

2018
-
2019



STRAIGHT from
the SOURCE



Stewardship Report



Our Mission

To provide world-class service for our customers and our environment.

Our Vision

We will provide our customers with high quality water, wastewater, and stormwater services.

Through adoption of best practices, we will place the highest value on public health, customer service, fiscal responsibility, workplace safety and security, asset management, regulatory compliance, and stewardship of the environment.

We will fully engage employees through teamwork, innovation, and professional development.

A Message from the General Manager



This is my last message as General Manager for Halifax Water, with my retirement on July 2, 2019. As I reflect on my last 31 years working for Halifax Water, much has changed, in particular, as we enter the digital age.

In terms of Halifax Water, significant transformation has occurred since the utility assumed a regional mandate for drinking water and fire protection services in 1996. With the improvements to water service as a result, and confidence from the customers we serve, HRM Council transferred the wastewater and stormwater assets to Halifax Water in 2007. With this, Halifax Water became a “one water” utility with responsibility from the source to the tap and back to the source again. It has been a privilege to work with some great professionals within the utility and industry to navigate the opportunities and challenges presented. On a true stewardship theme, Halifax Water has emerged as a world leader in water loss control, wet weather management, water quality and customer service.

Since becoming a “one water” utility in 2007, we have upgraded all wastewater treatment facilities to conform to the federal Wastewater System Effluent Regulations (WSER) and have made significant investments across the region to keep infrastructure in a state of good repair, and facilitate growth.

This year will see the completion of the Customer Connect Project which will usher in a new relationship between Halifax Water and the customers we serve. In particular, it will provide customers with the opportunity to manage their consumption with access to meter data in the future through a secure web portal. Embracing change in pursuit of improvement is a hallmark for Halifax Water since its beginnings in 1945.

Next year will mark the 75th anniversary for the utility from its original mandate to provide water service to the former City of Halifax. The next General Manager, Cathie O’Toole, will have the pleasure and privilege to guide us from here, and from that perspective, Halifax Water is in good hands to continue its mission of stewardship.

Yours in service,



Carl D. Yates, M.A.Sc., P.Eng.
General Manager



Drinking Water Quality

Providing our customers with reliable, affordable, high-quality drinking water requires investment in infrastructure, research, and robust quality assurance/quality control programs. Halifax Water has made considerable investments in all of these areas.

In order to ensure quality control is optimized, we maintain ISO 14001 Environmental Management System Registration as the J. Douglas Kline (Halifax), Lake Major (Dartmouth), and Bennery Lake (Halifax Airport) Water Supply Plants.

Halifax Water undertakes a comprehensive water testing program. Bacteriological testing is done weekly at 49 locations within the urban core, and at each of the small systems that are managed by Halifax Water. In the past year, 3322 tests for total coliform bacteria were conducted. In 99.97% (3321) of those tests, bacteria was absent from the water.

Additional testing includes:

- Chlorine residual, pH, and turbidity of treated water leaving each plant as well as multiple locations within the plant, to monitor and optimize the treatment process.
- Sampling twice per year for compliance with the Guidelines for Canadian Drinking Water Quality which includes approximately 90 parameters.
- Quarterly sampling of Lake Major and Pockwock Lake raw lake water and water from contributing streams for approximately 40 chemical parameters.
- A bi-annual sampling of Lake Major and Pockwock Lake raw and treated water for all parameters in the Guidelines for Canadian Drinking Water Quality.
- Bi-annual testing and sampling for giardia and cryptosporidium for treated and raw water for all surface water systems.

Drinking Water Compliance Summary: Total Coliform Results			
April 2018 - March 2019			
System	No. of Samples	No. of Exceedances	% Absent
Pockwock	828	0	100%
Pockwock Central	520	0	100%
Lake Major	1197	1	99.92%
Bennery	153	0	100%
Five Islands	106	0	100%
Silver Sands	104	0	100%
Middle Musquodoboit	102	0	100%
Collins Park	104	0	100%
Miller Lake	104	0	100%
Bomont	104	0	100%
TOTAL	3322	1	99.97%
Absent (A)	3321		99.97%
Present (P)		1	0.03%

Water test results are reported to Nova Scotia Environment and the Nova Scotia Medical Officer of Health on a regular basis. Protocols have been established between Halifax Water, and the provincial Health and Environment Departments, to clearly delineate roles and responsibilities in the unlikely event of a disruption in water quality.

Lead Line: Lead Service Line Rebates

Get The Lead Out!

Removing lead service lines from our water system is a top priority for Halifax Water. Prolonged exposure to lead can lead to adverse health effects which are particularly harmful to infants, breastfeeding and young children and pregnant women.

Since August 22, 2017 Halifax Water has been working together with our customers to remove lead water service lines (LSL). The Nova Scotia Utility and Review Board (NSUARB) approved a financial incentive for customers who replace their private LSL. The program provides a 25% rebate, up to \$2,500 of the cost of the private replacement. Halifax Water also has a Lateral Loan Program to assist customers who require financing and wish to replace their LSL, sewer, or stormwater lateral

