THE PROCESS, EFFECTIVE TREATMENT MAY NOT BE ACHIEVED.” TO OBTAIN OPTIMAL RESULTS, SHE MUST KEEP TRACK OF TEMPERATURE AND THE PROPORTION OF SOLIDS VIA A COMBINATION OF LABORATORY WORK AND ADJUSTMENT OF PUMP SPEEDS AND THERMOSTATS.

IN FACT, A LARGE PART OF HER WORK INVOlVES TROUBLESHOOTING PROCESS CONTROL ISSUES, INCLUDING THOSE OF A MECHANICAL/ELECTRICAL NATURE. IT IS AN ONGOING LEARNING PROCESS, SUPPORTED BY AMPLE OPPORTUNITIES FOR PROFESSIONAL DEVELOPMENT. SINCE BEING HIRED BY OCWA AFTER GRADING FROM COLLEGE TWO YEARS AGO, PORTER HAS TAKEN THE WEEK-LONG ENTRY LEVEL OPERATOR DRINKING WATER COURSE AS WELL AS THE CONFINED SPACE ENTRY AND THE ENVIRONMENTAL COMPLIANCE COURSE. SHE HAS ALSO OBTAINED HER CLASS II WASTEWATER TREATMENT LICENCE. “ALL OF THESE COURSES WERE VERY VALUABLE AND INFORMATIVE,” SHE SAYS.

EQUALLY VALUABLE FOR PREPARING HER FOR THE DAILY DEMANDS OF HER JOB WAS THE THREE-YEAR ENVIRONMENTAL TECHNOLOGY PROGRAM SHE COMPLETED AT GEORGIAN COLLEGE IN BARRIE, ONTARIO. THE PROGRAM COVERED A WIDE VARIETY OF SUBJECTS INCLUDING SOIL SCIENCE, AIR QUALITY AND ENVIRONMENTAL LAW. BUT IT WAS THE CLASS IN WATER AND WASTEWATER TREATMENT THAT CAUGHT PORTER’S ATTENTION. “AFTER TAKING THIS COURSE, AND VISITING SEVERAL TREATMENT PLANTS DURING FIELD TRIPS, I FOUND THIS INDUSTRY TO BE QUITE INTERESTING,” SHE RECALLS.

GEORGIAN’S ENVIRONMENTAL TECHNOLOGY PROGRAM ALSO ENCOMPASSES TWO CO-OPTERATIVE EDUCATION EXPERIENCES, DURING WHICH STUDENTS HAVE THE OPPORTUNITY TO WORK IN A PARTICULAR FIELD AND GAIN HANDS-ON EXPERIENCE. PORTER’S CHOICE OF WASTEWATER TREATMENT BROUGHT HER TO THE ORANGEVILLE PLANT AND A JOB OFFER AFTER GRADUATION. “I WOULD RECOMMEND DOING A CO-OP PROGRAM TO ANYONE IN ANY FIELD,” SHE REFLECTS. “IT HELPS GET YOU OUT THERE TO START YOUR CAREER.”

SINCE DECIDING TO FOCUS ON THE WASTEWATER INDUSTRY, PORTER HAS NEVER LOOKED BACK. “I LIKE TO WORK OUTDOORS AND I HAVE A PASSION FOR THE ENVIRONMENT,” SHE EXPLAINS. “I FIND THAT THE INDUSTRY IS CHANGING QUICKLY AND FOCUSING MORE ON THE PRESERVATION OF OUR WATER ENVIRONMENT.” FOR INSTANCE, SHE IS PLEASED THAT RECENT DE-CHLORINATION REGULATIONS HAVE PUT A STOP TO CHLORINATED EFFLUENT ENTERING WATERCourses.

THE 80-YEAR-OLD WASTEWATER TREATMENT PLANT WHERE SHE WORKS HAS BEEN UNDERGOING SEVERAL OTHER MAJOR UPGRADES AS WELL, INCLUDING A NEW BAR SCREEN SYSTEM, AS WELL AS A WET WELL AND BIGGER PUMPS. “WASTEWATER FACILITIES ARE FINALLY CATCHING UP TO TODAY’S TECHNOLOGY, AND IT IS EXCITING TO BE PART OF THIS,” SAYS PORTER.

