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his month, my column will be short and sweet, not for lack of things to write about, but rather because *INFLUENTS* magazine is doing so well, with so much content to fit in, that I need to keep my section succinct to allow as much room as possible for all the other information. The success is due to our members who contribute articles and to their employers who support the magazine by purchasing advertising space. What a pleasant change from the past, when conscripting people to provide articles to fill space was a regular occurrence.

I would like to thank and congratulate a number of groups and people, beginning with all the organizers of the 5th Canadian Biosolids Conference. The conference in Niagara Falls in September was a great success, the program was well run, and everyone involved did a great job. (I am being succinct remember, so there is no room for all the names). Even the attendance was beyond our projections. It is great to see that, even in these tough economic times, our members recognize the value of learning and exchanging ideas.

Second, the University of Toronto Student Design Competition team deserves a round of applause for finishing second in the competition at WEFTEC. This is quite an accomplishment considering this was WEAO’s first year of holding the Student Design Competition, and the University of Toronto team’s first time competing. Thanks to everyone involved in putting the competition together, and especially to all the students from all the teams for their great efforts.

Last, but not least, I want to acknowledge the two Operations Challenge teams for proudly representing Ontario in the Operations Challenge at WEFTEC. Be sure to read the articles in this edition of *INFLUENTS* on all of these great achievements.

We continue to grow as an association, seeking to provide the services our members need, and to be a strong voice for our profession. It is encouraging to see our efforts paying off with great results like these.

Be sure to visit the newly-revamped Water Environment Federation website at www.wef.org. If you are looking for information, this is a great place to find it, as proceedings of past WEF conferences are now available online for free. The WEAO Communications Committee members (who bring you this fine magazine) are also hard at work revamping our website. I am sure they will be bringing forward an equally great product in the not too distant future. ♦
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SLUDGE AND BIOSOLIDS

The most significant encounter with sewage sludge that I have had was at my first student job interview for the Ministry of the Environment (MOE). I excitedly entered the laboratory of the Limnology and Toxicity Section to be overpowered by an odour I care not to remember. I swore I never wanted to work in such a place. A place where they undertook bioassays, on sewage sludge of all things! Thirty plus years later, I am still working in the area of sludge and biosolids.

Terminology has changed,
• as have some of the treatment processes that now include a stage to change the final sludge to biosolids; and
• as have the analytical capabilities, interests and awareness of researchers, governments and the public.

Sewage sludge has many names around the world, as you will read later in the article on the Global Atlas of Excreta. There are also many beneficial uses of this being made of a product we have considered waste for so long. Here in Ontario, we tend to use sewage sludge (biosolids) to complement and supplement soils for crop production. We have been toying with application of biosolids for tree crops and mining and aggregate extraction site reclamation, but have a ways to go in Ontario. Other provinces such as British Columbia are further ahead in land reclamation and silviculture.

Now that I have introduced the topic of sewage biosolids, I should give WEAO’s Residuals and Biosolids Committee a great pat on the back for their recent conference. This was the 5th Canadian Residuals and Biosolids Conference, hosted by WEAO, and supported by Réseau environnement, BCWWA, CWWA, ACWWA and WCW. It was held at the Hilton Fallsview Hotel, Niagara Falls, Ontario from September 13-15, 2009.

Attendance, even in this economic climate, numbered close to 190. Co-chairs were Tony Ho, formerly of the MOE, and Michael Payne of Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). They and their Organizing Committee did a fabulous job with the likes of David Phillips, Senior Climatologist at Environment Canada as keynote speaker, and other prominent researchers, scientists and regulators from across North America.

On Sunday, the conference was preceded by a tour of the Niagara Region biosolids facility, followed by an ice breaker session. Technical sessions explored initiatives and regulatory updates from the provincial and federal governments; advancing biosolids science; energy from biosolids; product development; land reclamation; master planning; treatment technologies; emerging issues; land application; and septage treatment. As usual, there were awards and student presentations. The Best Student/NP Paper prizes were presented to:
• Martha Dagnen, University of Waterloo (1st prize),
• Kristi Sinykin, AECOM, Orlando, FL (2nd prize), and
• Matthew Green, Bishop Water Technologies Inc. (3rd prize).

Another significant change to this conference involved the WEAO donating $1,600 to Water For People Canada, in lieu of speaker’s gifts.

All in all, it was a very interesting and successful conference. Most of the presentations can be downloaded from our website www.weao.org. After all their hard work, the Organizing Committee and our Residuals and Biosolids Committee deserve a rest before the 6th Conference planning begins.

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|-----------------------------|-----------------------------|
| ACWWA | Atlantic Canada Water and Wastewater Association www.acwwa.ca | NL,NS,NB, PE |
| BCWWA | British Columbia Water and Waste Association www.bcwwa.org | BC, YT |
| Réseau environnement | www.reseau-environnement.com | QC |
| WEAO | Water Environment Association of Ontario www.weao.org | ON |
| WCW | Western Canada Water (formerly the Western Canada Water and Wastewater Association) www.wcw.ca | AB,SK,MB NU,NT |
| CWWA | Canadian Water and Wastewater Association www.cwwa.ca | |
| CWWA is a non-profit national body representing the common interests of Canada’s public sector municipal water and wastewater services and their private sector suppliers and partners. The Canadian WEF Member Associations are part of the CWWA. |
| CAWQ | Canadian Association on Water Quality www.cawq.ca | |
| The Canadian Association on Water Quality is a non-governmental, non-profit organization for scientists, engineers, technologists, administrators, practitioners and students engaged in or interested in research on water quality or on the control or treatment of water pollution. The CAWQ is an IWA (International Water Association) participating organization. |
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MICHAEL PAYNE: FROM WASTE TO NUTRIENT – OMAFRA ENVIRONMENTAL SPECIALIST GIVES BIOSOLIDS NEW LIFE

Michael Payne dreams of a day when 100% of Ontario’s municipal biosolids are re-utilized as nutrients that feed the province’s soils. As the Ontario Ministry of Agriculture, Food and Rural Affairs’ (OMAFRA) go-to guy for the management of non-agricultural source materials (NASM), he has spent almost 20 years working to see this vision become a reality.

Currently, an average of 40% of municipal biosolids generated in Ontario is applied on what constitutes only 5% of agricultural land. “The numbers vary from year to year, but are really driven by what cities like Toronto, Ottawa and Hamilton end up doing,” notes Michael. “If it is a wet year and they cannot get on the land, then the percentage goes down.”

But, weather conditions are not the biggest barrier to increasing the agricultural land application of municipal biosolids. The most significant challenge, says Michael, is public perception. “We are trying to get the public to understand that this is a valuable nutrient source and one we have to deal with,” he explains.

Recent efforts have involved shifting regulations for the management of biosolids from the Environmental Protection Act (EPA) to the Nutrient Management Act (NMA). Over the past year, as OMAFRA’s Environmental Specialist and a member of the Ontario Biosolids Utilization Committee (BUC), Michael has been hard at work on the new regulations. “Under the EPA, this material was, by association, deemed a waste,” he explains. “Under the nutrient regulations, it is deemed a nutrient beneficial for crop production.” He adds that the industry has been very supportive of the change.

Convincing the public is another story. “The main concern expressed by the public is odour,” notes Michael. An aesthetic rather than a health concern, odour is a feature of municipal biosolid application that he admits is difficult to amend. Ruling out odour reduction through further treatment is cost prohibitive. The new NASM regulations addressed this issue by adding an odour classification system.

Under the Certificate of Approval system, application on agricultural land was fixed at a specific distance from residential areas regardless of the level of odour generated by the municipal biosolid. The new regulations allow separation distances to be changed – both increased and decreased – according to the odour classification of a specific source of biosolids. Explains Michael: “If municipalities can develop a system whereby they reduce the odour of the material, we now have a regulatory mechanism that permits them to come to the government and say ‘my stuff doesn’t smell so bad and here is the research proof.’ Then, we can lower the separation distance.”

It is this type of situation that underlines the importance of Michael’s role as a liaison between OMAFRA and those involved in handling municipal biosolids, including operators, consultants and land applicators. His involvement with WEAO as a Director and as a member of the Residuals and Biosolids Committee provides further opportunities for networking. Notes Michael: “By being at the table, I get to listen to some of their concerns and possibly address them or get them resolved before they become a problem.”

Issues that arise include dealing with the public, understanding new regulations and providing training. The new regulations stipulate the preparation of a NASM plan as a prerequisite to the application of non-agricultural biosolids. Although the plan will be in the name of the farmer, Michael expects that land applicators and municipalities will continue to do the paper work, just as they did when regulations required a Certificate of Approval.

NASM plans must adhere to stringent criteria, particularly when it comes to application rates. Under the former Certificate of Approval system, a fixed amount was approved for application over a five-year period. “Under the nutrient management system, we are saying match what you apply to crop needs,” Michael explains. “It is much more agronomic based, much more about the beneficial use of nutrients.”

Because of the nature of the material, certain absolute limits will still apply. The new regulations make provisions for maximum levels of certain metals as well as phosphorus. On the other hand, for farmers, phosphorus is one of the most attractive attributes of the municipal biosolids. Depletion of world supplies is anticipated within 40 to 50 years. “That makes biosolids quite important as a phosphorus source,” says Michael. “That fits right in with the intent of the regulation and the focus on nutrient management.”

The transition period to full implementation of the new regulations in January 2011 will allow time for operators to receive training in preparing NASM plans. Michael spends a significant amount of time building training and certification courses. He often delivers the courses as well. Because he is involved in developing regulation and disseminating informa-
tion rather than enforcing regulation, operators and applicators feel comfortable in calling Michael with their questions and concerns. Sometimes, he can address their issues directly. At other times, the questions require further research. Other research needs arise through his interaction with farm groups and non-government organizations such as WEAO.

Michael takes these needs to researchers and assists in developing research studies to explore the issues. He then takes the research results and attempts to translate them into practice through regulations (if needed), fact sheets or information for the public. Some of the projects in which he is currently involved include investigating the ecological impacts of biosolids land application, and the potential uptake of pharmaceuticals and personal care products into agricultural crops.

Among the only researchers in the world studying the latter, Canadian scientists have determined that concentrations of these chemicals are very minute. “We are talking parts per billion and parts per trillion,” says Michael, explaining that, in terms of time, that would mean one second in 30 years and in 30,000 years, respectively. “They are there, but we only know they are there because we now have the analytical methods and instruments to find them.”

Another area of interest is in land reclamation, particularly mine tailings. Many tailings are too acidic to grow plants. Typically, the sites have also been bereft of topsoil. “Nothing grows under these conditions,” Michael points out. “You need organic matter. One of the things Ontario has not seriously looked at is the beneficial end use of municipal biosolids for things like land reclamation.”

The options that Michael is proposing include mixing municipal biosolids with mine tailing materials (if the PH is neutral) or covering the mine tailings with ‘manufactured soil,’ a blend of sand, municipal biosolids, and a carbon source such as wood shavings. Presently, Ontario regulations stipulate that biosolids cannot be applied to agricultural land between December 1 and March 31. Since many cities have very limited storage capacity, winter sees biosolids going to landfill. Michael envisions a scenario whereby biosolids would be transformed into manufactured soil at facilities in Northern Ontario, then applied on nearby mine tailings. There might even be a possibility of growing bio energy crops such as switch grass or hybrid poplars on the sites.

“I am an optimist,” he says. “I think if we look at our total waste stream in a new light, we can bring the amount we landfill down to zero.”

Exploring other beneficial land uses is certainly a step in the right direction. So are the latest regulations governing the management of biosolids. “But,” admits Michael grudgingly, “we still have a long way to go.”

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On August 29, 2009, I was one of the student delegates of the second annual Water Environment Association of Ontario (WEAO) Student Chapter Leadership Forum at Sheridan College in Brampton, Ontario. Building on the success of last year, nearly 50 delegates attended, representing all 11 active WEAO and Ontario Water Works Association (OWWA) student chapters in Ontario. The event was an invaluable resource for both new and established student groups.

The day began with an icebreaker session, in which all participants tried to obtain the signatures of people who match the statements listed on a question sheet. This simple, but effective session allowed me to meet students with similar interests from as far away as Windsor and as nearby as Sheridan itself. I was pleased to win one of two highly-coveted WEAO umbrellas as the door prize. We were then treated to presentations by WEAO New Professional Committee members who reminded us of the many benefits of being part of the organization. They also gave us ideas and advice on the best ways to advance WEAO’s mandate as part of a student chapter. In particular, Jeremy Kraemer’s talk on his experiences in founding the University of Toronto (UofT) Student Chapter was very beneficial. I also enjoyed OWWA Young Professionals past-chair Troy Leyburne’s overview of the water industry and the opportunities that will be available for new professionals over the next 5-10 years.

However, the vast majority of the day’s presentations came from the student chapters themselves. Both new and experienced groups shared ideas about what types of events are most successful, how to promote them to the student community, and how to make the most of the connections we have through WEAO, OWWA, Water Environment Federation (WEF), and, of course, employers. For example, both my chapter at U of T and the one at Ryerson have a monthly speaker series, and many of our speakers are WEAO members. Other chapters talked about their experiences in organizing plant tours, which are quite popular among students interested in the wastewater field. Another often mentioned idea was showing films about water, followed by discussions among chapter members. We also explored the idea of social events, including joint events between different chapters. The connections we made with other groups at the forum are the critical first step in planning these kind of events.

After a delicious lunch, we received a detailed tutorial on how to use the funds provided through WEAO to promote our events and chapter activities. We also learned more about other important student-related endeavours, including the WEAO and WEF scholarships, the annual conference in April, and the Student Design Competition. We are promoting all of these strongly at U of T, not just among our own members, but to undergraduate students in classes studying industrial design and wastewater treatment. We finished the afternoon with breakout sessions in which we started planning our events for the coming year, as well as succession planning to keep the chapters healthy and viable after we graduate.

In general, the day was well organized, well executed, and very helpful to student Chapters of all stripes. On behalf of all U of T Student Chapter Steering Committee members, I would like to thank the WEAO New Professionals Committee, in particular Student Chapter Program Manager Bill White, for putting it all together. I would also like to extend my gratitude to the Sheridan College Chapter and its staff advisor for graciously hosting for the day. The ideas gained at the leadership forum are already being implemented in our own programs, and we look forward to participating next year.
his year (2009) marks the fifth anniversary of the founding of UT-WEAO, the first student chapter in Ontario. Over the last half-decade, we have learned a lot about how WEAO benefits both graduate and undergraduate students, as well as how they can effectively serve the WEAO.

The mainstay of our program is the monthly speaker series. We have found that by having the event at a regularly scheduled time (the first Monday of every month), we are able to ensure a more stable turnout. Having plentiful snacks and drinks available is also extremely helpful. All of our talks this year have been well received. In September, NP Committee past-chair and former UT-WEAO founder Jeremy Kraemer gave us an overview of the organization. Our October speaker was Jana Levison, a recent Ph.D. graduate in Civil Engineering, who gave us a talk about anthropogenic contamination of aquifers, as well as her current work with the Ontario Centre for Engineering and Public Policy. We have already booked speakers for the rest of the year, and this core activity will no doubt continue in the future.

We have also branched out beyond the speaker series. This year has seen an increased focus on social events. Our first such event, a Karaoke night held in mid-September was enjoyable and entertaining, allowing our members to demonstrate their vocal skills in a less formal setting. In November, we held a screening of the Water For People film ‘Sharing the Gift of Life,’ which was followed by a social night featuring board games and snacks. A similar event in collaboration with the Ryerson Student Chapter is planned for December. In early October, we teamed up with the Ontario Water Works Association (OWWA) student chapter at U of T and held a barbecue to raise funds for Water For People. Despite a chilly torrential downpour, over 100 people showed up, and the word about both clubs spread among the student community.

Another major focus this year has been on promoting the Student Design Competition. Last year’s competition, which was the first ever held in Ontario, saw a very competitive showing by UT-WEAO’s team, which placed first in the provincial competition, and second at the international competition at WEFTEC 2009 in Orlando, Florida. This gave the team members a lot of momentum, and they are actively involved in recruiting a new team for this year’s competition. One strategy they have employed is to make

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presentations in related undergraduate classes, such as the third-year course ‘treatment processes.’ An information session held in early October was well attended, and it looks likely there will be another strong team participating in the competition this year.

All of these endeavours require funding, and our list of sponsors grew considerably in the last year. In addition to the funding provided by the WEAO NP Committee, we have connected with a number of on-campus organizations, including the University of Toronto’s Environmental Resource Network (UTERN), the Hart House Good Ideas Fund, the Skule Education Fund (Engineering Society), and the Graduate Students Union Social Justice Fund. Our budget is now over $1,000, which will allow us to expand our reach even further. In addition, many of the groups we have connected with for funding have related events in which we can participate and increase our exposure to the student body, such as the Chinese Engineering Student Association’s Campus Cleanup, which took place in mid-October.

Our club could not have been kept this vibrant and active without many hours of hard work by our dedicated steering committee. Many of our committee members have served for 2-3 years, which has helped immensely in terms of succession. Moreover, most of us are involved in at least one other student group, such as the Graduate Students Union and the Engineering Society, so we are able to achieve synergy with networks that are already in place. Our team meets 1-2 times per month to plan out activities and divide the work that needs to be done, in addition to the events themselves. We also keep in contact via a dedicated Google ‘group’ and numerous emails.

In general, the keys to growth have been a dedicated core group of volunteer organizers, an ability to take advantage of existing connections, and lots of optimism. We have had a great year so far, and we are looking forward not just to what is to come over the next several months, but also years ahead to preserve our chapter’s future.

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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.
EFTEC 2009 marked the first time the Water Environment Association of Ontario (WEAO) sent a student team to compete in the Student Design Competition (SDC). This year, the University of Toronto design team presented the design for the Rosebank Sanitary Sewage Pumping Station and Forcemain in the City of Pickering, Ontario. The team came in second place out of nine teams who competed in the Wastewater Competition. The other eight teams represented universities across the United States. The teams presented a broad range of topics that covered wastewater systems and processes. It was also the first year for the Environmental Design Competition to be held at WEFTEC. In this competition category, two universities from the US presented their sustainability and water reuse designs. Judges from the design competition were comprised of representatives from environmental consulting companies. Aside from being exposed to these projects, which were unique to each state, the design competition and the conference also proved to be an excellent opportunity to mingle with like-minded students from universities across North America.

