OCT. 6-8, 2019 HALIFAX, NS

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TECHNICAL PROGRAM

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Water Environment Federation
the water quality people

ATLANTIC CANADA
WATER & WASTEWATER ASSOCIATION

American Water Works Association
Atlantic Canada Section

10.07.2019 MONDAY	10:30 AM - 11:15 AM	11:15 AM - 12:00 PM
A1 Technical Session **Halifax Room A**	**Championing Change on the LaHave River** Stella Bowles Stella Bowles prompted action for the clean up of Nova Scotia's LaHave River, which contains alarmingly high levels of fecal contamination. Because of her work, three levels of government have allocated $15.7 million dollars to address the problem of illegal straight pipes that still drain raw sewage from over 600 homes along the river. Three years since her initial research, Stella continues to be an advocate for the elimination of illegal straight pipes province wide.	**The Benefits of Effective Leadership and Leadership Training** Tabatha Thibault, Saint Mary's University Tabatha Thibault holds a MSc in Applied Psychology focusing on Industrial/Organizational Psychology. She is currently a PhD candidate in Industrial/Organizational Psychology at Saint Mary's University as well as a part-time professor. Her research interests include leadership development, the Dark Tetrad of personality, and incivility and cyber deviance in the workplace. She has been part of a research-practitioner team that conducts leadership training workshops for the past three years.
A2 Technical Session **Halifax Room B**	**Hydraulics of Pressure Sewer Systems** Keith McHale Environment One Corporation	**Wet Weather Flow Management for Trunk Sewer Systems - City of Toronto Black Creek Sanitary Servicing Study** Harshad Shetye WSP Canada
A3 Technical Session **Halifax Room C**	**Fundamentals of Membrane Bioreactors: Facility Design, Procurement, Construction and Operation** Chris Fahie Halifax Water	**Ammonia Limits and Lagoons: Atlantic Canada's Options for Beating Effluent Limits** Francis Bordeleau Nexom

	1:30 PM - 2:00 PM	2:00 PM - 2:30 PM	2:30 PM - 3:00 PM
B1 Technical Session **Halifax Room A**	**Harvesting Nutirents for Reuse from Municipal Wastewater Using a Revolving Algae Biofilm System** Tom Kunetz MWRD Chicago	**The Use of Rare Earth Metals for Targeted Removals of Phosphorus** Kevin Bossy Bishop Water Technologies	**Understanding Factors Influencing Harmful Algae Blooms in a Headwater Lake in Cumberland County, NS** Baillie Holmes Dalhousie University
B2 Technical Session **Halifax Room B**	**PFAS Dark Matter: Precursors in Soil and Water** Virgil Guran Bureau Veritas (formerly Maxxam Analytics)	**Ellenvale Run Watercourse Rehabilitation** Adam Sketchley & Evan Teasdale DesignPoint Engineering and Surveying	**Potential Corrosivity of Groundwater in Nova Scotia and its Association with Lead in Private Well Water** Gavin Kennedy NS Department of Energy and Mines
B3 Technical Session **Halifax Room C**	**Assessing Recoverable Leakage Potential Through Evidence-Based Performance Indicators** Fabian Papa & Bradley Jenks HydraTek & Associates	**Water Loss Reduction Through Pressure Management to Save Money** Jody Malo Omnitech Inc.	**Water Distribution Monitoring to Inform Non-Revenue Water Reduction** Dr. Amis Preis Visenti, A Xylem Brand

	3:15 PM - 3:45 PM	3:45 PM - 4:15 PM	4:15 PM - 4:45 PM
C1 Technical Session **Halifax Room A**	**Lake Recovery Through Reduced Atmospheric Deposition: Experiences in Atlantic Canada and Key Lessons Learned** Lindsay Anderson Dalhousie University	**Operational Challenges at JD Kline Water Supply Plant in Light of Lake Recovery** Sanjeev Tagra Dalhousie University & Halifax Water	**Decision Making in an Era of Changing Source Water** Wendy Krkosek Halifax Water
C2 Technical Session **Halifax Room B**	**PVC Watermain Pipe - 40 Years of Successful Service** Douglas Seargeant IPEX	**Saving Energy and Money Through Better Wastewater Treatment Plant Mixing** Michele Braas Xylem Inc.	**Operational Improvements for Small and Medium-Sized Utilities** Darren Row & Jay Shanahan City of Miramichi
C3 Technical Session **Halifax Room C**	**Repair of a Critical Transmission Main** Kevin Healy Halifax Water	**Twin Rivers Effluent Pipe Replacement** Garrett Proud Stantec Consulting Ltd	**Minimize Metal and Concrete Damage in Water and Wastewater Applications** Randy Nixon Corrosion Probe Inc.

10.08.2019 TUESDAY	8:00 AM - 8:30 AM	8:30 AM - 9:00 AM	9:00 AM - 9:30 AM
D1 Technical Session **Halifax Room A**	**Planning for the Unknown Future and Reshaping Saint John's Water System** Dean Price Saint John Water	**Buffalo NY: Achieving 21st Century Results with Legacy Infrastructure** Dax Blake Emnet, A Xylem Brand	**Small Utility Tackles Full Water Meter Conversion to New Meters, New Technology, and Changing from Imperial to Metric** Jesse Hulsman Municipality of East Hants
D2 Technical Session **Halifax Room B**	**Pilot Plant Optimization Study of Coagulation Processes in a Direct Filtration Plant for Source Water Undergoing Lake Recovery** Isobel DeMont Dalhousie University	**Testing Ultraviolet Light Emitting Diodes (UV LEDs) Apparatus for Point-Of-Use (POU) Drinking Water Disinfection** Carolina Ontiveras Dalhousie University	**Understanding Drinking Water Biofiltration: Monitoring and Optimization Approach** Leili Abkar Dalhousie University
D3 Technical Session **Halifax Room C**	**MBBR Treatment in Saint John, NB** Dave McKenna Dillon Consulting	**Understanding the Impacts of Domestic Wastewater Microbial Communities on Rapid ATP-Based Monitoring Techniques for UV Inactivation** Kyle Rauch Dalhousie University	**Upgrading Wastewater Treatment at a Beef Plant by Installing First Membrane Bioreactor in P.E.I.** Adam Ryder ADI Systems

	2:00 PM - 2:30 PM	2:30 PM - 3:00 PM	3:00 PM - 3:30 PM	3:30 PM - 4:00 PM
E1 Technical Session **Halifax Room A**	**Update on Health Canada's Guidelines for Canadian Drinking Water Quality for Aluminum and Natural Organic Matter** Judy MacDonald Health Canada	**Kankakee Water Treatment Plant Improvements** Theresa O'Grady Crawford, Murray & Tilly Inc.	**Updates and Incorporation of Climate Change into the Atlantic Canadian Water and Wastewater Design Guidelines** Willard D'Eon CBCL Ltd.	**Gas Monitoring Requirements, Assessments and Certification** Alain Hamon Hetek Solutions
E2 Technical Session **Halifax Room B**	**Putting All the Pieces Together: More Than Just Another All-Pipe Wastewater Model Build** David Blades Halifax Water	**Use of CFD Analysis for Secondary Clarifier Design** Mike Abbott CBCL Ltd.	**A Proactive Approach to Transmission Main Condition Assessment - St. John's Regional Water Supply** Clayton MacDougald Pure Technologies, a Xylem Brand	**Confirming Uncertain Ground Conditions by Analyzing Microtunnel Data** Troy Bauman Robinson Consultants
E3 Technical Session **Halifax Room C**	**The Importance of Quality Control for CIPP Rehabilitation of Sewers** Kevin Bainbridge Robinson Consultants	**CIPP Watermain Lining - Consolidated Design and Compliance Guidance and Technical Advances** George Bontus Aegion Corporation	**Large Diameter Watermain Lining in the City of Toronto** Stewart Dickson & Patrick Lewis WSP Canada	**Storm Water Management: Underground Storm Sewer Treatment Unit and Canadian ETV Protocol Using Hydrodynamic Separation** Philippe Losier Soleno

Fresh Ideas presenters are a first time Young Professional participant at the ACWWA section conference presenting a water related topic, and will be considered for the Fresh Ideas program that has been developed through AWWA's Manufacturers/ Associates Council and the Young Professionals Committee. The top presentation selected from this group of presenters will be given the opportunity to compete in the Fresh Ideas poster competition at the AWWA Annual Conference and Exposition (ACE 2020) in Orlando, FL, representing the Young Professionals of ACWWA. Along with complimentary conference registration provided by the ACE 2020 organizing committee, ACWWA will provide the winner with a stipend to assist with travel costs to the conference.

Date	**Monday, October 7th, 2019**
Time	**10:30 AM - 11: 15 AM**
Technical Session Stream	**A1**
Location	**Halifax Room A**
Presentation Title	**Championing Change on the LaHave River**
Presenter - Organization	**Stella Bowles**
	Stella Bowles prompted action for the clean-up of Nova Scotia's LaHave River, which contains alarmingly high levels of fecal contamination. Because of her work, three levels of government have allocated $15.7 million dollars to address the problem of illegal straight pipes that still drain raw sewage from over 600 homes along the river. Three years since her initial research, Stella continues to be an advocate for the elimination of illegal straight pipes province wide. She has teamed up with Coastal Action Foundation and together they have started a campaign training other kids to become citizen scientists and test their own waterways. Stella has won many awards including the Meritorious Service Medal from the Governor General of Canada, the Action for Nature International Young Hero's Award from California and the Canada's Walk of Fame Community Hero Award. In a completely separate project, she has also recently become the youngest ever published micropaleontologist. Stella's story is now a book, My River: Cleaning up the LaHave River, written by Anne Laurel Carter. Stella hopes her story will inspire other youth to become advocates for issues they care about. "I've learned that kids do have the power to make change," says Stella. "And I'm just getting started."
Author(s)	Stella Bowles

Date	**Monday, October 7th, 2019**
Time	**11:15 AM - Noon**
Technical Session Stream	**A1**
Location	**Halifax Room A**
Presentation Title	**The Benefits of Effective Leadership and Leadership Training**
Presenter - Organization	**Tabatha Thibault, Saint Mary's University**
Abstract	Transformational leadership is a leadership model that involves leadership behaviours that go beyond the level of transactions to result in higher levels of performance. Leaders with this leadership style articulate a shared vision, foster the acceptance of group goals, have high performance expectations, and provide individualized support and intellectual stimulation. Transformational leaders can help counteract the negative consequences of job stressors, act as a resource for employees, instill a positive safety climate, and act as role models for safety behaviours. This leadership style is associated with many employee outcomes such as increased job satisfaction, well-being and safety performance, and decreased stress and frequency of workplace accidents. Transformational leadership is trainable and interventions can be used to help improve employee health and safety outcomes.
Biography	Tabatha Thibault holds a MSc in Applied Psychology focusing on Industrial/Organizational Psychology. She is currently a PhD candidate in Industrial/Organizational Psychology at Saint Mary's University as well as a part-time professor. Her research interests include leadership development, the Dark Tetrad of personality, and incivility and cyber deviance in the workplace. She has been part of a research-practitioner team that conducts leadership training workshops for the past three years.
Author(s)	Tabatha Thibault, MSc, PhD candidate, Saint Mary's University

Date	**Monday, October 7th, 2019**
Time	**10:30 AM - 11:15 AM**
Stream	**A2**
Location	**Halifax Room B**
Presentation Title	**Hydraulics of Pressure Sewer Systems**
Presenter	**Keith McHale, Environment One Corporation**
Abstract	Pressure sewer systems, incorporating semi-positive displacement grinder pumps, are no longer considered an alternative solution and have successfully provided wastewater collection in place of conventional gravity sewers for more than 40 years. An advantage of pressure sewer systems is their ability to be installed just below the frost line and follow the contours of the land. This can result in a situation where the pipe network includes both uphill and downhill segments. In this sense, a pressure sewer system has characteristics more similar to a force main than a gravity sewer. Given this, inquiries are sometimes made with respect to the hydraulic and flow characterization of pressure sewer systems. Environment One and Modern Energy conducted a detailed assessment on the hydraulics of pressure sewer systems. The evaluation considered the unique operation of semi-positive displacement (SPD) pumps compared to a more traditional centrifugal wastewater pump. The mechanical characteristics of a SPD pump produce a constant discharge flow that is only marginally affected by the system pressure. One of the key drivers in the evaluation was to see if the SPD pumps operational behavior was detrimentally impacted by traditional pumping challenges such as downhill pumping, two-phase flow, and pressure transients. In support of the theoretical evaluation, a field-demonstration unit was constructed to observe the concept of forced gravity – that is downhill flow driven by mechanical pumps. Some of the observations made include the characteristics of the pipe when vented and partially filled with water flowing at various rates as well as the influence of a “hill and valley” pipe configuration. This presentation will present the findings of the evaluation and observations of the physical demonstration.
Biography	Keith McHale is a professional engineer with 30 years in manufacturer and consulting engineering, focused in wastewater collection and treatment. Prior to joining E/One, worked as a Consulting Engineer in several capacities from staff engineer to senior-level project management. Project activities consisted of evaluation, planning and design of wastewater collection systems and treatment and disposal facilities. Experience in Life Cycle Cost Assessments, Sanitary Sewer Evaluations I/I evaluations, gravity and pressure sewer design, and pumping stations overflow evaluations and design. Professional License: Professional Engineer (P.E.), licensed in Maryland, Virginia, Connecticut, and New Hampshire.
Author(s)	Keith J. McHale, P.E.