OF COURSE, THESE ADVANCES TRANSLATE INTO MORE TRAINING AND DEVELOPMENT. FORTUNATELY, ONGOING EDUCATION IS AN IMPORTANT PART OF PORTER’S FUTURE PLANS. AS THE INDUSTRY CONTINUES TO EVOLVE, SHE LOOKS FORWARD TO EXPANDING HER KNOWLEDGE SO SHE CAN CONTINUE TO HELP PROTECT AND PRESERVE “ONE OF THE PLANET’S MOST VALUABLE RESOURCES.” SHE ADDS: “AT SOME POINT, I WOULD LIKE TO EDUCATE AND INFORM PEOPLE ABOUT THE SIGNIFICANCE OF OUR INDUSTRY AND THE PROTECTION OF OUR WATER ENVIRONMENT. WITH THE DEDICATION OF ORGANIZATIONS LIKE THE WATER ENVIRONMENT ASSOCIATION OF ONTARIO, WE CAN ALL HELP MAKE A DIFFERENCE FOR OUR PLANET’S FUTURE.”

PACKAGED AUTO-START SEWAGE PUMPING STATIONS

The Gorman-Rupp Base Mounted Auto-Start station incorporates the Gorman-Rupp Super T Self-Priming Pump with liquid level control which automatically converts to 12 volt DC and drives the pump with a standby engine - providing normal pumping service during power failures. When power resumes, AC motor operation is automatically restored. It meets all standby requirements and uses a variety of fuels.

A SPACE-SAVING MODULAR COMBINATION OF PUMP, ELECTRIC MOTOR AND ENGINE, ALL COUPLED TO THE SAME DRIVE, ELIMINATING THE NEED FOR AN EXPENSIVE ENGINE/GENERATOR SET.
Keeping operators informed about certification issues is important, and the Ministry of the Environment (MOE) and the Ontario Water and Wastewater Certification Office (OWWCO) want to share information and news with the operator community more frequently. As a result, starting this fall, information bulletins will be prepared on a biannual basis. Operators and municipalities will be updated on initiatives to improve the certification process and get the latest news on the certification front. To help further our greening efforts, operators and municipalities will be notified by email every fall and spring of new e-bulletins, which will be posted on OWWCO’s website.

Below are some articles featured in the latest Operator Certification e-Bulletin.

Subscribe to receive the latest certification news from OWWCO
Starting November 2010, you can sign up to receive frequent and current certification news and information from OWWCO throughout the year. Stay current on new developments, industry events and announcements. Also, if you are not a certified operator, but would like to be notified about the next edition of the Operator e-Bulletin, please subscribe.

Subscribe at: www.owwco.ca/subscribe.

Inspection program results: top improvement areas for municipal residential drinking water systems (MRDWS)
The Ministry’s rigorous annual inspection program for municipal residential drinking water systems helps determine how well these systems are complying with the province’s strict regulations.

Over the past several years, inspection results for MRDWS show continuous improvement, with very good overall performance ratings. For the 2008-09 year, a few common areas were identified where administrative and other procedures need to be improved. These include:

1. Treatment equipment operation
   When treatment equipment is not operating as it should, it is likely due to power interruptions, equipment changeover or filter performance. The Ministry is reviewing the criteria for filter performance and will share any findings with stakeholders.

2. Operations and maintenance manual compliance
   Operations and maintenance manuals contain information relating to the documentation of procedures for drinking water systems. Most of the issues related to the manuals stem from insufficient records on procedures that include monitoring, sampling and reporting schedules. More than 25% of the issues identified in 2008-09 were linked to significant changes that the system was undergoing, such as the installation of new equipment or changes in the operating authority of the system that had not yet been reflected in the manuals.

3. Chlorination equipment operation
   Approximately 5% of municipal residential drinking water systems had difficulty maintaining chlorine residuals in their distribution system. This resulted from low demand, piping dead-ends or monitoring equipment malfunctions.