Program Awareness



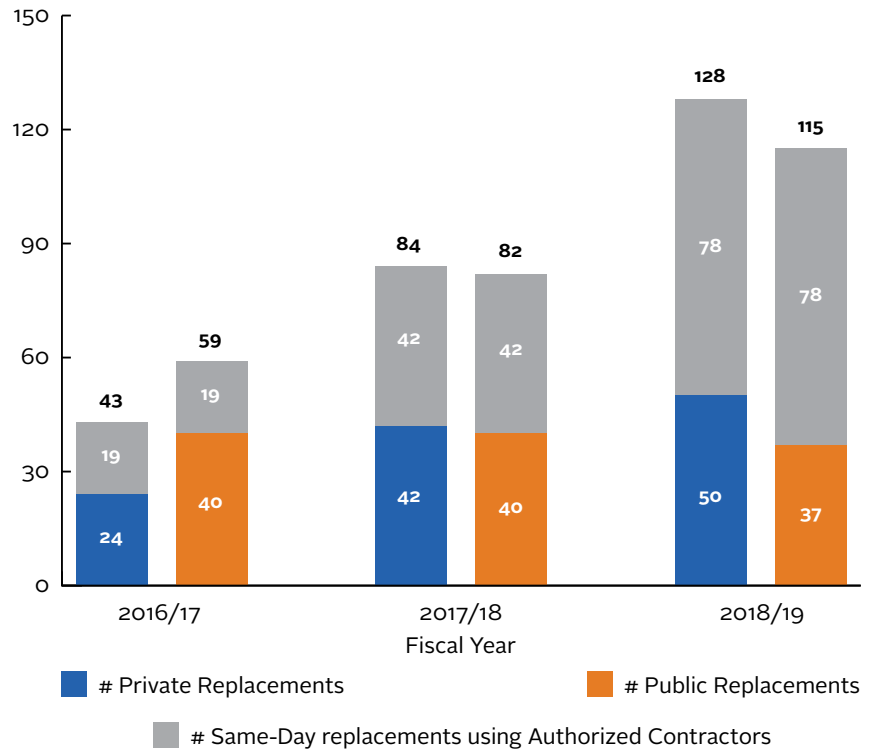
Halifax Water has created a variety of tools to help customers understand the lead issue. These include instructions on sampling and flushing, brochures, and other easy to follow program materials. Halifax Water's new website features a detailed section on lead in your drinking water <https://halifaxwater.ca/lead-water-quality>.

Rebate Success

Since the implementation of the 25% rebate, Halifax Water has provided a rebate to a total of 123 customers. The average cost of a private lead service line renewal for those that have participated in the rebate program is about \$3,500, and depends on many factors including length of service, and challenges encountered with location of service (decks, driveways, trees, etc.).

Halifax Water has removed 197 public lead service lines since the program began in 2017. Referring to the bar

Public & Private Lead Service Line Replacements



graph above, a steady rise in replacement numbers can be seen and Halifax Water hopes to continue to see increases annually.

Lead Service Line Replacement

Upon application by a homeowner for a LSL replacement, homeowners are contacted by program staff. At this time they are advised of sampling programs, provided with information on the renewal, post-renewal maintenance and provided with a NSF (National Sanitation Foundation) certified pitcher filter for temporary use for cooking and drinking during a period of increased lead exposure post renewal.

To simplify the renewal process for homeowners, Halifax Water has three approved contractors who can also renew a public service line. If homeowners use one of these three contractors, they can have both the public and private portions replaced as one job. The success of this program is shown by the gray bars in the figure above.



Lead Line: Lead Service Line Rebates Continued...

Lead Sampling Programs

Customer Sampling

Consistent with Health Canada protocols, Halifax Water provides complimentary lead testing for homeowners who have a known or suspected lead service line, and who live in a house built prior to 1960 within the lead service boundary. Test results are sent to the customer once they are available.

Lead Service Line Replacement Monitoring Program

Samples are taken prior to LSL replacement and following replacement at 72 hours, 1, 3, and 6 months. Homeowners are encouraged to participate in the program, as it allows them to have a better understanding of the lead levels in their household drinking water. When a permit is issued for a private lead service renewal the homeowner is contacted by email or phone to encourage their participation in the LSL monitoring program.

Volunteer Residential Monitoring Program

Halifax Water facilitates free water quality testing for lead and copper concentrations in drinking water

samples collected from over 100 residential homes throughout the distribution system annually. The purpose of the program is to monitor and assess the effectiveness of Halifax Water's current corrosion control program. The program is implemented based on recommendations provided from Health Canada.

Corrosion Control & Water Quality Monitoring

Distribution Corrosion Control Monitoring

Removing lead-containing components is the best way to minimize lead exposure from drinking water, but water quality can also play a role in how corrosive a water may be. Halifax Water has a corrosion control program, which consists of adding zinc orthophosphate to treated water to minimize corrosion, and then monitoring water quality throughout the distribution system to ensure corrosion control is working. Furthermore, Halifax Water has a research partnership with Dalhousie University where the research team focuses on improvements to and understanding of corrosion control. Outcomes of this research have played a critical role in optimizing our corrosion control program and shaping our lead service line replacement program.

Energy Efficiency

Energy use in municipal water and stormwater/wastewater treatment facilities (WWTFs) and their respective distribution and collection systems remains among the highest in North America, typically consuming over 30% of Municipal energy usage and over 4% of the total National energy usage (US Data). With this in mind, Halifax Water has continued its efforts to improve its energy footprint.

- The Energy Management Plan was updated to identify specific annual energy reduction targets and activities to be completed in 2018/19.
- Various equipment and infrastructure upgrades were completed in 2018/19, as well as a number of ongoing annual operating initiatives. A number of other projects are being considered for future implementation and depending on the technical and financial feasibility of each opportunity. Projects and initiatives completed in 2018/19 resulted in over 2,873,000 kWh_e in annual energy savings, over \$279,000 in cost savings, and over 1,850 Tonnes CO_{2e} in GHG reductions. Completed projects and annual initiatives are shown in the table on the following page.
- Continued use of the Energy Management Information System was ongoing in 2018/19, adding additional monitoring of potable water consumption data for all of Halifax Water's facilities, and water and wastewater treatment flow data for the larger facilities. These efforts improve the accuracy of data for each facility.