The conference itself presented a valuable learning experience. The exhibits covered all aspects of the wastewater treatment processes such as different chemicals, pumps and monitoring equipment. The exhibitors were eager to discuss and demonstrate the commercial and technical details of their products; hence providing us with a tangible experience beyond the academic realm. The technical sessions offered a variety of specialized topics in the form of presentations as well as discussion panels, which proved to be a valuable experience to students and experts in the industry.

Another popular Students & Young Professionals event was the Community Outreach Project: Wetlands Replanting. The event provided students and young professionals with the opportunity to learn more about the wetlands system. The participants of the event spent the day harvesting and replanting plants at the Orange County Utilities Northwest Water Reclamation Facility. Other social events such as the career fair provided a great opportunity for students to meet people from the industry. The university lounge provided a convenient place to relax and interact with other students who attended WEFTEC.

Members of the University of Toronto design team would like to sincerely thank WEAO for providing them the opportunity to attend WEFTEC as well as all the individuals who have contributed to the success of this team. We would especially like to acknowledge the role of the WEAO SDC sub-committee for providing us with a real-life problem and a well-defined scope. Both aspects of the project enabled us to focus our efforts on a detailed and well-rounded design. We look forward to seeing other students enjoying the student design competition and the conference as much as we did.
MOHAWK LAUNCH A SUCCESS

Bill White, P.Eng. CH2M HILL

More than 40 students turned out for the successful launch of Mohawk College’s Student Chapter on Thursday, October 8 in Hamilton. The launch was the successful culmination of eight months of planning and hard work by the student leadership team and their faculty advisor. Mohawk’s is the tenth active student chapter in Ontario, and the third at a community college.

Over submarine sandwiches and soft drinks, Water Environment Association of Ontario (WEAO) Director John Duong led off the evening, speaking to students about the breadth of the industry and providing some good advice to students as they prepare to enter the workforce.

In a special first for a WEAO chapter launch, the Mohawk chapter also played host to our colleagues and partners from the Ontario Waterworks Association (OWWA). OWWA Student Chapter Program Manager Monique Waller spoke about the partnership and relationship between WEAO and OWWA, while OWWA Young Professionals chair Alex Sandovski was one of the speakers for a presentation entitled ‘Making the Transition – Student to New Professional.’

Other presenters included Bill White, Kathleen Hum and Anthony Abbruscato of the WEAO New Professionals Committee. The presentation used the planning, construction and operation of a wastewater facility as a vehicle to explore the many careers available to graduates in environmental programs. The roles of municipal government, provincial regulators, consultants, suppliers and operators in stewardship of the water environment were highlighted in particular detail. The purpose of the ‘Making the Transition’ seminar was to expose students to the many branches of the water environment profession, and to help them select the career path of their choice.

The partnership between the WEAO New Professionals Committee and the OWWA Young Professionals – respectively the ‘NPs’ and ‘YPs’ to our members – mirrors the close and cordial relationship between the two committees, and is a harbinger of exciting joint ventures to come in the next few months. Mohawk’s launch is also a prime opportunity for partnership with the neighbouring McMaster University Student Chapter; the executives of the two student chapters have already begun discussing possible joint activities.

Special thanks go out to the organizing team for this presentation, including Mohawk student leaders Kyle Waldner and Halka Klement and their faculty advisor, Jeff Kemp; to Anthony Abbruscato, Kathleen Hum, Shailesh Parmar, Charlie Chen, and Erin Longworth of the WEAO NP Committee; and to Monique Waller and Alex Sandovski of the OWWA Young Professionals.

Bill White, P.Eng. is an Associate Engineer with CH2M HILL in the Barrie regional office. He is also the volunteer Student Chapter Program Manager on the WEAO New Professionals Committee.

The partnership between the WEAO NPs and the OWWA YPs mirrors the close and cordial relationship between the two committees, and is a harbinger of exciting joint ventures to come...
Congratulations are extended to the University of Toronto design team of Lyutfiye (Luccia) Gafarova, Sherif Kinawy, Rafiq Qutub and Tony Tsui, for placing second at the WEF Student Design Competition (SDC) in Orlando, Florida. This award was obtained under the Wastewater Design category, where a total of nine universities across North America participated. It is important to highlight that this was the first time a Canadian team took part in this competition. This marks a bright start for WEAO’s own SDC. Well done U of T.

For 2009-10, WEAO is running its second SDC (http://www.weao.org/sdc/) with six teams competing to become the next team representing Ontario at WEF SDC in New Orleans in 2010. I am sure our next WEAO winning team will do its part to keep Ontario known as a competitive region. Thanks to the kind offer made by the U of T team to mentor the next students representing Ontario. From now on this can only get better. Special thanks go to the Region of Durham for providing the design project.

As a friendly suggestion: since there are now 10 student chapters, and the trend is growing – making us the Member Association with the largest number of student chapters under WEF, we should aim at forming two competitions per year so that Ontario can participate in both WEF competition categories: Wastewater Design and Environmental Design. Of course, this will need additional funding and Board approval. After such a solid start, we have proven that we can make good use of our members’ generous support.

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The Town of Bradford has experienced a huge population growth in recent years, and, as such, so has the wastewater treatment plant (WWTP) which has just completed its fourth upgrade. Bradford WWTP has expanded over the years from the original 3,025 m³/d extended aeration plant and lagoon system in the late 1970s, to the 4,325 m³/d Sequencing Batch Reactor (SBR) in the early 1990s, to the latest procurement for additional wastewater treatment, a two-stage 10,000 m³/d extended aeration plant. These additions bring the total design flow capacity of Bradford WWTP to 17 ML/d, servicing the 24,500 people in the Bradford area.

On Saturday, October 24, 2009, Bradford WWTP was host to the New Professionals latest facility tour, focusing on extended aeration and SBR activated sludge technologies. The tour started at the main board room with Mike Gundry from AECOM, Whitby office, giving an overview of the plant, including the recent two-stage extended aeration expansion. Supervisor Rick Way, and Wastewater Manager Brad Sullivan, then guided the attendees through each component at the plant, starting with the control room’s SCADA system, allowing everyone to witness a good overview of the plant. The tour then proceeded to the influent pumping station and septage receiving station where guests were able to see how the existing biosolids lagoon can be utilized for storage of excess flows, which can later be pumped to the head of the plant for treatment, thus preventing the possibility of non-compliance discharges to a sensitive receiving water body. The headworks followed, showcasing front-rake mechanical bar screens, a vortex grit removal system with grit classifier, and an in-vessel biofilter for odour control.

Following the headworks, the SBR and extended aeration tanks were showcased. The SBR consists of two tanks ‘mirrored’ beside each other. Each tank has anoxic zones where nitrate are removed from the RAS via biological denitrification and alum is added for phosphorus removal to help achieve extremely low nitrogen and phosphorus discharge requirements. Attendees had an opportunity to view this unique method of the activated sludge process with a detailed description from each tour guide on the filling, settling, and decanting sequences. The extended aeration tanks consist of three basins, with alum added at the beginning of each tank for phosphorus removal.

Other points of interest on this tour included four 3,250 m³, two-stage aerobic digesters, which render a very stable liquid biosolid (around 3.5% solids) that is used for land application in the large agricultural Greenbelt area. A new glass fused to steel biosolids storage tank was also built at this plant and supplied with a hydraulic mixing system. This biosolids storage tank has broken a size record in North America; the covered tank has 12,000m³ biosolids storage capacity, measuring 36.57m in diameter and 12.19m in height. Near the end of the tour, attendees had a chance to see how Bradford WWTP achieves tertiary treatment requirements by utilizing continuous backwash sand filters along with ultra violet light disinfection, before effluent is discharged to a small tributary that connects with the Holland River. To end the tour, Supervisor Rick Way took participants to the lab, where they were able to view a 30-minute settling test from an aeration tank grab-sample, and then view some of the microorganisms present in the bioreactor under a microscope.

The tour was very informative and was particularly beneficial to students, who can now put images to textbook knowledge. Visiting the Bradford WWTP also offered the tour attendees an opportunity to appreciate a small treatment plant, which maintains a superior water quality in the effluent to minimize impact on a sensitive receiving watercourse.

WEAO NP Committee is glad to see the growing attendance from new professionals, particularly six Ryerson University students. The NP Committee specifically thanks Brad Sullivan (Wastewater Manager), Rick Way (Wastewater Supervisor) and Mike Gundry (Project Manager, AECOM) who made it possible for this tour to take place. A special thank you is also extended to Dale Jackson of ACG Technology for organizing the plant tour.
NEW PROFESSIONALS MEET AND GREET SOCIAL

Charlie Chen, AECOM, NP Committee Chair

On October 16, 2009, the fourth annual Meet & Greet social event was held at Joe Badali’s in downtown Toronto. This was an event jointly hosted by the Ontario Water Works Association (OWWA) Young Professionals and the WEAO New Professionals. The Meet & Greet provides an opportunity for new professionals to interact with seasoned professionals in the industry. Over 40 participants attended the event, including many students from newly-formed and existing WEAO student chapters. Among the attendees were past-presidents of WEAO and OWWA, George Lai and Tom Moulton, as well as WEAO Director, Vanessa Chau.

All NPs and students enjoyed talking with these seasoned professionals in an informal and relaxed environment.

A big thank you is extended to Tina Zhang of Genivar for organizing this amazing event.

“The WEAO NP Committee has been created to represent those WEAO members with 10 years or less of experience in the wastewater industry, or who are less than 35 years of age. Our primary goal is to aid in the technical and professional development of individuals entering the wastewater industry, as well as to encourage participation of New Professionals in WEAO activities.”

New Professionals and Students at Meet & Greet 2009

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Biosolids are a nutrient-rich end-product of the wastewater treatment process and have gone through a pathogen reduction process, as well as removal of other constituents depending on their chemical make-up. They contain nitrogen, phosphorous and organic matter as well as essential micro-nutrients which are important for plant growth and soil fertility.

Recycling this valuable resource benefits farmers and society. Farmers receive a substantial economic benefit because biosolids provide nitrogen, phosphorous and other micro-nutrients that they would otherwise have to purchase to grow their crops. Society benefits from this practice through reductions in landfill space requirements and greenhouse gas emissions.

To put the spotlight on sanitation, the United Nations General Assembly declared 2008 the International Year of Sanitation. The goal was to raise awareness and to accelerate progress towards the Millennium Development Goals (MDG), including the target to reduce by half the proportion of the 2.6 billion people without access to basic sanitation by 2015.

In order to advance the environmental agenda globally, and in recognition of the fact that 2008 was the International Year of Sanitation, the GMSC, in cooperation with UN-HABITAT, published the *Global Biosolids Atlas*, which was officially launched on September 8, 2008 at the International Water Association (IWA) – World Water Congress in Vienna, Austria.

The objective of the *Global Atlas* was to provide a global picture of the current status of information and opportunities for wastewater biosolids/sludge disposal and reuse, including trends and regional comparisons. Several contributions are included from countries in development and countries in transition, including regions or localities that have little or no centralized or mechanical sewage treatment. The *Atlas* also aims to contextualize biosolids management within the larger framework of global development challenges.

The publication runs to 608 pages and chronicles excreta, wastewater sludge and biosolids management practices in 37 countries and regions throughout the world, with reports on sanitation in 59 jurisdictions. They range from developing countries, with substantial portions of the population lacking access to modern plumbing or flush toilets, to developed countries with sophisticated treatment systems.

The idea for the creation of this *Global Atlas* originated at the IWA Biosolids Conference: ‘Moving Forward Wastewater Biosolids Sustainability: Technical, Managerial, and Public Synergy’ held in Moncton, New Brunswick in June 2007.

The *Atlas* provides a global summary with the intent that it be used as a resource of information of current wastewater treatment, disposal and reuse practices, which will hopefully enable identification of current trends, solutions and alternatives that could serve to promote action towards improving wastewater solids management and the beneficial use of biosolids around the world.

The *Atlas* provides a concise overview of the existing state of the management of biosolids across the globe, a presentation by the GMSC was made in May of this year at the WEF Residuals and Biosolids 2009 Conference in Portland, Oregon. More recently, Ronald J. LeBlanc and Roland Richard of the GMSC were invited to present a review of the *Global Biosolids Atlas* at the IWA Specialized Conference on Decentralized Water and Wastewater in Kathmandu, Nepal, November 2009.

The GMSC is proud to have partnered with UN-HABITAT to publish this most important resource. The *Atlas* is available for free download at [www.unhabitat.org](http://www.unhabitat.org). Printed copies may be ordered from the same website.
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Sometimes all it takes is a little thing to start a revolution. Presenting the Flexrake storm and wastewater screen from Duperon Corporation. Perfect for stormwater, intake protection or wastewater applications, the Flexrake is available in coarse or fine screens, doesn’t require routine maintenance and its motor and bearings only require semi-annual maintenance. And because it has no bottom shaft, bearings or chain guides the need for underwater maintenance is eliminated altogether. Plus there’s no jamming or stalling regardless of debris size. With all these features and more than 400 installations worldwide, it’s no wonder that the Flexrake comes with a 5-year limited warranty.* For complete details on how this landmark innovation can help you, contact ACG Technology Limited.
The Canadian Council of Ministers of the Environment (CCME) is the major intergovernmental forum in Canada for discussion and joint action on environmental issues of national concern. The 14 member governments work as partners in developing nationally consistent environmental standards and practices.

Currently, Canadians produce more than 660,000 metric tons of municipal wastewater biosolids each year, which is more than 2.5 million metric tons on a wet weight basis. The annual cost of biosolids management is approximately 50% of the total operating cost of wastewater management.

To study and make recommendations on issues related to biosolids management at the national level, CCME established the Biosolids Task Group (BTG) in 2008. The BTG membership is made up of representatives from:

- Nova Scotia and British Columbia (co-chairs);
- Alberta, Manitoba, New Brunswick, Newfoundland and Labrador, Northwest Territories, Nunavut, Ontario (MOE Waste Management Policy Branch and Standards Development Branch), Prince Edward Island, Quebec, Saskatchewan and Yukon; and
- the Canadian Food Inspection Agency and Environment Canada.
- The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) also participates on the Task Group as biosolids are regulated jointly by MOE and OMAFRA in Ontario under the Nutrient Management Act.

The desired outcome of BTG’s work is that local governments and other biosolids generators manage biosolids under a harmonized national policy and regulatory framework that clearly addresses issues of risk, defines beneficial use, instills public confidence, and protects the environment and human health.

The scope of the work of BTG includes municipal wastewater biosolids and septage, but does not include separate industrial and commercial biosolids derived, for example, from pulp and paper processing.

The initial work of BTG included:

- developing an inventory of substances of interest in Canadian biosolids;
- conducting an analysis of greenhouse gas emissions associated with biosolids management approaches and the development of a method to calculate emissions; and
- completing a review of current Canadian legislative frameworks for biosolids.

The inventory of substances of interest and the legislative framework review projects are currently in progress, while the greenhouse gas emissions calculator has been completed and is available on the CCME website.

Municipal biosolids sampling study

Although various studies in other jurisdictions have demonstrated the presence of substances of interest such as pharmaceuticals and personal care products (PPCP) in biosolids, a Canada-wide study to identify and inventory these substances in biosolids had not been done until now.

The BTG first contracted a literature review of available information and existing research done on substances such as PPCPs in biosolids in Canada, and subsequently an analysis of Canadian biosolids and septage samples from 10 wastewater treatment plants in Canada. Based on the literature review and survey, the results will include:

1) a list of substances present in Canadian biosolids;
2) a list of substances that may pose a risk through land application, according to general criteria used by the United States Environmental Protection Agency or others (contaminants that are both persistent in soil environment, bioaccumulative by plants, highly toxic, etc.); and
3) compiled data on levels of substances in Canadian biosolids.

The analysis of the biosolids and septage samples will include a minimum of five substances, nutrients (total kjeldahl nitrogen, nitrate, nitrite, ammonia, ammonium, total phosphorus and orthophosphate), and 11 metals (As, Cd, Cr, Cu, Co, Ni, Pb, Hg, Mo, Se, Zn).

This project is expected to be completed in the spring of 2010.

BEAM greenhouse gas emissions calculator

A consideration of increasing importance when evaluating biosolids management practices is the impact of greenhouse gas (GHG) emissions. The BTG retained the services of SYLVIS Environmental and its project team composed of Ned Beecher (Northeast Biosolids and Residuals Association), Dr. Sally Brown (University of Washington, College of Forest Resources), and Andrew Carpenter (Northern Tilth).

The objective of the project was to develop a GHG calculation methodology for Canadian municipal biosolids generators and managers to use as a tool for evaluating the environmental impacts of current and future biosolids and sludge management options, such as land application, composting, incineration and landfilling, with or without energy recovery, including anaerobic digestion.

A literature and background review was undertaken to support subsequent development of the GHG calculator tool. The literature review identified GHG sources (debits) and offset (credits) opportunities associated with biosolids management, determined and corroborated GHG emission factors, and summarized international GHG protocols. Biosolids management practices were summarized for over 40 Canadian jurisdictions. Based on the information gathered through the literature and background review, a simplified GHG calculator spreadsheet tool, known as the Biosolids Emissions
BIOSOLIDS

Assessment Model (BEAM), was developed.

Data and information for the validation phase of the project were solicited from nine Canadian municipalities. Participating municipalities were selected based on their current biosolids management practices, their leadership, the availability of data, and to provide regional representation across Canada. The data and information received from these municipalities were used to populate the BEAM and determine net GHG emissions (tonnes of carbon dioxide equivalents per dry tonne biosolids) from their biosolids management practices. Consultation with the participating municipalities provided valuable feedback that was used to refine the data and information requirements to optimize the BEAM model.

The BEAM provides a flexible, user-friendly model that can be applied to biosolids management scenarios across Canada. As market incentives develop further for GHG emissions reductions, documentation using BEAM, combined with an independent verification step, could lead to the generation of marketable carbon credits.

A user guide has been prepared to facilitate use of the BEAM, providing background, rationale for decisions and a summary of the steps involved in the BEAM development. The BEAM is available on the CCME website at: http://www.ccme.ca/ourwork/waste. html?category_id=137.

Legislative framework review

Part of the mandate of the BTG is to develop a Canada-wide approach for the management of municipal biosolids focusing on policy and regulatory harmonization.

One of the key steps to achieve this goal was to undertake a federal and provincial legislative review, with the objective of outlining the current regulatory framework, and identifying commonalities, inconsistencies and duplications.

To obtain the information required, a BTG sub-committee designed a survey which included a questionnaire and a series of comparative tables of standards and requirements. Federal and provincial representatives of each jurisdiction on the BTG responded to the survey, and the results were compiled and analysed.