4. Re-classification of systems and sub-systems
   When drinking water systems undergo construction and install new equipment, they are required to register their upgraded system with the Ministry, since this often changes how they are classified. In addition, in 2008-09, various systems were amalgamated to form larger systems and, as a result, they too needed to be re-classified. These circumstances contributed to the re-classification issues that were identified during the year.

The Ministry continuously works with its partners to help address areas where improvements can be made.

More information about the Ministry’s inspection program and results, details on the performance of Ontario’s drinking water systems, and highlights of drinking water protection activities is available in the Chief Drinking Water Inspector’s Annual Report.

Visit the Chief Drinking Water Inspector’s page on the Drinking Water Ontario site to access reports for the past five years.
Stay current on relevant new technical bulletins and guidance materials made available by MOE
Follow the links below to learn more.

<table>
<thead>
<tr>
<th>Title</th>
<th>Doc. #</th>
<th>Relevance/Description and Link</th>
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<tbody>
<tr>
<td>Filtration Processes Technical Bulletin</td>
<td>7467</td>
<td>Outlines the various regulatory requirements for the filtration process of a drinking water system. It includes how the performance of the filtration process must be calculated and provides the ministry’s interpretation of turbidity exceedances through the use of graphical examples. <a href="http://www.ontario.ca/drinkingwater/dw_el_prd_005451.pdf">http://www.ontario.ca/drinkingwater/dw_el_prd_005451.pdf</a></td>
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<tr>
<td>Tips for Maintenance of Small Drinking Water Systems</td>
<td>7780e</td>
<td>Applies to designated facilities and non-municipal year-round residential systems. The tip sheet provides suggestions to help owners and operators of small drinking water systems properly maintain wells, surface water intake areas, and treatment equipment. <a href="http://www.ontario.ca/drinkingwater/dw_el_prd_038758.pdf">http://www.ontario.ca/drinkingwater/dw_el_prd_038758.pdf</a></td>
</tr>
<tr>
<td>Corrective Actions to Take if Your Drinking Water Becomes Contaminated</td>
<td>7775e</td>
<td>Applies to designated facilities and year-round residential systems. The tip sheet explains what an owner and operator of private drinking water systems regulated under O. Reg. 170/03 must do to report an adverse result, and the corrective action to follow. <a href="http://www.ontario.ca/drinkingwater/dw_el_prd_038888.pdf">http://www.ontario.ca/drinkingwater/dw_el_prd_038888.pdf</a></td>
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These materials and many others are posted on MOE's Drinking Water Ontario website. They can also be requested by calling the ministry's Public Information Centre at 1-800-565-4923 or 416-325-4000.
Stay tuned for the next edition coming to you next spring.

### CALENDAR OF EVENTS

**JANUARY 2011**

- **Jan. 9-12** WEF Conference Nutrient Recovery & Management Miami, Florida
- **Jan 12-13** WEF Conference Impaired Waters Symposium 2011 Miami Florida
- **Jan. 11** Residuals & Biosolids Committee
- **Jan. 13** Conference Committee WEAO Office Milton 9:30 am
- **Jan. 18** Board Meeting AECOM Offices Mississauga, 9:30 am
- **Jan 20** Weao Forum On Provincial Ministries & Wastewater Issues Queen’s Park, Toronto Macdonald Block Kenora/Nipigon Room
- **Jan 21** Submission Deadline for INFLUENTS

**FEBRUARY 2011**

- **Feb 8-11** WEF Conference The Utility Management Conference 2011 Denver, Colorado
- **Feb 8** Residuals & Biosolids Committee
- **Feb 10** Conference Committee WEAO Office Milton, 9:30 am
- **Feb 15** Board Meeting AECOM Offices Mississauga, 9:30 am
- **Feb 24** Asset Management Committee Seminar Teatro Conference Centre, Chisholm Drive, Milton, 8:00 am

**MARCH 2011**

- **Mar. 4** INFLUENTS Release Date
- **Mar. 8** Residuals & Biosolids Committee
- **Mar. 8** Board Meeting AECOM Offices Mississauga, 9:30 am
- **Mar. 10** Conference Committee WEAO Office Milton, 9:30 am