Energy Efficiency Continued...

Service Area	Facility	Project/Initiative	Annual Savings (\$)	Energy Reduction (kWh _e)	CO ₂ Reduction (tonnes/yr)	Energy Source
Capital Project Completions						
Water	JD Kline WSP	Boiler Replacement	\$3,800	47,448	12	Heating Fuel Oil
Wastewater	Herring Cove WWTF	Fan Belt Replacements - V Belt vs. Timing Belt	\$13,486	132,000	86	Electricity
Wastewater	Halifax WWTF	Fan Belt Replacements - V Belt vs. Timing Belt	\$32,090	315,000	205	Electricity
Wastewater	Halifax WWTF	New Air Compressors	\$3,300	30,000	20	Electricity
System Wide	Various Facilities	NSPI Meter Read Adjustments (Credits)	TBD	-	-	Electricity
Annual Operation Initiatives						
Wastewater	HHSPs & EPWWTF	UV Shutdown (April & Nov. 2018 - March 2019)	\$172,767	1,865,696	1,216	Electricity
Wastewater	Halifax WWTF	OCS Bypass (April & Nov. 2018 - March 2019)	\$43,777	390,866	255	Electricity
Wastewater	Herring Cove WWTF	OCS Bypass (Nov. 2018 - April 2019)	\$10,686	92,524	60	Electricity
TOTAL			\$279,906	2,873,534	1,855	

- Early stage development of the Cogswell District Energy System (DES) has also continued. The 100% detailed design of the underground linear infrastructure (i.e. DES distribution piping systems) was completed in June 2019, along with a by-law review of similar Canadian systems. Next steps include the completion of a stakeholder information package to facilitate the promotion of the project to the local community and stakeholders. Included will be an updated business case to reflect any changes coming from HRM's design exercise. Completion of the detailed designs for the linear infrastructure, energy centre, energy transfer stations, the development of the required building specifications, and overall utility development efforts will also be part of the stakeholder information package.
- A continued focus on early stage involvement in infrastructure projects has also brought a focus on energy efficiency and sustainability at the design stage, resulting in efficiency improvements implemented during construction of these projects. Current projects include the Aerotech WWTF Upgrade, Roach's Pond Pumping Station Upgrades, and the upcoming Mill Cove WWTF plant upgrade.
- When appropriate, Halifax Water has also taken advantage of Provincial energy efficiency rebate programs offered by Efficiency Nova Scotia, which help to reduce capital costs and improve project payback.



New, more efficient air compressors installed at the Halifax Wastewater Treatment Facility

Overall results for 2018/19 were excellent, with an overall annual energy reduction of 4.7% in relation to capital projects. A focus on further energy efficiency and operational improvements to existing infrastructure and on completing energy audits in the coming years will allow Halifax Water to continue to build on these results.



Wastewater Treatment Facility Compliance

Wastewater treatment facilities in Nova Scotia are regulated by Nova Scotia Environment (NSE). They set effluent discharge limits for all wastewater facilities. The limits define maximum concentrations of parameters such as Carbonaceous Biochemical Oxygen Demand (CBOD – a measure of the amount of material in water which will consume oxygen as it decomposes), Total Suspended Solids (TSS – a measure of the amount of particulate matter in the water), and Fecal Coliform (bacteria associated with wastewater). For some facilities, parameters such as nutrients (nitrogen and phosphorus which cause excess growth of algae and plants) or pH (a measure of acidity) are also regulated.

Halifax Water oversees five large Harbour facilities and nine smaller, community based facilities.

The upgrades for the Aerotech Wastewater Treatment Facility we completed this year. Halifax Water continues to complete a number of optimization projects that

involve reduction of wet weather influences, equipment upgrades and process enhancements, which have resulted in improved compliance results.

Compliance for the Harbour facilities are measured on monthly averages. There has been a significant improvement with the compliance at the five Harbour facilities with three, Herring Cove, Eastern Passage and Mill Cove, being fully compliant for the year and Halifax having only one non-compliant result for the year.

Performance assessments for the 10 smaller wastewater facilities are based upon quarterly averages. Results for April 2018 to March 2019 are presented on the next page.

Five of the smaller wastewater facilities, Frame, Lakeside-Timberlea, Lockview-MacPherson, Middle Musquodobit and Steeves were fully compliant for the year.

