



**STRAIGHT from
the SOURCE**

STEWARDSHIP REPORT

2016/17

www.HalifaxWater.ca





FRONT COVER:

In Spring 2017 Halifax Water introduced its new slogan, Straight from the Source, for communicating with customers. It tells real stories and important news via the ultimate source of credibility - people whose lives are affected by clean water. It also educates and informs by shedding light on what it truly means to be stewards of the water cycle.

STRAIGHT from the SOURCE

A message from the General Manager



This year marks the 10th anniversary of Halifax Water becoming the first regulated water, wastewater and stormwater utility in Canada. This realization of a “one water” utility was made possible by the transfer of wastewater and stormwater assets from Halifax Regional Municipality to Halifax Water on August 1, 2007.

Much has been accomplished over the last 10 years, as the utility holds true to its mission to “provide world class services for our customers and our environment”. Key accomplishments include; successful completion of the Harbour Solutions Project, upgrade and expansion of the Eastern Passage Wastewater Treatment Facility, improved compliance with water and wastewater regulations, and a dedicated stormwater fee that is fair and equitable, as approved through the Nova Scotia Utility and Review Board. In addition, over \$500 million has been invested in infrastructure, including \$41 million for projects funded through the Clean Water and

Wastewater Fund, sponsored by the provincial and federal governments.

With respect to regulatory compliance for wastewater facilities, we are pleased to report that all fifteen facilities are now in compliance with new federal regulations, with the exception of the Aerotech Wastewater Facility, which will be compliant by the end of this year, after investing \$20 million in a capital upgrade. This represents significant progress in recognition that only two of fifteen wastewater treatment facilities were compliant in 2007.

Although there was a significant investment in wastewater and stormwater assets over the past 10 years, investments were also made within the drinking water system, including replacing and rehabilitating significant sections of the Pockwock water transmission main and replacement of the MacDonald Bridge water line. These investments were guided by research conducted with Dalhousie University through the Natural Science and Engineering Research Council (NSERC) Industrial Chair Program. This year marks the completion of two, five-year terms of NSERC sponsored research in partnership with Dalhousie. We are pleased to report that we have been approved for another five-year term under NSERC to further guide investments by Halifax Water. Of note, research has helped guide the utility to solutions focused on both public health outcomes and efficient operations. This research includes breakthrough results for understanding source water quality and the impacts of lead in drinking water. To that end, Halifax Water is now internationally recognized as a leader in its approach to remove lead from the entire distribution system and facilitate solutions for residents and businesses to remove lead service lines on private property.

Halifax Water has been privileged to serve the residents of the greater Halifax area since 1945, continuing to take on greater responsibility with Municipal amalgamation in 1996 and the transformation to a one-water utility in 2007. We are pleased to report that customers continue to rate our products and services highly, as measured through annual surveys conducted by Corporate Research Associates, a local organization specializing in research to document and understand public opinion.

We are grateful for the trust and goodwill of the customers we serve and look forward to serving future generations and protecting the environment for years to come.

Yours in service,

A handwritten signature in blue ink that reads "Carl Yates". The signature is written in a cursive, flowing style.

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 these areas.

In order to ensure quality control is optimized, we maintain ISO 14001 Environmental Management System Registration at 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 51 locations within the urban core, and at each of the small systems.

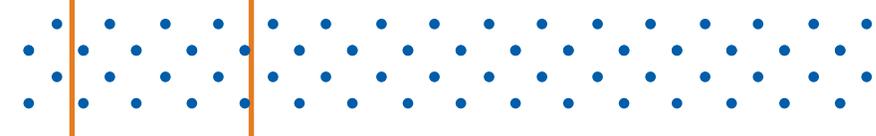
Approximately 3,500 tests for total coliform bacteria are conducted each year. Results of 99.9% of samples with bacteria absent are consistently achieved, as shown below:

Drinking Water Compliance Summary: Total Coliform Sample Results			
April 2016 - March 2017			
System	No. of Samples	No. of Exceedances	% Absent
Pockwock	962	0	100%
Pockwock Central	584	0	100%
Lake Major	1183	3	99.7%
Bennery	158	0	100%
Five Islands	104	0	100%
Silver Sands	103	0	100%
Middle Musquodoboit	102	0	100%
Collins Park	102	0	100%
Miller Lake	104	1	99.0%
Bomont	103	0	100%
TOTAL	3505	4	
Absent (A)	3501		99.89%
Present (P)		4	0.11%

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 raw lake water and water from contributing streams for approximately 40 chemical parameters.
- 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.

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.





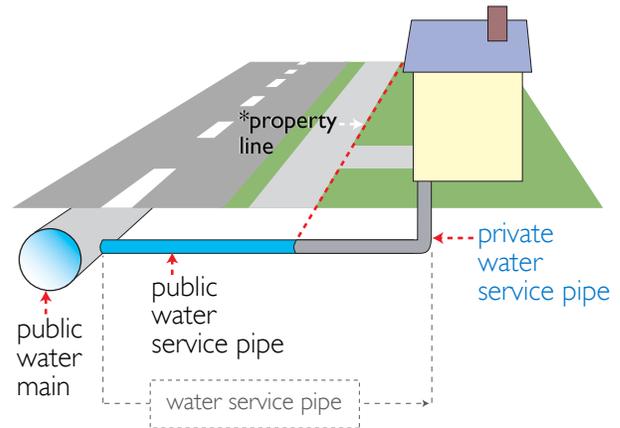
Get The Lead Out

As a result of recent research, proposed changes to regulations in North America, as well as the tragic events that occurred in Flint Michigan in 2015, reducing lead concentrations at the tap has become a focus area for water utilities around the globe.