**APRIL 2011**

- **Apr. 10-12** 40th Annual Technical Symposium & Exhibition The Westin Harbour Castle Hotel, Toronto
- **Apr. 10** Board Meeting President’s Suite, Westin Harbour Castle, 1:00 p.m.
- **Apr. 10** WEAO Annual General Meeting, 4:00 p.m.
- **Apr. 12** Operator Certification & OIT Examinations, Westin Harbour Castle, 9:00 a.m.
- **Apr. 12** Communications Committee Meeting, WEAO Conference 11:00 am.
- **Apr. 14-16** WEFMAX 2011 YP Summit Louisville, Kentucky
- **Apr. 28-29** WEFMAX 2011 Louisville, Kentucky

**Mar.**

- **Mar. 17-18** WEFMAX 2011 Atlantic City, NJ
- **Mar. 24** Americana 2011, Palais des congres de Montreal
- **Mar. 31** Conference Committee WEAO Office Milton, 9:30 am
PROTECTING LAKE SIMCOE: WHEN A STRATEGY IMPOSES LEGAL LIMITS

Julii Abouchar and Joanna Vince of Willms & Shier Environmental Lawyers LLP

Outside of the Great Lakes, Lake Simcoe is the largest lake in southern Ontario. Eight municipalities obtain their drinking water from Lake Simcoe. The Lake Simcoe watershed contains numerous provincially significant wetlands, woodlands, and productive agricultural areas.

Significant impacts have been observed on the water quality in Lake Simcoe, due to human activities. Phosphorus is one of the more significant challenges to Lake Simcoe. While phosphorus is naturally occurring in Lake Simcoe, by the 1980s, phosphorus levels had become unnaturally high due to human activities.

A high phosphorus load causes abundant growth of plants and algae that then die and decompose, creating an oxygen shortage in the lake which, in turn, affects the fish population. Because of these impacts and the ecological importance of Lake Simcoe, the lake has been the target of environmental protection and improvement efforts from the early 1980s.

In December 2008, the Ontario Government enacted the Lake Simcoe Protection Act (LSPA). The LSPA was another step in a long process to protect and restore the health of the Lake Simcoe watershed.

This process moved another step forward with the creation and approval of the Lake Simcoe Protection Plan (LSPP) in 2009. Though it is not legislation or a regulation, the LSPA has some enforceability. The LSPA contains provisions that allow for sections of the LSPP to be deemed as ‘designated policies,’ which have the force of law and must be followed. Under the LSPA, approximately 48 sections have been deemed designated policies. Designated policies include:

- requiring environmental assessments for the expansion or establishment of a new settlement area, if it will require increasing the capacity of existing sewage treatment plants or establishing new sewage treatment plants;
- restrictions on building new municipal sewage treatment plants;
- requiring applications to expand or establish a major recreational use to include a recreation water use plan;
- prohibiting development or alteration of vegetation protected zones outside existing settlement areas;
- and • requiring amendments to municipal official plans to make them consistent with the LSPP.

The LSPP also allows for sections of the LSPP to be designated as “have regard to.” This would require the relevant authority to consider the LSPP and ensure that decisions are consistent with the LSPP.

In February of this year, the Ministry of the Environment (MOE) released three proposals under the LSPP. Each proposal targets a different area under the LSPP and would aid in the implementation of the LSPP. The three proposals are a Phosphorus Reduction Strategy (PRS), a feasibility study for water quality trading, and a discussion paper on a shoreline protection regulation. To date, only the PRS has been finalized.

The PRS was finalized on July 7, 2010. The PRS was created as a mechanism to achieve the reduction in phosphorus loading required under the LSPP – 44 tonnes per year or approximately 40% of current average loadings.

The PRS is required under the LSPP. The PRS is not a legal document. The PRS is a review of the sources and quantities of phosphorus in Lake Simcoe. This is not to say that the PRS does not have legal implications. How? The PRS is one of the strategies for determining if the LSPP is adequate. If it is not, the PRS suggests changes to the LSPP to provide for lower phosphorus loading.