Wastewater Treatment Facility Compliance Summary															
April 2018 to March 2019															
WWTF	Apr-18					May-18					Jun-18				
	CBOD ₅	TSS	E.Coli	pH	Toxicity Pass	CBOD ₅	TSS	E.Coli	pH	Toxicity Pass	CBOD ₅	TSS	E.Coli	pH	Toxicity Pass
Halifax	30	23	N/A	7	YES	73	28	1,440	7	YES	41	19	349	7	YES
Herring Cove	25	21	N/A	7	N/A	24	19	33	7	YES	40	24	15	7	N/A
Dartmouth	23	39	N/A	7	YES	22	36	617	7	YES	53	29	1,402	7	YES
Eastern Passage	5	6	N/A	7	N/A	6	5	13	7	YES	5	6	116	7	N/A
Mill Cove	14	19	19	7	N/A	12	19	10	6	YES	8	13	10	7	N/A
	Jul-18					Aug-18					Sep-18				
Halifax	46	26	3,036	7	YES	50	24	19,279	7	YES	51	27	10,953	7	NO
Herring Cove	26	13	10	7	N/A	26	5	23	7	YES	38	9	50	7	N/A
Dartmouth	52	27	8,410	7	NO	65	30	24,773	7	YES	79	38	25,000	7	NO
Eastern Passage	10	14	53	7	N/A	8	6	42	7	YES	9	6	21	7	N/A
Mill Cove	14	18	16	6	N/A	16	19	10	6	YES	12	13	19	6	N/A
	Oct-18					Nov-18					Dec-18				
Halifax	41	31	1,833	7	YES	24	37	N/A	7	YES	40	31	404	7	YES
Herring Cove	21	12	52	7	N/A	31	17	N/A	7	YES	19	17	260	7	N/A
Dartmouth	34	29	1,622	7	YES	23	47	N/A	7	YES	29	26	135	7	YES
Eastern Passage	8	6	96	7	N/A	8	7	N/A	7	YES	8	6	45	7	N/A
Mill Cove	8	17	20	6	N/A	9	13	12	7	YES	18	21	20	7	N/A
	Jan-19					Feb-19					Mar-19				
Halifax	30	28	N/A	7	YES	41	20	N/A	7	YES	33	22	N/A	7	YES
Herring Cove	16	12	N/A	7	N/A	33	27	N/A	7	YES	23	22	N/A	7	N/A
Dartmouth	34	29	N/A	7	YES	40	36	N/A	7	NO	35	52	N/A	7	YES
Eastern Passage	7	12	N/A	7	N/A	9	9	N/A	7	YES	6	6	N/A	7	N/A
Mill Cove	11	20	17	7	N/A	11	9	20	7	YES	13	16	YES	7	N/A

N/A due to seasonal disinfection and toxicity requirements

CBOD₅: Carbonaceous Biochemical Oxygen Demand – a measure of the amount of organic material.

TSS: Total Suspended Solids – a measure of the number of particles in the wastewater.

Fecal Coliform / E. coli: Bacteria which are present in the treated sewage.

pH: A measure of the acidity of water.

Phosphorus (phosphate): A plant nutrient which can impact water bodies.

Ammonia: A chemical compound containing nitrogen, another plant nutrient.

Dissolved Oxygen: The amount of oxygen in the water, essential for fish and other aquatic organisms.

Aluminum: A metal dissolved in water

Wastewater Treatment Facility Compliance Continued...

Wastewater Treatment Facility Compliance Summary									
Q1 - April to June 2018									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	5	3	18	2.2	4.9	7.0	6.8	N/A	YES
Frame	5	1	10	N/A	N/A	6.8	N/A	N/A	N/A
Lakeside-Timberlea	5	18	12	1	3	7.1	N/A	0.10	YES
Lockview-MacPherson	4	4	67	0.4	2	7.2	N/A	N/A	N/A
Middle Musquodoboit	9	11	58	N/A	N/A	7.7	N/A	N/A	N/A
North Preston	7	25	136	0.5	0.3	6.7	N/A	N/A	N/A
Springfield	5	19	14	N/A	N/A	6.8	N/A	N/A	N/A
Steeves (Wellington)	2	1	10	0.1	0.06	7.5	N/A	N/A	N/A
Uplands Park	6	9	10	N/A	N/A	6.3	N/A	N/A	N/A
Q2 - July to September 2018									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	5	1	10	0.1	0.1	7.4	8.2	N/A	YES
Frame	4	1	10	N/A	N/A	7.3	N/A	N/A	N/A
Lakeside-Timberlea	5	12	14	1	1	7.3	N/A	0.10	YES
Lockview-MacPherson	5	2	10	0.3	0.3	6.8	N/A	N/A	N/A
Middle Musquodoboit	4	5	10	N/A	N/A	7.6	N/A	N/A	N/A
North Preston	5	3	10	0.2	0.1	6.7	N/A	N/A	N/A
Springfield	4	5	10	N/A	N/A	7.2	N/A	N/A	N/A
Steeves (Wellington)	5	2	10	0.1	0.05	7.3	N/A	N/A	N/A
Uplands Park	10	11	63	N/A	N/A	6.9	N/A	N/A	N/A
Q3 - October to December 2018									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	6	1	10	0.1	0.68	7.1	8.0	N/A	YES
Frame	8	1	10	N/A	N/A	7.2	N/A	N/A	N/A
Lakeside-Timberlea	7	14	24	2	2	7.0	N/A	0.08	YES
Lockview-MacPherson	5	7	32	0.4	1	6.9	N/A	N/A	N/A
Middle Musquodoboit	8	3	49	N/A	N/A	7.5	N/A	N/A	N/A
North Preston	8	7	13	0.3	1.2	6.9	N/A	N/A	N/A
Springfield	10	10	10	N/A	N/A	6.8	N/A	N/A	N/A
Steeves (Wellington)	5	10	10	0.3	0.1	7.5	N/A	N/A	N/A
Uplands Park	8	9	13	N/A	N/A	7.1	N/A	N/A	N/A
Q4 - January to March 2019									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	3	1	10	0.1	1.7	7.2	8.3	N/A	YES
Frame	6	1	21	N/A	N/A	6.9	N/A	N/A	N/A
Lakeside-Timberlea	7	16	14	2	5	7.1	N/A	0.10	YES
Lockview-MacPherson	8	20	40	0.5	11	7.1	N/A	N/A	N/A
Middle Musquodoboit	10	7	62	N/A	N/A	7.4	N/A	N/A	N/A
North Preston	8	16	10	0.4	1.1	7.0	N/A	N/A	N/A
Springfield	12	57	155	N/A	N/A	6.6	N/A	N/A	N/A
Steeves (Wellington)	5	1	10	0.1	4.1	6.9	N/A	N/A	N/A
Uplands Park	14	12	309	N/A	N/A	6.9	N/A	N/A	N/A

Environmental Management Systems (EMS)



An Environmental Management System (EMS) is a system of procedures, records and processes to manage environmental issues and assist with regulatory compliance. It also makes day to day operations more sustainable and engage

employees in these operational activities. The EMS program can be audited against ISO 14001 standards, and if found to comply, receives a Certification through ISO. The ISO standard has recently changed from 2004 version to a 2015 version with a greater focus placed on

organizational leadership and identification of risks and the associated influences, both internal and external to an organization.