Halifax Water has been removing lead service lines throughout the Halifax Regional Municipality since the 1970's. Halifax Water is continually researching ways to minimize lead in drinking water and in 2010, began working with Dalhousie University to further understand how lead can occur.

Water in the distribution system is lead-free. However, if the water service line between the water main and the customer's house is comprised of lead, contains tin solder and/or brass fixtures, lead can be released into the water through a process known as galvanic corrosion.

Between September 2015 and April 2016, Halifax Water made improvements to its corrosion control treatment program at the water supply plants. These improvements resulted in a 30% reduction in lead measured in a sample set of homes with known lead service lines.



Research with Dalhousie University showed that replacing only a portion of the lead service line could result in increased lead exposure, post-replacement. As a result, Halifax Water promotes the replacement of both the private and public portions at the same time.

Due to the increasing awareness of the hazards associated with lead in drinking water, Halifax Water is seeing increasing customer interest in replacing lead service lines. In September 2016, the Halifax Water Board approved a new program designed to reduce lead at the tap including removing all lead service lines. The program was built around recommendations of the National Drinking Water Advisory Council (NDWAC) which provides guidance to the Environmental Protection Agency in the United States.

The main pillars of Halifax Water's plan are as follows:

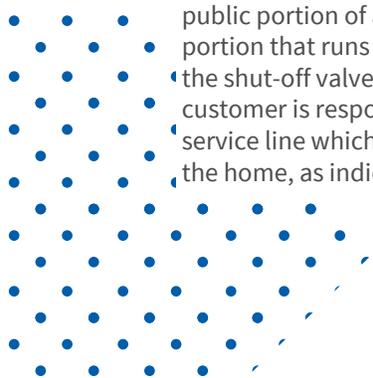
1. Remove Lead from the System
2. Communicate with Customers
3. Create an Inventory of Lead Services
4. Corrosion Control and Water Quality Monitoring
5. Customer Sampling

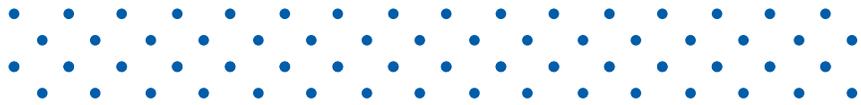
Go to the Halifax Water website for more information on [our lead programs](#), or email lead@halifaxwater.ca.

- While Halifax Water continues to do research to
- optimize corrosion control, the most effective
- means of reducing lead at the tap is to remove all
- lead components from the system.

Who's responsible for what?

Getting the lead out is a shared responsibility between Halifax Water and homeowners connected to the system. Halifax Water is responsible for the public portion of a lead service line, that is, the portion that runs from the watermain in the street to the shut-off valve near the property line. The customer is responsible for the private portion of the service line which runs from the property line into the home, as indicated on the sketch.





Energy Efficiency

With hundreds of electrical accounts, at least a dozen heating oil accounts and a handful of natural gas accounts, Halifax Water is committed to energy management as a key component of its operations.

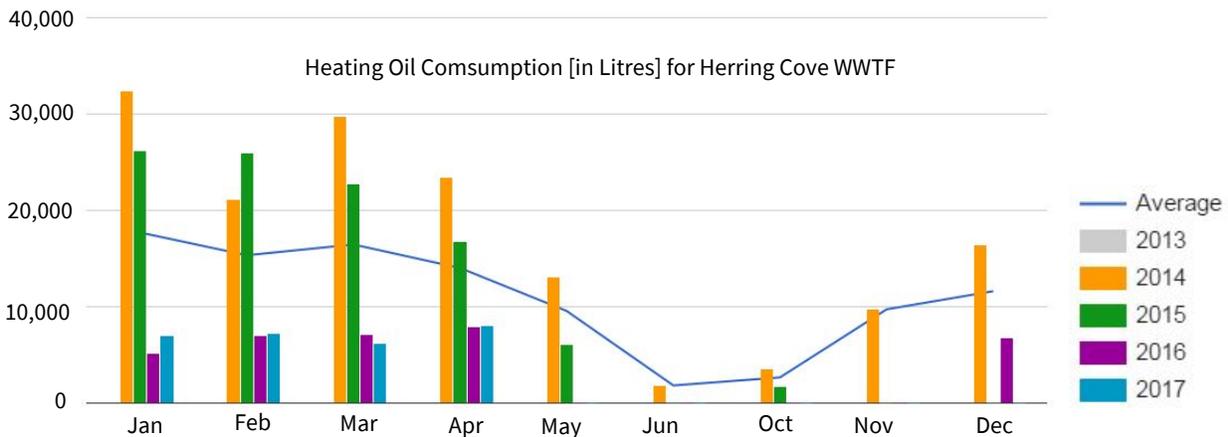
Energy is Halifax Water’s second largest expense and grows each year as the cost of energy goes up and our collection and distribution systems expand.

Without understanding and monitoring our energy use, there would be no way to understand how and where energy is used and what can be done to improve our energy efficiency. In order to accomplish this task, the Energy Management Team has developed an Energy Management Information System [EMIS] that monitors, tracks, and reports on our energy use.

including the Aerotech WWTF Upgrade, Herring Cove Pumping Station upgrades, and the Goudey Drive (Halifax Airport) pumping station upgrade project.

Overall results for 2016/17 were very good, with an overall annual energy reduction of 5.8%, an aggregate reduction in water and wastewater flows of 6.1%, and a reduction in GHG emissions of 6.2%. A focus on further energy efficiency and operational improvements to existing infrastructure and completing energy audits in the rest of our facilities in the coming years will allow Halifax Water to continue to build on these results.