Date	**Monday, October 7th, 2019**
Time	**11:15 AM - Noon**
Stream	**A2**
Location	**Halifax Room B**
Presentation Title	**Wet Weather Flow Management for Trunk Sewer Systems – City of Toronto Black Creek Sanitary Servicing Study**
Presenters	**Harshad Shetye, WSP Canada**
Abstract	The 15 km long Black Creek sanitary trunk sewer (STS) services a population of over 350,000 and covers a drainage area of approximately 5760 ha. The STS experiences capacity issues during extreme storm events, resulting in sewer surcharging, surface and basement flooding. In addition, during some storms, combined sewer overflows (CSOs) discharge into the nearby Black Creek watercourse. Over the next few decades, a significant increase in population is expected from urban densification, resulting in further capacity constraints. The servicing study was therefore required to support the following goals: • Accommodate flows for projected population to 2041 • Reduce trunk sewer surcharge levels during Wet Weather • Reduce CSOs to Black Creek • Reduce inflow & infiltration (I/I) into trunk sewers in accordance with Ontario Ministry of Environment requirements, the remedial measures must result in no increases to CSOs in a typical rainfall year. To identify deficiencies in system and recommend improvements, a dynamic hydraulic model was created using InfoWorks CS to simulate existing and future scenarios. Field investigation, flow monitoring, and rainfall data analysis were conducted to support model validation. The model was then used to evaluate impacts of Black Creek water levels and design rainfall events on the sewer performance and CSOs. Alternative solutions were evaluated, including cost/benefit and risk analysis, to select the preferred option to then proceed with design concept development. Basement flooding, as a consequence of sewer surcharging is an issue experienced by many municipalities across Canada. The ultimate design will strategically consider locations of emergency overflows to specifically prevent sewer surcharging. Redundancy and resilience must also be considered: the existing trunk sewer is over 50 years old, and the serviced population warrants the need for a sewer system to allow additional operational and maintenance flexibility, as well as increase the overall system's resilience in case of a catastrophic failure.

Technical Session Details Continue on the Next Page

Biography	Harshad Shetye is Manager of Water Resources at WSP and has more than 15 years of experience in Civil Engineering and Project Management. Harshad is a specialist in hydraulic modelling for combined and separate sewer systems and has developed many combined sewer overflow (CSO) and sanitary sewer overflow (SSO) elimination plans for large municipalities. Harshad's extensive skillset includes medium to large projects involving Inflow and Infiltration (I/I) reduction, hydrologic and hydraulic modelling, operational strategies, rainfall and flow monitoring analysis, condition and criticality analysis, intensification systems, and master planning. His experience includes the planning and design of wet weather control facilities, water quality improvement projects, pipeline rehabilitation projects and site development projects. Harshad has led and supported efforts for wet weather and rehabilitation related work for the City of Toronto, Region of York, Region of Peel and City of London. He has had the distinct pleasure of working on three major programs that included over a billion dollars in capital improvements across North America (City of Toronto, City of San Francisco, City of Baltimore) solving basement flooding, surface flooding, CSO, SSO, I/I and wet weather issues.
Author(s)	Harshad Shetye, P.Eng.

Date	**Monday, October 7th, 2019**
Time	**10:30 AM - 11:15 AM**
Stream	**A3**
Location	**Halifax Room C**
Presentation Title	**Fundamentals of Membrane Bioreactors: Facility Design, Procurement, Construction and Operation**
Presenter	**Chris Fahie, Halifax Water**
Abstract	Membrane Bioreactor (MBR) systems have become a promising wastewater treatment technique combining activated sludge and membrane separation; resulting in a high quality effluent independent of settling characteristics of the biomass. Retrofit of existing treatment plants with membrane filtration presents unique challenges and opportunities. The results of engineering evaluation, design, commissioning, operating experiences, and plant performance in a full-scale retrofit of an extended aeration and SBR treatment facilities to membrane bioreactors are presented. Discussion of operational conditions and performance of existing MBR will be discussed in relation to mass loading, hydraulic loading, MLSS, F/M ratios, SRT, HRT, flux rate, DO, recirculation ratios, membrane fouling, TMP cleaning and final effluent quality related to BOD, COD NH3, TN, SS and TP.
Biography	Mr. Fahie holds a Bachelor's degree in Environmental Engineering and Biology as well as a Masters of applied Science in Civil Engineering from Dalhousie University. He has 17 years of professional engineering experience in the field of water and wastewater treatment plant design, municipal servicing, construction management, start-up and commissioning. For 12 years he worked as a consulting engineer in the USA and Halifax, NS and for the past 5 years has work at Halifax Regional Water Commission as a Project Manager in the engineering department. His currently position within Halifax Water is the Superintendent of Wastewater Treatment. Most recently he was the project manager for the $22 Million Aerotech Wastewater Treatment Facility Upgrade and Expansion, His expertise includes coordinating multi-disciplinary teams in wastewater and water infrastructure projects, undertaking detailed design of water and wastewater treatment plants and infrastructure planning, design and renewal; coordinating and directing the preparation of construction drawings, specifications, tender documents, applications for approval, technical reports, proposals, design briefs and process optimization. Mr. Fahie resides in Halifax and enjoys spending time with his wife and two children, traveling and was the former director of Member Involvement for the ACWWA (2012-2018) and is a member of the Water Environment Federation and Engineers Nova Scotia.
Author(s)	Chris Fahie, MASc., P.Eng.

Date	**Monday, October 7th, 2019**
Time	**11:15 AM - Noon**
Stream	**A3**
Location	**Halifax Room C**
Presentation Title	**Ammonia Limits and Lagoons: Atlantic Canada's Options for Beating Effluent Limits**
Presenter	**Francis Bordeleau, Nexom**
Abstract	It has been over 5 years since the Canadian government's Wastewater Systems Effluent Regulations (WSER) department introduced low ammonia limits for all Canadian wastewater treatment facilities. Since then, engineers in small and medium municipalities throughout Atlantic Canada are having to decide if they need to replace lagoon-based facilities entirely, or if there is a way to modify the existing infrastructure. With a focus on the lagoon-based wastewater treatment plant in Doaktown, New Brunswick, this presentation digs into the factors limiting lagoon-based nitrification, discusses the merits and challenges of mechanical plants, and introduces the SAGR post-lagoon nitrification option—which has shown to consistently reduce ammonia to <1 mg/L in <1°C water. Ammonia toxicity is a misunderstood parameter. Historically, lagoon systems like Doaktown's were designed to meet BOD and TSS limits but not to produce non-toxic effluent throughout the year. Because many provincial discharge licenses do not include ammonia limits, many facilities unknowingly exceed allowable federal toxicity requirements while still meeting their discharge permits. The first indication of an issue is a fish kill in receiving streams or rivers. Increased federal enforcement of toxicity requirements results in a greater focus on effluent ammonia levels. Using Doaktown for the story arc, this presentation explores the many factors that influenced their decision. Since commissioning in 2011, the system has reduced effluent ammonia to 0.20 mg/L in the summer and 0.84 mg/L in the winter, well below the limits of 1 mg/L (summer) and 7 mg/L (winter). Additionally, 97% of effluent samples are below detection limits of 6 mg/L BOD and 5 mg/L TSS. Doaktown is an example of a cost-effective and efficient solution for small communities. These communities face the same effluent challenges as larger communities and are now able to keep the low operational complexity and costs associated with their existing lagoon systems.
Biography	Francis is Vice President for Sales & Marketing for Nexom—a Winnipeg-based company—and provides support to engineering consultants and municipalities that are looking for proven and cost-effective wastewater treatment technologies. Francis is a Civil Engineering graduate of Ecole Polytechnique de Montreal with 25 years of experience in the water treatment industry. Francis has worked for manufacturers and consultants in design, project management and business development roles.
Author(s)	Francis Bordeleau

Date	**Monday, October 7th, 2019**
Time	**1:30 PM - 2:00 PM**
Stream	**B1**
Location	**Halifax Room A**
Presentation Title	**Harvesting Nutrients for Reuse from Municipal Wastewater Using a Revolving Algae Biofilm System**
Presenter	**Tom Kunetz, Metropolitan Water Reclamation District of Greater Chicago**
Abstract	An innovative algal biofilm technology is being pilot tested for potential application as a sustainable means for nitrogen (N) and phosphorus (P) recovery at Wastewater Resource Recovery Facilities (WRRFs). The technology uses revolving belts that extend vertically up from the wastewater to provide sunlight for microalgae growth. Naturally occurring algae grows attached to the belt as a fixed-film biomass, obtaining water and nutrients from a shallow basin, then receiving sunlight and carbon dioxide for photosynthesis as the belt revolves out of the basin and into the air. This Revolving Algae Biofilm (RAB) reactor has demonstrated the ability to recover nutrients in approximately 15% of the footprint required by traditional raceway ponds for removing equal mass of nutrients, making it practical for application at municipal WRRFs. The resultant biomass is easily harvested from the biofilm with a scraping mechanism, providing an algae product that is ready to be processed for use as a biomass feedstock for bioplastics, fertilizers, aquaculture feed, and other sustainable products. A pilot plant is in place at the O'Brien Water Reclamation Plant outside Chicago, IL. The O'Brien Water Reclamation plant receives an average of 230 MGD of flow. Phase 1 pilot plant results demonstrate the RAB technology has the ability to remove total p and total kjeldahl N by 80% and 87%, respectively, from primary sludge gravity thickening supernatant. The ortho-P and ammonia removal efficiencies reached almost 100%, with RAB effluent consistently showing < 0.01 mg/L ortho-P and ammonia-N concentrations. Both nutrient removal results demonstrated superior performance by the RAB versus a control raceway pond. The results of a half year operation experience on the performance of the Phase 2 pilot plant treating plant effluent will be presented in this paper.
Biography	Thomas E. Kunetz is the 2018-2019 President of the Water Environment Federation (WEF). He is the assistant director of monitoring and research for the Metropolitan Water Reclamation District of Greater Chicago, leading the district's efforts on key strategic engineering initiatives. He has over 30 years of experience in the field of environmental engineering in both the public and private sectors, focusing on design of wastewater treatment facilities, improving the water environment, and protection of public health. Tom earned his B.S. in environmental engineering from the Pennsylvania State University and an M.S. in water resources engineering from Villanova University.
Author(s)	Tom E. Kunetz, Kuldip Kumar, Martin A. Gross, and Zhiyou Wen

Date	**Monday, October 7th, 2019**
Time	**2:00 PM - 2:30 PM**
Stream	**B1**
Location	**Halifax Room A**
Presentation Title	**The Use of Rare Earth Metals for Targeted Removal of Phosphorus**
Presenter	**Kevin Bossy, Bishop Water Technologies**
Abstract	Achieving extremely low phosphorus discharge limits has always been a challenge for wastewater treatment facilities. Biological phosphorus removal is extremely complex and requires fastidious operation and is a risky option for facilities with limited operator oversight. The most common and well-understood mechanism of phosphorus removal is via chemical precipitation. The standard method for this is using iron or aluminum salts, such as ferric chloride, ferric sulfide, alum, or PAC, which require at least a 5:1 molar ratio to achieve sufficient phosphorus removals. More stringent phosphorus discharge guidelines are on the horizon, and oftentimes ferric and alum are unsuccessful in achieving these standards even at extremely high dosages. Moreover, traditional chemical dosing leads to high sludge volumes, potential corrosion of infrastructure, and the need for pH adjustment. To address the growing need to achieve effluent phosphorus concentration of 0.1 mg/L and below, Rare Earth metals can be utilized for more targeted, efficient precipitation. Rare earth elements, or "Lanthanides", are high atomic weight metals found in period 6 of the periodic table. They often exist together in mineral complexes, and once complexed are extremely hard to separate. Two of these rare earth elements--Lanthanum and Cerium--complex naturally to phosphorus, forming an insoluble rhabdophane precipitate. RE300 is a specialized rare earth salt solution comprised of lanthanum and cerium salts. The solution specifically targets both soluble and insoluble forms of phosphorus via a strong, crystalline bond at a molar ratio of only 1:1. The insoluble precipitate then readily settles out of solution, achieving effluent phosphorus levels of 0.07 mg/L and below. In this presentation, we will cover the science behind using Rare Earth metals for phosphorus precipitation, and highlight the efficacy of RE300 to achieve ultra low phosphorus limits. This will include key findings about dosage and settling rates, increased dewatering performance, stability, bioavailability to crops, and other properties contributing to the advantages of Rare Earth metals for phosphorus removals. A few key case studies will be summarized demonstrating the real-world performance of RE300, its operational benefits, and capital cost comparisons.
Biography	Kevin Bossy joined Bishop Water Technologies in October of 2008 as CEO. He has built on the success of the Bonnechere Valley Nutrient Processing Facility which utilises Geotube® dewatering technology. Since Kevin's arrival, Bishop Water Technologies has grown exponentially, with projects and installations across Ontario. Kevin worked at RBC Capital Markets for 13 years, he then moved to the commercial and personal side of banking, as a Commercial Account Manager. In his role he offered financial advice and products to a variety of businesses - from small home-based operations to companies with multi-million dollar sales.
Author(s)	Kevin Bossy