Halifax Water staff have successfully obtained certification for the existing facilities, Pockwock, Lake Major and Bennery Water Treatment Facilities and the Herring Cove Wastewater Treatment Facility under the new audit. An external audit for the Dartmouth Wastewater Treatment Facility was carried out in May 2019 to bring it into the ISO 14001 standard.

Wet Weather Management

Like many municipalities and utilities across North America, sections of Halifax Water’s sanitary sewer system are subject to dramatic flow increases in response to precipitation events. Wet weather flows can lead to sanitary sewer overflows, capacity reduction, sewer backups/basement flooding, treatment process upsets and increased operation and maintenance cost.

To address this issue, Halifax Water has developed a proactive approach to address the negative impacts of

wet weather events on the sanitary sewer system. Since its inception in 2013, the goal of Halifax Water’s Wet Weather Management Program (WWMP) has been to develop a long-term strategy to cost effectively address wet weather generated flows. The first phase of the work was a comprehensive pilot program to study the effectiveness and cost of various rehabilitation activities. Currently, there are six sewersheds that have undergone pilot activities with an additional pilot to study the effectiveness of “private-only” interventions.

Sewershed	Rehabilitation Activity				Private Side Inspections	Peak Flow Reduction (L/sec)	Peak RDII Reduction (%)
	Mainline Lining	Lateral Lining	Manhole Lining	Deep Storm			
Fairview	✓					162	42%
Stuart Harris Drive	✓	✓	✓		✓	45	45%
Leiblin Park	✓	✓				19	19%
North Preston	✓					27	24%
Cow Bay Road				✓	✓	86	42%
Crescent Ave (MH182)	✓	✓	✓		✓	43	74%
Crescent Ave (MH174)	✓	✓	✓		✓	41	92%

Wet Weather Management Continued...

Faiview, Clayton Park, Bridgeview: Full Scale Project Summary

The analysis of flow monitoring data, undertaken as part of the West Region Wastewater Infrastructure Plan identified the potential for a significant reduction in Rainfall Derived Inflow and Infiltration (RDII) in the Fairview, Old Clayton Park and Bridgeview areas. With the goal of reducing peak flows by 212 litres per second (l/s), a multi-year program was initiated in 2017 with overall project planning, sewershed evaluation study (SSES) activities and engineering design activities occurring in the 2017/18 year.

The first phase of the project, undertaken in the summer/fall of 2018, was the first year of rehabilitation activities and also represented the first large scale RDII reduction project undertaken by Halifax Water outside of the pilot program. The project saw 11,659 metres

of cured in place pipe (CIPP) lining in the Fairview sewershed. Preliminary results indicate a reduction of 162 l/s of peak flow based on the analysis of the flow metering data collected between October 1 and December 31, 2018. These results confirm previous pilot work with the expectation that the target of 212 l/s will be achieved once the second phase of the sewer main lining is complete. Phase 2 will take place in 2019 and involves approximately 9,500 metres of lining in the Old Clayton Park and Bridgeview sewersheds.

Flow monitoring and data analysis will continue to be performed to confirm RDII reductions for the project area and assess the effectiveness of the asset renewal during all phases of the project.

The WWMP team will continue with pilot activities and investigate target sewersheds in the Central and East regions to realize similar gains.



CIPP work taking place in the project area

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Ellenvale Run Rehabilitation: Investing in Stormwater Management and Fish Habitat



A completed section of Phase 1 of the Ellenvale Run Rehabilitation Project

Ellenvale Run conveys stormwater from Lemont Lake to Morris Lake and is a major stormwater drainage corridor. The retaining walls along the channel consist of various materials and types; gabion basket, masonry stone walls, steel sheet piles, and precast concrete blocks. The condition of the retaining walls varies along the channel. In some areas the walls are in relatively good condition while in others the walls are failing and temporary bracing was installed to prevent them from falling into the stream.

In an effort to stabilize the channel walls and 'naturalize' the channel, the section of Ellenvale Run between Main Street and Portland Street underwent a major rehabilitation over the summer of 2018. Along with stabilizing the channel walls, the project sought to reestablish or improve natural habitat along the Run through the use of energy dissipation pools, natural pool and riffle sequencing and natural stone on the bottom of the

channel liner. This provides a naturalized stream bottom that reduces the speed of stormwater flows, creates pools and meanders, and helps to improve fish passage.

In order to complete the work, Halifax Water required permits from the provincial Department of Environment and Federal Department of Fisheries and Oceans. While construction was taking place, any fish that made their way to the channel work site were collected using dip nets at one end of the project work zone, placed in buckets and released at the other end of the work zone. The fish checks took place daily. Pickerel, trout, and alewife are species that use the waterway, but eels were the main species encountered during construction.

For 2019, further enhancement to additional sections of the Ellenvale Run will take place.



The 'naturalized' stone floor of Phase 1 of the Ellenvale Run Rehabilitation Project

Customer Connect Project Update



Upgraded Customer Connect Water Meter Face

In 2017, Halifax Water began the rollout of advanced metering infrastructure (AMI) technology as part of Customer Connect. Customer Connect is an initiative to upgrade Halifax Water’s water meter technology to better serve our customers. AMI is a fixed network of radio devices established over Halifax Water’s service area to read meters on a much more frequent basis (typically hourly).