Halifax Water is also keen on harnessing energy within the water cycle. Although the Cogswell



- EMIS stores information from our invoices and presents it in user friendly formats for all Halifax Water employees to see and understand. In its first year alone, EMIS contributed to over \$50,000/year of savings without any capital investment.

- In 2016/17 EMIS added additional monitoring of potable water consumption data for all of Halifax Water’s facilities as well as water and wastewater treatment flow data for the larger facilities. This will improve the accuracy of data for each facility, and provide better benchmarking of similar facilities against each other.

Also, a continued focus on early stage involvement in infrastructure projects has brought a focus on energy efficiency and sustainability at the design stage. This has resulted in efficiency improvements implemented during construction of new projects,

Redevelopment Project is still in the early design stages, the opportunity exists to have the Interchange redevelopment lands tied into a district energy system (DES).

Results of a preliminary analysis show a positive business case for Halifax Water to harness heat from the nearby sewage treatment plant to create enough energy to heat and cool whatever goes up near the Cogswell Street Interchange – residential and business units alike. Endorsement by Regional Council for district energy was provided in October 2016. Next steps include further business case analysis, preliminary and detailed designs for the linear infrastructure, energy centre, energy transfer stations, and the development of the required buildings.



Wastewater Treatment Facility Compliance

Wastewater treatment facilities in Nova Scotia are regulated by Nova Scotia (NS) Environment. They set effluent discharge limits for all wastewater facilities. The limits define maximum concentrations of parameters such as Carbonaceous Biochemical Oxygen Demand (CBOD), Total Suspended Solids (TSS), and Fecal Coliform. For some facilities, parameters such as nitrogen and phosphorus or pH are also regulated.

- Since 2007, when Halifax Water accepted the responsibility of the municipal wastewater facilities from the Municipality, as well as the Halifax Harbour Solutions Project facilities in 2010, treatment processes have been continually optimized and upgraded.

In 2016-17 the small Belmont wastewater pumping station was decommissioned and sewage directed

to the Eastern Passage facility, which was upgraded to secondary treatment in 2014. In the spring of 2017 the Ultraviolet system at the Mill Cove facility was upgraded and it is anticipated this will address compliance issues with E.coli. A major upgrade to the Aerotech wastewater treatment facility is in progress which will improve capacity and performance.

All of Halifax Water's wastewater treatment facilities will meet the Wastewater System Effluent Regulations (WSER) set by the federal government, effective January 1, 2015.

Performance assessments for the 5 larger wastewater facilities are based upon monthly averages. Results for April 2016 to March 2017 are presented below:

Wastewater Treatment Facility Compliance Summary															
April 2016 to March 2017															
WWTF	Apr-16					May-16					Jun-16				
	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	24	16	N/A	7	YES	28	17	2,777	7	YES	25	15	3,066	7	YES
Herring Cove	14	14	N/A	7	N/A	26	20	216	7	YES	21	17	108	7	N/A
Dartmouth	33	43	N/A	7	YES	18	9	175	7	YES	26	20	398	7	YES
Eastern Passage	8	7	N/A	8	N/A	10	7	13	7	YES	7	3	18	7	N/A
Mill Cove	12	14	92	6.5	N/A	12	12	116	6.5	N/A	9	12	119	6.4	YES
Jul-16															
Halifax	30	16	2,231	7	YES	29	11	2,228	7	YES	35	13	2,914	7	YES
Herring Cove	28	19	70	7	N/A	28	17	115	7	YES	28	16	281	7	N/A
Dartmouth	23	8	808	7	NO	42	12	1,066	7	NO	45	17	1,216	7	YES
Eastern Passage	13	16	45	7	N/A	8	8	56	7	NO	7	9	100	7	YES
Mill Cove	11	14	73	6.5	N/A	14	13	1,199	6.6	N/A	10	11	111	6.5	YES
Aug-16															
Halifax	32	11	1,176	7	YES	27	21	1,587	7	YES	24	31	1,783	7	YES
Herring Cove	14	14	87	7	N/A	11	9	10	7	YES	9	11	447	7	N/A
Dartmouth	24	20	283	7	YES	19	14	265	7	YES	18	25	517	7	YES
Eastern Passage	8	12	27	7	YES	6	4	N/A	7	YES	8	12	77	7	N/A
Mill Cove	7	8	163	6.6	N/A	11	12	206	6.6	NO	16	24	1,109	6.6	YES
Sep-16															
Oct-16															
Nov-16															
Dec-16															
Jan-17															
Halifax	31	36	N/A	7	YES	41	14	N/A	7	YES	35	23	N/A	7	YES
Herring Cove	15	20	N/A	8	N/A	22	16	N/A	7	YES	26	24	N/A	7	N/A
Dartmouth	28	30	N/A	7	NO	38	26	N/A	7	YES	35	34	N/A	7	YES
Eastern Passage	8	8	N/A	7	N/A	9	13	N/A	7	N/A	7	7	N/A	7	YES
Mill Cove	11	9	928	6.7	N/A	14	16	170	7.1	N/A	11	13	N/A**	6.9	YES

N/A due to seasonal disinfection
N/A**due to UV Upgrade

Wastewater Treatment Facility Compliance Continued...