The result of the survey is a picture of the current Canadian legislative framework, including a description of the roles and responsibilities of the different jurisdictions, the procedure for approving biosolids, applicable standards and requirements, and compliance and monitoring. Analysis of the survey information indicates that certain policies (e.g., pathogens, organic contaminants) are quite similar across the country, whereas others (e.g., application rates, separation requirements) vary between provinces.

The information gained through this review will be used to facilitate BTG’s work to develop a Canada-wide approach for managing biosolids focused on policy and regulatory harmonization.

Research clearing house

CCME hosted a workshop to determine the most appropriate mechanism for wastewater/biosolids research coordination and information dissemination nation-wide. The one-day workshop was held on December 2, 2009 in Ottawa in conjunction with the annual Canadian Water and Wastewater Association’s Window On Ottawa Conference. Participants included researchers, professional associations, potential funding partners and provincial, federal and municipal government representatives.

The objectives of the workshop were to determine:

1) the most appropriate mechanism for wastewater and biosolids information dissemination and research coordination, in order to make effective use of the limited resources available in Canada;

2) the governance approach, organizational structure and funding options of a research coordination body, its functions and scope of activities (terms of reference); and

3) how to engage key stakeholder organizations and determine the essential steps for building their support for this initiative (either as active participants or as funding partners).

Canada-wide Approach for Biosolids Management

A Canada-wide Approach for Biosolids Management will be developed from these projects and from additional work to be carried out by BTG. Public consultation and information exchange will be an important component of the development of the Canada-wide Approach for Biosolids Management.
The Canadian Biosolids Partnership
Past, Present and Future

T.D. Ellison, Executive Director CWWA

The need for a Canadian Biosolids Partnership was first presented at the Canadian Water and Wastewater Association’s (CWWA’s) 2004 ‘Window On Ottawa,’ by Ronald J. LeBlanc, Chairman of the Greater Moncton Sewerage Commission. The proposal was then further articulated at the 1st Canadian National Wastewater Forum, hosted by CWWA in the spring of 2005, where it received widespread support. The broad concept of the Canadian Partnership was based on the United States (US) model, with a federal department acting as a champion and with all other stakeholders, including provincial governments, municipal producers, private sector contractors and other stakeholders, involved in working to ensure that biosolids could be produced according to accepted standards and used beneficially. CWWA agreed to act as an administrative secretariat for the Partnership. In support of the initial proposal, the Greater Moncton Sewerage Commission (GMSC) has been a tireless champion for the Partnership, and provided financial support for its establishment and development.

A small delegation visited the offices of the US National Partnership in Washington, DC in mid-2005 to learn more of how that Partnership functions and reported back to stakeholders at the 2006 Window On Ottawa. Letters were sent to federal and provincial ministers and Canadian Council of Ministers of the Environment (CCME) as well as to municipal producers and others inviting them to indicate their interest in participating in the Partnership. At the 2006 Window, an agreement was reached to proceed and develop a formal business plan and proposal that would be sent to stakeholders, seeking their participation both organizationally and financially. The Business Plan was reviewed at a stakeholders meeting which took place at the International Water Association (IWA) Specialty Conference – Moving Forward Wastewater Biosolids Sustainability: Technical, Managerial and Public Synergy – in Moncton, New Brunswick in June, 2007. The Business Plan was reviewed and a follow-up meeting of stakeholders took place in Toronto in September, 2007. At that point, the Partnership had commenced to receive contributions from municipal producers, but had only received expressions of interest from federal and provincial departments. Initial research work was undertaken to document the current legislation across the country, to identify and try to harmonize terminology, and to identify beneficial uses for biosolids from a global search. An initial website was set up and is hosted through the CWWA webpage www.cwwa.ca, where this and other information is posted.

The Canadian Food Inspection Agency (CFIA) had commenced a review of the Fertilizer Regulations and interventions were made regarding one of the items listed – sewage sludge – to encourage CFIA to recognize that biosolids were a product of a waste-water treatment process, and not just untreated sludge. At the same time, submissions were made to the National Pollutant Release Inventory (NPRI) program of Environment Canada, indicating that, according to International Organization for Standardization (ISO) definitions, products are “the result of a process” and, therefore, biosolids should not be considered a pollutant released to the environment, but a product and thus outside the scope of NPRI. On behalf of the Partnership, CWWA also wrote to the CCME and urged them, knowing that a future biosolids activity would be taking place as a result of the Municipal Waste Water Management and Machine Builders in Canada and around the world look to SEW-EURODRIVE for integrated drive solutions and around-the-clock service and support.

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Effluents Strategy, to take advantage of the proposed Partnership and conduct the review of options and needs within that framework. Unfortunately, that offer was turned down and we were informed that CCME would set up a task group of provincial and federal officials who would consult from time to time with other stakeholders according to their normal practices. A parallel effort to identify a federal champion was unsuccessful – neither Environment Canada nor the CFIA were willing to take on this role. CCME set up its Task Group on Biosolids in late 2008 and it has commenced work.

In the meantime, the situation with biosolids remains as it was – the burden of multiple regulatory instruments, conflicts in definitions (product versus waste), and the lack of adequate public education and communications are preventing municipalities and others from using these products to their full potential: a potential that could reduce costs and provide environmental benefit through soil augmentation, nutrient addition, alternative energy production, and the creation of new industries (e.g., biofuel production). There remains no ability to concertedly address public perception issues and, perhaps most importantly, an environmental resource is under-appreciated and under-used.

What is its future? The answer to this is not known, although it is reasonable to conclude that the original concept of the three levels of government working in partnership is not going anywhere. It seems that decision-making and regulation is and will remain a function of provincial and federal governments, albeit with public consultation. The concept of federal or provincial champions of biosolids and their beneficial uses is unlikely. There remains strong support for a partnership from the municipal producers and other stakeholders. CWWA is “holding in trust” funds provided by the municipal producers against the need to do specific research or to conduct educational programs, but the municipal and other stakeholders await the outcome of the CCME Task Force. In the meantime, CWWA will maintain the Biosolids Partnership website and looks for information from stakeholders to post on it and keep it current.
Introduction

A Biosolids Management Master Plan Class EA was completed by Dennis Consultants, a division of R.V. Anderson Associates Limited (RVA), in order to provide the City of Greater Sudbury with a sustainable plan to manage biosolids produced at its Wastewater Treatment Plant (WWTP).

Background

The City of Greater Sudbury (City) has been fairly unique in its management of solids generated at its wastewater facilities. Waste Activated Sludge (WAS) from the City’s nine wastewater treatment plants, the Vale Inco WWTP, and outlying Ontario Clean Water Agency (OCWA) facilities, such as Espanola and Blind River, is collected from the various facilities and hauled by truck to the City’s Sludge Transfer Station, where it is pumped to Vale Inco’s R1 and R3 Tailings Ponds. Figure 1 provides an overview of the City’s current wastewater operations.

This practice has been in place for more than 30 years, and while the operation has been generally trouble free, on occasion throughout the history of the relationship between Vale Inco and the City, operational issues have arisen. This has resulted in odour problems and the sight of plastics and needles being washed up on the tailings pond banks. All this has generated complaints from local workers and area residents, which have on occasion been serious enough to strain the relationship between the City and local residents.

Localized odour issues were historically minor in nature, and were successfully dealt with by the City altering the sludge discharge locations and INCO burying the deposited sludge within the tailings area. The City experienced more severe odour problems in 2005 and 2007. These were sparked by a combination of changes that altered the pond dynamics and developed sustained and significant odour generation. Numerous complaints were received from local residents in the communities of Lively, Walden and Copper Cliff.

In order to address these problems, the City developed an odour abatement program. As part of a short-term, interim solution, the City used chemical dosing on the ponds with Bioxide™ and installed a Coherent Water Resonator on a trial basis.

The City also planned for a long-term sustainable solution in order to permanently resolve the odour issues. This long-term solution was prepared through a Master Plan Class Environmental Assessment.

The Class EA process follows the procedures and regulations set by the Municipal Engineers Association, in order to meet the requirements of Ontario’s Environmental Assessment Act. Adherence to the prescribed process ensures that potentially affected, natural, social, economic, cultural and technical components of the environment are considered.

A master plan process is actively promoted by the Ministry of Environment. The main objective of the master plan approach is to develop multi-year infrastructure, while adhering to principles such as consulting with affected parties, providing a wide range of alternatives, objectively evaluating alternatives, and considering the impacts on the environment and the community.

The desired features and key strategies for the Biosolids Management Master Plan were developed through consultation with representatives from the City. The following key elements were developed and found to be relevant to the selection process:

- consider public acceptance to be of utmost importance;
• cease the disposal of sludge or biosolids products into the tailings ponds;
• reduce or eliminate haulage of unsta-bilized (and odourous) material;
• reduce haulage costs and truck traffic;
• consider pro-active approaches to odour management/control (enclosed process);
• produce Class A odour-free end-product with minimal residual odour;
• strive for end-use/disposal diversity (landfill cover, mine reclamation, agricultural, land reclamation, marketable soil product);
• use proven technologies that have representative installations in Ontario;
• emphasize reliability and ease of operation;
• consider treatment of recycle streams; and
• consider comparative life-cycle costs.

Existing conditions assessment
A summary of the existing situation was carried out, including an evaluation of an odour study in the tailing ponds area. This also helped outline some of the criteria and standards by which the Master Plan would be evaluated.

A forecast of the City’s expected population growth was conducted in order to effectively address the City’s future needs. The City has experienced a series of cyclical decline and recovery periods, with a peak population of 170,000 in 1971.

Based on a population projection study executed by Meridian Planning Consultants as part of the Official Plan Review process, four projections were identified:
• out-migration,
• natural increase,
• in-migration, and
• high in-migration.

A careful analysis of in-migration and high in-migration scenarios was conducted, as these are of particular interest for this study, since the City has experienced significant growth over the last five years in outlying areas. For the purpose of the study, it was assumed that the City would most likely experience growth until the year 2033. A total serviced population of 177,000 for the above mentioned year was utilized.

After reviewing operating data at the various wastewater treatment facilities (maximums and averages), an estimated average daily sludge production of 500 m³/day (i.e., based on thickened WAS, 3% solids) was forecasted for the year 2033.

Operational requirements were based on the City’s desire to operate the biosolids facility, five days per week, 10 hours per day. A rated capacity of 700 m³/day, including provisions for redundancy, was used as a basis to develop and review the various treatment technologies and alternatives. The City will have the flexibility to double the capacity of the treatment process by operating the treatment facility 20 hours per day or during weekends, if required. This value is slightly conservative and will result in having increased spare capacity for any unforeseen circumstances.

A review and assessment of plant capacity and biosolids production of the main and satellite plants was prepared. This helped to identify an important design criteria and assumptions such as:
• Trucked sludge from satellite plants is only a fraction of the total (the major portion of sludge being generated at the City’s main plant).
• Construction of a biosolids facility, if required, would be preferred in a centralized location.
• The need to truck sludge from the satellite plants will remain; however, the overall haulage effort would be reduced.

Establishing criteria
A study of the natural environment of the City and surroundings was a key parameter for all decisions related to biosolids management.

On a broad level, the City of Greater Sudbury lies within the Sudbury basin, forming part of the Canadian Shield. The topography is variable and is comprised of a mix of bedrock, wetlands, lakes, agriculture, and wooded areas. The surrounding landscape is recovering from years of mining activity. Re-greening and land reclamation projects have transformed the landscape over the past 30 years, with great success. Trees and grass now cover what years ago was barren terrain. Efforts at re-greening have earned the community worldwide recognition.

Many of the local mines share in the City’s re-greening projects and have embarked on their own acid mine reclamation projects to improve the landscape.

Sudbury has an active agricultural sector, concentrated along an extensive swath of land that forms the centre of the Sudbury Basin. The City’s Official Plan Review, adopted in June 2006, identifies the need to maintain prime agricultural lands. The supporting background study also recommends the preservation of topsoil, and prohibiting the removal of topsoil in agricultural lands.

End-use diversity for the biosolids program was a key consideration of the evaluation process. Products that were considered more suitable to the local situation were deemed to have greater beneficial use diversity.

Various end-use disposal alternatives were evaluated such as land application, horticulture, silviculture, landfill cover amendment, monofilling, co-disposal, land reclamation, soil remediation and land farming.

Applicable regulatory standards regarding disposal of biosolids were consulted. Of particular importance is the Nutrient Management Act, which defines the maximum nutrient application allowable and defines limits for concentrations in materials applied to land.

The City undertook a comprehensive analysis of metals in its sludge produced by all wastewater treatment facilities. Metal levels in the City’s sludge, both at the individual plants and weighted composite values, were found to be consistently below the lowest maximum regulated concentrations of various provincial, federal and US EPA regulations. This suggested that the City would have a number of end-use options available for further consideration.

It was determined during the assessment of the study area that opportunities for marketing could exist for an end-product that can be used for soil remediation purposes. The following opportunities were identified:
• alleviate local soil deficiencies,
• mine reclamation,
• land reclamation, and
• landfill cover material.
From this perspective, any technology that could produce a Class A end-product with a relatively high alkalinity would be given preference in terms of end-use diversity and sustainability.

**Alternatives**

During the Master Plan Class EA, the alternatives outlined below were identified:

1. **Do nothing**: Not a visible alternative due to logistic issues ruled out.
2. **Haul sludge to another municipality**: Due to logistic issues ruled out.
3. **Build only at the Sudbury Wastewater Treatment Plant (SWWTP)**: Can produce Class A or B Biosolids.
4. **Build only at the Sudbury Landfill Site**: Not practical, no treatment of side streams available.
5. **Build facilities at the SWWTP and Sudbury Landfill Site**: Can produce Class A or B Biosolids.
6. **Build only at a new site**: Not practical, no treatment of side streams available.
7. **Build facilities at the SWWTP and a new site**: Can produce Class A or B Biosolids.

**Figure 2: Summary of Planning Scenarios**

<table>
<thead>
<tr>
<th>Planning Alternative</th>
<th>Technical Alternative</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do nothing</td>
<td>ATTAD™</td>
<td>Lystek™</td>
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<tr>
<td>2. Haul sludge to another Municipality</td>
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</tr>
<tr>
<td>3. Build only at the SWWTP</td>
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<tr>
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<td>5. Build facilities at the SWWTP and Sudbury Landfill Site</td>
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<tr>
<td>6. Build only at a New Site</td>
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</tr>
<tr>
<td>7. Build facilities at the SWWTP and a New Site</td>
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</tr>
</tbody>
</table>

From this perspective, any technology that could produce a Class A end-product with a relatively high alkalinity would be given preference in terms of end-use diversity and sustainability.

**Alternatives**

During the Master Plan Class EA, the alternatives outlined below were identified:

1. **Do-Nothing**: Considering the magnitude of problem related to public complaints due to odours at the tailing ponds and other factors such as:
   - Ministry of Environment concerns regarding the disposal of unstabilized sludge, and
   - Vale Inco’s announcement that the ponds will not be available after 2010.
   As a result this option was promptly discarded.

2. **Truck sludge to another municipality**: In theory, this alternative could certainly resolve immediate odour issues at the tailing ponds, as the sludge is diverted to another location for treatment. This alternative also has the advantage of having an expected low capital cost. Unfortunately, Sudbury’s remote location, relative to available sludge stabilization facilities (e.g., Peel or Duffin Creek incinerators), and its relatively high sludge production would likely yield a very high operating cost. It is also contingent on spare capacity and continued availability of a third party’s treatment facility.
3. **Build a biosolids dewatering and stabilization facility only at the Sudbury Wastewater Treatment Plant**: The facility would be constructed as an upgrade to the plant, which is considered a Schedule B undertaking in the Class EA. After performing a brief analysis of existing plant layouts, it was found that enough space was available to allocate this facility, as long as the selected technology would not require an exceedingly large foot print (e.g., composting facility). Any upgrade to the plant will need to be coordinated with any planned expansions to the existing liquid treatment train.
4. **Build a biosolids facility only at the landfill site**: Alternative 4 involves the construction of a new biosolids treatment facility at the Sudbury landfill site. Any of the proposed treatment technologies may be selected for this option. The end-product would be a stabilized biosolids material safe for disposal or storage at the Sudbury landfill or for use as a soil amendment product. This alternative was considered impractical, as there is no ability to treat the dewatering or process recycle streams at the landfill without adding a separate liquid treatment train, which would be costly.
5. **Provide biosolids dewatering at the SWWTP and build a stabilization facility at the landfill**: This option considers construction of dewatering and trucking facilities at the SWWTP, while the main facility would be constructed as an upgrade to the landfill. Both expansions are considered as Schedule B under the Class EA. The landfill property has much more available space to contain a stabilization facility. If footprint size is removed from the list of constraints, it provides a wider technology pool.
6. **Build a biosolids dewatering and stabilization facility only at a new site**: The rationale behind this alternative is that the new site could be chosen freely in order to suit the needs of the facility. This option also allows avoiding interrupting or interfering with existing facilities. However, it might be quite difficult to find a property for these needs without having to truck unstabilized sludge for long-distances. Recycle streams from dewatering would need to be trucked back to the SWWTP for treatment or treated using a new system in the new site, which is cost prohibitive.
7. **Provide biosolids dewatering at the SWWTP and build a stabilization facility at a new site**: Alternative 7 involves the construction of a new...
biosolids treatment facility at a site yet to be determined. Technologies such as composting would require a larger footprint. Initial treatment in the form of dewatering would occur at the SWWTP, with final treatment and disposal or stockpiling of the stabilized end-product at the new site. The final product would be a stabilized biosolid material safe for disposal or storage on site or for use as a soil amendment product.

Technologies

A long list of technologies was developed to include all available stabilized processes such as digestion, alkaline treatment, composting, thermal treatment and sludge reduction.

A level one screening approach employing a pass/fail ranking system was used to quickly eliminate unsuitable or undesirable options to create a short list of feasible technologies. All technologies were subjected to a pass/fail scoring based on the following criteria:

• public acceptance,
• environmental/public health/worker safety,
• proven technology – easy to operate: reliable,
• control/manage odours,
• environmentally/economic sustainable, and
• end-use diversity.

For a technology to be selected for further review, it had to obtain a ‘passing’ score on all of the above criteria. Options receiving a ‘pass’ mark proceeded to a more detailed evaluation, whereby the relative weighting of each criterion was assessed.

Technology alternatives were developed to ‘best fit’ with the City’s existing wastewater processes technologies, while providing a useable biosolid end-product.