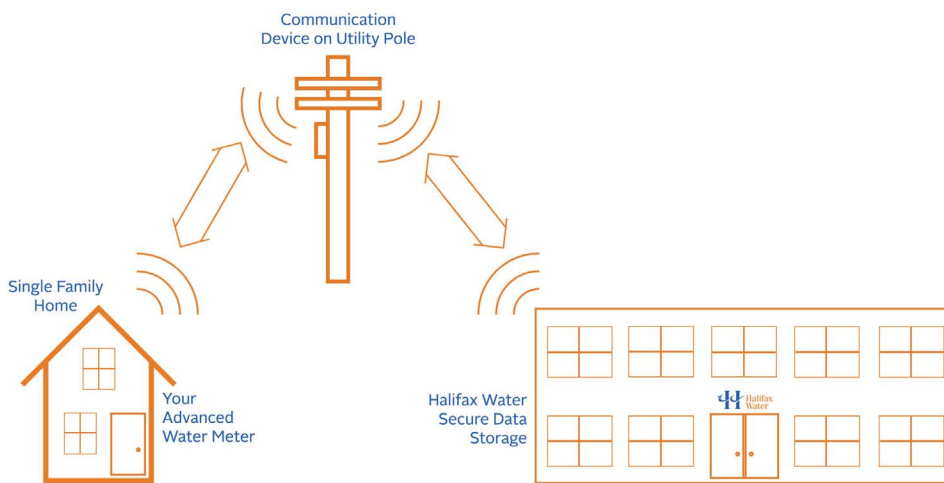
Halifax Water contracted with Neptune Technologies Group, an experienced meter installation vendor, to complete the full deployment.

In addition to streamlining the meter reading process and reducing costs, AMI promises many features that will improve the level of service Halifax Water can offer in future to its customers. These include:

- The ability to offer monthly billing to residential and small commercial customers making it easier for customers to manage cash flow.
- Halifax Water will be able to alert customers to high consumption due to things like plumbing leaks, almost as they happen, reducing billing disputes and high bill amounts.
- Customers will have the ability, should they choose, to manage their water consumption in near real time through a web portal and see the effect of any conservation measures they take.
- Estimated meter readings will be eliminated.

AMI will also provide much more data about customer consumption and water distribution system operations which could further enhance early detection of distribution system leaks.

The water meter installation phase of the project is scheduled for completion later this fall.



AMI Technology Diagram

Project Milestones

March 20 2018
10,000 meters installed

June 22, 2018
20,000 meters installed

February 1, 2019
50% (approximately 42,000) of meters installed

June 10, 2019
75% (approximately 63,000) of meters installed

STRAIGHT from the SOURCE

Aerotech Wastewater Treatment Facility Upgrade and Expansion - Update

The expansion and upgrade of the Aerotech Wastewater Treatment Facility was undertaken to achieve regulatory compliance and facilitate growth for the area encompassing the Halifax Stanfield International Airport and Aerotech Business Park. The design focused on biological nutrient removal (BNR) supplemented with chemical phosphorous utilizing ultrafiltration membrane bioreactor treatment technology. The project commenced in 2012 and included conceptual and preliminary design studies with a focus on environmental sustainability, energy efficiency, life cycle cost, and operational automation for process control. The project progressed to detailed design and procurement from 2014–2016, with construction commencing in September 2016 and completion on August 23rd, 2019.

Required Effluent Quality		
BODs	< 5.0	mg/L
TSS	< 5.0	mg/L
TN	< 8.0	mg/L
NH₃-N	< 3.0	mg/L
TP	< 0.13	mg/L
Turbidity	< 1.0	NTU
pH	6.5 - 9.0	
WET	Non-Toxic	
E-Coli	< 200	cfu/100 mL

Aerotech WWTF has a design flow capacity of 6.0 million litres per day (ML/D) and is Halifax Water’s most technically advanced wastewater treatment facility, capable of achieving tertiary effluent quality as indicated in the table above.



An aerial photo of the Aerotech WWTF

**STRAIGHT from
the SOURCE**

Water Research Programs

As a utility, Halifax Water has a history of applying research to inform and improve operations. In June 2018, Halifax Water was awarded one of two Outstanding Subscriber Awards for Applied Research from the Water Research Foundation. This award honors utilities that have successfully applied research to make notable improvements to water treatment, delivery, and/or management processes. Halifax Water is also an industrial partner of the National Sciences & Engineering Research Council of Canada (NSERC)/Halifax Water Industrial Research Chair in Water Quality and Treatment since its inception in 2007. This program has created a centre of excellence in drinking water quality and treatment for the Atlantic Region and has resulted in extensive technology transfer between Dalhousie University and Halifax Water.

NSERC Research Chair

The NSERC/Halifax Water Research Chair is about halfway through its third five year term. The Chair program has been instrumental in improving water quality, decreasing operational costs, steering capital projects and shaping Halifax Water's lead service line replacement program. One of the main research themes of the Chair at the moment is lake recovery. Lake recovery is process by which improved air emissions standards leads to less acid rain, and as a result, water quality in lakes around Nova Scotia is changing. Some changes are chemical, including an increase in pH, and other changes are biological and include changes to the types of plants and animals our lakes can support. This is good news for recreation and the health of our lakes, but it poses challenges to utilities like Halifax Water who designed plants for a static water quality that is now changing.