Performance assessments for the 10 smaller wastewater facilities are based upon quarterly averages. Results for April 2016 to March 2017 are presented below:

Wastewater Treatment Facility Compliance Summary									
Q1 - April to June 2016									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	5	11	19	0.4	0.13	7.4	N/A	N/A	YES
Belmont	17	19	3,420	N/A	N/A	6.8	N/A	0.15	N/A
Frame	9	11	26	N/A	N/A	6.0	N/A	0.10	N/A
Lakeside-Timberlea	6	21	15	1.9	2	7.0	8.0	0.10	YES
Lockview-MacPherson	5	2	10	0.1	4	7.0	N/A	N/A	N/A
Middle Musquodoboit	17	20	86	N/A	N/A	7.5	N/A	N/A	N/A
North Preston	7	18	10	0.9	0.1	7.5	N/A	N/A	N/A
Springfield	3	1	397	N/A	N/A	7.0	N/A	0.49	NO
Steeves (Wellington)	5	1	10	0.1	0.05	7.6	N/A	N/A	N/A
Uplands Park	19	17	717	N/A	N/A	6.9	N/A	N/A	N/A
Q2 - July to September 2016									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	5	5	11	0.4	0.13	7.5	N/A	N/A	YES
Belmont	13	24	1,842	N/A	N/A	6.8	N/A	0.70	N/A
Frame	8	12	94	N/A	N/A	6.6	N/A	0.10	N/A
Lakeside-Timberlea	6	10	10	2.1	1	7.3	6.3	0.10	YES
Lockview-MacPherson	5	7	36	0.4	1	6.9	N/A	N/A	N/A
Middle Musquodoboit	7	13	86	N/A	N/A	8.0	N/A	N/A	N/A
North Preston	4	2	10	0.6	0.1	7.2	N/A	N/A	N/A
Springfield	3	3	10	N/A	N/A	7.3	N/A	1.12	NO
Steeves (Wellington)	5	1	10	0.1	0.08	7.6	N/A	N/A	N/A
Uplands Park	9	7	18	N/A	N/A	7.2	N/A	N/A	N/A
Q3 - October to December 2016									
WWTF	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	4	3	10	0.2	0.68	7.2	8.8	N/A	YES
Belmont	40	82	2,686	N/A	N/A	7.0	N/A	0.29	N/A
Frame	10	37	256	N/A	N/A	7.2	N/A	0.10	N/A
Lakeside-Timberlea	13	26	20	2.1	7	7.5	7.7	0.14	YES
Lockview-MacPherson	5	10	10	0.6	3	6.7	N/A	N/A	N/A
Middle Musquodoboit	5	6	22	N/A	N/A	7.3	N/A	N/A	N/A
North Preston	5	3	10	0.5	0.2	6.9	N/A	N/A	N/A
Springfield	4	7	36	N/A	N/A	6.5	N/A	N/A	YES
Steeves (Wellington)	5	1	10	0.1	0.1	7.4	N/A	N/A	N/A
Uplands Park	6	4	79	N/A	N/A	7.0	N/A	N/A	N/A



Wastewater Treatment Facility Compliance Continued...

Q4 - January to March 2017									
	CBOD ₅	TSS	E. coli	Phosphorus	Ammonia	pH	Dissolved Oxygen	Chlorine	Toxicity Pass
AeroTech	5	10	15	0.5	6.7	7.4	8.5	N/A	YES
Frame	5	1	29	N/A	N/A	7.7	N/A	N/A	N/A
Lakeside-Timberlea	7	20	25	1.9	7	7.2	8.3	0.13	YES
Lockview-MacPherson	5	5	17	0.2	2	7.9	N/A	N/A	N/A
Middle Musquodoboit	21	13	215	N/A	N/A	7.5	N/A	N/A	N/A
North Preston	5	12	10	0.6	0.2	6.9	N/A	N/A	N/A
Springfield	6	13	74	N/A	N/A	7.6	N/A	N/A	N/A
Steeves (Wellington)	5	11	10	0.4	0.1	7.6	N/A	N/A	N/A
Uplands Park	9	8	296	N/A	N/A	7.3	N/A	N/A	N/A

Definitions:

CBOD₅ – Carbonaceous Biochemical Oxygen Demand – a measure of the amount of organic material
 TSS – Total Suspended Solids – a measure of the amount of particles in the wastewater

Fecal Coliform / E. coli – bacteria which are present in the treated sewage

Phosphorus (phosphate) – a plant nutrient which can impact water bodies

Ammonia – a chemical compound containing nitrogen, another plant nutrient

pH – a measure of the acidity of water

Dissolved Oxygen – the amount of oxygen in the water, essential for fish and other aquatic organisms
 Aluminum – a metal dissolved in water

N/A – Not Applicable

Legend:

Specific parameter limit achieved

Specific parameter limit not achieved



Wet Weather Management

- Like many utilities across North America, Halifax Water’s sanitary sewer system is subject to dramatic flow increases in response to rain and snow-melt events. These wet weather generated flows can lead to sanitary sewer releases, capacity reduction, sewer backups, basement flooding, process upsets, increased operation and maintenance cost, and treatment facility effluent quality issues.

Recognizing the impacts of wet weather generated flows on the system, Halifax Water developed a proactive Wet Weather Management Program (WWMP) to systematically address the negative

impacts of wet weather on the collection system, wastewater treatment processes, and ultimately, the environment.

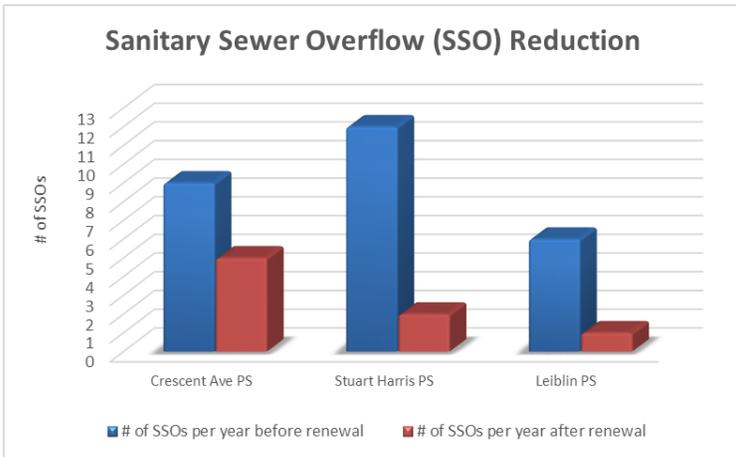
Halifax Water's WWMP is currently running a pilot consisting of five sewershed sites that are actively being monitored. These sites include: two at Crescent Avenue, Stuart Harris Pump Station, Leiblin Drive Pump Station and the North Preston Concrete Sewer.