Scenarios

After developing a short list of viable technologies, each was compared with other feasible alternatives using an evaluation matrix. The following scenarios were generated:

• dewatering and Schwing Bioset™ at the Sudbury Wastewater Treatment Plant,
• dewatering and Lystek™ at the Sudbury Wastewater Treatment Plant,
• dewatering and ATTAD™ at the Sudbury Wastewater Treatment Plant,
• dewatering and N-Viro™ at the Sudbury Wastewater Treatment Plant,
• dewatering at the SWWTP and N-Viro™ at the Sudbury landfill,
• dewatering at the SWWTP and composting using Gore™ technology at the Sudbury landfill, and
• dewatering at the SWWTP and composting using Gore™ technology at a new site.

Figure 2 provides a summary of these alternatives.

Evaluation of alternatives

A detailed evaluation of the eight combined planning/technical alternatives

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(technologies) was conducted utilizing the following criteria:
- protection of public health,
- environmental sustainability,
- public acceptance,
- ease of operation,
- reliability and flexibility,
- end-use diversity, and
- operational/market risks.

Each criterion had an individual weighting from 1 to 10, and each scenario was scored from 1 to 10 and weighted against this criteria. The results of the scoring are summarized in the technical evaluation matrix. The following ‘highest scoring scenarios’ were identified:
- Schwing Bioset™ at the Sudbury Wastewater Treatment Plant,
- ATTAD™ at the Sudbury Wastewater Treatment Plant,
- N-Viro™ at the Sudbury Wastewater Treatment Plant, and
- N-Viro™ at the Sudbury landfill.

Each alternative produces a Class A, near-pathogen-free soil type end-product, with no known documented health risk to the public or workers managing the process. The first three can be sited at the Sudbury Wastewater Treatment Plant and incorporate ‘closed’ vessel process to reduce odour and, as a result, odour emissions.

Processing at the SWWTP has a number of advantages including reduced haulage of sludge and reduced sludge truck traffic, reduced manageable odour emissions, as well as the ability to treat the recycle streams from the biosolids process.

From the City’s perspective, the siting of the new facility at the SWWTP will greatly reduce the trucking through the City and, in recognition of this siting, the N-Viro™ process at the City’s landfill site is not a preferred option.

Capital and O&M cost estimates for all these alternatives were also prepared. Net present values (NPV) over a 25-year return period were also calculated. An interest rate of 5% and inflation rate of 2% were used for this computation. All alternatives had a forecasted cost of $285 to $400/dry tonne. Capital costs were $20-40 million, while NPVs varied between $50 million and $70 million.

**Project delivery method**

To accommodate the City’s scheduling requirements and target deadline of December 2010 for the project, conventional design-tender-construction was not recommended. Instead, alternative delivery options such as design-build were examined.

The design-build approach has some known risks. Because the design/engineering phase is included in the contractor’s scope of work, the owner loses input into the detailed design, which can result in a project that fails to meet accepted City quality standards as well as operational reliability and flexibility requirements.

For this reason, a design-build and operate method is preferred. By adding the operating component, it forces the design-builder to set a standard of quality in order to successfully run the plant as part of the contract.

**Conclusions and recommendations**

Sudbury should consider the following:
- construction of a centralized Biosolids Treatment Facility at the Sudbury Wastewater Treatment Plant;
- provision of short-term storage at the plant site until such time as the primary clarifiers/storm tank are required;
- consideration of long-term storage options at the Sudbury landfill site;
- further detailed investigation of end-use/disposal options to determine the safest and most economically beneficial options (i.e., landfill cover vs. land reclamation or agricultural use or a combination thereof);
- development of a Nutrient Management Strategy for end-use/disposal as required;
- project solutions should consider any of the following technologies ATTAD™, N-Viro™, and Schwing Bioset™; and
- to accommodate the tight timeframe for ceasing the discharge of unstabilized sludge into the tailings ponds, the City should consider alternative delivery methods in lieu of the traditional design-tender-construction option.

**Reference**

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## Opportunities for Beneficial Use of Residuals in Ontario

Mel Webber, Webber Environmental, mdwebberenvironmental@cogeco.ca, Phil Sidhwa, President, Terratec Environmental Ltd., psidhwa@amwater.com

### Introduction
Ontario has approximately one-third of Canada’s population and a large proportion of its manufacturing industries concentrated in a relatively small southerly region bordering Lakes Erie and Ontario. Enormous quantities of raw materials are produced in and imported into this region and the high levels of human and industrial activity result in vast quantities of residuals requiring environmentally safe management. They include agricultural residuals such as animal manure, industrial residuals such as sugar refinery lime and paper fibre biosolids (PFB), and urban residuals such as kitchen and yard wastes and municipal sewage biosolids (hereafter called ‘sewage biosolids’). In general, management of agricultural residuals is not problematic because these materials are valuable fertilizers/soil amendments and are used beneficially in the farmland from which they are generated. In contrast, the large quantities of urban and industrial residuals produced in confined spaces and in close proximity to human populations usually require specialized, expensive management procedures.

### Objectives
This article addresses opportunities for beneficial use of urban residuals such as sewage biosolids and industrial residuals such as PFB and sugar refinery lime in Ontario. Traditional and non-traditional situations including agriculture, tree-nurseries, land reclamation, and preparation of manufactured soils/growth media are considered and there is brief mention of sewage biosolids as a ‘green’ energy source.

### Urban and industrial residuals

#### Sewage biosolids

Typical properties of sewage biosolids are presented in Table 1. Data for the liquid and dewatered materials are from one biosolids source whereas those for pelletized, composted and alkaline stabilized materials are from different sources. As expected, the liquid and dewatered materials exhibit similar properties except for their total solids, soluble N concentrations and C:N (carbon to nitrogen) ratios. The dewatered material exhibits higher total solids and lower soluble N than the liquid material, and an increased C:N ratio. Low TKN (total Kjeldahl nitrogen) concentrations in the compost and alkaline stabilized materials probably are related to: (1) addition of materials such as tree bark and

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Anaerobically digested¹</td>
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<tr>
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<tr>
<td>Volatile solids</td>
<td>%</td>
</tr>
<tr>
<td>Total C</td>
<td>%</td>
</tr>
<tr>
<td>TKN</td>
<td>%</td>
</tr>
<tr>
<td>C:N ratio</td>
<td></td>
</tr>
<tr>
<td>NH₄-N</td>
<td>%</td>
</tr>
<tr>
<td>NO₃-N</td>
<td>%</td>
</tr>
<tr>
<td>Total P</td>
<td>%</td>
</tr>
<tr>
<td>Total K</td>
<td>%</td>
</tr>
<tr>
<td>Heat content kcal/kg</td>
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</tr>
<tr>
<td>Arsenic mg/kg</td>
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<td>Chromium mg/kg</td>
<td>67</td>
</tr>
<tr>
<td>Cobalt mg/kg</td>
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<tr>
<td>Copper mg/kg</td>
<td>489</td>
</tr>
<tr>
<td>Lead mg/kg</td>
<td>35</td>
</tr>
<tr>
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<tr>
<td>Molybdenum mg/kg</td>
<td>7.7</td>
</tr>
<tr>
<td>Nickel mg/kg</td>
<td>24</td>
</tr>
<tr>
<td>Selenium mg/kg</td>
<td>1.3</td>
</tr>
<tr>
<td>Zinc mg/kg</td>
<td>620</td>
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</table>

¹ Units are dry solids basis except as indicated.
⁴ Means of three samples taken in 2008 from large lots of finished compost.
⁵ Means of 31 samples taken during 2007–2008 from three different biosolids sources.
⁶ Organic carbon
cement kiln dust with low N concentrations; and (2) significant organic matter degradation and N volatilization during treatment. These factors also would contribute to increasing C:N ratios in the order liquid/dewatered < pelletized < compost/alkaline stabilized materials. The concentrations of regulated metals in liquid, dewatered and pelletized materials are typical for Ontario sewage biosolids, whereas concentrations in the compost and alkaline stabilized materials are low due to admixing bulking agent and alkaline ingredient, respectively.

Selected residuals
Typical properties of PFB, sugar refinery lime, wood ash and mushroom compost are presented in Table 2. Whereas mushroom compost exhibits properties similar to sewage biosolids compost, the other residuals generally exhibit much lower nutrient and metal concentrations than sewage biosolids. Sugar refinery lime and wood ash contain almost no nutrients, but have considerable lime concentrations, and PFB contains little nutrient, but has a high organic matter concentration. The copper concentration in PFB is similar to that in sewage biosolids.

Agriculture
Sewage biosolids result from municipal wastewater treatment and are largely organic residues that contain a variety of macro- and micro-nutrients essential for plant growth. Added to soil, sewage biosolids organic matter enhances soil water holding capacity, structure and tilth, and the nutrients enhance plant growth. Liquid, anaerobically-digested sewage biosolids are good sources of ‘plant-available nitrogen (PAN)’ and the organic matter in all sewage biosolids is a source of ‘slow release N.’ All sewage biosolids also contain significant amounts of phosphorus (P), the plant availability of which varies depending on the wastewater treatment process.

Land application is a well-established beneficial use of sewage biosolids involving mainly agricultural land, but also some forest and disturbed lands. For example, of the 6.5 million dry tonnes of sewage biosolids produced in the US in 2004, 36% was used on agricultural land and 13% was used on other lands (NEBRA, 2007). Similarly, in 1990, more than 7 x 10^4 tonnes ds of sewage biosolids were produced in the European Union and agricultural use ranging from 10% to 80% of production in the 12 countries accounted for a total of 2.6 x 10^4 tonnes ds or 36% of European sewage biosolids production (Lue-hing et al., 1996). Apparent modest land application of US and European sewage biosolids probably relates to a few urban municipalities landfilling or incinerating their large volumes of material. Current Canadian production is estimated at more than 660,000 tonnes ds per year (Bryden and Langman, 2009), one-third of which is used on agricultural land. About 80% of Ontario municipalities land apply sewage biosolids, which accounts for ~150,000 tonnes ds or one-half of the annual production.

Except for pellets, compost and alkaline treated material, land application of sewage biosolids in Ontario (~90,000 tonnes dry solids annually (t a^-1 ds)) is free-of-charge to farmers/landowners and occurs only at Ministry of the Environment (MOE)-approved soil conditioning sites. Pellets and alkaline treated material (~60,000 t a^-1 ds) are CFIA (Canadian Food Inspection Agency)-approved for sale and are subject to federal regulation. The alkaline treated material is

Table 2. Typical properties of selected residuals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units^1</th>
<th>Mushroom compost^2</th>
<th>PFB (Paper fibre biosolids)^3</th>
<th>Sugar refinery lime^4</th>
<th>Wood ash^5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solids</td>
<td>% wet wt.</td>
<td>31</td>
<td>56</td>
<td>67</td>
<td>61</td>
</tr>
<tr>
<td>Volatile solids</td>
<td>%</td>
<td>57</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total C</td>
<td>%</td>
<td>28</td>
<td>33</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>TKN</td>
<td>%</td>
<td>1.9</td>
<td>0.54</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>C:N ratio</td>
<td></td>
<td>15</td>
<td>61</td>
<td>382</td>
<td></td>
</tr>
<tr>
<td>NH4-N</td>
<td>%</td>
<td>0.002</td>
<td>0.006</td>
<td>0.01</td>
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<tr>
<td>NO3-N</td>
<td>%</td>
<td>0.08</td>
<td>0.00</td>
<td>0.01</td>
<td></td>
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<tr>
<td>Total P</td>
<td>%</td>
<td>1.2</td>
<td>0.07</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Total K</td>
<td>%</td>
<td>0.88</td>
<td>0.03</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>Agricultural index (lime)</td>
<td></td>
<td>88</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/kg</td>
<td>2.7</td>
<td>1.0</td>
<td>&lt;1</td>
<td>2.8</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/kg</td>
<td>0.3</td>
<td>0.6</td>
<td>&lt;1</td>
<td>2.2</td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/kg</td>
<td>7.0</td>
<td>5.5</td>
<td>&lt;5</td>
<td>60</td>
</tr>
<tr>
<td>Cobalt</td>
<td>mg/kg</td>
<td>0.9</td>
<td>2.0</td>
<td>&lt;2.5</td>
<td>5.1</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/kg</td>
<td>51</td>
<td>301</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/kg</td>
<td>1.7</td>
<td>7.4</td>
<td>&lt;10</td>
<td>6.1</td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/kg</td>
<td>&lt;0.1</td>
<td>0.1</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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<tr>
<td>Molybdenum</td>
<td>mg/kg</td>
<td>2.9</td>
<td>2.3</td>
<td>&lt;2.5</td>
<td>&lt;4.3</td>
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<tr>
<td>Nickel</td>
<td>mg/kg</td>
<td>4.5</td>
<td>5.0</td>
<td>&lt;3.1</td>
<td>36</td>
</tr>
<tr>
<td>Selenium</td>
<td>mg/kg</td>
<td>&lt;0.5</td>
<td>1.0</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/kg</td>
<td>271</td>
<td>189</td>
<td>&lt;28</td>
<td>303</td>
</tr>
</tbody>
</table>

^1 Units are dry solids basis except as indicated.
^2 Analysis of a single grab sample.
^5 Means of four samples of a wood ash taken in 2007.
land applied primarily as a soil-liming agent. There is no production of sewage biosolids compost in Ontario, because the metal concentrations do not comply with provincial guidelines for unrestricted use of compost. However, it is produced and land applied elsewhere in Canada, notably British Columbia (BCMWLAP, 2002) and Québec (MDDEP, 2008).

Whether applied on the surface or injected into soil, provincially regulated sewage biosolids applications to land in Ontario are at rates consistent with agricultural Best Management Practices (BMPs) and are related to crop nutrient requirements – frequently the N requirement. Sewage biosolids are low-grade fertilizers containing 2–5% N, 1–3% P and insignificant potassium (K) concentrations (Table 1). Sewage biosolids organic matter additions to agricultural land are small and provide minimal soil conditioning value, however, they mineralize and release N slowly, which is beneficial, particularly for sod and forage crops.

A 2008 field demonstration conducted by Terratec Environmental Ltd. showed $240/ha and $500/ha savings respectively, from 1 t/ha ds application of pelletized material and 8 t/ha ds application of dewatered material. These treatments received commercial fertilizer supplements to provide the same levels of N, P and K as the BMP commercial fertilizer treatment established for comparison. Corn grown on all three treatments was healthy and vigorous throughout the growing season and exhibited no visual treatment differences.

Assuming that 30,000 tonnes ds of liquid, 60,000 tonnes ds dewatered biosolids and 30,000 tonnes ds each of pelletized and alkaline treated biosolids are land-applied annually in Ontario and that 33% of the nitrogen and 40% of the phosphorus is plant-available, the fertilizer value of sewage biosolids is compared with 2006 Ontario commercial fertilizer use in Table 3. The nitrogen and phosphorus fertilizer values of land-applied sewage biosolids are equivalent to ~3,500 tonnes of urea and ~5,500 tonnes of monoammonium phosphate, respectively. Although these amounts are small relative to total fertilizer use, it is estimated that they represent a saving for Ontario farmers of more than $5 million annually.

In addition to providing nutrients for crop production, agricultural use of sewage biosolids reduces fossil energy consumption for fertilizer manufacture. Since 950 m³ of natural gas is a required to produce 1 tonne of anhydrous ammonia, an annual saving of ~1.9 x 10⁶ m³ of natural gas can be attributed to the plant-available nitrogen in sewage biosolids applied to Ontario agricultural land – and further saving is attributable to the plant-available phosphorus. Furthermore, sewage biosolids is a good substitute for phosphate fertilizer and their agricultural use helps to conserve the limited world supply of phosphate rock used in fertilizer manufacture.

### Mushroom compost

Mushroom compost exhibits similar total N and P concentrations, but a higher K concentration and much lower metal concentrations than sewage biosolids. It satisfies the Ontario guidelines for compost use on an unrestricted basis and is a valuable soil amendment and component of manufactured soils/growing media for production of high value (e.g., horticultural) crops. It is too valuable to use for production of conventional agricultural field crops.

### Paper fibre biosolids (PFB)

PFB are high C:N ratio materials (Table 2) that are available in large quantity. They are land-applied to enhance the organic matter contents and water-holding capacities of southern Ontario

<table>
<thead>
<tr>
<th>Table 3. Comparison for Ontario of 2006 commercial fertilizer use and annual land-applied sewage biosolids fertilizer value (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer material</td>
</tr>
<tr>
<td>NITROGEN</td>
</tr>
<tr>
<td>Urea</td>
</tr>
<tr>
<td>Nitrogen solution</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>PHOSPHATE</td>
</tr>
<tr>
<td>Monoammonium Phosphate</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>
soils and supplementary N is required to avoid deficiency and reduced yield of the subsequent crop. Usually, this N is added as commercial fertilizer, but field experience indicates that it also can be added as a low C:N ratio material such as sewage biosolids, mushroom compost or animal manure.

Similar to sewage biosolids, land application of PFB in Ontario is free-of-charge to farmers/landowners and is subject to provincial regulation, occurring only at Ministry of the Environment approved sites and the maximum permissible application rate is 70 t/ha wet wt. (i.e., 35-40 t/ha ds) per five years.

PFB is a valuable mulch for grape vineyards because of its high C:N ratio. It conserves soil moisture and moderates soil temperature while supplying very little N. Too much N encourages vegetative growth and reduces fruit yield. Mulching Ontario vineyards with 70 t/ha wet wt. per five years of PFB has proven effective.

Sugar refinery lime and wood ash

Unlike sewage biosolids, sugar refinery lime and wood ash contain no significant N and P, although wood ash contains some K. Both materials, however, exhibit significant liming value and are used primarily to raise soil pH.

Combinations of residuals

Novel agricultural land application practices involving combinations of the different forms of sewage biosolids (Table 1) or of sewage biosolids and residuals from industrial operations (Table 2) can offer advantages over sewage biosolids alone.
**Liquid or dewatered and pelletized sewage biosolids** – Required separation distances from residences, water wells, streams, etc. are large for land application of liquid or dewatered sewage biosolids because of odour and pathogen concerns. They are much shorter for pelletized sewage biosolids and frequently a combination of these materials is land-applied to provide increased coverage of fields.

**Sewage biosolids and residuals** – Except for alkaline treated material, sewage biosolids may not be applied to soils with pH<6. However, they may be applied in combination with sugar refinery lime or wood ash to adjust soil pH≥6. Applications of alkaline-treated material also are subject to the soil pH≥6 condition.