Date	**Monday, October 7th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**B1**
Location	**Halifax Room A**
Presentation Title	**Understanding Factors Influencing Harmful Algae Blooms in a Headwater Lake in Cumberland County, Nova Scotia, Canada**
Presenter	**Baillie Holmes, Dalhousie University**
Abstract	Eutrophication and algae production are an important lake management issue in rural Nova Scotia. In the past decade, there have been increasing instances of harmful algae bloom events in locations previously unaffected. Mattatall Lake in Cumberland County underwent three major cyanobacteria bloom events in 2014, 2015 and 2016. Research beginning in 2017 focused on quantitatively characterizing phosphorus sources within the Mattatall Lake watershed through water quality monitoring and watershed modelling analysis (using an adaptation of the Nova Scotia Phosphorus Loading Model). Water quality results from the 2017 sampling program indicated that the lake was oligo-mesotrophic. Modelling demonstrated that external phosphorus loads have not increased significantly since 1985. These inconclusive results, not unique to Mattatall Lake, signaled the need for a holistic approach that considers climate, internal, and external influences on lake trophic state. A multiproxy paleolimnological assessment, in combination with hindcasted modeling of lake thermal regime, is being applied. This will aid in further understanding the complex interactions of several variables through time to identify drivers of algae bloom events at enigmatic lakes like Mattatall Lake. Parallel analyses on a lake with similar depth, geology, and catchment landcover with no history of algae blooms will provide reference conditions for this study.
Biography	Baillie completed a Bachelor of Science in Environmental Science at Acadia University where she first began researching environmental change. Her Honours thesis focused on contaminant spatial distribution and temporal deposition in sediment at Boat Harbour, an industrial waste treatment lagoon. She was also involved with many other projects ranging from mycorrhizae fungal relations in seagrass to organic fertilization techniques in apple orchards! After finishing her degree, Baillie became a project coordinator for the Paleo-Environmental Lab at Acadia where she directed an interdisciplinary environmental monitoring program on a barrier beach and lagoon complex in Pictou Landing First Nation. She is now a Master of Applied Science Student at Dalhousie University studying factors influencing harmful algae blooms in rural headwater lakes under the NSERC ASPIRE program.
Author(s)	Baillie Holmes, Rob Jamieson, Joshua Kurek, Ian Spooner, Richard Scott, Lindsay Johnston, Meggie Letman, and Jenny Hayward

Date	**Monday, October 7th, 2019**
Time	**1:30 PM - 2:00 PM**
Stream	**B2**
Location	**Halifax Room B**
Presentation Title	**PFAS Dark Matter: Precursors in Soil and Water**
Presenter	**Virgil Guran, Bureau Veritas (formerly Maxxam Analytics)**
Abstract	Background/Objectives. Per- and polyfluorinated alkyl substances (PFAS) are ubiquitous, persistent, anthropogenic chemicals that bioaccumulate in both humans and biota. While significant effort has been focused on identifying high priority impacted sites and delineating the extent of PFAS contamination, an additional consideration that is expected to influence remediation efforts is the potential for in situ oxidative transformation of PFAS precursor compounds to the current terminal PFAS of concern. The transformation of precursors to terminal PFAS introduces potential additional risk and liability at impacted sites. The pool of potential precursor compounds is large and poorly characterized. As a result it is difficult for stakeholders to quantify, assess and/or mitigate the potential risk posed by the presence of these precursor compounds. Approach/Activities. In 2012 Erika Houtz and David Sedlak of the University of California, Berkeley published a laboratory-based oxidative conversion of precursors to terminal PFAS in water by persulfate thermolysis . By measuring a standard suite of terminal PFAS from the same sample before and after oxidation, the presence of a potential PFAS precursor pool could be determined. Maxxam Analytics has implemented the assay as published for water samples. A parallel assay to measure the presence PFAS precursor compounds (often referred to as PFAS "dark matter") in contaminated soils and sediments has been developed and validated by Maxxam. Results/Lessons Learned. During this presentation, we will share our experiences and "lessons learned" during the implementation and verification of the total oxidizable precursors assay for water; and the development and validation of a reliable method for soils and sediments, including: • Precursor conversion efficiencies and changes to chromatographic peak patterns; • Impacts of sample heterogeneity on assay results and recommendations for controlling this impact; • Laboratory quality assurance including sample hold time studies for both soil and water; • Advantages and limitations of the methods.

Technical Session Details Continue on the Next Page

Biography	Virgil Guran has over 7 years of industry experience, specializing in Site Assessment, Water and Wastewater characterization. During his four-year tenure with Maxxam, Virgil has been a key member of the Environmental Forensics and Specialty Services team, providing consultative support to customers on complex environmental questions. Virgil has extensive hands-on site assessment, remediation and water/ wastewater expertise developing sampling and analysis plans, technical documentation, data analysis and interpretation, as well as engaging with and providing input to regulatory bodies in advisory groups. Prior to Maxxam, Virgil worked as an environmental consultant with a large Consulting Engineering firm in Ontario, Canada, as well as a researcher for a large Canadian mining firm. He holds a M.A.Sc. in Environmental Applied Science and Management (specializing in Environmental Chemistry and Microbiology) and a B.Sc. in Applied Chemistry and Biology. Virgil is an Ontario Chartered Chemist (C.Chem.).
Author(s)	Virgil Guran, Pasquale Benvenuto and, Taras Obal

Date	**Monday, October 7th, 2019**
Time	**2:00 PM - 2:30 PM**
Stream	**B2**
Location	**Halifax Room B**
Presentation Title	**Ellenvale Run Watercourse Rehabilitation**
Presenter	**Adam Sketchley & Evan Teasdale, DesignPoint Engineering and Surveying**
Abstract	Ellenvale Run, a 3.4km long watercourse located in the southeast end of Dartmouth, conveys the base flow from Lemont Lake to Morris Lake, as well as stormwater from a highly urbanized tributary drainage area. Over the past 60 plus years, the area adjacent and tributary to this watercourse has been developed. In most cases, the older developments (tributary to a 2.2km section from Main Street to Portland Street) have encroached on this stream and rerouted it. The overall project focuses on the portion of Ellenvale Run between Main Street and Portland Street, which has been significantly urbanized and now almost entirely consists of a constructed channel instead of a natural stream. Urbanization of this watershed has increased runoff, reduced hydraulic capacity by building a narrow channel, and increased velocities by creating multiple straight sections instead of natural meanders. Due to the previous changes made to this channel, it is more susceptible to flooding during heavy rain events. The consequences of this flooding are exacerbated by several homes being located very close to the channel; in some cases decks, carports, and sheds are resting on the existing retaining walls. This not only makes floods more damaging, but also adds a great deal of complexity when repairing or replacing the retaining walls. The existing retaining walls along the channel consist of various materials and types. The condition of the retaining walls also varies along the channel and the walls range from being in sound condition to having already failed. The rehabilitation project involves removing the existing walls and installing a precast concrete channel liner with a naturalized stone bedding to restore much of the natural function of the watercourse. Construction has been completed on two sections of Ellenvale Run, and three more sections are scheduled for construction in 2019.
Biography	Evan Teasdale, P.Eng. CPHD – Project Engineer/Principal Evan has 12 years of experience in the civil engineering field. He has had extensive involvement in the design, construction, and project management of numerous municipal infrastructure projects, including residential, commercial, and industrial developments ranging from single site development to large scale master plan communities. With experience in hydraulic and hydrologic design and analysis, Evan has worked on many heavy civil infrastructure programs, including the design, construction, and commissioning of water booster stations, wastewater pumping stations, and treatment facilities. Evan also has a diverse knowledge of structural engineering and building science; being responsible for large scale wind turbine inspections and major cell tower design and analysis, as well as Passive House building design and analysis.

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Biography	Adam Sketchley, P.Eng. M.A.Sc – Project Engineer/Principal Adam is a Project Engineer specializing in civil/municipal design, project management, construction administration, system modelling, and master planning. At DesignPoint, Adam works with the team on both private and public projects involving municipal servicing, land development, modelling and analysis of stormwater, wastewater and water systems, hydraulic analysis, construction management, and project management. Adam has been deeply involved in a variety of municipal projects covering water, wastewater, and stormwater design and management in master plans, private development, and public infrastructure.
Author(s)	Evan Teasdale and Adam Sketchley

Date	**Monday, October 7th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**B2**
Location	**Halifax Room B**
Presentation Title	**Potential Corrosivity of Groundwater in Nova Scotia and its Association with Lead in Private Well Water**
Presenter	**Gavin Kennedy, NS Department of Energy and Mines**
Abstract	Lead in drinking water is associated with a range of adverse health effects. The content of lead in plumbing materials has been restricted over the last 30+ years, but issues with respect to lead exposure from drinking water supplies persist, mainly due to the presence of lead in older plumbing materials. Although municipal drinking water systems in Nova Scotia are risk-managed for lead exposure, private well water supplies account for 42% of Nova Scotia's domestic water supplies and are not regulated, and therefore lead exposure in private wells is a significant public health concern. The potential corrosivity of groundwater was characterized for seven major aquifer types across Nova Scotia using available groundwater chemistry data and the chloride to sulphate mass ratio and langelier saturation indices to identify areas where there may be a greater likelihood of waterborne lead in private well water supplies. Crystalline rock type bedrock aquifers, especially plutonic aquifers, and most of the province's surficial aquifers, showed a high potential for corrosive groundwater, whereas water well chemistry data from carbonate/evaporite aquifers and surficial aquifers in contact with these aquifers showed a lower potential for corrosive groundwater. Analysis of lead in well water data showed that the percentage of lead exceedances of the Health Canada guideline for each of the seven major aquifer types assessed in the study followed a similar trend as potential corrosivity for each of the aquifer types. In general, aquifer types associated with a higher potential for corrosive groundwater were associated with a higher likelihood of concentrations of lead in well water exceeding acceptable levels. A relative risk map of the potential corrosivity of groundwater was produced to communicate risk to private well owners and to highlight the importance of routine water testing to assess the risk of lead in private well water supplies.
Biography	Gavin Kennedy is a 2002 graduate of the Earth Sciences program at the University of Waterloo, where his Master's research involved the development of a groundwater simulation model for the restoration of bogs that have been drained and cutover for peat products. Gavin worked in the consulting field for over four years as a project hydrogeologist specializing in groundwater resource assessment and development in Ontario and Nova Scotia prior to being hired to lead the Hydrogeology Program at the Nova Scotia Department of Natural Resources in 2007. As a research hydrogeologist, Gavin's work has focused on applying GIS software and geostatistical techniques to regional scale datasets to build knowledge and communicate groundwater science to Nova Scotians.
Author(s)	Gavin Kennedy

Date	**Monday, October 7th, 2019**
Time	**1:30 PM - 2:00 PM**
Stream	**B3**
Location	**Halifax Room C**
Presentation Title	**Assessing Recoverable Leakage Potential Through Evidence-Based Performance Indicators**
Presenter	**Fabian Papa & Bradley Jenks, HydraTek & Associates**
Abstract	Like many other aspects of water system operation and management, practices can be measured and improved upon with appropriate benchmarking. Water loss management is no exception and, given that is it not currently widely practiced across Canada, but is increasing in terms of awareness and forays by municipalities into this field, it could certainly stand to benefit from additional benchmarking practices. Much of the benchmarking and information sharing at present is related to the results of "top-down" water audits which produce estimates of what is known as the Infrastructure Leakage Indicator (ILI) and other metrics. While these have certain uses, more granular "pipe-level" performance indicators are possible with data that has been collected thus far, as well as ongoing and future work, concerning segments of water distribution systems known as District Metered Areas (DMAs). Further, metrics such as the ILI are based on empirical relationships from European experiences which may not be reflective of the Canadian context. This research seeks to use DMA information collected from selected Canadian municipalities, organize, analyze and present it in a relatively novel way to characterize relative DMA performance for purposes of understanding leakage potential. For instance, plots of Minimum Night Flow (MNF) relative to the number of service connections or pipe length have been found to show meaningful lower limits (referred to as frontiers in this work). To facilitate the information available to support such evidence-driven analyses, this work also considers development of a mobile testing unit to affordably collect data from temporary DMAs.
Biography	Fabian Papa has over 20 years of experience in engineering practice with a focus on urban water systems. He is a principal of HydraTek & Associates and has held the position of Adjunct Professor at the University of Toronto. He is also a reviewer of funding applications received by the Federation of Canadian Municipalities' Green Municipal Fund and Municipalities for Climate Innovation Program. Based in Toronto, Canada, HydraTek specializes in hydraulics and energy investigations in water and wastewater systems. Bradley Jenks is a graduate of Civil Engineering from the University of British Columbia and, in association with HydraTek, is currently pursuing a graduate degree at the University of Toronto where his focus is municipal hydraulics and systems analysis. His research is focused on water loss management practices and includes conducting a project funded in large part by the Ontario power industry making use of a mobile testing unit for measuring minimum night flows and the potential effectiveness of pressure management so as to encourage water loss reduction in municipalities which, in turn, reduces the consumption of pump energy.
Author(s)	Fabian Papa and Bradley Jenks

Date	**Monday, October 7th, 2019**
Time	**2:00 - 2:30 PM**
Stream	**B3**
Location	**Halifax Room C**
Presentation Title	**Water Loss Reduction Through Pressure Management to Save Money**
Presenter	**Jody Malo, Omnitech Inc.**
Abstract	Managing pressure in today's water systems is a significant challenge for all Water System Managers. The need to supply water at adequate pressures for all types/ demands of customers, as well as for fire protection is an ever-changing challenge. Adding the Financial and Regulatory demands that are now requiring water managers to do even more with less money, as well as reduce the water being supplied, pressure management is a key tool to help achieve everyone goals. Managing water pressure can help save water, money, and reduce pipe bursts..... so let's learn different ways to do this to meet everyone budgets. Key topics of the session • What is Non-Revenue Water (NRW) • Why do we want to reduce it • 4 Pillars of Waterloss Reduction • Leak Detection and how is it done. • District Meter Areas • How does Pressure Reduction reduce leakage and pipe burst • Different methods and equipment to reduce pressure
Biography	Jody has worked in the water industry for over 25 years after graduating from UBC in Vancouver, BC. Recently he was the Director of Sales for Singer Valve, an automatic control valve manufacturer for the water industry based in British Columbia. At Singer he traveled the world teaching engineers, municipal workers, and well as contractors on all key aspects of control valves. He taught course on maintenance and troubleshooting, as well valve selection on applications ranging from basic to difficult. During his 6.5 years at Singer Jody taught and spoke at water conferences around the globe, as well as oversaw Singer's training programs at the factory
Author(s)	Jody Malo