The sites included in the pilot have each undergone some level of public side rehabilitation and private side compliance.



Wet Weather Management Continued...

While the results are impressive, the really exciting news is the reduction in sanitary sewer overflows as a result of Halifax Water's effort. Three of the pilot areas had pump stations that were frequently overwhelmed during wet weather events. These pilot stations have experienced less than half the frequency of overflow events following rehabilitation as seen in the chart below:

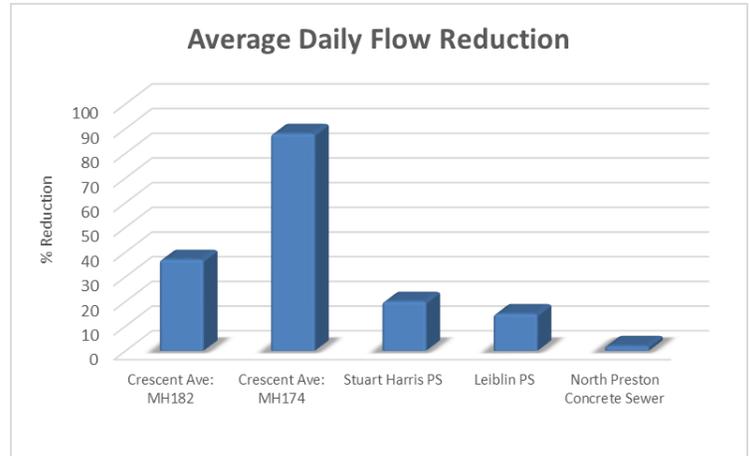


The program continues to expand with plans for a new project that will see the reduction of over 200 liters per second in wet weather generated flow. This is certainly more great news for our environment.



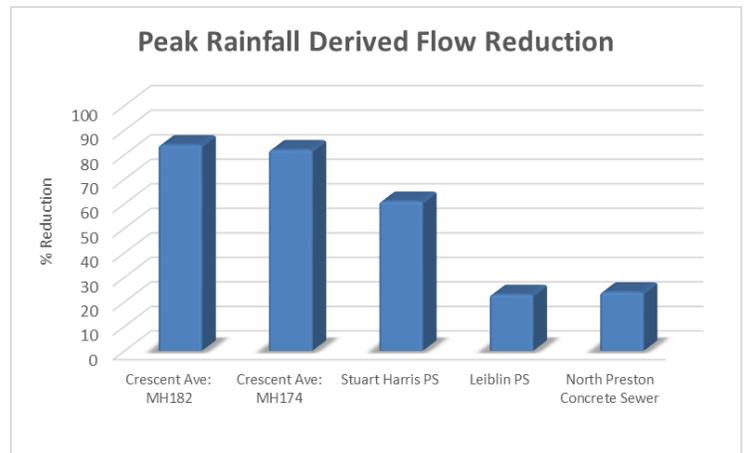
“Halifax Water is recognized as a world leader in water loss control and the corporate goal is to put wet weather management in the same category.”

Carl Yates, General Manager



Site	Total Annual Volume Reduced (m ³)	Peak Flow Reduction (m ³ /day)*
Crescent Ave: MH182	57,670	4,231
Crescent Ave: MH174	60,270	3,147
Stuart Harris PS	6,935	1,798
Leiblin PS	23,561	3,460
North Preston Concrete Sewer	4,696	2,350
Total Reduction	153,132	14,986

*Normalized to a 24-hour 10-year storm return





Toilet Paper

The One and Only Flushable Wipe

There are many products available these days that are marketed as being flushable. But the one and only truly flushable wipe is toilet paper.

“Flushable” wipes aren’t flushable. They may flush down the toilet, but they may not flush all the way out and they don’t break down like toilet paper. They’re clogging sewer systems from coast to coast and costing Canadian ratepayers at least \$250 million a year.

harbour, or your home.

Please help protect water quality, our environment, your property and prevent costly wastewater collection system, pumping station and wastewater treatment facility repairs by not flushing 'flushable' wipes. Only flush toilet paper, the one and only flushable wipe.



Wipes and other debris bubble up in a parking lot



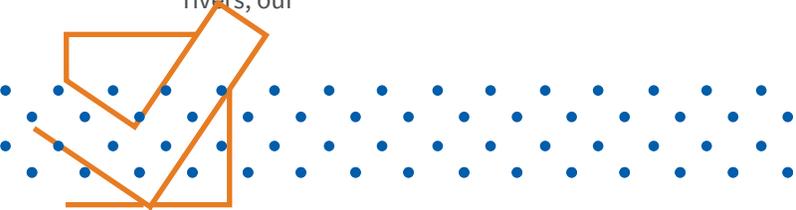
Tangle of wipes, dental floss and other products clog a pumping station

- Halifax Water’s wastewater infrastructure includes
- 14 wastewater treatment facilities, 172 wastewater
- pumping stations and over 2,500KM of sewer pipes.
- So-called “flushable” wipes are creating expensive
- problems for this wastewater infrastructure as they
- were designed to treat human waste and toilet
- paper only.