Chair research is focusing on both discovery and response to Lake Recovery. The discovery research is focused on what is changing in the lake and forecasting water quality in 5, 10 or 20 years. This is done through a combination of looking at historical water quality



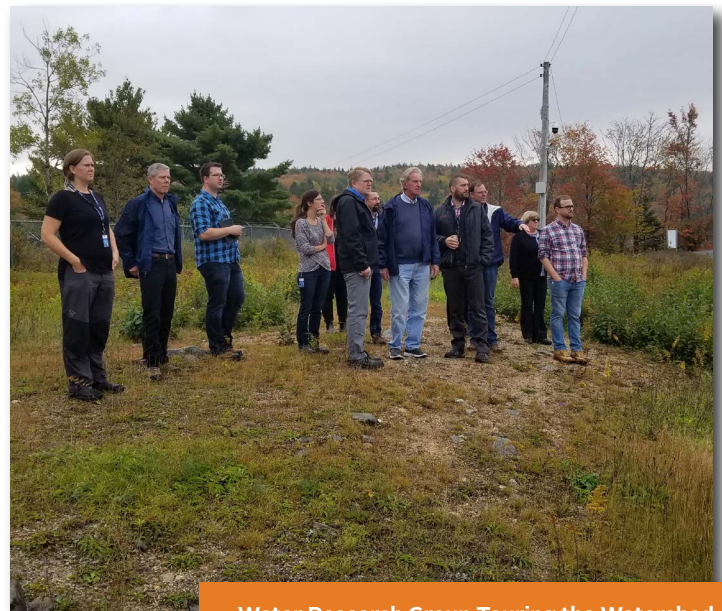
Lake Water Sampling

data, and digging through lake sediments to see what history can tell us about water quality. Response research is focused on ways to operate and optimize treatment plants with changing source water quality. Specifically, Dalhousie University is using the pilot plant at the J.D. Kline Water Supply Plant to investigate different approaches to treating changing water quality.

Both discovery and response research will help Halifax Water with plant operations in the short term, but also with capital planning for treatment upgrades in the future.

Water Research Foundation 4920

In 2018, Halifax Water initiated a research project through the Water Research Foundation to develop a tool for selecting treatment technology and monitoring plans for utilities that are experiencing changing source water quality from lake recovery. This project is being led by consulting firm Hazen & Sawyer, with numerous technical experts and several other participating utilities, including Tampa Bay Water. A kickoff workshop was held in October and the team is now busy mining data and developing a framework that will help Halifax Water make important decisions for future treatment technology that may be required to address changing source water quality.



Water Research Group Touring the Watershed

Water Research Programs Continued...

Lead Research

Halifax Water has been very active in lead related research over the past decade. This past year, Halifax Water participated in two large-scale lead research projects:

Water Research Foundation Project 4713

Project 4713 aims to understand the impacts of, and develop an optimized process for conducting flushing after lead service line replacement to minimize lead exposure. Halifax Water conducted in depth sampling for 9 full service line replacement as a partner in this project. We are currently waiting for the final summary report from the WRF.

Nova Scotia Environment/Dalhousie University Lead Survey

Halifax Water participated in a lead survey conducted on behalf of Nova Scotia Environment by Dalhousie University last year. Halifax Water, along with 6 other communities across Nova Scotia, collected samples to assess the differences in sampling approaches proposed under the new Health Canada lead guideline. In total, Halifax Water worked with homeowners to arrange for sampling at 47 homes in Halifax and Dartmouth. Participation in this project provided Halifax Water with information on the impact of changing regulations and sampling protocols on lead levels, and also provided valuable information on the logistics and requirements of sampling that will help Halifax Water prepare for required changes to the program.

Wastewater Research Collaboration

With a focus on the full water cycle, we are proud to announce that Dalhousie University and Halifax Water have signed a Memorandum of Understanding (MOU) that will direct research initiatives to the advancement of wastewater effluent quality for the protection of public health and the environment. The initial phase of the partnership will focus on improving wastewater effluent

quality from the three chemically enhanced primary treatment facilities located in Halifax, Dartmouth and Herring Cove to ensure compliance with the Federal Wastewater Systems Effluent Regulations (WSER). This will be accomplished through bench, pilot, and full-scale optimization of coagulation/flocculation processes, tracer studies, computational fluid dynamic work to understand tank hydraulics, application of innovative UV disinfection technology, and assessment of contaminants of emerging concern. The project will engage ten highly qualified personnel over three years to address research needs surrounding the increasing complexity of Canada's wastewater.

The program will provide for the training of highly qualified personnel, outline cost effective methods to meet the Federal WSER, and provide advancements in wastewater treatment beneficial to Halifax Water and the industry. It will also align with the research efforts at Dalhousie University around Clean Technology, Energy Efficiency, Environment Protection, Clean Water and Sanitation Sustainable Development Goals.



Presentation of the signed MOU between Halifax Water & Dalhousie University

Water Loss Control

Halifax Water continues to maintain its position as one of the top performing utilities in North America for reducing system losses due to leakage.

In 1999, Halifax Water was the very first utility in North America to adopt a methodology for water loss control developed through the International Water Association (IWA). This methodology is outlined in the American Water Works Association (AWWA) Manual M36. Using this approach, Halifax Water has reduced water system inputs by 40 million litres per day, saving over \$700,000 per year in operating costs. There are also operational and property damage savings from finding leaks before they erupt and repairing them in a controlled manner.