Date	**Monday, October 7th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**B3**
Location	**Halifax Room C**
Presentation Title	**Water Distribution Monitoring to Inform Non-Revenue Water Reduction**
Presenter	**Dr. Amis Preis, Visenti, A Xylem Brand**
Abstract	Water providers continue to increase focus on minimizing non-revenue water. Limited staff resources and lack of actionable system information often force water providers to react to leaks (and failures) rather than proactively addressing them. To gain insight on physical losses due to leaks and potential operational inefficiencies, the Howard County Department of Public Works (Howard County) initiated a pilot program which deployed sensing technology in a portion of their distribution system. The network of hydrant-mounted sensors provided high resolution pressure and acoustic information uploaded to the cloud. The data stream was continually monitored by advanced algorithms and trained analysts, utilizing existing spatial information (i.e. pipe and hydrant GIS coverages). Using advanced analytics, the estimated location of leak/burst and transient events could be detected and displayed via an online dashboard. After two months, the system identified a series of anomalies, some of which were identified as known operations (e.g. pump station cycling, hydrant flushing). Others were categorized as suspected leaks. For the first leak event, Howard County chose to monitor the data in the area and address the anomaly in the course of normal repair operations. A subsequent pipeline break highlighted the need to promptly address suspected leaks identified by the analytics software. For the remaining events, field acoustic correlators were used to refine the leak location. In the first instance, a break occurred in the vicinity of the reported location but prior to Howard County's ability to repair the leak. The last incident resulted in the successful identification, location, and repair of a small leak prior to failure. The ongoing success of this pilot in locating leaks and the propensity of these leaks to signal a rapid failure has led Howard County to evaluate the need to expand sensor coverage and refine its operations leak response.
Biography	Ami is a senior technical director at Xylem. Prior to joining Xylem, Ami co-founded Visenti which is a company providing advanced software solutions to water utilities across the globe. Visenti was acquired by Xylem in 2016. In his role, Ami overseas the development and implementation of various digital solutions for improved management of water networks. Ami holds a PhD in Civil and Environmental Engineering. Prior to co-founding Visenti in 2011, he worked as a research scientist at MIT (the SMART Centre) where he developed water analytics technologies, which were subsequently deployed to and integrated into Singapore's water supply system. Ami co-authored more than 20 peer reviewed academic and industry papers related to water network analysis in both academic and industry journals.
Author(s)	Zachary Barker & Amis Preis

Date	**Monday, October 7th, 2019**
Time	**3:15 PM - 3:45 PM**
Stream	**C1**
Location	**Halifax Room A**
Presentation Title	**Lake Recovery Through Reduced Atmospheric Deposition: Experiences in Atlantic Canada and Key Lessons Learned**
Presenter	**Lindsay Anderson, Dalhousie University**
Abstract	The implementation of acid rain control programs has led to substantial reductions in SO2 emissions. Accordingly, several lakes throughout Atlantic Canada have shown signs of recovery from acidification as evidenced by increasing pH and natural organic matter (NOM) concentration with no corresponding increase in nutrient loading (Anderson et al., 2017). A similar phenomenon has been observed in the U.S. and in Europe, where levels of organic matter have increased by up to 0.15 mg/L/year (Monteith et al., 2007). In Halifax, Lake Major - a protected surface water supply, experienced a 3.8x increase in NOM concentration over the past 17 years, corresponding with a similar increase in coagulant demand at the Lake Major Water Supply Plant (Anderson et al., 2017). Additional analysis has confirmed that pH, alkalinity, and NOM are increasing in most Nova Scotian lakes (Redden, 2019). Furthermore, in Summer 2018, the JD Kline Water Supply Plant, a direct biofiltration plant supplied by Pockwock Lake, experienced a sudden reduction in unit filter run volumes. Sampling of the lake revealed that *Tabellaria fenestrata*, a diatom known to cause filter clogging, was present throughout the summer. At the same time, fractionation of NOM in Pockwock Lake showed an increase in hydrophilic content and this change was attributed to algal activity. Another Halifax Water supply has experienced the occurrence of Microcystin-LR since 2016. It is hypothesized that these changes in water quality are associated with lake recovery. Lake sediment cores are currently being used to help understand long-term trends. It is anticipated that such events will become the new normal for water treatment plants in regions that have been exposed to chronic acid rain. This presentation will provide an overview of the challenges associated with lake recovery experienced in Halifax water supplies and will also provide a summary of the key lessons learned.
Biography	Lindsay is currently a PhD candidate in civil engineering at Dalhousie University. She received her B.Eng in Environmental Engineering from Dalhousie in 2011 and finished her MASc in Civil engineering at Dalhousie in 2013. Her research focuses on source water monitoring and drinking water treatment plant optimization. Prior to starting her PhD, Lindsay was a Research Engineer at the Centre for Water Resources Studies (CWRS) where she worked on several water treatment and distribution projects in Atlantic Canada.
Author(s)	Lindsay Anderson, Dewey Dunnington, Dave Redden, Michael Brophy, Amina Stoddart, Wendy Krkosek and Graham Gagnon

Date	**Monday, October 7th, 2019**
Time	**3:45 PM - 4:15 PM**
Stream	**C1**
Location	**Halifax Room A**
Presentation Title	**Operational Challenges at J. D. Kline Water Supply Plant in Light of Lake Recovery**
Presenter	**Sanjeev Tagra, Dalhousie University and Halifax Water**
Abstract	Lake Recovery has led to changes in Halifax Water's source water quality. As a direct filtration plant, the JD Kline Water Supply Plant (WSP) was designed for a low turbidity, DOC, alkalinity and pH source water. The changes to source water quality associated with lake recovery have the plant reaching the limits of its design capacity for direct filtration. This became clear in summer 2018 when the plant experienced a diatom bloom that significantly challenged plant operations, a first in the plant's 40 year history. The particular diatom in this case was Tabellaria fenestrata which is known to be a filter clogging algae. This diatom is generally associated with spring and fall blooms. It is heavy due to its silica cell wall and usually settles out once waters calm, but was present in our source water from June to September. At the peak of the incident, the filter run hours dropped to 16 hours from their normal run hours of 70 hours. With these reduced filter run times, it was challenging for production to meet demand and hence a decision was made to activate the bridge watermain to bring water across the harbour from Lake Major WSP. The diatom bloom not only caused water treatment challenges, it had significant impact on distribution operations as well. Halifax Water handled this incident using the Incident Command System (ICS) where over 40 staff were engaged from various business units. Additional support was also provided by Dalhousie University (Dr. Gagnon and Pilot Plant staff) and consulting company Hazen and Sawyer. Staff explored and implemented changes to nearly all aspects of the treatment plant from shutting down the lights to prevent regrowth within the plant, changing pre-treatment chemistry, adjusting coagulation conditions, changing hydraulics, conditioning filters, adjusting backwash regimes and finally re-implementing pre-chlorination. The pilot plant was an extremely valuable tool and was used as a proof of concept to minimize any unintended consequences due to changes in treatment at full scale. This presentation will provide an overview of the incident, discuss the treatment changes made throughout, provide some key lessons learned and discuss steps moving forward to provide resiliency and mitigate impacts from a similar event in the future.

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Biography	Sanjeev Tagra works as a Project Engineer for Halifax Water in their Water Infrastructure Engineering division. His group is responsible to deliver a wide range of water treatment and distribution upgrades, rehabilitations and retrofits projects. His primary role in this position is to manage projects related to water treatment plants. He is currently working on replacing/rehabilitating the existing eight rapid sand filters at JD Kline Water Supply Plant with new underdrains, media and incorporate the air scour feature which will be new for this plant. In addition to being a Professional Engineer, he is also a Class IV Water Treatment Plant Operator having experience of operating all the three big water plants for Halifax Water. He is also currently pursuing Masters in Applied Science (MASc) in Civil Engineering from Dalhousie University where his focus is on looking at the operational challenges JD Kline WSP is facing in light of Lake Recovery and provide some immediate, short and long term recommendations.
Author(s)	Sanjeev Tagra, Wendy Krkosek, Andrew Houlihan, Colin Waddell, James Campbell and Graham Gagnon

Date	**Monday, October 7th, 2019**
Time	**4:15 PM - 4:45 PM**
Stream	**C1**
Location	**Halifax Room A**
Presentation Title	**Decision Making in an Era of Changing Source Water Quality**
Presenter	**Wendy Krkosek, Halifax Water**
Abstract	Source water quality is changing in many parts of North America and Western Europe, largely due to two main drivers: lake recovery and climate change. Nova Scotian lakes have historically been impacted by acid rain, and with changes over the past several decades to air emissions standards, lakes are now experiencing recovery. Lake recovery is characterized by an increase in acid neutralization capacity, alkalinity, pH, colour, and natural organic matter, which then further results in changes to the biotic structure within lakes. Many drinking water treatment plants were designed in the era of acidification around a narrow range of water quality parameters and are often not easily able to adapt to changes in source water quality, both short- and long-term. Lake Recovery brings with it increased treatment and energy costs and in some cases challenges to design limits of treatment plants. The complex interplay between lake recovery, climate change, land cover, nutrient dynamics, and other drivers of water quality change make it exceedingly difficult to fully predict future conditions for planning scenarios. This poses a major challenge to a utility's ability to make defensible and cost-effective capital planning decisions. However, key dependencies and uncertainties can often be quantified in a probabilistic manner to support robust, "no regrets" decisions. Accordingly, Halifax Water and the Water Research Foundation are currently co-funding an effort to develop a Decision Support Framework (DSF) to help utilities facing water quality changes due to lake recovery and other long-term drivers better understand the impacts of those changes on source water quality and treatment process performance. The DSF leverages multiple data scales and platforms, from watershed through the distribution system, to facilitate a holistic planning process. Data analysis routines will help decision-makers better understand the long-term trends and predictive analytics will enable development of possible or likely future scenarios in support of robust long-term plans. Current and future scenarios will be applied to decision trees that cover watershed and source water activities, potential treatment process upgrades, and distribution system impacts, and results will be analyzed in the context of a utility's key performance indicators (KPIs), such as concentrations of contaminants in raw water, filter run times and other unintended consequences of a dynamic water supply. This presentation will focus on both the impacts of lake recovery on Halifax Water's drinking water treatment plants as well as progress on Water Research Foundation project 4920 - developing a decision support framework for drinking water treatment plants experiencing lake recovery.

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Biography	Wendy Krkosek Ph.D. P.Eng., is the Water Quality Manager with Halifax Water, where she works with treatment, water quality and distribution operations staff to conduct water quality research, solve water quality and treatment problems, improve treatment methodologies, and develop and implement water quality plans. Wendy received her BASc in Civil (Environmental) Engineering from the University of Waterloo, followed by a PhD in Civil Engineering at Dalhousie University. Wendy is currently the Technical Director with ACWWA.
Author(s)	Wendy Krkosek, Josh Weiss and Graham Gagnon

Date	**Monday, October 7th, 2019**
Time	**3:15 PM - 3:45 PM**
Stream	**C2**
Location	**Halifax Room B**
Presentation Title	**PVC Watermain Pipe – 40 years of Successful Service**
Presenter	**Douglas Seargeant, IPEX**
Abstract	Water distribution system reliability is a primary concern for most water utilities. Not only do customers become dissatisfied when the water supply is not available when they want to use it, but the cost of responding to and repairing water main failures can put unwanted pressure on utility operating costs and associated rates charged to those customers. Failure rates vary between different pipe materials. PVC water main pipe has provided exceptionally reliable service for more than 40 years in some Canadian utilities. The results of testing of this pipe material have demonstrated its resilience. This presentation provides a summary of recent testing of pipe after 40 years of service, as well as a number of other tests of PVC water main pipe conducted over a period of almost 25 years, combined with information related to actual water utility experiences with this pipe material.
Biography	Doug Seargeant has worked in the municipal engineering field since 1978. After working for 10 years in the consulting engineering industry, Doug joined EPCOR Water Services in Edmonton, Alberta where, for the next 30 years, he provided leadership for the water distribution system to design, construction and maintenance teams. During this time, he also undertook testing of various pipe materials, including PVC pipe.
Author(s)	Doug Seargeant

Date	**Monday, October 7th, 2019**
Time	**3:45 PM - 4:15 PM**
Stream	**C2**
Location	**Halifax Room B**
Presentation Title	**Saving Energy and Money Through Better Wastewater Treatment Plant Mixing**
Presenter	**Michele Braas, Xylem Inc.**
Abstract	In the past, mixers have been given little consideration in the grand design of wastewater facilities. Mixers were designed for worst case scenarios, whether flow or loading, and very little other thought was given. With an increased focus on energy management and treatment optimization, mixers present an opportunity for both. Many engineers and operators have come to recognize that overmixing not only wastes energy, but provides sub-optimal treatment process results. Flygt has been conducting a number of adaptive mixing pilot projects around North America. The purpose of the pilot studies was to determine the actual energy needed to provide mixing and the amount of energy savings that can be seen when mixers are "turned down". The studies took into consideration the effectiveness of mixing as determined by TSS levels, along with power required to maintain a completely mixed tank. For this talk we will focus on several studies. The first where larger mixers were able to be replaced with smaller mixers, saving more the $100,000 in annual energy costs. The other studies focus on the use of a variable speed mixer and the energy needed to maintain complete mixing within a treatment tank. In these studies, the operators took TSS measurements throughout the mixed tanks to determine whether or not adequate mixing was being provided. It was discovered that over 150,000 gallon tank could be mixed with 0.22 horsepower. In addition to the studies, the basics on mixing will be presented. We will discuss mixing applications, the measurement and importance of thrust, and the energy requirements for mixing. We will wrap up the presentation by sharing with the audience a process that they can use to perform a desktop study to determine if their mixers may be oversized and/or if varying the speed of their mixers could save them energy.
Biography	Ms. Braas is an Environmental Engineer with Xylem's Flygt Mixer Group. While she currently focuses on mixers and mixing applications, she has more than 20 years of experience in designing wastewater and drinking water systems. Her work has included performance and design of BNR evaluations.
Author(s)	Michele Braas