Wipes don’t decompose. They get caught up in wastewater treatment plant screens and filters, wrap around and clog pump impellers, leading to expensive repairs and replacement, and possible sewage overflows into nearby lakes, rivers, our

“[Toilet paper, The One and Only Flushable Wipe](#)” is one of the video's on Halifax Water's YouTube channel. You can also learn more on the [pollution prevention pages](#) on the Halifax Water website.

Don't flush that wipe, toss it in the garbage.



Aerotech Wastewater Treatment Facility Upgrade and Expansion

The Aerotech Wastewater Treatment Facility (AWWTF) currently utilizes a sequencing batch reactor treatment process, a variant of the activated sludge process to treat wastewater from the Halifax Stanfield International Airport and the Aerotech Industrial Park. The plant is located at the east end of Aerotech Drive and discharges effluent to the adjacent Johnson River that feeds into Soldier and Miller Lakes, which are part of the Shubenacadie River Basin system. The current plant has a rated average daily capacity of 1360 m³/d (cubic meters per day) and maximum daily flows of 2080 m³/d.

Existing and future planned growth around the Halifax Stanfield International Airport (HSIA) and the Aerotech Industrial Park identified the need to double the existing near-term capacity with a long term capacity of about 4 times the existing. In addition to the increased capacity, the upgrade and expansion would be required to meet more stringent effluent objectives identified through a receiving water study.

Project Objectives

Halifax Water's objectives for this upgrade and expansion are to deliver an upgrade that meets the following:

Reliable long-term operation and performance: new processes and process upgrades to meet new enhanced effluent criteria and provide capacity for future design loads, address existing limitations related to operations, maintenance, process equipment and structural deficiencies, process control and monitoring, health and safety and current design codes.

Fully integrated facility: fully integrate existing processes and facilities with new facilities, so that the upgraded Aerotech WWTF will function as a single facility and reduce overall lifecycle costs.



Aerial view of original Aerotech WWTF

Sustainability and environmental protection: incorporate sustainability in the upgrades as appropriate to minimize energy use and greenhouse gas emissions, minimize the use of materials and chemicals, recover resources, reduce biosolids generation and enhance the natural environment.

Respect and protect neighbours and the environment: design and construct the upgrades in a manner that is compatible with the limited access to the site, and ensures continuous operation and performance during the construction period.

Value: develop a final design and construction plan by evaluating capital, operating and life-cycle costs, to obtain the highest value in achieving the project goals.

Solution

An evaluation process was undertaken to compare various options for the plant expansion, including



AWWTF Upgrade and Expansion Continued...

several conventional treatment options along with membrane bioreactor (MBR) technology. MBR was selected as the basis for expansion, and following a competitive bid process, GE Water & Process Technologies was selected to provide 0.04 micron ultrafiltration membrane equipment for the project. A key consideration in the use of MBR technology was the ability to retrofit the existing infrastructure to accommodate the upgrades resulting in a smaller footprint and construction costs that would otherwise be required. In addition, the selection of the MBR process ensured that the effluent quality requirements would be met consistently and reliably.

premium efficiency screw compressors for aeration requirements and associated instrumentation for process control;

- Emergency equalization storage;
- Ultrafiltration membrane filter technology;
- Ultraviolet disinfection;
- Final effluent post aeration;
- Solids dewatering using centrifuge technology; and
- Chemical injection systems for supplemental alkalinity, coagulation, phosphorus removal and supplemental carbon addition to achieve optimal nutrient removal.

Process Overview

The retrofit of the AWWTF from conventional to MBR technology is occurring with the plant staying in operation throughout the construction process. A summary of the proposed major unit processes include:

- New influent pumping station and headworks facility equipped with two-train design consisting of 6-mm perforated plate screens, vortex grit removal and 2-mm perforated fine drum screens;
- Additional bioreactor tank capacity consisting of pre-anoxic, aeration, post-anoxic, featuring

Implementation/ Construction Phase

The project design was completed and construction contract tendered in the fall of 2016 with the contract awarded to LTR Construction. Construction began in late September 2017 and is scheduled to be substantially complete by December 2017. Despite the challenging winter construction period the project is approximately 55% complete and is tracking to meet project schedule and budget. With the completion of the project, this facility will be the large MBR treatment facility in the Maritimes.



Construction underway on capacity expansion and treatment level upgrade

Environmental Management Systems

An Environmental Management System (EMS) is a program comprised of procedures, records and processes designed to manage environmental impacts. The EMS program, for any organization, can be audited against the International Standards Organization (ISO), and if found to comply, receives a certification.

Halifax Water is audited against the ISO 14000 family of standards for environmental management. In December 2016, after a two year journey, the Herring Cove Wastewater Facility became the first wastewater facility in Atlantic Canada to obtain an ISO 14001 Certification.

The ISO standard has recently changed from a 2004 version to a 2015 version and staff at Halifax Water have commenced the process to adjust the existing EMS programs for the Pockwock, Lake Major and Bennery Water Treatment Facilities, as well as the Herring Cove Wastewater Treatment Facility.



Water Loss Control

In 1999, Halifax Water became the first utility in North America to adopt a new methodology for reducing non-revenue water, that is, water produced that does not find its way to the customer.

Contrary to popular belief, most water lost to leakage is not lost in the large water main breaks that make the nightly news. This is because these leaks are shut off quickly once they occur. Most leaks start out as very small flows that can run for days, weeks and even years if no one is actively looking for them.

With 1500 km of water mains, finding leaks is an on-going challenge. To combat this issue, Halifax Water has divided its system into 75 district





Water Loss Control Continued...

metered areas (DMA's). By analyzing the flow of water into a DMA between 3 and 4 am in the morning, when flow is at its lowest, Halifax Water can quickly determine if any one DMA may have a leak. Crews then check the DMA with sophisticated acoustic leak detection equipment to pinpoint the leak.