Many of our customers have seen water main breaks that erupt in a burst, spraying water and causing property damage. These leaks lose relatively little water



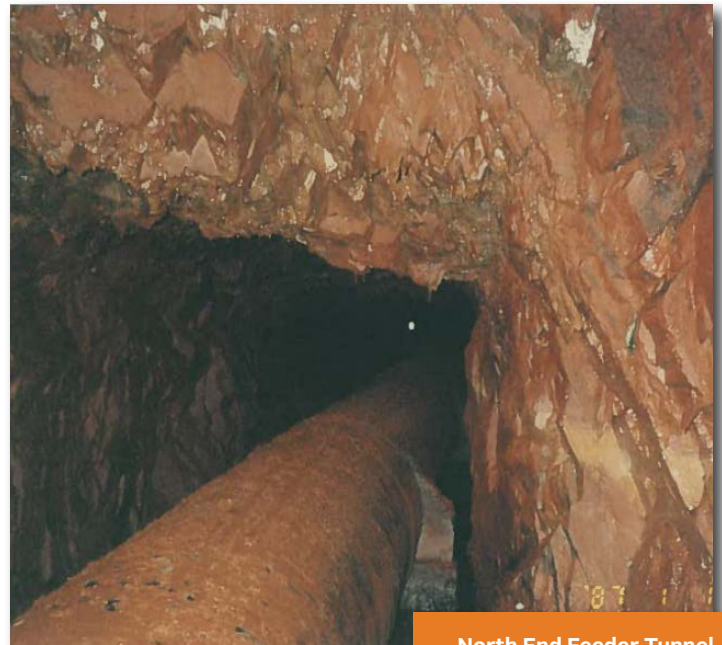
A Leaking Lateral

because they are discovered and shut off quickly. Due to the geology in the Halifax area, most leaks do not erupt suddenly, but can run underground for months or years if the utility is not actively finding them. Even small leaks, if left undiscovered, can lose much more water.

Halifax Water takes a holistic approach to find leaks. Halifax Water has divided its distribution system into 75 zones known as district metered areas (DMA's). An average DMA at Halifax Water has 100 hydrants, 1000 service connections and 20 km of pipe. Each morning, DMA flows between 3:00 AM and 4:00 AM are compared to historical benchmarks. Increases in the night flow are an indication of a possible leak. Crews are then dispatched to the DMA to survey for the leak using sophisticated acoustic equipment. Once the leak is found a crew will repair the leak within two to three days.

Halifax Water had a very successful water loss year in 2018/19. The Infrastructure Leakage Index was reduced from 3.3 to 2.7 and losses were reduced from 199 to 172 L per service connection per day.

In 2017, Halifax Water discovered a leak in the North End Feeder. The North End feeder is a significant transmission main supplying much of the water to the Halifax peninsula. The repair was complicated by the fact that the feeder is located in a tunnel, in excess of 30 m below the Bedford Highway, Fairview Cove container terminal and Windsor Street/Lady Hammond Road intersection. The leak was flowing at a rate of 900 L/min. After a year of planning and preparation, the repair work commenced on October 9, 2018 and was successfully completed on October 17, 2018. Approximately 50 Halifax Water staff, plus contractors were involved with planning the repair, making the repair and maintaining uninterrupted service to customers.



North End Feeder Tunnel

Halifax Water is looking to further its water loss control efforts in the coming years through advanced pressure management to reduce leaks, advanced analytics of monitoring data to detect leaks earlier, and automated transmission main monitoring to detect small performance changes in critical pipes.



Changes to the Health Canada Guidelines for Drinking Water Quality

The Guidelines for Canadian Drinking Water Quality (GCDWQ) are prepared by Health Canada and used to varying degrees by each Province in Canada for regulatory purposes. Provincially, Nova Scotia Environment adopts all health based values set by Health Canada, and Halifax Water, along with all other utilities in the province, are required to meet the guidelines.

The GCDWQ includes guidelines on approximately 140 parameters. To set a guideline, the committee, representing each province and territory, and Health Canada, collects and considers the full body of scientific evidence on a parameter. The committee is supported by a diverse staff of public health professionals consisting of medical doctors and experts in epidemiology and toxicology. The committee also considers all possible means of exposure (not just through drinking water) and after a public comment period, sets a limit for safe exposure through drinking water. This is a non-biased process that attempts to reach a decision while considering all available scientific evidence.

Health Canada made some notable changes to their guidelines for drinking water quality in 2018/19 that are described below.

Lead

Health Canada has both lowered the maximum acceptable concentration (MAC), and also changed the sampling protocol for lead to be more representative of typical customer exposure. Halifax Water has been sampling homes since 2011 using a sampling approach that provides a more conservative estimate of lead exposure than the new Health Canada approach. Therefore, this guideline change will not change much for Halifax Water. It only reinforces Halifax Water's efforts to accelerate lead service line replacement. Removal of lead containing components, including lead service lines, lead-tin solder and lead containing brass fixtures, is the only way to eliminate exposure to lead from drinking water. Halifax Water is committed and will continue to work with homeowners to remove lead service lines through programs like: the lead line rebate, the lateral loan, customer request lead sampling and post replacement monitoring.

Manganese

Manganese is a naturally occurring element with varying concentrations in both surface and ground water sources. Historically Health Canada has set aesthetic objectives for manganese as it can affect the taste and colour of the water (black staining). Based on recent research on the impacts of manganese exposure, Health Canada has both lowered the aesthetic objective and introduced a maximum acceptable concentration. The guideline changes also comes with changes to sampling requirements for manganese, including more representative distribution system sampling.

Cyanotoxins

Water quality changes due to lake recovery (see water quality research above), also mean there is an increased possibility for cyanobacteria blooms in Atlantic Canada. Cyanobacteria blooms can produce toxins that can lead to health impacts if consumed in drinking water. Health Canada has recently changed the guideline for cyanotoxins from a guideline for one specific variant of microcystin, to a broader guideline for total microcystins. Halifax Water has developed a multifaceted monitoring strategy for cyanotoxins which involves pre-screening for early detection of blooms and an understanding of treatment system response to cyanotoxins.

Contact Us

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