Date	**Monday, October 7th, 2019**
Time	**4:15 PM - 4:45 PM**
Stream	**C2**
Location	**Halifax Room B**
Presentation Title	**Operational Improvements for Small and Medium-Sized Utilities**
Presenter	**Darren Row & Jay Shanahan, City of Miramichi**
Abstract	The City of Miramichi operates 3 separate water and wastewater systems covering a large area. With dwindling population, the City is forced to stretch limited funds to maintain a consistent level of service. The presentation will focus on cost saving ideas that have been adapted into operations and planning, ranging from small common-sense ideas to emerging technology.
Biography	Darren Row, P. Eng. A graduate of UNB Fredericton in 1998, Darren has been employed with the City of Miramichi since 2006 starting as a Project Engineer, responsible for planning and managing capital infrastructure projects. After 6 years Darren moved on to the Superintendent of Public Works to gain additional experience in the operation and maintenance of all aspects of Public Works including water, wastewater and transportation. In January of 2016 he was promoted to his current position of Director of Engineering, where he is responsible for capital budgets and long-term planning. Jay Shanahan Jay has progressed through the water and wastewater industry since 1983 when he was first employed as an inspector on water and sewer installations. He then moved on to the contracting side of the business until 1994 when he was hired at the former Town of Newcastle, now part of the City of Miramichi. Jay has held various positions in Public Works including Assistant Superintendent, Superintendent and the Director of Public Works, a position he has held since 2011.
Author(s)	Darren Row and Jay Shanahan

Date	**Monday, October 7th, 2019**
Time	**3:15 PM - 3:45 PM**
Stream	**C3**
Location	**Halifax Room C**
Presentation Title	**Repair of a Critical Transmission Main**
Presenter	**Kevin Healy, Halifax Water**
Abstract	In October of 2017, Halifax Water discovered an estimated 900 L/min leak on a drain line from a 900 mm prestressed concrete cylinder transmission main located at the bottom of 23 m deep tunnel access shaft. This critical transmission main is the primary feed for the Peninsula of Halifax including the downtown core, hospitals, universities, military bases and a significant residential population. During planning for the repair, it was quickly determined that the transmission main would need to be shut down for at least a week and possibly longer. Planning for the repair and shut down took almost a year to complete and included: • Identifying the most appropriate repair methodology, • Doing a trail shutdown of the transmission main to ensure that the emergency booster stations would work properly, and • Ensuring the safety of workers in the tunnel shaft. In October 2018, after extensive planning and preparation work, the repair was successfully completed with the transmission main out of service for a little over a week. During that time, all back-up systems operated as expected thanks to the planning that went into the operation. This presentation will share Halifax Water's experience working through the failure of a critical piece of infrastructure including how we identified the leak, planned for the repair, operated the water system during the shutdown and implemented the repair.
Biography	Kevin Healy is a Project Engineer at Halifax Water within the Water Infrastructure Team with a degree in Civil Engineering from Dalhousie University. The Water Infrastructure Team delivers capital projects throughout the supply plants and distribution/ transmission system.
Author(s)	Kevin Healy, P.Eng.

Date	**Monday, October 7th, 2019**
Time	**3:45 PM - 4:15 PM**
Stream	**C3**
Location	**Halifax Room C**
Presentation Title	**Twin Rivers Effluent Pipe Replacement**
Presenter	**Garrett Proud, Stantec Consulting Ltd.**
Abstract	Twin Rivers Paper operates a pulp mill in Edmundston, NB which is serviced by an effluent pipeline conveying 22 MGPD of storm water and effluent from the mill and discharging it 5km away at a separate treatment facility. A 1.2 km section of this critical pipeline is made of creosote treated woodstave pipe, installed in 1972, required replacement due to deteriorating condition. The pipeline runs in narrow corridors within CN Railway property, and is constrained by rock ledges, residential development, and the Saint John River posing environmental and constructability challenges. To minimize shutdown of Mill operations, the pipeline was left in operation for all but 48 hours of the 6-month construction. The final alignment was developed to facilitate installation and minimize impacts and risks to neighboring properties and the environment. The project challenged and inspired us to work with unique materials, adaptive designs, and multidisciplinary collaborations to make the delivery a success. Through a close relationship between Stantec, the Mill, and the Contractor, a design was developed to overcome the constraints of the site and the aggressive 48 hour window for installation. The woodstave pipeline was replaced with a high-density polyethylene material using butt-fusion technology to drastically reduce the number of joints in the system. Due to proximity to the river it was a priority to eliminate weak points in the system for long-term reliability and environmental protection. The project was coordinated amongst stakeholder groups including the City of Edmundston, New Brunswick Government, and private properties to make this project a success.

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Biography	Garrett Proud is a Civil Engineer with Stantec Consulting Ltd. Working in the Water Group in Fredericton, NB, registered with APEGNB. He has experience in the municipal and construction sector working as a project manager for a municipality and as a consultant in Alberta and New Brunswick. Born in New Brunswick and receiving a bachelor's degree from the University of New Brunswick, Garrett has been calling Atlantic Canada home for most of his life and enjoys the opportunity to help to build for the future of our region. Garrett has worked in the engineering industry for 6 years with diverse project experience and roles. He is certified as an Envision Sustainability Professional and has worked on projects in the Atlantic region with the goal to improve sustainability and environmental protection for water and wastewater infrastructure. His current role with Stantec includes leading design work, project management, and construction administration for projects. Garrett has been involved in the design, tendering and construction management of heavy civil, land development, water / wastewater, storm water management, and road and sewer rehabilitation projects in Alberta, Ontario, Atlantic Canada, and the USA.
Author(s)	Garrett Proud, P.Eng.

Date	**Monday, October 7th, 2019**
Time	**4:15 PM - 4:45 PM**
Stream	**C3**
Location	**Halifax Room C**
Presentation Title	**Minimize Metal and Concrete Damage in Water and Wastewater Applications**
Presenter	**Randy Nixon, Corrosion Probe Inc.**
Abstract	Understanding the most common corrosion mechanisms that degrade concrete and metals in water and wastewater applications is the first step in preventing and controlling corrosion damage. This presentation explains the most common mechanisms of metals and concrete corrosion damage in water and wastewater infrastructure and presents successful corrosion mitigation strategies to be used by the utility to maximize the service lives of its infrastructure assets.
Biography	Randy Nixon is President and Founder of Corrosion Probe, Inc. which has been in business for 34 years and has an international reputation for excellence in corrosion and materials engineering, consulting, testing, and inspection services. Corrosion Probe is a consulting engineering firm that provides engineering, testing, failure analysis, inspection, and project management services in the technical areas of metals corrosion, concrete deterioration, protective coatings/linings, FRP, cathodic protection, infrastructure rehabilitation, materials science, mechanical integrity evaluation, retrofit design, and Q.C./Q.A. inspection. CPI also operates a full capability testing laboratory to support its team with failure analysis, metallurgical testing, non-metals testing, and electrochemistry/ corrosion testing. Mr. Nixon has over 35 years of experience. He has published over 60 technical papers and articles through SSPC, NACE, WEF, AWWA, and TAPPI. Mr. Nixon is widely recognized in the water/wastewater industry for his expertise and extensive experience in piping corrosion, concrete degradation evaluation, protective coatings/linings, and overall materials performance.
Author(s)	Randy Nixon

Date	**Tuesday, October 8th, 2019**
Time	**8:00 AM - 8:30 AM**
Stream	**D1**
Location	**Halifax Room A**
Presentation Title	**Planning for the Unknown Future and Reshaping Saint John's Water System**
Presenter	**Dean Price, Saint John Water**
Abstract	The number one priority of the City of Saint John was identified, as establishing a program to deliver safe, clean drinking water. The detailed design and build phase started in early 2016. The big water project is wrapping up in 2019. Most of the infrastructure is in service as of March 2019. Safe, Clean Drinking Water Project The Safe, Clean Drinking Water Project is the single largest infrastructure initiative in the City's history. The project is large and included 13 major components including a new water treatment facility. Dependable, reliable delivery of clean water is essential for public health, economic growth and community satisfaction of municipal services. The project includes several interesting infrastructure upgrades that benefit both the industrial and potable customers. The scope also includes a new groundwater supply for West Saint John, large water transmission main installations and slip lining segments, dam modernization and three new raw water intakes. The presentation will focus on the steps and decisions that have been required to plan, and carry out the conceptual and preliminary design the project, to accommodate the City's water customers for another 100 years. Planning for an uncertain future is always a challenge when you have a once in a generation opportunity to upgrade the system to meet the demands of customers. An update on the status project will be given to the audience.
Biography	Dean Price graduated from UNB with a Civil Engineering degree. He has been working since 1991 as a civil/municipal design engineer and project manager. He has been working for the City of Saint John since 1999 and is currently the Project Manager for the Safe, Clean Drinking Water Project. His focus since joining the city has been to improve the drinking water and industrial water systems.
Author(s)	Dean Price, P.Eng.

Date	**Tuesday, October 8th, 2019**
Time	**8:30 AM - 9:00 AM**
Stream	**D1**
Location	**Halifax Room A**
Presentation Title	**Buffalo NY: Achieving 21st Century Results with Legacy Infrastructure**
Presenter	**Dax Blake, Emnet, A Xylem Brand**
Abstract	Once the 8th largest city in the U.S. and one of the fastest growing, Buffalo, NY designed and built its sewer infrastructure for an estimated population of 750,000 and a booming industrial sector. Today the Buffalo Sewer Authority serves a population of 259,000 people and a drastically reduced industrial base. The good news? Buffalo has enormous under-utilized sewers, that with applied control will dramatically reduce the City's CSO issues at minimal cost. BSA launched its inline storage RTC program several years ago, and subsequently negotiated down its administrative order budget with the State of New York by $145 million, based largely on its commitment to this program. To date the first of many RTC sites are commissioned and the results are very compelling.
Biography	Dax Blake, Client Program Architect Dax has spent his career working to resolve the challenges associated with sewer systems and wastewater treatment. He started his career as a consultant developing infrastructure master plans to address community needs, water quality, and compliance for drinking, stormwater, and clean water utilities throughout the Midwest. For 12 years, Dax served in a leadership role for two large public sewer and stormwater utilities including 10 years leading the Division of Sewerage and Drainage for the City of Columbus, Ohio. Mr. Blake joined Xylem in 2016 where he continues to provide expert guidance to utilities across the United States. He has extensive experience with planning, design and construction of massive capital improvements including consent decree programs, stormwater programs, tunnels, treatment plants, and green infrastructure. Dax has leveraged extensive modeling work and real time control strategies to save nearly $1B in capital improvements to meet consent order mandates.
Author(s)	Dax Blake, MSCE, PE

Date	**Tuesday, October 8th, 2019**
Time	**9:00 AM - 9:30 AM**
Stream	**D1**
Location	**Halifax Room A**
Presentation Title	**Small Utility Tackles Full Water Meter Conversion to New Meters, New Technology, and Changing from Imperial to Metric**
Presenter	**Jesse Hulsman, Municipality of East Hants**
Abstract	The East Hants Water Utility provides service to approximately 2800 water customers across 4 communities. In the summer of 2016 the Utility conducted an assessment of the current state of water meter assets, knowing that it would also be submitting a rate review application to the Nova Scotia Utility and Review Board that fall. That review brought to light the risks to the Utility in having the majority of meter assets over 20 years old, operating with outdated technology, and not being aligned with the majority of the industry by still operating in Imperial measurement and billing. With new water rates set in July 2017, the Utility underwent a procurement review that resulted in the original 5 year internal led implementation plan, changing to a 1 year external implementation. The external contracted implementation took place over approximately 4 months from June 2018 to September 2018, and achieved 100% completion of the contracted scope. This conference presentation will walk through the journey of East Hants Water Utility's decision processes, accomplishments and learnings from what has been a transformation project for a small water utility.
Biography	Jesse Hulsman is the Director of Infrastructure & Operations for the Municipality of East Hants. In this role Jesse, provides strategic direction and oversees the operation of the East Hants Water Utility, Wastewater Collection & Treatment program, and the Engineering department. Jesse is also the Nova Scotia representative on the Board of Directors for the Canadian Water & Wastewater Association.
Author(s)	Jesse Hulsman

Date	**Tuesday, October 8th, 2019**
Time	**8:00 AM - 8:30 AM**
Stream	**D2**
Location	**Halifax Room B**
Presentation Title	**Pilot Plant Optimization Study of Coagulation Processes in a Direct Filtration Plant for Source Water Undergoing Lake Recovery**
Presenter	**Isobel Demont, Dalhousie University**
Abstract	Pockwock Lake, the source water for the J.D. Kline Water Supply Plant, is undergoing lake recovery as observed through increased concentrations of organic matter and biological occurrence. To ensure high quality drinking water is maintained, optimization of treatment processes is required. The presented study investigates the use of a cationic polymer for water treatment at J.D. Kline Water Supply Plant to improve coagulation without increasing the alum dose, which is at the upper limits of the plant's design guidelines. Polymer has previously been used as a flocculant aid in the winter, however polymers have not been employed during warmer seasons. An initial bench-scale study focussed on screening of potential polymer types and doses is currently underway. Initial results indicated improved turbidity removal and increased zeta potential with the addition of polymer, as compared to the current plant operation conditions. Results also suggested an overdose of polymer at 1mg/L of product and 10 mg/L of alum. Following further initial bench-scale study, a pilot plant study will be conducted that will vary both the polymer type and dose, across different coagulant doses. Flocculation parameters will be kept constant and will be set equivalent to those of the full-scale plant. The optimal polymer type and dose will be selected based on conventional water quality parameters, such as turbidity and natural organic matter removal, but also the filter hydraulic performance, concentration of disinfectant by-products, and microbial activity. Further analysis on removal rates will be conducted with the pilot plant's in-line particle counter, which classifies residual particles into seven different size groups. Lastly, the concentration of residual aluminum will also be considered in preparation for the anticipated stricter regulations for aluminum that is under development by Health Canada.
Biography	Isobel DeMont is a Master's of Applied Science candidate in Environmental Engineering at Dalhousie University, just a few hours from her hometown of New Glasgow, Nova Scotia. Working under the supervision of Dr. Graham Gagnon, her research focuses on treatment of source water undergoing lake recovery. Isobel received a Bachelor Degree in Mechanical Engineering with a Minor in Environmental Engineering from McGill University in 2018. Her time at McGill involved conducting research projects with McGill's Ice Hockey Research Group and with the Community College of Barbados. Outside of academics, Isobel is an athlete and competed on both the Varsity Rugby and Track and Field Team at McGill.
Author(s)	Isobel Demont