**Sewage biosolids and PFB** – Sewage biosolids exhibit low C:N ratios <30 (Table 1) and there is a potential for N leaching and contamination of groundwater following their application to soils, particularly in autumn. This can be avoided by applying them in combination with high C:N ratio PFB to fix available N, and various combinations for this purpose are considered below.

   The recommended maximum, five-year land application rates for PFB are 70 t/ha wet wt. (i.e., 35-40 t/ha ds) and 8 t/ha ds of sewage biosolids. Assuming these rates, C:N ratios for combinations of PFB with the Table 1 sewage biosolids are shown in Table 4. The combinations with C:N ratios <30, including liquid, dewatered and pelletized sewage biosolids would be effective N fertilizers. In contrast, the combinations including composted and alkaline-treated sewage biosolids with larger C:N ratios would fix soil N and be suitable for late autumn application. Similarly, reducing application rates of the liquid, dewatered and pelletized biosolids to 4 t/ha ds in combination with 40 t/ha ds of PFB would provide soil N fixation.

   In response to transportation safety issues, PFB (~50% ds) is combined at a 1:5 (v:v) ratio with dewatered sewage biosolids (<20% ds). Approximately 9,300 tonnes of this material (~22% ds) have been applied on ~250 ha of young trees. A low (60 m³/ha) application rate satisfies the ~45 kg/ha annual N requirement of the trees and it can be applied three times within the 135 kg/ha N and 5-year approval limitations. The nursery manager has observed significant improvements in soil tilth resulting from sewage biosolids application and reduced dependence on commercial fertilizers. Application is free-of-charge and the fertilizer value is estimated at ~$200/ha for each sewage biosolids application and ~$600/ha during the five-year approval period (i.e. a total value of ~$140,000).

   In this time of increasing environmental concerns, using sewage biosolids rather than commercial fertilizer to grow trees reduces the consumption of non-renewable resources and fossil energy. It avoids human food chain issues, and represents a ‘green cycle’ of renewal, since the urban population is both responsible for producing the sewage biosolids and the beneficiary of tree production for urban plantings. Based on the success of the Durham experience, there is potential for tree nurseries to become significant users of Ontario sewage biosolids in the future.

Terratec Environmental Ltd. received a Water Environment Association of Ontario, 2009 Exemplary

---

**Table 4. C:N ratios of selected sewage biosolids and PFB mixtures**

<table>
<thead>
<tr>
<th>Sewage biosolids</th>
<th>40 t/ha PFB plus</th>
<th>8 t/ha sewage biosolids</th>
<th>4 t/ha sewage biosolids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>26</td>
<td>38</td>
<td>35</td>
</tr>
<tr>
<td>Dewatered</td>
<td>32</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Pelletized</td>
<td>30</td>
<td>39</td>
<td>39</td>
</tr>
<tr>
<td>Composted</td>
<td>46</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>Alkaline treated</td>
<td>47</td>
<td>53</td>
<td>53</td>
</tr>
</tbody>
</table>

Application rates are dry solids.

---

**Tree nursery**

Sewage biosolids may be used as a fertilizer material on tree nursery and forest lands. In general, application rates are related to the tree nutrient requirements and, for new plantations, the sewage biosolids may be either surface applied or injected into the soil. Application to standing forests is not a common practice and does not occur in Ontario, but where it occurs, liquid sewage biosolids are sprayed among the trees from access roads.

Tree nursery fertilization is a non-traditional use of sewage biosolids that provides opportunity for land application outside of conventional agricultural cropping schedules. A field-scale ‘Tree Nursery Enhancement Project’ initiated in Durham, Ontario in 2007 involving sewage biosolids is proving highly successful. It is established on ~230 ha of MOE-approved sites and equipment specially designed by Terratec Environmental Ltd. and the Regional Municipality of Durham is used to apply liquid anaerobically digested biosolids near the base of young trees. A low (60 m³/ha) application rate satisfies the ~45 kg/ha annual N requirement of the trees and it can be applied three times within the 135 kg/ha N and 5-year approval limitations. The nursery manager has observed significant improvements in soil tilth resulting from sewage biosolids application and reduced dependence on commercial fertilizers. Application is free-of-charge and the fertilizer value is estimated at ~$200/ha for each sewage biosolids application and ~$600/ha during the five-year approval period (i.e. a total value of ~$140,000).

In this time of increasing environmental concerns, using sewage biosolids rather than commercial fertilizer to grow trees reduces the consumption of non-renewable resources and fossil energy. It avoids human food chain issues, and represents a ‘green cycle’ of renewal, since the urban population is both responsible for producing the sewage biosolids and the beneficiary of tree production for urban plantings. Based on the success of the Durham experience, there is potential for tree nurseries to become significant users of Ontario sewage biosolids in the future.

Terratec Environmental Ltd. received a Water Environment Association of Ontario, 2009 Exemplary...
Biosolids Management Award in the category of Technology Innovation and Development Activities for the Durham, Ontario Tree Nursery Enhancement Project.

**Land reclamation**

Land reclamation holds great promise for utilization of many of the organic residuals generated in southern Ontario. Surficial materials at sites such as spent gravel pits, stone quarries and mine tailings areas requiring reclamation invariably exhibit plant nutrient deficiencies and very low water holding capacities. Sewage biosolids incorporated into these materials can supply both the nutrients, except for K and organic matter required to establish and maintain vegetative growth. The organic matter provides water holding capacity and a medium for soil establishment, and K can be supplied as commercial fertilizer. In order to build a good growing medium, a high application rate of sewage biosolids (~100 t/ha) is required for land reclamation. As a result, there is the potential for significant N leaching to groundwater prior to establishing vegetation. A remedy for this is layering or blending the sewage biosolids with a high C:N ratio residual such as PFB or shredded wood. This can minimize N loss and provide a reservoir of slow release nutrient for enhanced long-term plant growth.

There is a large body of international, including Canadian, information that documents the value of sewage biosolids for land reclamation. However, despite the numerous gravel pits and stone quarries requiring reclamation, none of the Canadian studies were conducted in Ontario. In the mid-1990s, PFB were used to reclaim a stone quarry near St. Catharines on which a vineyard was established and to establish vegetation on a section of Welland Canal embankment. Similarly, near Cornwall, they were used to reclaim a gravel pit on which trees were established. However, these success stories have not lead to wide-scale residuals use for land reclamation, probably because Ontario’s land application, compost and aggregate regulations do not encourage the use of innovative techniques.
Manufactured soils/growing media

Manufactured soils/growing media are employed in the greenhouse, container nursery and landscaping industries, and the Ontario market for these materials is very large. Estimates are that greenhouse growers use ~300,000 m³/yr, nursery growers use ~75,000 m³/yr, and the landscape industry uses ~400,000 m³/yr. These materials are ‘made-to-order’ from a wide variety of constituents including soil, sand, peat, wood waste, composted animal manure, commercial fertilizer, vermiculite, perlite, styrofoam beads, etc., but they seldom include sewage biosolids.

Greenhouse growers produce high-value crops on mixtures of peat and perlite that provide required aeration and allow careful control of nutrient supply. Most residuals fail these requirements and are unsuitable as greenhouse growing media. Although considerable research in the Niagara area has proven the value of PFB as a constituent of container nursery media (Bellamy et al. 1995), they are not widely used for this purpose. Generally, the media consist of evergreen bark to provide structure and aeration and peat moss for water holding and cation exchange capacity, with nutrients supplied in slow release commercial fertilizer.

A wide variety of media including triple mix, screened topsoil, screened sandy soil, screened peat loam, 50% triple mix and 50% topsoil, custom mixes, mulches and woodchips are used for landscape purposes. However, projects frequently require media with nutrient value and triple mix, a blend of equal parts topsoil, peat and manure compost, meets that need and is a major component of the landscape market.

Maximum permissible metal concentrations in manufactured soils/growing media are similar for Ontario, British Columbia and Quebec (Table 5). But, whereas sewage biosolids may be constituents of British Columbia and Quebec materials, they may not be constituents of Ontario materials because they fail the metal regulations that all constituents must meet. If Ontario regulations were revised in agreement with those for British Columbia and Quebec, ~10% of Ontario’s annual sewage biosolids production might be used to replace the peat moss and fertilizer in container nursery media and the manure compost in landscape triple mix.

Energy

Sewage biosolids exhibit heat contents equal to that of medium quality coal (~3,500 kcal/kg ds) and large amounts are incinerated. Modern incinerators are designed for heat recovery to generate electricity that is used locally or sold to the grid. Although there is only recent interest in co-incineration of coal and sewage biosolids for electricity generation in North America, this practice is common and increasing in European and Asian countries. Sewage biosolids are a ‘green’ energy source because they contain no fossil carbon.

Furthermore, ‘green’ methane from anaerobic digestion of wastewater sludge can be used to power vehicles. In Linkoping, Sweden, it is used to power all city buses, taxis and a commuter train.

Conclusions

Many urban and industrial residuals exhibit fertilizer and soil conditioning properties and agriculture will continue to provide the largest opportunities for future beneficial use of these materials in Ontario. They will be land-applied alone or in various combinations to satisfy particular cropping or environmental requirements and tree nurseries are likely to become significant users of sewage biosolids. Sewage biosolids are likely to become an increasingly important phosphate fertilizer material, as the limited world supply of rock phosphate is reduced. There is considerable opportunity for residuals, particu-
Table 5. Maximum permissible metal concentrations (mg/kg ds) in selected manufactured soils/growing media

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ontario</th>
<th>British Columbia</th>
<th>Quebec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compost - unrestricted use¹</td>
<td>Class A compost²</td>
<td>Biosolids growing medium³</td>
</tr>
<tr>
<td>Arsenic</td>
<td>10</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Cadmium</td>
<td>3</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>Chromium</td>
<td>50</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Cobalt</td>
<td>25</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Copper</td>
<td>60</td>
<td>400</td>
<td>150</td>
</tr>
<tr>
<td>Lead</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.15</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Nickel</td>
<td>60</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Selenium</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Zinc</td>
<td>500</td>
<td>500</td>
<td>150</td>
</tr>
</tbody>
</table>

¹ MOEE (1991); ² BCMWLAP (2002); ³ MDDEP (2008)

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larly sewage biosolids, PFB and liming agents, to be used in reclamation of disturbed lands such as mine tailings, gravel pits and construction sites. To date, the reliance on readily available agricultural land, high transportation costs and regulatory impediments have limited use of these materials for land reclamation. There are significant opportunities for residuals, particularly sewage biosolids use in manufactured soils/growing media, but this too will require changes in the Ontario regulatory framework.

References


The papers “City of Greater Sudbury – Biosolids management master plan” and “Opportunities for Beneficial Use of Residuals in Ontario” were first presented at the 5th Canadian Residuals & Biosolids Conference.

Niagara Falls, Ontario September 13-15, 2009

Shawn Northwood, Environmental Scientist, SYLVIS Environmental, John M. Lavery, Senior Environmental Scientist, SYLVIS Environmental

Introduction

Biosolids generators evaluate and prioritize management options using several social, economic, technical and environmental criteria. Conventional environmental criteria for evaluating biosolids management options include impacts on air (i.e., odour and dust), soil and water quality and compliance with applicable environmental regulations. Recently, there has been an increasing interest to include the estimation of greenhouse gas (GHG) impacts of biosolids management practices as an evaluation criterion. In addition to environmental protection, there are also economic and social drivers facilitating the assessment of GHG emissions from biosolids management. For example, as carbon trading markets develop, quantification of existing or potential carbon credits could provide biosolids generators the opportunity to recover costs of biosolids management through the sale of offsets.

Despite the interest in evaluating GHG impacts, there is limited information on GHG emissions and methodologies for calculating GHG emission from biosolids management. The Canadian Council of Ministers of the Environment (CCME) identified this knowledge gap and commissioned the development of a methodology for calculating GHG emissions from common Canadian biosolids management practices. The CCME retained SYLVIS Environmental and its project team consisting of Dr. Sally Brown (University of Washington, School of Forest Resources), Ned Beecher (North East Biosolids and Residuals Association), and Andrew Carpenter (Northern Tilth) to develop the methodology.

Development of the BEAM consisted of three general steps:

• a review of literature and leading GHG quantification protocols;
• model development; and
• population of the BEAM with real data provided by several Canadian jurisdictions and model refinement.

This article provides an overview of the development of the BEAM, discusses the applications and limitations of the model, and provides a discussion on general observations from the entry of real data into the BEAM.

BEAM development

Prior to the development of the model, a scoping exercise and literature review were undertaken to verify potential GHG sources and emission/sequestration factors for biosolids management practices. Where possible, emission/sequestration factors and assumptions were corroborated by multiple literature sources to ensure the use of current and accurate information for model development. The boundaries of biosolids management considered in the development of the BEAM were solids thickening and final end-use (e.g., land application, incineration, etc.). A review of existing GHG accounting and verification protocols was completed to ensure the terminology and reporting methods adopted in the model were consistent with these protocols. Development of the model was based on leading protocols to facilitate the use of the model as a tool that is widely accepted as a verifiable method of determining carbon credits which can be sold or traded to offset the cost of biosolids management.

The review of relevant literature and protocols provided the necessary background and context for model development. The BEAM is currently Microsoft Excel™-based and consists of several calculation modules for common biosolids management unit processes. Each module contains the calculations required to determine GHG emissions from the selected unit process. The user selects the unit process modules applicable to his/her current or potential biosolids management options. The cells are colour-coded in the modules, indicating cells that require inputs. In these input cells, the user has the option of providing his/her own measured data, or using default values which are provided in the BEAM. Each module generates a GHG emissions value (expressed as megagrams of carbon...
development. The scenarios cover the commitment to participate in modelership in biosolids management, and practices, regional representation, lead-
upon a variety of biosolids management 40 Canadian cities. Selection of the were selected from an initial list of over of the BEAM. The nine jurisdictions provided 'real-world' tech-
agement programs and these data were
jurisdictions applicable to a wide variety of biosolids management.

The BEAM was developed with the
emissions from upstream wastewater processes (e.g., wastewater conveyance). Emissions from septic tanks and the pumping and management of septage (including its direct land application or transportation to a wastewater treatment facility) are also not within the boundaries of the BEAM. Due to the modular design of the overall model, the BEAM can accommodate the addition of new unit process calculation modules. SYLVIS and its project team have had discussions with several wastewater treatment technology developers about developing modules specific to their processes.

Sources of GHG credits and debits

The BEAM was developed to be applicable to a wide variety of biosolids management scenarios. Nine Canadian jurisdictions provided 'real-world' technical data from their biosolids management programs and these data were used in the development and validation of the BEAM. The nine jurisdictions were selected from an initial list of over 40 Canadian cities. Selection of the participating jurisdictions was based upon a variety of biosolids management practices, regional representation, leadership in biosolids management, and the commitment to participate in model development. The scenarios cover conventional biosolids management practices including land application, composting, high-temperature drying, incineration and landfiling, and energy recovery processes, including biogas recovery from anaerobic digestion.

The application of real data to the BEAM provided an opportunity to identify sources of GHG credits and debits. The BEAM outputs indicate larger emissions from jurisdictions employing high-temperature drying and incineration in their management processes due to high energy requirements and substantial N₂O emissions from incineration. Conversely, it appears that net GHG neutrality or offsets can be obtained through land application due to the ability to sequester carbon and offset the production and use of chemical fertilizers. Jurisdictions that capture and utilize biogas from anaerobic digestion offset their demand for purchased electricity and, subsequently, reduce their GHG emission. Biosolids transportation distances generally have little impact on GHG emissions from biosolids management.

Summary

The need to report to the different stakeholders with a sound understanding of risks, benefits, and innovative solutions to mitigate GHGs from biosolids management is becoming increasingly important. The future of a holistic lifecycle analysis for biosolids management is linked with the capacity and ability to recognize GHG contributions and identify GHG emission mitigation opportunities.

The BEAM was developed with the objective of providing a simplified and flexible methodology for estimating GHG emissions – debits and credits – from different biosolids management scenarios. The BEAM will be a useful model for wastewater treatment plant operators and biosolids managers as it:
- allows the user to evaluate other unit processes they employ or are consider-
ing, so that their impact on overall GHG emissions can be estimated; and
- can be used to calculate existing or potential carbon credits, which will become marketable as carbon trading systems develop, and facilitate opportunities for cost recovery or revenue generation from biosolids management programs.

The BEAM provides estimates of emissions for the solids management train that can be added to estimates for the wastewater treatment process to establish an overall estimate for the entire operation. The BEAM could serve as an important tool in the identification of opportunities for GHG mitigation measures and offset potentials in biosolids management. As market incentives for GHG emissions reductions develop further, documentation using BEAM, combined with an independent verification step, could lead to the generation of marketable carbon credits.

Greenhouse gas emissions from biosolids management is a relatively new and active field of research. The BEAM was designed to be ame-
nable to continuous expansion and improvement. As our understand-

ing of the GHG impacts of biosolids management increases, future itera-
tions of the BEAM will reflect this increased knowledge.

The BEAM report, spreadsheet and user guide are available on the CCME website (www.ccme.ca/ourwork/waste.html). The final report provides the details of the literature and protocol review, as well as a thorough description of the unit process emission calculation equations and associated assumptions. SYLVIS and the BEAM development project team look forward to promoting the use of the BEAM through education and extension. The project team is interested in working with technology developers to develop unit process modules for new and emerging technologies with the goal of expanding the applicability of the BEAM to more biosolids management programs across North America.