The PRS divides phosphorus sources by sectors, and then sets sector-specific targets based on the proportion of current phosphorus loading. These targets can be made legally binding through their incorporation in the LSPP as designated policies. This can be seen with the current version of the PRS. The PRS alters a designated policy provision in the LSPP to require loading limits under Certificates of Approval for sewage treatment plants (STPs) to be lowered in five years or the next time the STP expands, whichever occurs first. The PRS sets ‘targets’ for STPs to meet between now and 2015. In 2015, these targets will convert to legal limits, and Certificates of Approval will be amended.

Under the current PRS, STPs are the only sector that will be legally affected. For all other sources of loading, the PRS provides only suggested actions – provisions that are neither legally binding nor require authorities to ‘have regard to.’ However, the PRS is reviewed every five years. During this review, it will be determined if targets should be lowered or if sectors should be held accountable through imposing legal limits or reductions.

The PRS also allows for the creation of a water quality trading system. In essence, this is a proposal to implement a system normally associated with air emissions in the context of a water shed. The plan is similar to an emissions trading system, a popular option for regulating air emissions, such as greenhouse gases and sulphur dioxide.

Under a water quality trading system (as with emissions trading systems), pollutants are commodities. If a discharger can reduce its pollutant output, the reduction can be sold as a credit to regulated dischargers who are unable to meet their regulated output levels. For example, STPs could reduce their phosphorus loading to meet the legal limits by paying for farmers to implement practices that will reduce phosphorus loading from their fields. This is generally less expensive for the exceeding discharger than to install new equipment or processes to reduce their own output.
Over time, the buying and selling of credits can result in a net reduction in the pollutants being released. A similar system is already in place in Ontario under the South Nation Total Phosphorus Management Program.

Implementing water quality trading would require new regulations and some amendments to the LSPP. It is worth noting that the Ontario Water Resources Act already contains provisions (though not yet proclaimed in force) to allow for regulations establishing and governing water quality trading. It is unlikely, however, that STPs will be buying credits any time in the near future. On July 7, 2010, the MOE announced that it will evaluate a number of issues raised in meetings with the public and key stakeholders, as well as by the Lake Simcoe Science Committee and the Lake Simcoe Coordinating Committee, before deciding whether to move ahead with water quality trading. Additionally, the MOE has not yet committed to implementing water quality trading. The MOE’s decision will depend on the outcome of further consultations.

For now, it is important for all sectors responsible for phosphorus discharges to Lake Simcoe to be aware that they cannot simply look to the Environmental Protection Act or the Ontario Water Resources Act to determine their legal responsibilities. Instead, for those parties located within the Lake Simcoe watershed, there is another, potentially more stringent, layer of legal obligations imposed.

End notes
2 Ibid. at p. 2
3 S.O. 2008, c. 23 [LSPA].
5 Supra note 3 at s. 5(4), 6(1), 6(9), 9.
6 Policy 4.1-DP.
7 Policy 4.3-DP.
8 Policy 5.6-DP.
9 Policy 6.1-DP.
10 Policy, 6.13-DP, 6.38-DP, 8.4-DP.
11 Supra note 3 at s. 6(1), 6(7), 6(9).
14 Policy 4.24-SA.
COMMUNITY-BASED LEADERSHIP ENSURES SUSTAINABILITY

Water For People supports the development of hundreds of water and sanitation projects each year. But our overarching mission goes beyond simply pipes, pumps and potties. It is about making sure these systems work for the long-term. Community involvement and ownership are at the heart of Water For People’s successful programmatic principles to ensure sustainability.

In the central Bolivia municipality of Cuchumuela, most people are subsistence farmers, cultivating beans and potatoes, while also raising cows and chickens. Families are poor and scores of people still do not have access to safe water or adequate sanitation. Water-related illnesses such as dysentery frequently plague villagers, and women and children spend hours every day transporting water to their homes.

In the community of Condo Qhochir, Water For People and its local partners helped establish a safe and reliable water source, and the local water committee has been able to maintain the system via affordable tariffs it collects from community members each month. The committee has raised an impressive $1,000 through tariff collection, with no outside support.

While the water committee’s president, Doña Cinda, is proud of her community’s ability to pay for the water system maintenance on its own, she became discouraged that repeated pump repairs were required due to overuse of the system for irrigation.