Date	**Tuesday, October 8th, 2019**
Time	**8:30 AM - 9:00 AM**
Stream	**D2**
Location	**Halifax Room B**
Presentation Title	**Testing Ultraviolet Light Emitting Diodes (UV LEDs) Apparatus for Point-of-Use (POU) Drinking Water Disinfection**
Presenter	**Carolina Ontiveros – Dalhousie University**
Abstract	UV LEDs are a novel technology that is drawing attention in different sectors, including the water industry. The advantages that UV LEDs have over traditional mercury lamps make them ideal for point of use (POU) drinking water applications. Homes and buildings that are not connected to centralized drinking water facilities, which are common in small and remote communities in Canada could benefit from the correct application of UV LEDs drinking water disinfection at the POU. Many UV LED based POU options have recently entered the market, but few manufacturers have published information about the effectiveness of their reactors under challenging water quality conditions. An improved understanding of the effects of initial water quality and reactor design will help to encourage the adoption of UV LEDs for POU applications. The objective of this research project was to evaluate and characterize UV LEDs reactors intended for POU drinking water applications that are currently on the market and to verify their manufacturer's claims. Reactor efficiency curves comparing the impacts of initial water quality, bacterial load and operational flow rate were also developed to further model the ideal application of UV LED reactors in diverse scenarios. For the UV LED POU apparatus testing, an artificial water matrix with E. coli as a target microorganism and different concentrations of humic acid to simulate organic matter and ultraviolet transmittance (UVT) levels in the water was used. The artificial solutions were passed through the reactors at different flow rates to test the disinfection efficiency of the different UV LED reactors. Preliminary results from the UV LED POU apparatus testing showed that the change of UVT and flow rate had a significant impact on the log inactivation achieved in two of the reactors, which was expected. Additionally, it was found that some of the reactors did not achieve the bacterial inactivation claimed by their manufacturer.
Biography	Carolina Ontiveros finish her master program on the spring 2019 and is now working as a research assistant in the Centre of Water Research Studies. Part of her research is the application of ultraviolet light emitting diodes (UV LEDs) as point of use (POU) technology drinking water treatment technology. One of her research focuses on the testing of the UV LED POU reactors on challenging water quality conditions, especially decentralized drinking water treatment systems, to find their real efficiency and how to improve their application.
Author(s)	Carolina Ontiveros, Stephanie Gora, Kyle Rauch, and Graham Gagnon

Date	**Tuesday, October 8th, 2019**
Time	**9:00 AM - 9:30 AM**
Stream	**D2**
Location	**Halifax Room B**
Presentation Title	**Understanding Drinking Water Biofiltration: Monitoring and Optimization Approach**
Presenter	**Leili Abkar, Dalhousie University**
Abstract	As biofiltration is gaining more attention in North America as an alternative approach in drinking water treatment, it is necessary to understand the particulate distribution in different depths as well as the microbial community. This understanding will help to better operate, monitor and define approaches for biofiltration optimization and system improvements. In this study, media samples were taken of full-scale biofilters in the JD Kline Water Supply Plant in Halifax, Nova Scotia from different filter media depths using a coring device. Sampling was divided into seven parts to cover the whole depth of filter medias [0-2", 2-6", 6-12", 12-18", 18- 24", 24-30" and 30-36"]. The water source for the plant is, Pockwock Lake, which has low to moderate organic carbon in the range of 2.1 to 3.4 mg/L of total organic carbon (TOC) and low turbidity between 0.3 to 0.5 NTU, low pH and alkalinity (<1 mg/L). The dual media filters contain anthracite (60 cm) above sand (30 cm). The plant uses direct filtration design and contains eight filters with a design capacity of 227 ML/day. The cores were taken in different months to study the impact of seasonality on the particulate distribution and microbial community variation. 16s rRNA sequencing was used to investigate the microbiome. QIIME 2.0 (Knight and Caporaso labs) was applied to analyze the microbiological structures parameters such as diversity, richness and evenness of the biofilter microbial community. Core samples were examined for biomass density measured by adenosine triphosphate (ATP), and extracellular polymeric substances (EPS), metals (aluminum, calcium, manganese), organic carbon as TOC and turbidity to represent floc retention. This study furthers our knowledge and understanding of biofilters under varying conditions and aims to help indicate monitoring parameters and enhanced methods for optimizing biofilter performance.
Biography	Leili Abkar Leili is a PhD candidate at Dalhousie University, where she is studying different approaches on optimizing the drinking water biofiltration performance.
Author(s)	Leili Abkar, Anita Taylor, Jessica Campbell, Nicole Allaward, Amina Stoddart, and Graham Gagnon

Date	**Tuesday, October 8th, 2019**
Time	**8:00 AM - 8:30 AM**
Stream	**D3**
Location	**Halifax Room C**
Presentation Title	**MBBR Treatment in Saint John, NB**
Presenter	**Dave McKenna, Dillon Consulting**
Abstract	Wastewater collection and treatment services for two small systems (Morna Heights Subdivision and Greenwood Subdivision) have been provided for the past half century. Both systems utilized a trickling filter process for treatment of wastewater, which were no longer able to provide the desired level of treatment to satisfy the effluent requirements. In 2014, the City initiated the process of evaluating alternative treatment technologies to replace the existing trickling filter wastewater treatment facilities. Moving bed biological reactor (MBBR) technology was ultimately selected as the preferred option for each site. Construction of both sites is wrapping up in early 2019. Both sites incorporate preliminary treatment, equalization, MBBR process, clarification, and ultraviolet light disinfection prior to discharge. The Morna Heights project required a new submerged effluent outfall to the Saint John River. This project presented many challenges in the design and construction phases that many aging small municipal wastewater treatment facilities in Atlantic Canada face such as limited space, close proximity to residents and limiting operational costs. The paper presents the results of technology evaluation, facility design, construction challenges, startup and initial operating results. The paper presents learnings from construction at both sites, initial operational results for CBOD, TSS, and coliforms, as well as feedback from the City regarding initial operational experience.
Biography	Dave McKenna, P.Eng. Dave is an Associate at Dillon Consulting, with experience in the water and wastewater industries as both a process engineer and project manager. He has over 25 years' experience both as a consultant and client in the design, construction, commissioning and startup, operations, and management of a variety of municipal and industrial projects in Canada, the United States, Asia, and Europe. Dave was the senior lead process engineer on the Morna Heights and Greenwood wastewater treatment facilities.
Author(s)	Dave McKenna, Alexander Williams, and Kevin O'Brien

Date	**Tuesday, October 8th, 2019**
Time	**8:30 AM - 9:00 AM**
Stream	**D3**
Location	**Halifax Room C**
Presentation Title	**Understanding the Impacts of Domestic Wastewater Microbial Communities on Rapid ATP-Based Monitoring Techniques for UV Inactivation**
Presenter	**Kyle Rauch, Dalhousie University**
Abstract	Adenosine triphosphate (ATP) based assays have widely been used to determine microbial water quality following oxidant-based disinfection; however, the use of ATP assays to quantify UV inactivation has been unsuccessful as ATP concentrations are found to be the same before and after UV treatment. This is due to the main mechanism of UV inactivation not immediately destroying the cells; but rather, rendering the microorganisms harmless by hindering them from replicating or producing harmful toxins. It was hypothesised that by implementing a short incubation step prior to quantifying ATP, the relative growth rates of microorganisms could be exploited to allow for a measurable difference in ATP concentrations before and after UV treatment, which Rauch et al. (2018) demonstrated to be the case using a biomass recovery method they developed in both pure E. coli cultures and in some real domestic wastewater matrices. While Rauch et al. (2018) demonstrated that the biomass recovery method can be used to quantify a difference in ATP following UV treatment, the authors did also note some limitations. Namely, that some domestic wastewater matrices responded poorly to the method. This was thought to be due impart to microbial communities consisting of slow growing organisms; however, this idea was not explored. Thus, this study used heterotrophic plate counts and 16s DNA analysis on samples before and after UV treatment and with and without the application of the incubation step of the biomass recovery method to examine the impact the microbial community of domestic wastewaters collected from Nova Scotia treatment facilities has on the biomass recovery method. This was done to better understand why some domestic wastewaters respond better to the biomass recovery method versus others.
Biography	Kyle Rauch is originally from Victoria, British Columbia and moved to Halifax to study engineering at Dalhousie University, where he received a Bachelor of Environmental Engineering in 2016. Kyle completed his Master of Applied Science program in the Civil and Resource Engineering department at Dalhousie University in 2018, where he focused on rapid biological monitoring techniques for UV treated domestic wastewaters as well as the applicability of UV-LEDs for disinfection. Kyle is now in his first year of his doctoral program under the supervision of Dr. Gagnon, where his research focus is on UV disinfection of municipal wastewaters.
Author(s)	Kyle Rauch, Allison Mackie, Brian Middleton, Xuesong Xie and Graham Gagnon

Date	**Tuesday, October 8th, 2019**
Time	**9:00 AM - 9:30 AM**
Stream	**D3**
Location	**Halifax Room C**
Presentation Title	**Upgrading Wastewater Treatment at a Beef Plant by Installing First Membrane Bioreactor in P.E.I.**
Presenter	**Adam Ryder, ADI Systems**
Abstract	Wastewater generated from meat processing plants contains high concentrations of organics, suspended solids, fat, oil, and grease (FOG), and disinfection chemicals, which presents many challenges for on-site wastewater treatment. The Atlantic Beef Products processing plant in Albany, PE not only had to address these challenges, but also faced numerous site-specific challenges relating to temperature control, sludge disposal, and future production plant expansion. EISI partnered with ADI Systems, an Evoqua company, to solve these issues by reusing existing tanks and infrastructure and investing capital for equipment to modernize the treatment plant. Treatment plant upgrades included: • Install a rotary drum screen in the tripe processing room • Convert the sequencing batch reactor (SBR) to a membrane bioreactor (MBR) system • Install a membrane cassette and ancillary equipment in the existing sludge thickening tank to convert sludge thickening from gravity settling to physical solids/ liquid separation. • Install plate-and-frame heat exchangers to cool the mixed liquor in the aeration tank • Convert the existing UV equalization tank to a sludge storage tank and install coarse bubble diffusers to both sludge storage tanks The MBR system is a modification of the conventional activated sludge system; physical membrane barriers, as opposed to gravity clarification, are used to retain solids and biomass within the system. Incorporating membrane technology into the process provided many benefits: • Near-perfect retention of activated sludge within the MBR system • Consistently generates effluent free of suspended solids • Eliminated dependence on gravity sludge settling, making the process easy to control and more reliable • Increased treatment plant design organic load without increasing reactive volume • Improved final effluent quality • Reduced operator attention requirements The presentation will outline how upgrading the existing treatment plant to the first MBR system in Prince Edward Island has set up Atlantic Beef Products for future expansion, improved final effluent quality, and simplified overall system operation.

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Biography	Adam Ryder is a project manager at ADI Systems in Fredericton, NB. He received his bachelor's degree in civil engineering from McGill University, his MBA from the University of New Brunswick, and his M.Phil in Engineering for Sustainable Development from the University of Cambridge. He has over 15 years of experience in the design and management of civil, municipal, and industrial infrastructure projects. With ADI Systems, he has been involved in the construction of a large number of industrial wastewater projects across North America. Adam served as the project manager for the upgrade of the wastewater treatment plant serving Atlantic Beef Products in Albany, PE.
Author(s)	Adam Ryder, MBA, MPhil, P.Eng.