(See next page for Figure 1)
### Summary of Wastewater Treatment Inputs and CO2 Equivalent Totals

| Jurisdiction:                  | Village of Emissions Reduction |
| Wastewater Treatment Plant:    | Scrubber WWTP                  |
| Date of calculation:          | 3/27/2009                     |
| Calculations by:              | John Henry                    |

### WWT & Solids Characteristics

<table>
<thead>
<tr>
<th>Treatment and Solids Characteristics</th>
<th>Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Wastewater Treated (MLD)</td>
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</tr>
<tr>
<td>Amount of Wastewater Treated (m³/day)</td>
<td>160,600</td>
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<tr>
<td>Population served by Wastewater Treatment Plant</td>
<td>181,348</td>
</tr>
<tr>
<td>Influent BOD₅ (mg/L)</td>
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<tr>
<td>Location (by province)</td>
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<tr>
<td>Weighted GHG Emissions for Power Generation by Province (g/kWh)</td>
<td>181</td>
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</table>

### CO₂ eq Totals (Mg/year)

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<th>Unit Process</th>
<th>Enter “x” for all applicable processes:</th>
<th>Scope 1</th>
<th>Scope 2</th>
<th>Scope 1 &amp; 2</th>
<th>Scope 3</th>
<th>Biomass combustion*</th>
<th>Total</th>
</tr>
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<tbody>
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<td>Storage</td>
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<td>8</td>
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<td>3</td>
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<td>291</td>
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<td>0</td>
<td>291</td>
</tr>
</tbody>
</table>

**TOTALS** 34,418 374 34,791 4,887 20,120 39,678

- **Scope 1** - direct emissions
- **Scope 2** - purchased electricity, heat, or steam
- **Scope 3** - production of purchased materials and uses of end products

### Instruction and Notes

**General:** Enter data for the wastewater treatment process, as well as the province in which your program’s electricity consumption occurs. Complete only those pages of the BEAM that apply to unit processes marked with “x” above. Greenhouse gas emissions, including totals and scope subtotals, for the entire biosolids management program are summarized above. For all calculator sheets enter data starting at the top of each sheet. Use actual data and enter into the green cells whenever possible.

* Biomass combustion emissions are not included in total CO₂ equivalents. See User’s Guide for more information.

**Note:** General notes and instructions are included at the bottom of the worksheet.
In North America, millions of tons of wastewater biosolids are generated annually. Traditional methods of use and disposal of these materials are under increasing pressure and scrutiny, with regulators’ attempts to keep organics out of landfills, landfills shutting down – creating longer haul routes, concerns over incineration emissions/by-product, and conservation concerns over potential for nutrient run-off into watercourses and groundwater. As a result, an opportunity exists for an advanced conservation technology that can recycle this waste into valuable end-product for sale to end-users and do it in a commercial, sustainable, and low-impact way...Vermicomposting is one of those technologies.

In 2005, the Australian-based company Vermitech contracted, designed, and installed the first vermicomposting operation in the United States to process biosolids commercially in central Pennsylvania. Around the same time the first site was being commissioned, another Sewer Authority in Pennsylvania was contracted. That facility was commissioned in 2007. WeCare Organics, headquartered in Jordan, New York, acquired Vermitech’s intellectual property and existing sites in 2008. Currently under WeCare Organics, every facility is distinctively designed and managed to accommodate for varying feed and site characteristics. The original general process flow for the first two sites was implemented as described below.

**The Vermitech System**

The process description for a typical facility is as follows (see Figure 1 – System Schematic):

**Biosolids capacity**

The core of the technology is an open top, steel vessel or bed in which the earthworms are housed. The quantity of beds is site specific, however, the dimensions of each bed are approximately 100 feet long, 5 feet wide and 5 feet high. Each bed is designed to treat an average of 2 to 2.5 wet tons per week of biosolids. The dewatered biosolids are inspected before feeding and tested regularly for characterization purposes and to monitor long-term trends. These and all test results are entered into a custom-made database.

**Feeding and mixing**

A controlled blend of biosolids is fed to the surface of the bed on a regular basis (e.g., 1-2 times per week). The exact feedrate is dependent upon a number of process control conditions including bed temperature and population density, all of which are monitored via regular operator checklists. The earthworms consume the waste in and around the top region generating a mesophillic composting environment producing vermicompost.

The feeder system (see Figure 2 – Configuration) provides the opportunity for biosolids to be mixed with a small amount of woodchips (approximately 10–20% by volume). The woodchips are added as a structural agent rather than a composting or diluting agent. The feeder system is a semi-automatic machine in which the feed is ‘cut’ to the required depth and delivered onto a belt, which is pulled by a multi-purpose winch at the other end of the bed. Speed and other parameters are adjustable to ensure an even depth and consistency and to ensure the feed is evenly dispersed.

**Processing**

The earthworms stay in the bed permanently, although a small percentage of biomass is removed during harvesting operations. There are several thousand pounds of earthworms in the system. The predominant earthworm species used is *Eisenia fetida*, which is a robust and productive species when conditions are suitable. The process has much in common with typical wastewater-activated sludge, with the earthworm population balanced to the incoming food. As with a typical wastewater plant, operators are trained to monitor critical parameters and ensure the
system is operated correctly and that feedrates are matched to population and other environmental parameters. As the new feed source is established, the beds are monitored for parameters such as worm population and distribution, moisture content, bed temperature, pH, and electrical conductivity. These data are used to monitor and maintain the system within the normal operating conditions and to determine whether adjustments to additional process control measures (e.g., feedrate and frequency) are required. Regular audits (both qualitative and quantitative) of worm population and health are also undertaken.

The beds act as a plug-flow-type unit and the quality assurance processes ensure that sufficient retention time is allowed for the required product quality. Typical retention time is on the order of 2-3 months.

Harvesting and retrieval
After the bed has been built up enough in order to sustain the plug configuration, the vermicompost is harvested (removed) regularly from the base of the bed using a proprietary cutting device. The material within the bed then moves down, in plug-flow, creating space at the top for further feed. Harvested material is dried, screened and used/distributed following a quality assured testing process.

The bed-bases have a special design that supports the bed material while also allowing access for a specialized harvesting/cutting device. The harvester travels along guide rails situated beneath the bed and powered using the winching system (see Figure 2 for configuration) at the opposite end. The operator controls the depth and speed of cut. Once harvested, the material falls onto a collection belt system, which is regularly extracted from one end of the bed, and discharges into a receiving conveyor/vessel for storage.

Storage and handling
After harvesting, the material is still moist and has been noticeably processed to a stable, humus-type material. The material is stored on site and prior to the agricultural growing seasons, it is solar dried on an adjoining pad. Once it reaches the required moisture content, it is screened to meet end-product customer specifications (typically around 1/4-inch). Facilities have options regarding the marketing and/or distribution of the material.

Testing and release
The end-product is placed into Quarantine storage bay(s) and, once materials are passed as suitable, they are identified with a batch number. Facilities apply for Beneficial Use of Exceptional Quality Biosolids permits by the governing state or federal agency, after a rigorous assessment of compliance with regulation in regards to biosolids quality, process control, sampling and analysis, storage, distribution and record-keeping.

The regulations are designed to verify the safety and quality of the end-product. Personnel from the governing agency and on-site staff work together to ensure that all elements of the program are complied with. Specific requirements with regard to demonstrating the Exceptional Quality (EQ) of the end-product follow the United States Environmental Protection Agency Part 503 Biosolids Regulations, as described below.

- **Pathogen reduction:** The EQ biosolids end-product must meet Class A pathogen standards (i.e., below detectable levels of viable Helminth ova, Enteric virus and Salmonella). The original concept was for facilities to utilize Alternative 4 (end-product testing) for the demonstration of this pathogen reduction. Under this program, batches of end-product are tested over a 60-day period to ensure they met the Class A standard. Ongoing testing will ensure the continued quality of the end-product prior to dispatch.

- **Pollutant concentration:** The pollutant levels of the end-product are sampled and tested in accordance with a sampling plan complying with permit requirements. The pollutant levels in the end-product conform to Table 3 levels and
are consistent with the standards required for EQ biosolids.

- **Vector Attraction reduction:** To meet the standards of VAR, regular testing of volatile solids across the system demonstrates volatile solids reduction in excess of 38%. Distributed end-product has shown itself to be a stable material capable of long-term storage.

### Quality control

The Quality Assurance/Quality Control (QA/QC) System used is a management approach that is designed to identify potential hazards, nominates preventive measures to stop them occurring, monitor these areas, and formalize action plans if a hazard is identified (in combination with plans to prevent re-occurrence).

The QA/QC System is preventative, moving from reactive quality control to pro-active quality assurance and targets resources at the most critical parts of a process. These features mean that a facility anticipates that the system can form the basis for, and be easily incorporated into, any future Biosolids Environmental Management System (EMS) that may be introduced.

### Operations and technical support

Use of moving parts and equipment is intermittent, mainly for routine tasks (feeding, harvesting, monitoring, etc). Outside of this, the system is designed to operate under periodic supervision only. With the earthworms carrying out continuous processing of the biosolids, wear and tear on moving equipment is reduced and breakdowns are reduced.

To ensure the ongoing success of a facility, to produce the best quality end-product, and to ensure compliance with the facility permit, a support arrangement is structured that mandates the following:

- only trained and certified operators may operate the equipment;
- it must be operated in accordance with supplied operating manuals;
- regular records are kept and sent to a technical team on a regular basis;
- ongoing backup and technical support is provided; and

### “Vermicompost is widely recognized as having beneficial properties for plant and soil health”

- annually, technical staff will conduct an on-site audit of the facility and records.

### Grants and financing

Being categorized as a ‘green’ and ‘innovative’ technology, there is potential for funding assistance. Both facilities in Pennsylvania were assisted by grants from the States Growing Greener program, a state-based program designed to promote environmental initiatives and technologies for the environment.

### End-product

Vermicompost is widely recognized as having beneficial properties for plant and soil health. Biosolids vermicompost produced from process-controlled vermiculture contains not only the benefits of conventional composts (e.g., organic matter, cation exchange capacity, nutrients, etc), but significant biological qualities as well. Soils that are well balanced in inorganic, organic and biological features can produce healthy and productive crops with maximum efficiency.

 Facilities have been provided with technical assistance in the marketing of the end-product, utilizing specific research and case studies to target applications in the local area. Potential end-product users have been focused on vineyards, golf courses, turf/athletic fields, and landscaping.
WEFTEC.09 drew a total of 17,722 water professionals and 995 exhibitors to the annual event held this year in Orlando, Florida. This year’s strong showing, in spite of a downturn in the economy, reinforces the importance of WEFTEC for promoting information and technology exchange among water professionals and as an invaluable venue for business opportunities in the water quality field.

Bill Bertera, Water Environment Federation (WEF) Executive Director commented, “We know there is a recession out there and it has not passed us by, but this year’s numbers are a strong indication that WEFTEC is where people come to do business…to learn about the latest developments and research in the water quality field. We will continue to meet the needs of our members and the water profession…especially as municipal and private sector revenues are challenged by the economy.”

The conference featured the usual high-quality technical program with 122 technical sessions, 31 workshops, nine facility tours, and several high profile events. The well-attended 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. He also thanked those in attendance for their invaluable service to the community and encouraged collaboration between the two professions. “It is my hope that, in addressing this complex issue together, we will broaden the social context of health, engage health partners in water management and planning, and advance health as the leading edge of human development,” he said.

Also at the Opening Session was an address by 2008-2009 WEF President Rebecca West, recognition of two of WEF’s most prestigious awards: the Emerson Distinguished Service Medal awarded to Dr. Richard D. Kuchenrither, and the Engelbrecht International...
Achievement Award given to Jim Clark (WEF Past-president). The 2009 Stockholm Junior Water Prize winners were also introduced to the audience.

During a ceremony on Tuesday, October 13, the WEF ‘gavel of leadership’ was passed from President Rebecca West (Spartanburg, SC) to incoming President Paul Freedman (Ann Arbor, MI). In addition to President Freedman, the 2009-2010 Board of Trustees includes: Immediate Past-president West, President-elect Jeanette Brown (Stamford, CN.), Vice-president Matt Bond (Kansas City, MO), Treasurer Chris Browning (Canton, GA), Secretary and Executive Director Bill Bertera (Alexandria, VA), Paul Bowen (Atlanta, GA), Judy Jones (Marietta, GA), Deborah Houdeshell (Akron, OH), Carl Janson, (Blue Bell, PA), Betty Jordan, (Dallas, TX), Terry Krause (Chicago, IL), Ed McCormick (Oakland, CA), Sandra Ralston (Charleston, SC), Leslie Samel (Jacksonville, FL), Cordell Samuels, (Pickering, ON), Paul Schuler (Portland, OR), and Rick Warner (Reno, NV).

After considering a report on the business case for a two city rotation (Chicago-NewOrleans) from the WEFTEC Advisory Committee, the HOD (House of Delegates) agreed that these venues, which have already been contracted, should not be changed. These venues provide the conference with some notable advantages including exhibition space on a single floor, appropriate hotel inventory, priority booking (due to bi-annual status) and significant subsidies towards shuttle costs. This is a substantial economic benefit as well to the host city, in excess of US$ 250,000 per year.

Nonetheless, the HOD passed a motion requesting staff to review other venues for events after 2018. Although there will be no clashes with Canadian Thanksgiving at any of the above events, WEF was requested by Ontario Delegate V. Nazareth that the Advisory Committee recognize Canadian Thanksgiving and avoid booking WEFTEC over those dates.

STUDENT DESIGN COMPETITION

Each year WEF hosts a Student Design Competition. At this year’s conference, two competitions were held: a Wastewater Design competition that includes a traditional wastewater design project (hydraulic, capacity design, upgrades to existing systems, biosolids handling, etc.) and an Environmental Design competition that includes the current contemporary engineering topics (sustainability, water reuse, wetland construction, etc.).

This year, the WEAO hosted its first design competition at the Annual Conference which was won by the University of Toronto. Part of the prize was sponsorship of the team to represent Ontario at WEFTEC.09. We are very proud to report that the Toronto team won second prize in the Wastewater Design Category in this, Ontario’s first entry in the competition.

ON THE SOCIAL FRONT

To kick off the Conference, Canadian delegates enjoyed a get-together at the Caribe Royale Orlando Hotel on Saturday evening. The annual Great Canadian Icebreaker, organized by WEAO’s Michael Albanese and his helpers and held outdoors by the pool on a typical Florida night, with a lightning show to boot, proved that our neighbours in the south have not as yet fully appreciated how fast Canadians can put away beer when it gets humid. There were some delays as the barmen struggled to keep up with the pace, but thankfully no one fainted as a result of ‘beer-deprivation.’ It was good to see Dave and Lynn Hein, who are still doing well in Abu Dhabi. All in all, a good time was had by all. Brian Evans was also seen pottering around the conference; Brian is still working in Dubai.

PASSING THE GAVEL

Our thanks and congratulations are extended to George Crawford (WEF Delegate 2006-2009) who finished his term at this year’s Conference in Orlando. WEAO’s Junior Delegate will be Tim Constantine, who is no stranger to the WEAO Board. Tim’s term will run until 2012.

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 (timm.constantine@ch2m.com).
The 2009 WEF Operations Challenge competition was held in Orlando at the Water Environment Federation’s 82nd annual technical exhibition and conference, the largest water quality event in North America and the largest annual water quality exhibition in the world.

Teams from across the United States, Canada and Argentina competed in the Challenge at the Orange County Convention Centre in October. The purpose of the Challenge is to recognize excellence in wastewater treatment operations.

Now in its 22nd year, the WEF Operations Challenge has grown from the original 22-team event to its current 41-team, two-division format. Winners are determined by a weighted point system for five events including 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.

Canada was represented by two teams from Ontario and one from British Columbia. The Ontario Clean Water Agency’s OCWA Jets and the Craptors represented the Water Environment Association of Ontario. The Canadian Cross Connection represented the British Columbia Water and Wastewater Association.

The two Ontario teams earned the right to compete in Orlando by placing first and second at the WEAO Operations Challenge competition held in Toronto last April.

All three Canadian teams competed in Division 2 against 31 other teams in the dual division format. 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 or first in any Division 2 event.

Ontario’s OCWA Jets finished in 7th place in Division 2, led by an impressive first place in the Safety Event. This was an improvement of eight positions over last year’s competition. The memorable Safety Event trophy accompanied the team home and will serve as a memento of their competition in Orlando, home of Disney World.

The OCWA Jets also won the Team Congeniality Award as voted by all 41 competing teams and judges. This award speaks volumes for how the team members conducted themselves while representing the Water Environment Association of Ontario and the Ontario Clean Water Agency.

Ontario’s second team, the Craptors, placed a respectable 16th out of 31 teams in their first visit to the WEF Challenge.

The 2008 defending champions, TRA CREW Sers from the Water Environment Association of Texas, again took top honours, capturing first-place in Division 1 (10 teams) and Terminal Velocity from the Virginia Water Environment Association finished first in Division 2.

Congratulations go to the members of both teams. The Ontario Clean Water Agency’s OCWA Jets: Coach Beverly Mollard, Captain Marcel Misuraca, Mike Paola, Dennis Rau, Al Robdrup and their supporting fans. Craptors team members included Coach Hardut Singh, Patrick Dowman, Tyson Ferreira, Chris McDonald and Dave Smith.

2010 will mark the 20th year of the Ontario Operations Challenge and the event will be held as part of the 39th annual WEAO Technical Symposium and OPCEA Exhibition in April at the London Convention Centre in London.

For information and updates, contact John Rammler, the 2010 Operations Challenge Committee Chair, at john.rammler@durham.ca.

To find out how to enter a team, please go to: http://www.weao.org/committees/Operations_Challenge/Operations_Challenge.html

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OCWA Jets L to R Mike Paola, Al Robdrup, Bev Mallard, Marcel Misuraca - Ontario Clean Water Agency

Congeniality Award

Safety Trophy
2009 CANADIAN ICEBREAKER
Michael Albanese, Special Events Committee Chair, michael@h2flow.com

This year’s Icebreaker was held at the Caribe Royale Hotel in Orlando. The Caribe Hotel was the designated Canadian Hotel, so this venue choice proved to be very convenient for most attendees. The location featured a beautiful view of the courtyard, waterfall and pool, with palm trees and many tropical plants. It was a beautiful hot evening and it was perfect weather, although at the tail end of the event—a Florida storm was coming.

The Icebreaker was successful as it was attended by over 200 people from all over Canada. It is the once-a-year occasion for everyone across the provinces to get together in our own private setting and enjoy a reception with buffet style appetizers, pastas, roast beef and turkey, just in time for Canadian Thanksgiving. That was not a coincidence, by the way.

We were also very lucky to have a special guest in Allan Bester, former Toronto Maple Leaf goalie from 1983 to 1991, originally from Hamilton, who was there signing autographs. Thanks to Julie Vincent for arranging this added attraction – she does have connections.

Once again, in true Canadian style, we proved that one bar is just not enough for this type of crowd... the hotel would not believe us when we told them that it probably would not suffice. So, our apologies if the bar lines were a bit long at times.

Hopefully, everyone enjoyed the selection of plentiful foods on hand that just kept coming. The hotel staff certainly gave us more than what we bargained for.