Halifax Water is one of only two utilities in North America who have 100% of its system organized into

DMA's. By using DMA's, Halifax Water can repair most of its leaks when they are small and before they grow into larger leaks that can cause disruption of service and property damage.

Halifax Water is also working to prevent water main breaks by managing pressure in the water distribution system. Water main breaks can often be caused by sudden pressure increases in the system. These increases can be caused by large customer use or Halifax Water activity. By analyzing each water main break we can develop preventative measures to reduce water main breaks.



Water Research Programs

Halifax Water is proud and excited to announce that our partnership with Dr. Graham Gagnon at Dalhousie University has been extended for another five years.

The partnership with Dr. Gagnon, a renowned researcher in the North American drinking water industry, began through the NSERC/Halifax Water Industrial Research Chair in Water Quality and Treatment in 2007 and has helped keep Halifax Water on the leading edge of water quality science.

Not only does this partnership benefit the numerous post-doctoral, PhD and Masters students studying with Dr. Gagnon, it provides Halifax Water with an opportunity and access to research that has direct value to the operation of the utility.

Research from the Chair program has resulted in over:

- 110 research papers presented at conferences
- 50 journal articles published
- 1100 citations of these papers.

This research helps keep Halifax Water at the forefront in the development of best practices, and proactive in planning for upcoming regulatory changes. It also helps our customers save money in the long run and ensures the adoption of cost effective practices that protect public health.

This past year saw the majority of research focused on changes in source water quality, including further research into geosmin as well as continuing work in the water distribution system investigating corrosion inhibitors for lead.



On-going research at Pockwock Pilot Plant

Research direction over the next five years will be focused on four themes:

1. source water quality changes;
2. optimization of treatment processes;
3. improved distribution system water quality;
4. integration of data management processes.



Stormwater Billing

The Nova Scotia Utility and Review Board (NSUARB) exercises general supervision over all water utilities operating as public utilities within the Province. This authority includes the setting of rates. In 2013, the NSUARB approved a distinct rate structure for stormwater services offered through Halifax Water.

During this approval process, the rate structure was changed from a combined wastewater/stormwater charge to a separated charge - one for stormwater and one for wastewater. This separated charge allows for a more equitable user pay system.



Maintaining the stormwater system to help protect the environment and property

Based on the concept of tiering, 88% of Halifax Water customers will see a decrease in their Site Generated Flow Charge.

2. New Definition of Service

Properties that have a driveway culvert will be deemed to be receiving stormwater service and will be charged in accordance with the Halifax Water Rules and Regulations. Some complex properties such as pits, quarries and refineries which were previously exempt, are now included in billable impervious area.

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The new rates and credit program came into effect July 1st, 2017.

- In April 2016 the NSUARB approved a revised rate redesign for stormwater billing to incorporate industry best practice and reflect customer feedback since 2013. The rate redesign included three concepts:

1. Tiering

- The concept of tiering is based on a *Site Related Flow Charge* where residential customers would be placed in 1 of 5 tiers based on their impervious area.
- Impervious areas, such as roofs, asphalt, concrete, and packed gravel do not allow stormwater to seep back into the ground and therefore must be dealt with by Halifax Water's stormwater system. The more water-resistant areas you have, the more stormwater charge you will pay.

Stormwater tier rates for residential properties

(old annual rate \$33.39)

Tier Parameters (Impervious area in square meters)	New Annual Charge	# of Customers Affected
Tier 1 - Less than 50m ²	\$0.00	2,326
Tier 2 - 50 to 200m ²	\$14.00	44,710
Tier 3 - 210 to 400m ²	\$27.00	31,041
Tier 4 - 410 to 800m ²	\$54.00	7,768
Tier 5 - Greater than 810m ²	\$81.00	2,123



Seasonal Disinfection

The final stage of wastewater treatment involves disinfecting wastewater by ultra violet (UV) lights. The UV disinfection process kills bacteria before the effluent is released into the harbour. Seasonal disinfection means UV disinfection would continue during the spring, summer and fall months (May to October), but not during the winter months (November to April). All other treatment processes continue to operate year round, including the screening of floatables.

Halifax Water implemented its first successful seasonal disinfection pilot program in 2016 from March 1st to April 30th. During this pilot Halifax Harbour water quality remained within safe swimming limits, with the exception of four samples.

With the success of the initial program, Halifax Water was granted approval by Nova Scotia Environment to undertake a second seasonal disinfection pilot program.



Families enjoy Dingle Beach

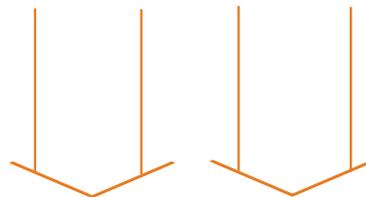
This second pilot program saw the UV disinfection systems shutdown at the Halifax, Dartmouth, Herring Cove and Eastern Passage wastewater treatment facilities (WWTFs). The second pilot ran from November 7th, 2016 to April 30th, 2017. The UV systems were turned on December 19th, 2016 until January 2nd, 2017 to accommodate annual Polar Bear swims. Again, full screening of floatables and all other treatment processes continued to operate year round.

Halifax Water monitored bacteria levels at selected sites around Halifax Harbour for the duration of both pilots. However, for the second pilot, the sampling program was enhanced and went from monthly sampling to bi-weekly sampling, with excellent results.

Halifax Water will be seeking permanent changes to the "Approval to Operate" Halifax, Dartmouth, Herring Cove and Eastern Passage wastewater treatment facilities from Nova Scotia Environment, to implement a full Seasonal Disinfection Program.