Date	**Tuesday, October 8th, 2019**
Time	**2:00 PM - 2:30 PM**
Stream	**E1**
Location	**Halifax Room A**
Presentation Title	**Update on Health Canada's Guidelines for Canadian Drinking Water Quality for Aluminum and Natural Organic Matter**
Presenter	**Judy MacDonald, Health Canada**
Abstract	Health Canada works in collaboration with the Federal-Provincial-Territorial Committee on Drinking Water (CDW) to update the Guidelines for Canadian Drinking Water Quality. This presentation will provide an overview of the CDW and summarise the findings of the reviews completed by Health Canada for aluminum and natural organic matter in drinking water. Highlights are noted below. Aluminum: The guideline technical document for aluminum proposes a maximum acceptable concentration (MAC) of 2.9 mg/L (2,900 µg/L) for total aluminum in drinking water, based on neurological effects observed in rats. An operational guidance (OG) value of 0.050 mg/L (50 µg/L) is also proposed for total aluminum to optimize water treatment and distribution systems. The American Water Works Association (AWWA) has recommended that residual aluminium concentrations be maintained below 0.050 mg/L since the 1960s to minimize hydraulic capacity impacts; more recently, AWWA added this recommendation to its internal corrosion manual to ensure optimum distribution system operation. The aluminum guideline document was issued by Health Canada for a 60-day public consultation on June 28, 2019. A critical component of this consultation is to solicit comments on potential economic impacts. Natural organic matter: The guidance document on natural organic matter (NOM) provides information on the impacts that NOM has on drinking water quality, including its influence on: 1) coagulation, filtration and disinfection processes; 2) disinfection by-product formation; 3) corrosion control; and 4) biological stability in the distribution system. The document summarizes the factors that affect the concentration and character of NOM and discusses the points to consider when developing a NOM control strategy. It also provides specific guidance on treatment, monitoring, and water quality goals. The intent of this document is to provide the water industry with helpful guidance to ensure that NOM is adequately removed to consistently achieve water quality goals. The document was issued by Health Canada for a 60-day public consultation on March 19, 2019 and will be considered by CDW at its Fall 2019 meeting.
Biography	Judy MacDonald joined Health Canada as a Water Quality Engineer in November 2013. She is responsible for preparing the water treatment sections of the Guidelines for Canadian Drinking Water Quality. Prior to joining Health Canada, Judy was the Supervisor of the Drinking Water Program for Nova Scotia where she was responsible for program standards, regulations and technical support to the Compliance Division. She was also an intervenor in the Walkerton Inquiry. Prior to moving to Nova Scotia, Judy worked for the Regional Municipality of Halton and a consulting company in the Greater Toronto Area.
Author(s)	Judy MacDonald

Date	**Tuesday, October 8th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**E1**
Location	**Halifax Room A**
Presentation Title	**Kankakee Water Treatment Plant Improvements**
Presenter	**Theresa O'Grady, Crawford, Murray & Tilly Inc.**
Abstract	From the onset of the preliminary design in January 2016, the clock was ticking. The goal – have $18 million in improvements designed and constructed by November 1, 2017. It was a tall order but CMT and Aqua worked together making decisions quickly so that preliminary design was completed in April 2016 (3 months) and final design was completed in August 2016 (4 months). The Contractor received the Notice to Proceed and begin work on site in November 2016, allowing for a one-year construction period. Construction was completed on time in December 2017. The schedule was difficult, but equally difficult was everything else. The existing water treatment plant, which had parts constructed in 1929, is located on a tight site in a residential area. AND the water treatment plant had to remain in service for the duration of construction. AND there have been over 90 projects constructed at the water treatment plant since 1929, so sifting through the mountains of drawings (351 in total) was time-consuming. AND things do not always go as planned. When everything was studied and designed, the project consisted of the following improvements to increase capacity, reliability and redundancy: • 36" Raw Water Line and Raw Water Vault • Head Tank rated at 25 MGD • Piping, Dewatering and Sludge Handling Vault • One (1) 80-foot diameter ClariCone rated at 1.75 gpm/square foot of surface area or 12.67 MGD • 48" ClariCone Effluent Line, run through the existing 240' Clarifier • Replacement of Lime Slaking & Feed System, including modification of a Mixing Basin to house the new Slurry Aging Tanks • Addition of an Anionic Polymer Feed System • Addition of a Carbonic Acid Feed System • Replacement of 1930's Electrical Gear • Replacement of CO2 Tank & Feed System

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Abstract Continued	We have learned a lot along the way: • If you can't go around it, go through it – The only available land was on the east side of the site and the new Claricone effluent had to get to the filter Gallery in the middle of the site. There was no clear path that did not involve placing the pipe outside the flood wall and then breaching the flood wall to return it to the Filter Gallery. So, it was decided to place the pipe inside the existing 240' clarifier. • Eating an elephant one small chunk at a time doesn't always work – To help the schedule and to try to spend more money in 2016, the project was split up into pieces with 5 pre-procurement equipment contracts, 7 smaller projects where local contractors could be used and one main project that was bid out. Issuing the pre-procurement contracts worked perfectly. Having the 7 local contractor projects did not go so well. • Condensing a major design into 4 months can be done but at a cost – And no the cost isn't engineering overtime. The cost is that there are things that are bound to be missed and not fully coordinated. Many of these times were picked up in large addendums, but some have trickled into construction.
Biography	Theresa is the Water Resources Group Manager for Crawford, Murphy & Tilly Inc. in Aurora, Illinois. With 25 years of experience in the water industry, Theresa has been an active member of AWWA since 1996. Involved in the Illinois Section, Theresa has served two terms as Trustee – District 2, Vice-Chair, Chair-Elect, Chair and Past-Chair. On the Association level, she is serving on the Board of Directors as the Illinois Director and Vice President. She is also a member of the AWWA Engineering and Modeling Applications Committee (EMAC). She is also a member of Mid-Central Waterworks Association and Kane County Water Association. Currently, she is serving as the Resident Representative on the Will County Stormwater Planning Committee. Theresa holds a BS degree in Civil Engineering with a Hydraulics & Hydrology Empasis from the University of Illinois, Champaign-Urbana and is a licensed Professional Engineer (P.E.) in the State of Illinois. She lives in Naperville, Illinois with her husband (Michael) and two kids (Aidan and Riona).
Author(s)	Theresa O'Grady

Date	**Tuesday, October 8th, 2019**
Time	**3:00 PM - 3:30 PM**
Stream	**E1**
Location	**Halifax Room A**
Presentation Title	**Updates and Incorporation of Climate Resilience into the Atlantic Canada Water and Wastewater Design Guidelines**
Presenter	**Willard D'Eon, CBCL Ltd.**
Abstract	ACWWA has recognized the effects of climate change on existing and future water and wastewater infrastructure, and in late 2018, secured funding to incorporate the consideration of climate resilient infrastructure into the updates of the existing "Water Supply Guidelines (2004)" and "Wastewater Guidelines (2006)". The presentation will provide background information on development of the project, outline the major components of the project, define climate resilient infrastructure, provide examples of global climate change events, and provide examples of recent climate related impacts on water and wastewater infrastructure in Atlantic Canada. Capacity building is a major component of the project, and therefore the project includes workshops, webinars, and presentations at local and national conferences. Stakeholders include consultants, equipment suppliers, managers of utilities, regulators, private developers and provincial regulators, all of which utilize the Water Supply Guidelines and Wastewater Guidelines for infrastructure projects. This presentation will lead into the first proposed Capacity Building Workshop, to be held Wednesday October 09, 2019 following this conference. This presentation and subsequent workshops will provide ample opportunity for stakeholders to provide input as the project evolves. The project schedule is May 2019 to late 2020.
Biography	Willard D'Eon, MPH, P. Eng. Project Manager, CBCL Limited Willard has a B. Sc. in Civil Engineering from UNB (1974), and a Master of Public Health (in Environmental Health) from the University of Minnesota (1979). Willard was with CBCL from 1974 to 1976, with the Nova Scotia Department of Health from 1976 to 1990, after which he returned to CBCL where he is currently "retired" and working part time. Experiences with Guidelines include assisting in the development of the Nova Scotia on-site sewage disposal program and in the development of the Nova Scotia On-Site Technical guidelines, the preliminary development of the Prince Edward Island On-Site Sewage Systems program, on the review committee of the Nova Scotia Wastewater Guidelines, and with the production of the current ACWWA Water Supply Manual (2004). Willard joined AWWA through the Minnesota Section, and held ACWWA positions of Small Systems Committee Chair, Section Chair, and Secretary-Treasurer.
Author(s)	Willard D'Eon

Date	**Tuesday, October 8th, 2019**
Time	**3:30 PM - 4:00 PM**
Stream	**E1**
Location	**Halifax Room A**
Presentation Title	**Gas Monitoring Requirements, Assessments, and Certification**
Presenter	**Alain Hamon, Hetek Solutions**
Abstract	Recent tragedies related to exposure of workers to deadly gases have highlighted the importance of having a robust gas monitoring system in all facilities where the potential of gas contamination is possible. Wastewater treatment plants in particular must have adequate gas monitoring to protect the health and safety of people entering the plant. Hetek Solutions is proposing to discuss the following topics: Sensor and transmitter technology advancements Sensor technology and their application Mounting heights and locations Communications with PLC's and BAS's Gases found in Water and Waste Water applications Cross contaminants, interference and false positives TWA, STEL and leak detection Importance of Certification and Calibration of gas detection equipment Calibration services and frequencies Why calibration is important How often should sensors be calibrated Expected life of sensors depending on installation e environment Proactive sensor change programs to avoid down time Certification of equipment Can anyone certify the equipment for proper function and calibration? What should you expect from certified techs once system is certified? Liability covered by certified calibration technicians Site assessments on existing equipment and installations What is a site assessment and what does it consists of? How can the info provided from a site assessment help you? The presentation will cover all above topics in the hopes of better understanding the logistics behind managing and implementing gas detection equipment at a wastewater facility.
Biography	Alain joined Hetek Solutions in 2008 as Regional manager in charge of sales and services for the Eastern Canada markets. Hetek Solutions Inc. has been established in Canada since 1956. Hetek is one of Canada's primary vendors of products and services to municipalities, natural gas distribution utilities, midstream and upstream oil and gas companies, contractors and other industrial clients. Alain's background prior to joining Hetek was in fixed gas monitoring systems and worked for Armstrong Monitoring Corp for 10 years as an account specialist and handled distribution for north America
Author(s)	Alain Hamon

Date	**Tuesday, October 8th, 2019**
Time	**2:00 PM - 2:30 PM**
Stream	**E2**
Location	**Halifax Room B**
Presentation Title	**Putting All the Pieces Together: More than Just Another All-Pipe Wastewater Model Build**
Presenter	**David Blades, Halifax Water**
Abstract	Wastewater infrastructure operates in an intricate interaction of pipes, pump stations, weirs, check-valves, overflows and outfalls. System owners, operators, and engineers are asking more and more how this system will perform under a widening range of scenarios. Hydraulic system models are decision support tools that apply first principles of the underlying physics to complex hydrologic and hydraulic problems in order to simplify them to a form that we can comprehend. In 2018, to better support decision makers, Halifax Water developed a new “all-pipe” wastewater system model. Including both stormwater run-off calculations as well as a “new to Halifax” inflow and infiltration methodology, the new model covers both separated and combined sewer systems. It also incorporates system performance data from SCADA and the corporate flow monitoring program with rainfall data and tidal information from a variety of sources. The model development goal was to bring all of these disparate data sources together in a way that is manageable and repeatable with a minimum level of “human” data manipulation. This will eliminate the manual labour of cutting and pasting information into the model and allow Halifax Water staff to focus on operating the model. Not only developed as a “master planning tool”, the model has been developed to support capital design, operational decision making and other corporate programs. New reporting tools were introduced to support the wet weather management program, vulnerability to climate change, and annual CSO spill volume reporting. This presentation will discuss the journey as well as the technical and not so technical lessons learned throughout the development of this comprehensive tool.
Biography	David is the Infrastructure Program Manager within the Asset Management team at Halifax Water. Responsible for long term infrastructure planning, hydraulic modelling, and corporate flow monitoring programs, David works to provide information to various Halifax Water stakeholders to facilitate data driven decision making in the prioritization of capital and operating needs. With the exception of a brief hiatus in Fredericton to complete a Civil Engineering degree at the University of New Brunswick, David is a lifelong resident of Halifax.
Author(s)	David Blades

Date	**Tuesday, October 8th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**E2**
Location	**Halifax Room B**
Presentation Title	**Use of CFD Analysis for Secondary Clarifier Design**
Presenter	**Mike Abbott, CBCL Ltd.**
Abstract	TransAqua, the Greater Moncton Wastewater Commission (GMWC), is currently in the process of designing and constructing upgrades to complete their secondary treatment expansion project. The secondary expansion project was initiated in early 2014 following the completion of the long-term sustainable wastewater collection and treatment strategy in June 2010 and the subsequent pilot plant study and basis of design report in 2013. CBCL Limited initially completed the preliminary design phase of the project in January 2015. One component of the upgrade was to evaluate the necessary upgrades for conversion of the existing primary clarifiers to secondary clarifiers and to provide recommendations for the configuration of the new fourth secondary clarifier. One of the challenges in this evaluation was determining the effectiveness of the existing primary clarifier configuration for settling of activated sludge from the proposed step feed BNR process. This presentation will outline the evaluation and design process, including the utilization of computational fluid dynamics (CFD) to evaluate the existing tankage and advanced clarification design options.
Biography	Mike Abbott is a wastewater treatment specialist with CBCL Limited. He holds a B.Sc. Eng. in Civil Engineering from the University of New Brunswick, and a M.Eng. in Environmental Engineering from McGill University. During the past twenty years with CBCL Limited he has performed the process evaluation and detailed design of more than 50 domestic and industrial wastewater treatment plants and upgrades throughout Atlantic Canada. Most recently he has been involved with the detailed design of the TransAqua Upgrade to Biological treatment, the Charlottetown Pollution Control Plant Upgrades, the City of Fredericton Wastewater Treatment Plant Upgrades, the Mill Cove UV System upgrades, and the preliminary design of eight wastewater treatment facilities in CBRM.
Author(s)	Mike Abbott, M.Eng., P.Eng.