Thanks for all the positive reviews we had from everyone. We can only hope to have a similar venue, but with multiple bars, for next year’s Icebreaker at WEFTEC in New Orleans.
ONE World ….. ONE Water Environment

39TH ANNUAL WEAO TECHNICAL SYMPOSIUM
AND OPCEA EXHIBITION

April 18 - 20, 2010
LONDON CONVENTION CENTRE
LONDON, ONTARIO

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SPACE IS LIMITED.

THE LARGEST CANADIAN TECHNICAL CONFERENCE FOR THE WASTEWATER INDUSTRY
## Monday, April 19, 2010

- **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. - 10:30 a.m.**
  - Coffee Break

- **10:00 a.m. - 12:00 p.m.**
  - PWO Workshop

- **10:30 a.m. - 12:00 p.m.**
  - Technical Sessions

- **12:00 p.m. - 2:00 p.m.**
  - Awards Luncheon

- **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

- **2:00 p.m. - 4:00 p.m.**
  - Operations Challenge Process Control Exam

- **2:00 p.m. - 5:00 p.m.**
  - OPCEA Exhibition

- **4:00 p.m. - 5:00 p.m.**
  - PWO Meet and Greet

- **5:00 p.m. - 7:00 p.m.**
  - OPCEA Reception

## Tuesday, April 20, 2010

- **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

- **9:30 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 in Exhibit Area

- **1:30 p.m. - 3:30 p.m.**
  - Technical Sessions

- **3:45 p.m. - 4:00 p.m.**
  - Coffee Break

- **9:00 a.m. - 3:00 p.m.**
  - Operations Challenge

- **8:00 a.m. - 5:00 p.m.**
  - OPCEA Exhibition

- **9:00 a.m. - 12:00 p.m.**
  - Operator Certification Exam

- **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

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### Conference Attendee Inquiries

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Julie A. Vincent, Executive Administrator
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Milton, ON L9T 4N9
T. (416) 410-6933 x1
F. (416) 410-1626
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### Exhibitor Registration Inquiries

Ontario Pollution Control Equipment Association
Kelly Madden, Executive Administrator
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### Operations Challenge Inquiries

John Rammler, District Plant Supervisor
Regional Municipality of Durham
Corbett Creek WPCP
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T. (905) 576-9844
C. (905) 260-3537
F. (905) 576-8611

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**Please Note:** Conference and exhibition registration will not open until early 2010. Please check the web sites for updates.
ONCE-IN-A-LIFETIME EXPERIENCE FOR CSJWP WINNER

Cindy Toth, Town of Oakville, Co-Chair, CSJWP Committee (WEAO)

Ms. Mary Yiyue Zhao of Vancouver, BC with her project, ‘Grasping water: A novel method to make rain using an Ice Nucleating Protein,’ was selected by the Canadian Stockholm Junior Water Prize (CSJWP) Committee to represent Canada at the internationally prestigious Stockholm Junior Water Prize (SJWP) competition held in Stockholm, Sweden, August 16-22, 2009.

This competition brings together the world’s brightest young scientists, encouraging 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. During their time in Stockholm, winners of the national competitions meet and learn from the present leaders of the global water community and make life-long friendships with international compatriots who share a passion for water and science.

Ms. Zhao traveled to Stockholm as the CSJWP winner. Her experiences were extraordinary and Mary has shared these with the CSJWP Committee. In her own words, she filed the following report:

“The week that I spent in Stockholm was the most amazing one that I have experienced. I had the chance to discuss my project with water specialists from around the world, make lasting friendships with the other finalists, and discover Stockholm through the many tours of the city.

I found the rich cultural atmosphere of the week to be unforgettable. I was impressed by the history and culture that are evident everywhere in Stockholm. We visited the Old Town, which included the royal palace, Nobel Museum, and the parliament buildings. As well, we went on a boat tour of the surrounding archipelago. I loved the beautiful scenery and the water that was present, even in the heart of the city. By the end of the week, I even learned a few words of Swedish! One of my most lasting impressions of the week is the mélange of cultures. In addition to delving into the Swedish culture, I felt fortunate to learn about the other finalists’ countries. The cultural cabaret was the first evening event of the week, and it brought all of us closer together. I was eager to share with the others Canada’s maple syrup tradition. I enjoyed learning about the political structure of Turkey, the water crises in South Africa, and the schooling system in Vietnam. Throughout the week, we exchanged contact information and developed great friendships. On the last night, everyone was reluctant to sleep.

Discussing my project with the international jury, researchers, and visitors was one of the most rewarding experiences. I truly appreciated the judges’ thorough reading of my paper and their preparation of thought-provoking questions. They were very nice and encouraging. I talked about my plans for future extensions to my project, and they offered insightful suggestions for possible modifications. I had the chance to meet some of the judges on several other occasions, such as during the awards dinner and at the royal banquet, and to learn about their experiences in the water-related fields. In addition to talking with the jury, I had the valuable opportunity of meeting several water specialists who were interested in my project. In particular, I was excited to share the findings of my project with a regional advisor from the UN Economic and Social Commission and the Director General for the Mexico Institute of Technology. They asked for a copy of my full report and showed a lot of interest in the findings of my project. As well, I enjoyed presenting my project to the ambassador of Canada in Sweden and to this year’s Stockholm Water Prize laureate.

I learned so much during the week and still keep in touch with the friends that I made in Stockholm. I know that I will always cherish the countless memories. It was a truly unforgettable experience. I am so grateful for this once-in-a-lifetime opportunity. Thank you [to the CSJWP organizers] so much for giving me the chance to have this incredible experience!”

The Stockholm Water Foundation and the Stockholm International Water Institute (SIWI) awarded 18-year-old Ceren Burçak Dag (Turkey) the 2009 Stockholm Junior Water Prize. The young woman won the coveted honour by developing an innovative method for generating energy through piezoelectric pulses from falling rain drops.

The Stockholm Water Foundation and the Stockholm International Water Institute (SIWI) awarded 18-year-old Ceren Burçak Dag (Turkey) the 2009 Stockholm Junior Water Prize.

From left to right: Emily Elhacham (Israel), Ceren Burçak Dag (Turkey), and Mary Zhao (Canada).
Environmental, Health, Safety & Security

By Chair Duane Forth, Veolia Water Canada Inc., duane.forth@veoliawaterna.com

The Environmental, Health, Safety & Security (EHS&S) Committee is looking for new members.

WEAO is an “organization dedicated to the preservation and enhancement of Ontario’s water environment” through the “promoting of sound public policy.” In direct relationship to the vision of WEAO, it is the goal of the Environmental, Health, Safety & Security (EHS&S) Committee to transfer collected information to its members regarding developments in standards, policies, applicable laws and best management practices related to EHS&S within the wastewater industry.

In conveyance of this information, the EHS&S Committee is determined to provide the wastewater community with reliable information that reflects current issues such as environmental health and compliance, worker health and safety and security threats to water and wastewater systems.

The EHS&S Committee will utilize multiple resources (INFLUENTS magazine, Webinar training, website alerts, etc.) to alert and enhance the membership’s awareness of pending issues.

The jury also awarded two (2) Diplomas of Excellence to Mary Zhao (Canada) for her project and Emily Elhacham (Israel) for her project on detecting water contamination chemical sensors using metal nanoparticle networks.

The CSJWP Committee is very proud of Mary’s achievement in winning a Diploma of Excellence at the SJWP competition.

The SJWP competition is hosted by the Stockholm International Water Institute (SIWI). ITT Corporation is the global sponsor for the international SJWP competition.

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 including Atlantic Canada Water Works Association, RÉSEAU environnement, Water Environment Association of Ontario, Western Canada Water Environment Association, and British Columbia Water and Wastewater Association) as well as the Canadian Water and Wastewater Association, ITT Water and Wastewater Canada, and for 2009, Eramosa Engineering Inc.

For more information on how students can participate in the CSJWP as well as a list of past winners, 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. You can also learn more about the ITT Corporation at http://www.itt.com/

The photographs accompanying this article are published with permission from the Stockholm International Water Institute (SIWI).
BELT FILTER PRESS MAINTENANCE AT CHATHAM WPCP

John L. Siletto, Phoenix Process Equipment Company

In April 1992, the Chatham Water Pollution Control Plant (WPCP) purchased two Model WWX-2.5 belt filter presses (BFPs) from PHOENIX Process Equipment Co. of Louisville, Kentucky. These BFPs were commissioned in July 1993 and have been in continuous and successful operation ever since. This is an unusual record of reliability for machines of this type that have not been refurbished or updated to any substantial degree. This article will explore the reasons for this significant accomplishment.

The Model WWX-2.5 belt filter press is typical of the heavy-duty machine design. The two BFPs for Chatham WPCP were designed to dewater an anaerobically digested combination of municipal and industrial biosolids sludges at 23.4 m³/hour with a feed concentration of 2.5-5.0% by weight solids. The objective was to create a surface-dry (16-18% by weight solids) cake that could be economically transported and would be acceptable for landfill disposal. These objectives have successfully been achieved throughout the history of this installation.

The weekly operating schedules for this belt filter press installation generally range from five days for eight hours per day to seven days for 10 hours per day each week. One of the BFPs is always on-line, with the second machine normally held in reserve as an in-place replacement/spare in case the operating machine encounters any operational difficulties. The belt filter press that is not in operation at any given time receives service and maintenance attention from the plant operators. The on-line and reserve belt filter presses are routinely alternated.

The filter belts installed on these two BFPs have, at times, achieved two-plus years of useful operating life, which is exceptional. In-situ belt cleaning is normally accomplished at relatively low spray water pressures of 74-86 psi (510-593 kPa), which is well below the 100-110 psi (690-758 kPa) that is recommended by the manufacturer, based on successful experience in many installations for this application. In addition, Chatham WPCP has augmented on-board belt cleaning operations with a weekly application of a dilute chlorinated ‘safety acid’ wash.

The reliability and performance of these two belt filter presses result from:

- plant maintenance standards that require consistently high level equipment service;
- the pride and initiative of the rotating staff of plant operators, who constantly aim to exceed the plant’s standards;
- the selection and application of high quality equipment that is well-suited to this application; and
- use of the manufacturer’s replacement parts and site services, thereby making use of their knowledge and expertise to augment the plant’s good intentions.

Let’s review what a high quality belt filter press service/maintenance program might consist of:

**PROCESS** – It is important that the correct equipment be chosen to achieve desired results in a given application. It is equally important that, as plant operations change, care is taken to understand the impact of these changes on the dewatering equipment and to take actions that properly reflect any operational changes.

**PERFORMANCE** – Routinely monitoring BFP performance can give insight into potential reliability issues. If belt filter press cake dryness deteriorates, it could serve to predict problems relating to belt integrity, doctor blades,
belt tensioning system, belt tracking system, belt cleaning system, belt speed, feedbox distribution, etc.

**BELT FILTER PRESS INSPECTION AND MAINTENANCE** – The best maintenance programs are those characterized by schedules of routine inspection tasks that are rigidly adhered to; an understanding of the appropriate steps that must be taken in response to any problems that are identified; and a firm commitment by operating, maintenance, and administrative staff to conscientiously support maintenance and service objectives. It is especially useful for these maintenance programs to be well documented – providing a record of what has been accomplished, by whom, when, in response to what, and with a description of the final result or action taken – to serve as a guide to future problems as they arise.

Specifically with regard to belt filter presses, a maintenance inspection schedule might look like:

**Daily or once per operating shift:**
1. Inspect filter belts, doctor blades, and wiper bars for wear or damage. Replace if necessary.
2. Check tracking system for responsive operation and for wear or damage to components. Make any necessary adjustments.
3. Check pneumatic system and belt wash system, and take appropriate action to correct any deficiencies observed.
4. Check air line lubricator for proper adjustment and add the appropriate lubricant if necessary.
5. Check roller bearing lubrication and add lubricant wherever necessary.
6. Check drain pans, sumps, spray boxes, rollers, and frame for unusual or unacceptable solids build-ups and wash down as necessary.

**Monthly:**
7. Check condition of rollers. Coating surfaces should be smooth and free of blemishes, and the bond to the metal substrate should be fully intact.
8. Check the BFP frame for any breeches in the coating system and for signs of oxidation.

**Every six months:**
9. Replace lubricant in BFP drive gearmotor.
10. Remove wash water spray bars from the machine and thoroughly inspect the nozzles for wear. If wear that would adversely impact belt cleaning is observed, the offending nozzles must be replaced.

Belt filter press appurtenant equipment (i.e., pumps, polymer makedown systems, air compressors, etc.) should be inspected, maintained, and serviced per their manufacturers’ recommendations. Because the Chatham WPCP has incorporated many of the above guidelines into their belt filter press operating and maintenance philosophies, their BFPs have remained steadfastly reliable and effective for more than 16 years. Those machines should continue to do so well into the future as long as those guidelines are conscientiously adhered to. In addition, the pride that the Chatham staff has exhibited in their BFP area has resulted in it being clean and aesthetically pleasing. As a result, PHOENIX Process Equipment Company has used this as a showcase installation for prospective BFP purchases on numerous occasions, with Chatham’s cooperation.
Winter is no downtime for the Midland Flush Waters, as the team prepares for the Operations Challenge to be held during the 2010 WEAO Technical Symposium and OPCEA Exhibition. “It is not just about competing,” explains Coach Tim Toole, manager of Water & Wastewater Operations for the Town of Midland. “They must have time to practice. It takes a lot of commitment.”

There is no shortage of commitment at Midland’s Water & Wastewater Operations. Six years ago, when the region was trying to get more teams involved, the utility rose to the challenge with Pat LeClair and Mike Charlebois becoming the first-ever two-man team to enter the competition.

Charlebois is the senior wastewater operator while, as assistant manager, LeClair is Toole’s right hand man. Besides looking after day-to-day operations at the wastewater treatment plant, he is responsible for maintenance of the water and wastewater systems.

After competing as a two-man team in 2004, the pair took a year’s hiatus before coming back as part of a four-man team in 2006. Today, they are joined by Roland Friedrich and Tom LeCamp, both water and wastewater operators.

“All our operators are cross-trained in both water and wastewater,” Toole points out. Water & Wastewater Operations has a total staff of 19 serving the Town of Midland’s 16,500 people.

Having such a small complement makes it difficult for Toole to give team members time for training. “We try to give them as much time as we can, but they still have to do a lot on their own,” he says. Recently, the team even traveled to Toronto to practice on a manufacturer’s display pump.

Toole explains that preparing for the pump event requires practicing on the specific model to be used in competition. Team members then decide what role each of them will play in the event. Toole’s responsibility is to ensure each member fulfills his function without missing a step.

“You do enough practicing that it becomes routine,” he says. “But, little things can still throw you off. Our team worked really hard last year, but the others did too.” In 2009, the Flush Waters placed fourth out of seven teams. The previous year, however, they were able to snag third place overall.

That year, they placed second in the lab event as well as first in both Collection and Process. Toole explains that, for the process event, team members “got down to the books,” much as if they were studying for an exam.

“Both the municipality and the team members benefit from the extra knowledge,” he notes. “It helps to make better operators. It is a bit of a challenge, but fun at the same time. The guys really enjoy it. They love the networking and seeing all the operators at work.”

In 2010, WEAO is introducing new elements to each of the five events. This means that all teams will be starting on the same footing. Not that the Flush Waters are taking anything for granted. They are working hard to eliminate any little mistakes, so that each event runs smoothly. Spring may not yet have arrived, but already the challenge is on! ✈
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PWO NORTHEAST REGION TRAINING DAY AND CONFERENCE

Brian Renwick, City of Greater Sudbury

The third annual PWO Northeast Training Day and Conference were held in Sudbury on September 29 and 30 and were very successful. The seminar format featured training day educational workshops, technical program sessions, as well as a trade show and a meet and greet social for approximately 33 delegates and 27 equipment suppliers and consultants.

The training day of the seminar featured concurrent training workshops. Instructor Dave Russell of the Ontario Water Operator Training Centre (OWOTC) presented a Sewer Flushing and Cleaning Techniques workshop, with a value of 0.7 CEUs. During the workshop, participants gained an overview of the types of collection systems, flushing procedures, other various methods of pipe cleaning, and potential problems within collection systems. Feedback from the workshop attendees indicated both the content and delivery were very good.

The other concurrent workshop was entitled Basic Wastewater Collection for Treatment Plant Operators. Rob deBortoli of the OWOTC presented this 0.7 CEU workshop which covered pipes, manholes and flows, various system types, lift stations and various operations and maintenance procedures. This workshop also received very positive feedback from attendees.

After completing their training, delegates were invited to the meet and greet dinner social featuring an exceptional hip-of-beef buffet dinner. This was followed by delegate visits to the tradeshow which featured 23 exhibitors.

We would like to express appreciation to the following consultant sponsors: J.L. Richards & Associates Ltd., AMEC Earth & Environmental Ltd., Golder Associates, and Waters Environmental Geosciences Ltd.

On the second day, following a continental breakfast, delegates were welcomed to Sudbury and the PWO Northeast Region Technical Program by Shawn Scott, Vice-President of R.V. Anderson. Shawn also introduced Peter Takaoka from R.V. Anderson, who presented a case study on risk assessment. Michael Payne, WEAO Director 2009-2012, gave an overview of WEAO Updates for 2008-2009. In a later presentation, he spoke on Using Sewage Biosolids in Manufactured Soils and Land Reclamation. The next technical speaker was Judy Sewell from the Sudbury District Conservation Authority. She described the City of Greater Sudbury’s status on the Drinking Water Source Protection and the Clean Water Act. Kewal Kharbanda of the Ontario Water Wastewater Certification Office (OWWCO) closed the technical presentations with a very informative update on licensing certification of water and wastewater operators in Ontario.

PWO SOUTHEAST REGION WASTEWATER DIGESTER OPERATION & CONTROL WORKSHOP

Stephen King, Utilities Kingston, President, PWO Southeast Region

On October 26, 2009, the Professional Wastewater Operators (PWO) Southeastern Region held a Wastewater Digester Operation & Control Workshop at the Royal Canadian Legion in Kingston, Ontario. Twenty-five operators attended from as far west as the Quinte Region and east to Cornwall. The workshop was delivered by instructor Jack Macrae from Ontario Water Operator Training Centre, based in Windsor. The day-long workshop is designed to give operators the basics on digester operations, both aerobic and anaerobic, which included acid formation, methane production and critical control and operation. After completing a quiz at the end of the workshop, a certificate for 0.7 CEUs will be sent to each participant. Thanks to Jack Macrae and Julie Vincent (WEAO).