During the first two years of operation, Doña Cinda replaced parts of the electric pump several times, at a cost of more than US$100, demonstrating sustainable financial management and the necessary technical capacity to keep the system running. But, when system supplies began dwindling because some users were irrigating their crops (a practice not allowed under the water committee’s management guidelines) Doña Cinda took action.

In November 2009, Doña Cinda approached and finally convinced the mayor of Cuchumuela, David Guevarra, to split the cost of installing water meters throughout the community so that they could effectively track water use. By mobilizing her water committee and community, she also convinced water users to fund, install, and, perhaps most important, utilize water meters as a means to conserve and equitably manage their limited water supplies. As of April 2010, 75% of the meters had been installed, putting water meter adoption in Condo Qhochir close to its goal of 100% coverage.

Success in one community is always something to be celebrated. But, the real impact is that all of the community water systems in Cuchumuela will be metered by the end of 2011. This demonstrates that Water For People’s sustainable development model can be replicated by others in similar rural districts of Bolivia – a true measure of our impact. By engaging people to take charge of their own solutions, the community of Condo Qhochir will be able to sustain its water system for years to come.
THE REAL EVENT AT THE WEAO GOLF TOURNAMENT: PUTTING FOR PEOPLE

Bill White, P.Eng, CH2M HILL

On a cold and rainy Thursday in September, 100 very, very (did I say very) avid golfers travelled to the Shawnkeeki Golf Course in Newmarket, Ontario for the Water Environment Association of Ontario’s (WEAO) annual golf tournament. Tournament participants ranged from a variety of consulting engineers and technicians, regional municipality managers and staff, operations and technical personnel, as well as representatives of equipment manufacturers in the industry who all had two things in common – a keen sense of putting and a willingness to showcase their ability for a great cause – Water For People - Canada.

The Water For People Putting Contest featured a simple concept, hit a pit from a 10-foot distance and be entered into a draw for a number of great prizes, which included something for everyone: sporting event tickets, a submersible pump, dinner gift certificates, portable stereo system, etc. All the prizes where generously donated by participating WEAO and Ontario Pollution Control Equipment Association (OPCEA) members. Overall, Dean Whittaker (of the Municipal Infrastructure Group Inc.) and Louise Hollingsworth (Water For People volunteer) help to raise monies, through the generous contribution of the golf participants, in support of Water For People.

A NEW STRATEGY

Wat For People - Canada is developing a new strategic plan to assist with its long-term growth and development and to align with the new Water For People Strategic Plan (2010-2014) http://www.waterforpeople.org/unique/strategic-plan/. The Water For People - Canada Board of Directors participated in a strategic planning workshop in November to help direct growth and future planning. If you have any questions please contact Joan Conyers at JConyers@waterforpeople.org or (416) 499-4042.

Water For People works to build a world where all people have access to safe drinking water and sanitation, and where no one suffers or dies from a water- or sanitation-related disease. An international grass roots organization, it is directed by a single premise – do the right thing.
OPCEA ANNUAL GENERAL MEETING
– NEW LOCATION

Tonia Van Dyk, C & M Environmental Technologies Inc.

The Ontario Pollution Control Equipment Association (OPCEA) Annual General Meeting will be held on February 8, 2011 at a new location this year – the Mississauga Grand Banquet and Convention Centre, 35 Brunel Road, Mississauga, ON L4Z 3E8. Please note that there is free parking at this location.

The OPCEA Board requests that every member company make an effort to attend. This is your chance to make suggestions to the Board and be updated as to its activities. Also, voting by representatives of the member companies will take place to replace the Board members who have reached the end of their terms.

The tentative meeting schedule is as follows:
3:00-3:30 pm – Meet and Greet
3:30-5:30 pm – General Meeting
5:30-6:00 pm – Cocktails
6:00 pm – Dinner

WEAO TECHNICAL SYMPOSIUM AND OPCEA TRADESHOW

The 2011 WEAO Technical Symposium and OPCEA Tradeshow will be held April 10-12, 2011 at the Westin Harbourcastle in Toronto. The tradeshow booths have sold out very quickly in the past, so watch for tradeshow registration packages coming soon.

IMPORTANT MEMBERSHIP INFORMATION

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