Date	**Tuesday, October 8th, 2019**
Time	**3:00 PM - 3:30 PM**
Stream	**E2**
Location	**Halifax Room B**
Presentation Title	**A Proactive Approach to Transmission Main Condition Assessment – St. John's Regional Water Supply**
Presenter	**Clayton MacDougald, Pure Technologies, a Xylem Brand**
Abstract	Based approximately 20km south of the City of St. John's, the Bay Bulls Big Pond Water Treatment Plant supplies potable water to the Ruby Line Pump Station through a 1,050 mm PCCP transmission main. From this station, water is pumped through the Regional transmission system comprised of several 750 mm PCCP mains to supply the local municipalities of St. John's, Mount Pearl, Paradise, Conception Bay South and Portugal Cover – St. Philip's. Although the 1,050 mm and two 750 mm transmission mains had not experienced any previous condition-based failures, the City wanted to proactively assess the condition of each because of the important role each plays in the Regional Water System. In 2014, the City and Pure Technologies Ltd conducted a non-destructive inspection and condition assessment of the 1050-mm Transmission Main while it was primarily in service. Due to the favorable results the City conducted two more inspections on the Ruby Line to Dunn's Road 750 mm main and Ruby Line to Southlands Reservoir 750 mm main in 2015 and 2016, respectively. Short shutdowns were used to insert and extract the inspection tools on all three lines. Inspection data was collected to look for leaks, air pockets, transient pressures and pre-stressing wire breaks. A description of the inspections and results of the condition assessments will be discussed.
Biography	Clayton received his bachelor's degree from Queen's University in Kingston, ON and his MBA from the Rotman School of Management in Toronto, ON. After 10 years with GE's Water division focusing on water and wastewater treatment, Clayton joined Pure, a Xylem Brand as a Business Development Manager focusing on Atlantic Canada and parts of Ontario.
Author(s)	Clayton MacDougald

Date	**Tuesday, October 8th, 2019**
Time	**3:30 PM - 4:00 PM**
Stream	**E2**
Location	**Halifax Room B**
Presentation Title	**Confirming Uncertain Ground Conditions by Analyzing Microtunnel Data**
Presenter	**Troy Bauman, Robinson Consultants**
Abstract	The City of Brantford constructed a curved microtunnel in challenging soil conditions to upgrade the existing Greenwich Sanitary Trunk Sewer (STS) in 2018. The new sewer provides additional capacity for future growth in the downtown core and for a new recreational facility jointly developed by the City, the YMCA and Laurier University. Identified in the 2014 City of Brantford Master Servicing Plan for sanitary sewers, and subsequently confirmed with the City's sewer modelling consultant, this project includes upgrades to the existing sanitary trunk sewer between Clarence Street South and the Greenwich Street sewage pumping station. The existing Greenwich Sanitary Trunk Sewer (STS) in the City of Brantford was upgraded to provide additional capacity for future growth in the downtown core. The new sanitary trunk sewer was installed via microtunnel construction on a curved alignment (radius 970m) and crossing an active rail corridor. The final installed length of microtunnel was 430m proceeding through mixed-face ground conditions. Robinson Consultants Inc., together with Aldea Engineering Services Ltd., prepared the design for the microtunnel that was subsequently constructed by Ward & Burke Microtunnelling. This paper explores the challenges faced during design and construction, and the innovative solutions developed by the Contractor and the Project Team to successfully complete the project on time and within budget. The paper also evaluates the application of GBR sheets to establish the geotechnical baseline and how the anticipated ground conditions were reflected in the microtunnel data.
Biography	Troy Bauman is a licenced engineer in Ontario and Nova Scotia, and Designated Consultant with more than 25 years of experience serving municipal and utility clients in Ontario and around the world. His project accomplishments include multi-million-dollar program management and project management for municipal infrastructure design and construction projects; Class EA studies; quality system development and ISO 9000 compliance activities; as well as safety management and HAZOP facilitation. In addition to his engineering qualifications and training, Troy has earned a Master's degree in Business Administration (Schulich School of Business, 2000) to enhance and augment his management knowledge and expertise, and he is also pursuing a bachelor of laws degree (University of London) with concentration in contract law and procurement. Troy is an accomplished project manager with a thorough understanding of strategic, organizational and business process issues that, together with his engineering expertise and experience, brings a unique perspective for his projects and clients alike.
Author(s)	Troy Bauman, P.Eng., MBA

Date	**Tuesday, October 8th, 2019**
Time	**2:00 PM - 2:30 PM**
Stream	**E3**
Location	**Halifax Room C**
Presentation Title	**The Importance of Quality Control for CIPP Rehabilitation of Sewers**
Presenter	**Kevin Bainbridge, Robinson Consultants**
Abstract	With increased pressure on operating budgets and capital financial resources to maintain aging sewer collection infrastructure, many municipalities and utilities are looking at rehabilitation technologies to manage these demands while maintaining or increasing the service level in the delivery of wastewater collection. Halifax Water is no exception in managing their wastewater collection pipes to address structural issues, infiltration issues, stability issues, etc. The use of CIPP for the rehabilitation of aging and deteriorated sewers has been around for over 40 years and can provide significant benefits over traditional replacement; however this is heavily reliant on the quality of the CIPP installed. CIPP involves the process of manufacturing pipe in co-ordination with construction processes in the field. This requires that sound QA/QC process are established on site, similar to those found in pipe manufacturing plants, in order to quantify that the CIPP installed meets the performance expectations. These expectations are inherent in the CIPP design and can include life expectancy, ground water pressure, earth load etc., all of which form the basis of the decision to use CIPP. Halifax Water has been actively programming the structural rehabilitation of their sewer pipes using Cured In Place Pipe (CIPP) periodically since 1997 however this program has accelerated to an annual program over the past 5 years. To date more than 30 km of pipe has been structurally rehabilitated using CIPP, with the upcoming 2019 program scheduled to CIPP over 18 km of sewer. This presentation will present the design approach to CIPP and importance of a sound quality control process to establish that engineering design and life expectancy objectives are met on each CIPP installation.
Biography	Kevin is a registered Civil Engineering Technologist and has worked in the municipal sewer and water industry for the past 22 years. Kevin is currently the Infrastructure Management Practice Leader for Robinson Consultants Inc. responsible for the firms practice in trenchless rehabilitation, condition assessment and asset management. He has directed or project managed numerous trenchless technology projects on both watermain and sewer pipes over the past 20 years. Projects have included the use of various rehabilitation and condition assessment technologies, including CIPP, GRP, Spray on Liners, RFTC, leak detection, carbon fibre and slip lining. He has authored and co-authored over 30 papers on various aspects of Infrastructure Management and Trenchless Technologies and spoken nationally and internationally at various conferences and seminars on the subject. Kevin is also a trainer for three NASTT training course, including, CIPP Good Practices, Lateral Rehabilitation Good Practices and Trenchless Rehabilitation Introductory.
Author(s)	Kevin Bainbridge & Roger Levesque

Date	**Tuesday, October 8th, 2019**
Time	**2:30 PM - 3:00 PM**
Stream	**E3**
Location	**Halifax Room C**
Presentation Title	**CIPP Watermain Lining – Consolidated Design and Compliance Guidance and Technical Advances**
Presenter	**George Bontus, Aegion Corporation**
Abstract	Cured-in-Place Pipe lining for watermains has experienced significant advances in the past several years. Owners, consulting engineers and academics, supported by many manufacturers and suppliers, have joined to address two of the key components involved in providing reliable and robust CIPP lining systems for watermains. AWWA's Pipe Rehabilitation Standards Committee supported a subcommittee in the development of a logical design and compliance system for CIPP pressure pipe liners. This consensus report entitled Structural Classifications of Linings – Suggested Protocol for Product Classification entered the balloting phase in late 2018. It builds on the qualitative description for liner classification in AWWA Manual M28 – Watermain Rehabilitation and limited design guidance provided in ASTM F1216. Ensuring that a CIPP pressure pipe lining system provides water tight seals at end terminations and service connections is paramount for a successful product. Significant investigation has been undertaken to assess what level of adhesion or bond should be required, and what can be achieved with increasing cleaning effort applied to the inside of host pipes in lining projects. Securing a water tight seal at liner end terminations can be accomplished from outside the pipe using appropriate procedures combining adhesive and mechanical options. Elimination of the reliance on bond between liner materials and the host pipe or corporation stops has been identified as a desired capability as the industry evolves. However, a fully mechanical process that provides a solid, long-term solution to service connection sealing is a much more complicated undertaking. This presentation provides an overview of AWWA's Report on Liner Classification including design and compliance aspects. It also reviews adhesive capability related to surface preparation and the applicability at end terminations. Finally, it describes the development of a new mechanical internal service reinstatement process that eliminates the reliance on adhesion.

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Biography	George Bontus, P.Eng. is Director of Engineering with Insituform Technologies Limited. George is involved in all aspects of pressure pipe lining including marketing, design, estimating and project managing installations throughout North America, as well as design and review for CIPP liners in gravity applications. He is involved in product development, testing and quality assurance. George is currently vice chair of AWWA's Manual M28–Rehabilitation of Watermains committee, and Chair of the CIPP Lining Section. As a member Pipeline Rehabilitation Standard #257 Committee, he is Chair of the Sliplining and Close-Fit Sliplining Standard Committee, and vice chair of the CIPP Standard Committee. In current research and development projects, George is involved in assessment of surface preparation and sealing capability at critical points for potable water rehabilitation, as well as development of mechanical internal service reinstatement technique improvements. George is a University of Alberta graduate, and a registered professional engineer in Alberta, British Columbia, Saskatchewan, Manitoba and Ontario. Prior to joining Insituform in 2004, he was a senior project manager with municipal consulting firms for over 15 years focused on water resources and infrastructure rehabilitation.
Author(s)	George Bontus

Date	**Tuesday, October 8th, 2019**
Time	**3:00 PM - 3:30 PM**
Stream	**E3**
Location	**Halifax Room C**
Presentation Title	**Large Diameter Watermain Lining in the City of Toronto**
Presenter	**Stewart Dickson & Patrick Lewis, WSP Canada**
Abstract	In 2015 the City of Toronto retained WSP to investigate alternatives for the replacement of two trunk watermains that were over 100 years old. The pipelines are located near the first pumping station constructed in the City of Toronto's transmission system (High Level PS) and are therefore also some of the oldest watermains in the system. They are 750 and 900 mm diameter cast iron pipe. The City has experienced failures of their cast iron pipes and were looking to ensure these two sections of pipe were addressed prior to any major failures. Given their age and location, the streets are also very old, narrow and congested with utilities and other infrastructure. Upon completion of a condition assessment of the existing pipes and an investigation on alternatives for their replacement, it was determined that structural lining was the most appropriate method for renewal of the pipes. WSP completed the design of the rehabilitation project, which included the reconstruction of the valve chambers and the structural lining of the local distribution watermain on the same street. The design of the chambers was challenging as the required size was significant, with limited working space and challenging ground conditions. Construction of the project was completed between June 2018 to October 2018. While there were challenges overcome in construction, the overall impact of the construction was significantly less than a full open cut replacement, and much less expensive than a tunnelled installation. The presentation will cover the project through the various investigation, condition assessment and design stages where we "shone a light on the unknown" in regards to the condition of the pipes and the most appropriate renewal methodologies. We will also discuss some of the benefits and challenges experienced during construction.

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Biography	Stewart Dickson, P.Eng. - Director, Conveyance, WSP Canada, Thornhill, Ontario Stewart Dickson is a licensed engineer with over 20 years of consulting engineering experience in the water and wastewater industry. He has been responsible for the management, planning, design and construction of water and wastewater infrastructure projects ranging from small watermain and sewer replacements to major pumping stations. He is an experienced Program Manager who has led the design and construction of numerous large-scale infrastructure projects and the delivery of a number of Infrastructure Programs. Stewart is the Director of WSP's Conveyance Team in Thornhill, Ontario. His team includes over 100 professionals who deliver underground water and wastewater infrastructure projects for Municipal clients. The team has a wealth of experience in all types of projects and programs including small diameter pipelines, large diameter transmission mains and trunk sewers. Many of the projects have significant trenchless components, from lining of watermains and sewers using CIPP to short micro tunnelled crossings to long, large diameter bored tunnels. Stewart is an expert in watermain structural lining having been responsible for the lining of over 100 kilometers of local distribution watermains and several large diameter pipelines using CIPP technologies. He has completed watermain relining courses and presented at several workshops provided by the Centre for the Advancement of Trenchless Technologies (CATT), numerous conferences and is currently serving on the committee updating the AWWA M28 Manual of Practise for Watermain Rehabilitation. Patrick Lewis P.Eng. Manager, Infrastructure, WSP Patrick Lewis is Manager of Municipal Engineering and Land Development of the Dartmouth office of WSP, a world leading engineering consulting firm with over 500 offices and 40,000 employees throughout the world. Patrick is a graduate of the Technical University of Nova Scotia (TUNS) and a registered Professional Engineer in the Province of Nova Scotia. Patrick is a Senior Project Manager with over 20 years' experience in planning, design and construction of municipal infrastructure in the Maritime Provinces and Ontario. He has been both a Project Manager in the consulting environment, as well as a Senior Project Manager for one of the largest municipalities in the country.
Author(s)	Stewart Dickson & Patrick Lewis

Date	**Tuesday, October 8th, 2019**
Time	**3:30 PM - 4:00 PM**
Stream	**E3**
Location	**Halifax Room C**
Presentation Title	**Storm Water Management: Underground Storm Sewer Treatment Unit and Canadian ETV Protocol Using Hydrodynamic Separation**
Presenter	**Philip Losier, Soleno**
Abstract	The treatment of storm water marks a major change from traditional approaches in Atlantic Canada. Municipalities, consulting engineering firms and developers are called upon to design and select systems that meet those needs. This conference will allow participants to become familiar with Canadian Environmental Technology Verification (ETV) Program. Although relatively new in the Atlantic Provinces, stormwater treatment by hydrodynamic separation is one of the proven solutions for the management of SS present in runoff waters. The basic concept, as well as the general operation of a SS processing unit, will be presented to allow the participants to identify the various parameters in the system. Solves the most stringent problematics in stormwater treatment The evolution and implementation of a more strict regulatory framework is gradually transforming traditional practices towards integrated stormwater management. Sewer system owners and managers must use new treatment solutions while ensuring the sustainability of infrastructure, in accordance with new environmental requirements. In addition to the removal of total suspended solids (TSS), oils and floating debris, the significant removal of nutrients, soluble metals and hydrocarbons from stormwater is now required.
Biography	Philippe Losier is a civil engineer, graduated from Université de Moncton (1991). He has 14 years of experience in municipal infrastructures construction supervision and design in both the province of New Brunswick and Québec. Also, he was a technical representative for a PVC pipe manufacturer for 7 years in Atlantic and Québec provinces. Since 2012, he has joined the technical department at Soleno Inc., a manufacturer of products for storm water management. He specializes in the design, implementation and development of products and solutions for storm water management in the municipal, commercial and institutional sectors.
Author(s)	Philippe Losier, P.Eng.