On a disappointing note, the Annual Southeastern Region PWO Conference the next day (October 27) had to be cancelled due to a very low registration. I hope this was an economic reflection of this past year and we can plan for a better 2010 conference. Thanks to Julie Vincent (WEAO) and the Water Environment Association of Ontario for all the support.
The Aboriginal Water and Wastewater Association of Ontario (AWWAO) held an Operations Challenge competition at its Annual Conference on Thursday, August 27, 2009 in Sault Ste. Marie, at the Roberta Bondar Pavilion located behind the Waterfront Inn. It was the first time in four years that the Operations Challenge has been at the conference and AWWAO is hoping to make it an annual event once again. AWWAO had four teams comprised of three individuals in the competition. Each group tackled five events that would test differing areas of the operator’s expertise. The competitors all withstood a Safety, Maintenance, Lab, Collection, and Process situation where they were judged by a rules official and also by event completion time as they battled against the clock.

Despite the relatively small group of competitors, the event was still a great success as everyone involved enjoyed themselves, from the operators battling it out to claim first place, to the spectators having a laugh watching the operators sweat. AWWAO hopes that the event will see more participants at the next Annual Conference. The winners of the Operations Challenge received a $100 Mark’s Work Warehouse gift card. Every competitor was given an AWWAO hard hat and a pair of work gloves. We would like to thank all those who participated and hope to see a bigger crowd next year. AWWAO would like to thank the volunteers from the Water Environment Association of Ontario (WEAO) Operations Challenge Committee, for without them, this event would not have been possible. These individuals are Ian Smith, Dave Spiller and Gary Burrows, who put in countless hours to make sure that this event ran smoothly. We would also like to thank the volunteers from the Water Environment Association of Ontario (WEAO) Operations Challenge Committee, for without them, this event would not have been possible. These individuals are Ian Smith, Dave Spiller and Gary Burrows, who put in countless hours to make sure that this event ran smoothly. We would also like to thank the Ontario Clean Water Agency (OCWA) who put together and ran the Lab and Process events.

There were also volunteers from the City of Toronto, Tyson Ferriera and Chris MacDonald, who helped with the setup and running of the Safety Event. A thank you goes to John Rammler (Region of Durham) for all of his input and direction. Overall, it was a terrific event and the AWWAO has heard nothing but positive feedback from everyone.

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To those who know him, it came as no surprise to see Dave Durant win the 2005 Norman J. Howard Award from the Ontario Water Works Association. Established to recognize proficiency in such areas as management and regulation of municipal water supplies, the award was a fitting tribute to a life devoted to equipping operators with the tools, skills and knowledge to do their jobs.

Dave has been in the water and wastewater field since graduating with a degree in civil engineering from Queen’s University in 1962. For 24 years, he worked for chemical dosing and disinfection specialist Wallace & Tiernan, eventually becoming the Canadian sales and service manager.

It was through his association with the company that he became involved with OPCEA. Active on several water and wastewater committees over the years, he served a term as president of the association in the early 1970s. “We spent a good part of the year in discussion with the Ministry of the Environment (MOE) regarding financial guarantees for pre-selected equipment on wastewater jobs,” recalls Dave. “When an equipment supplier was pre-selected, we had no idea who would be a project’s general and mechanical contractors. Sometimes, there was questionable financial status with either or both contractors, yet we were obligated to the pre-selection financial arrangements.”

Those arrangements left equipment suppliers at risk, with only the Mechanics Lien Act as protection. However, if payment did not arrive by the time the equipment was on the site, it was too late to lien the job. Having already paid the general contractor, there was little that government could do. In theory, the contractor was supposed to pay the mechanical installer, who would then pay the equipment supplier. In reality, payments did not always reach the pre-selected supplier. Eventually, thanks to pressure by organizations such as OPCEA, the government decided to pay suppliers directly from the money set aside for a project.

By that time, Dave had moved on. In 1986, now living in Bracebridge, he decided to start his own business, Envirosupply Ltd., supplying water and wastewater disinfection and treatment systems to municipalities, industries, resorts and camps in central and northern Ontario.

At the same time, he began to do contract training for the Ontario MOE at the Brampton training centre. Most of the training was the five-day gas chlorination workshop. “I noted that several participants on the gas course were not using chlorine gas,” recalls Dave, adding that only the gas workshop was available at the time. “As a result, I developed and obtained MOE approval to deliver a hypochlorination workshop.”

When the MOE withdrew from the training business, demand skyrocketed. Dave developed 12 additional courses, with comprehensive training manuals on chemical safety and handling for the water and wastewater fields. Soon, he found himself conducting courses throughout the Maritimes and Ontario, with little time left for equipment sales.

In 1990, he sold that side of the business to his son Jeff, a chemical engineer. After Walkerton, Dave became busier than ever. His wife Nancy even quit her job as a rehabilitation consultant to work full time for the training company.

But, by 2005, it was time to retire and the company was sold to MacViro (now Genivar). Since then, Dave has shifted his energy to other projects. Besides being a lifetime member of the American Water Works Association, he is also a lifetime member of Lions Clubs International. During his 33 years of service with the organization, he has received numerous awards, including the International President’s Medal (second highest international Lions award) and the Brian Stevenson fellow (highest Canadian award). Both he and his wife have been district governors and presently serve on the training faculty for the organization.
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ANNUAL GENERAL MEETING

Please note that there is a change in the date of the OPCEA AGM. It will be held at the Delta Meadowvale on February 16, 2010. Charles Rittner from the Regional Municipality of Niagara is scheduled to be the guest speaker. The executive requests that you make every effort to attend this event. The meeting also provides a forum for the executive to update the members on their activities and for the members to make suggestions to the Board. Last year’s AGM minutes may be viewed on the OPCEA website.

The tentative schedule of events 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

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We invite you to learn more about these member benefits by contacting JVK Life & Wealth Advisory Group at (905) 642-0654, email info@jvkgroup.com, or website www.jvkgroup.com/OPCEA.htm

2010 OPCEA GOLF TOURNAMENT – NEW LOCATION

Please note that, for 2010, the annual OPCEA Golf Tournament will be held at a new location, the Cardinal Golf Club, on June 2, 2010.
In a recent survey, less than one in three member companies of the Ontario Pollution Control Equipment Association (OPCEA) supported the Federation of Canadian Municipalities (FCM) ‘Fair Trade’ Resolution. This resolution encourages Canadian municipalities to adopt procurement policies aimed at excluding the use of products in Canadian infrastructure projects, which are imported from countries that do not allow free and unfettered access to Canadian made products. The FCM Resolution was crafted in response to the ‘Buy American’ provisions contained in the American Recovery and Re-investment Act (ARRA), and was intended to support Canadian manufacturers.

OPCEA believes both the ‘Buy American’ provisions of the ARRA and the retaliatory FCM Resolution are contrary to the provisions contained in the North American Free Trade Agreement (NAFTA), which the association supports. OPCEA is comprised of companies that manufacture wastewater treatment equipment in Ontario, and companies that sell, or distribute wastewater treatment equipment in Ontario, from companies based in foreign countries, including the United States.

While the association recognizes the need to support free access to the US market for its Canadian manufacturing members, it also supports member companies that sell American products into the Ontario market. It is the opinion of the association that the two markets are inextricably linked, and that any policy that restricts market access in either direction is counter-productive, and ultimately will negatively affect Canadians. While the proponents of the FCM Resolution claim that equipment currently sourced in the US can be replaced with products from other countries, according to OPCEA, Canada does not have free trade agreements with those countries.

There will be a heavy price penalty involved in sourcing equipment from non-NAFTA countries, due to countervailing duties and higher shipping costs. Those costs will be borne by municipalities, and ultimately by taxpayers.

Another reality is that Canadian wastewater equipment manufacturers have neither the range of products nor the capacity to fill the approximately six billion dollar annual void that would be created if US-made wastewater and water infrastructure products are no longer purchased. Additionally, OPCEA fears many member companies may be forced to lay off workers, or even close down operations, if they cannot sell American-made products on Canadian municipal infrastructure projects.

OPCEA believes that this issue should be addressed and resolved at the federal government and provincial/state government levels, and not at the municipal level. It encourages the FCM to step back from its confrontational stance, and allow bilateral negotiations to progress to a mutually satisfactory conclusion, serving both American and Canadian interests.

Founded in 1970, the Ontario Pollution Control Equipment Association represents over 150 Ontario companies involved in the manufacture or distribution of environmental and related equipment. For more information email opcea@opcea.com or visit www.opcea.com.
NEW RULES AND GUIDELINES FOR LAND APPLICATION OF SEWAGE BIOSOLIDS

Juli Abouchar and Raj Bharati of Willms & Shier Environmental Lawyers LLP

On September 18, 2009, the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the Ministry of the Environment (MOE) jointly announced new rules and guidelines for applying non-agricultural source material to farmland. These changes will provide consistent province-wide standards and requirements for material quality and application, and will remove overlapping approval processes for both generators of non-agricultural source material and the farmers who accept it.

Most wastewater treatment facilities produce biosolids as a solid waste resulting from the treatment of domestic sewage. Sewage biosolids’ high nutrient content make it apt for use as a fertilizer for agricultural soils. Land-application completes the nutrient cycle between soils, food and human consumption and waste. It also contributes to water conservation by allowing soils to breathe and hold water, thereby decreasing water runoff, as well as soil erosion.

Biosolids nevertheless present unique challenges that must be addressed before they can be land-applied. The primary concerns are pathogens and toxins, and the potential to create odours. Land-application must also be done in a manner that prevents impacts to groundwater and surface water, and avoids creating a nuisance for neighbours.

In Ontario, the MOE regulates the generation, transport and disposal of waste, and OMAFRA regulates the application of ‘non-agricultural source material’ (NASM) on agricultural lands. NASM includes sewage biosolids, as well as yard waste, fruit and vegetable peels, food processing waste, and pulp and paper biosolids.

The new rules and guidelines are the final part of a initiative to revamp the regulatory framework governing the application of non-agricultural source materials on agricultural land. This entails amendments to regulations under both the Environmental Protection Act and the Nutrient Management Act, 2002.

Some regulatory amendments came into force when the regulations were filed on September 18, 2009. These include preliminary changes such as establishing the new framework and describing the purpose and content of the NASM plan.

Amendments containing the substantive requirements of the new framework, such as for the preparation of NASM Plans and land-application requirements, will come into force on January 1, 2011.

Complementing the new regulatory framework are the following new or updated policy documents, all released September 14, 2009:
• Sampling and Analysis Protocol
• Nutrient Management Protocol
• NASM Odour Guide
• Nutrient Management Tables.

In developing the new regime, the government carried out a consultation process that included public meetings, a 120-day public comment period in late 2007, and another 30-day comment period in summer 2009. The government received over 170 submissions during these comment periods.

The new regime also takes into account the conclusions of Walkerton Inquiry, which recommended a science-based approach to protecting drinking water.

Standards-based approach

The centrepiece of the new regime is the establishment of consistent standards for non-agricultural source materials that are to be land-applied. These standards, some of which were previously only guidelines, are contained in province-wide regulations. The key parameters are metals, pathogens and odour-generating potential. There will also be consistent standards for setback distances from surface water, wells, depth to bedrock and maximum application rates.

Currently (i.e., prior to these amendments taking effect), the agricultural use of NASM is managed through approvals under both the Environmental Protection Act (EPA) and the Nutrient Management Act, 2002 (NMA). The dual role is consistent with the Walkerton Inquiry recommendation that MOE play a lead role in regulating the potential impacts of farming activities on drinking water sources, with technical support and advice to farmers coming from OMAFRA.

Generators of sewage biosolids (such as municipal wastewater treatment plants) are currently required to have MOE certificates of approval. Generators are also required to have a Nutrient Management Strategy for its NASM, which includes information about the material and its generation, storage and final destination.

Farmers who land-apply sewage biosolids are currently required to have a certificate of approval under the EPA for spreading NASM. Farmers are also required to have Nutrient Management Plans that detail how NASM (and other nutrients) are to be land-applied.

A Nutrient Management Plan has some similar components to Nutrient Management Strategy, but is specific to a particular field. It is intended to optimize the utilization of nutrients by crops and minimize environmental impacts.

The current regime created some overlap of approvals for both facilities-generating NASM and the farmers who receive it. This overlap is a by-product of increasing regulation of NASM under the NMA since it was introduced in 1992, but with MOE still retaining much of its traditional role in regulating all aspects of waste generation, transport and disposal under Part V of the EPA and Regulation 347 (Waste).

For generators, this duplication has been ended with the removal of the requirement for generators to have a Nutrient Management Strategy.

Generators will still be required to have...
certificates of approval under the EPA. For farmers, the standards and requirements for receiving and applying NASM contained in a land application approval under the EPA will be contained in the regulations and, where necessary, NASM Plan (described below). A land-application approval will still be required for certain materials, including sewage biosolids.

Material quality and NASM Plans

The new framework also addresses the quality of the non-agricultural source material, and introduces a new requirement for a NASM Plan. Material is assessed using various criteria to determine how beneficial it will be to the soil. This assessment determines whether a NASM Plan will be required for the material.

A NASM Plan is similar to a Nutrient Management Plan, but specific to NASM. It must be prepared by a certified person and approved by OMAFRA.

A NASM Plan will always be required for sewage biosolids.

Odours

Another key feature is a new odour classification system based on the material’s odour potential. A new NASM Odour Guide provides guidance in assessing the potential for odours, and provides storage, handling and setback requirements for NASM, depending on its odour categorization. Stronger odours will require greater setbacks from potential receptors. Some materials may even be too odorous for any land application.

The NASM Odour Guide sets out the three methods that can be used to determine where a specific NASM fits within the odour classification system (historical data, comparative and empirical assessment, and the professional judgment of ministry staff).

Notably, the odour guideline uses the European Odour Unit as the basis for assessing odours. This means that laboratories that assess odours must comply with the standard method for measurement associated with the European Odour Unit.

Notification

The new framework simplifies notification procedures. The applicable MOE District Office must be notified prior to the spreading of any material approved under a NASM Plan. Municipalities are only notified by OMAFRA when a NASM Plan is approved.

Interplay with Source Water Protection Legislation

As reported previously in this column, Ontario has new source water protection legislation that requires multi-stakeholder Source Protection Committees to prepare Source Protection Plans that identify threats to drinking water and identify measures to reduce those threats. Such measures include new municipal orders, land use restrictions, prohibitions and existing provincial approvals. Favouring a one-window approach, the province’s preferred mechanism to reduce these threats is through existing or new regulatory instruments.

However, only ‘prescribed provincial instruments’ will be open for source protection. The list of prescribed instruments is still under development. In order to ensure that drinking water sources are protected, it will be important to include land application

certificates of approval, Nutrient Management Plans and NASM Plans, as prescribed provincial instruments for the purposes of source protection.

What’s next

The government is currently preparing a plain language guide to the regulatory amendments, which is anticipated to be ready in late 2009. The regulations contain transition provisions, which detail the process of moving over to the new regime.

OMAFRA is currently developing a training course for NASM Plan preparers. Training for certification requirements are anticipated to be available in late spring 2010.

End note


Juli Abouchar
Raj Bharati

Juli is an Environmental Law Specialist certified by the Law Society of Upper Canada. She was Assistant Commission Counsel to Justice O’Connor during the Walkerton Inquiry, serves as a member of the CTC Source Protection Committee (greater Toronto watershed), and is a Director of the Ontario Clean Water Agency.

Raj is an Associate Lawyer with a degree in environmental engineering.

Key changes to NASM Regulation

<table>
<thead>
<tr>
<th>Regulated party</th>
<th>Current requirements</th>
<th>After January 1, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASM Generators (e.g., WWTPs)</td>
<td>MOE Certificates of Approval for sewage works and transport</td>
<td>Still required</td>
</tr>
<tr>
<td></td>
<td>Nutrient Management Strategy</td>
<td>No longer required</td>
</tr>
<tr>
<td>NASM Accepters (e.g., farmers)</td>
<td>MOE Certificates of Approval for Land Application</td>
<td>Only required for certain substances (including sewage biosolids)</td>
</tr>
<tr>
<td></td>
<td>Compliance with regulatory standards required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nutrient Management Plan</td>
<td>Still required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NASM Plan may also be required</td>
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</tbody>
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PUTTING FOR PEOPLE

Dean Whittaker, P.Eng, Municipal Infrastructure Group Ltd.

On a hot and sunny Thursday in September, over 100 avid golfers traveled to the Shawnkeeki Golf Course in Newmarket, Ontario for the Water Environment Association of Ontario’s (WEAO) Annual Golf Tournament. Tournament participants included 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.

Water For People Canada (WFPC) is an international grassroots organization which is directed by a single premise – do the right thing. Specifically, WFPC is dedicated to the development of locally sustainable drinking water resources, sanitation facilities, and health and hygiene education programs in developing countries. WFP’s vision is to create a world where all people have access to safe drinking water and sanitation, and where no one suffers or dies from water or sanitation-related disease.

The Water For People Putting Contest featured a simple concept: sink a single putt 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, a rugged chainsaw, dinner gift certificates, portable stereo system, scotch whisky, etc. All the prizes were generously donated by participating WEAO and Ontario Pollution Control Equipment Association (OPCEA) members.

Overall, more than 100 golfers participated and approximately 600 putts were attempted, of which only 63 actually dropped in the hole (I’m not sure what a success rate of about 10% says about our organization’s putting skills, but no one can argue with our generosity).

Overall, Dean Whittaker (Design Engineer) and Mei Ling Tamkei (University of Waterloo Co-op Student) of the Municipal Infrastructure Group, who chaired the event, helped to raise just over $1,000 in support of Water For People. Both Dean and Mei Ling are looking forward to next year and are promising a new twist to what will hopefully become an annual fundraising event.

BIOSOLIDS SUPPORT WATER FOR PEOPLE CANADA

Louise Hollingsworth, Public Relations Coordinator, Water For People Canada

Hats off to the WEAO Biosolids Committee. Volunteer Brian Topp of Hollen Controls Ltd. managed the raffle, with prizes supported by Greatario Industrial Storage System Ltd., H2Flow, Hollen Controls Ltd, American Water - Terratec Environmental, and our host hotel, the Hilton Niagara. A total of $711, plus $7 US was raised through the raffle. Instead of speaker gifts, the Biosolids Committee also donated $25 per speaker to Water For People Canada, raising $1,600. Thank you to all the speakers as well.

Dan Hoekstra and Louise Hollingsworth with the cheque. (Image from Vince Nazareth)

Louise Hollingsworth and Brian Topp selling tickets at the Biosolids Icebreaker. (Image from Steve Davey of Environmental Science and Engineering)
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