There are a number of reasons to implement a full Seasonal Disinfection Program. In addition to extending the useful life of the UV equipment, there are significant reductions in electricity usage, reductions in greenhouse gas emissions, significant cost savings and improved safety during maintenance activities.

By simply shutting off the UV disinfection system during the winter months alone (November to April) it is estimated:



1. total greenhouse gas reductions would be **1,100 Tonnes per year** - equivalent to getting 234 vehicles off the road.
2. total energy saved would be **1,572,000 kWh per year** - equivalent to the annual usage of approximately 157 average NS households/year
3. the total cost savings would be **\$148,000.00 annually**

Visit the Halifax Water website for more information on [Seasonal Disinfection](#).



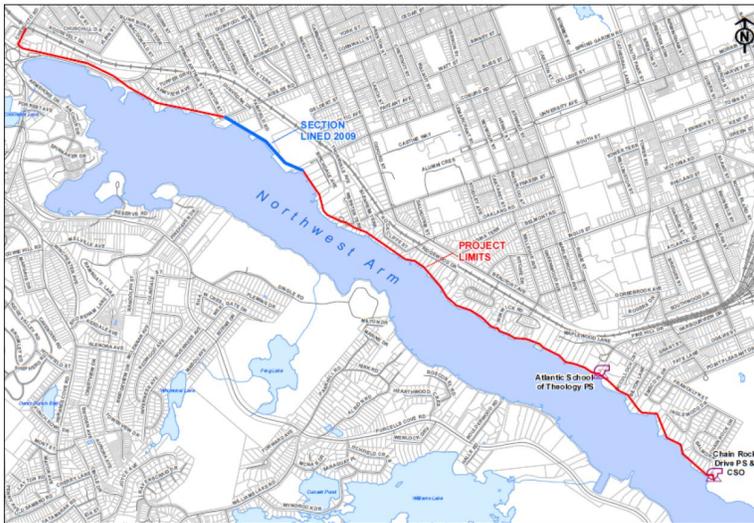
Northwest Arm Trunk Sewer Project Overview

The Northwest Arm is a valuable recreational, economic and quality of life asset for our community. The sewer infrastructure located within the Northwest Arm easement is over 100 years old and in need of significant rehabilitation.

To help protect this community asset, Halifax Water is carrying out an [Underground Overhaul](#) to rehabilitate the Northwest Arm sewer infrastructure. The Underground Overhaul project will extend the life of 4.1km of critical wastewater/stormwater infrastructure for up to 75 years and improve the water quality of Northwest Arm. Construction got underway in late June 2017.



Cleaning the sewer prior to lining process



The sections of sewer being upgraded run from the foot of Chebucto Road to Jubilee Road, and from Coburg Road to Chain Rock Drive. A section between Jubilee Road and Coburg Road was upgraded in 2009, as a pilot to ensure success.

The project is being funded through the Clean Water and Wastewater Fund (CWWF). The Province of Nova Scotia and Halifax Water are each contributing \$4,085,927 while the federal government contributes \$8,171,854. The project must be completed by March 2018 in order to secure the CWWF funding.

Even though the sewer infrastructure is located within Halifax Water's easement, some areas are difficult to access and it may be necessary for crews to enter private property. As such, Halifax Water has been working to keep residents in the construction zone informed about this major project.

Community outreach began months in advance with a community meeting November 30th, 2016. Since then, numerous information pieces have been delivered to the community; a [project specific website](#) was created; and a second community meeting took place June 15th, 2017, prior to work getting underway.

- In order to minimize the impact of this project on residents and their properties, Halifax Water is using the latest in trenchless technology - cured-in-place pipe (CIPP). CIPP provides a jointless, seamless, pipe-within-a-pipe using a durable resin insert, with little to no digging needed.
- The project takes place in stages:
 - **Stage 1:** cleaning and removing debris from the existing sewer
 - **Stage 2:** lining the existing sewer with a new CIPP
 - **Stage 3:** restoring the work zone.



Sullivan's Pond

Storm Sewer Renewal Project Overview

The Sullivan's Pond stormwater system conveys stormwater from Lake Banook/Sullivan's Pond, and the upstream watershed, to Halifax Harbour. In 1971 Hurricane Beth flooded most of downtown Dartmouth. In order to help reduce future flooding events and protect public and private property, in 1972 the current stormwater system was constructed from Sullivan's Pond to the Harbour. This stormwater system is now, essentially, at the end of its service life.

In spring 2017 a final design was completed, a public tender released, further community consultation took place and Dexter Construction was awarded construction of Phase 1.

Phase 1 of construction got underway in late July and will replace 290 metres of deteriorated storm sewer from Sullivan's Pond to approximately Irishtown Rd.

Two permanent sections of engineered open channel are included in Phase 1, allowing the public to view open water; approximately 40 metres at the outlet of Sullivan's Pond and approximately 60 metres on the south side of Ochterloney St.

The [Sullivan's Pond Storm Sewer Renewal Project](#) is budgeted at just over \$11.6 million, with \$6.3 million coming from federal/provincial funding, if the project is completed by March 2018.

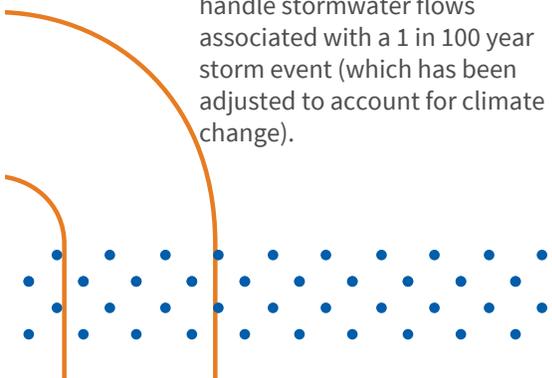


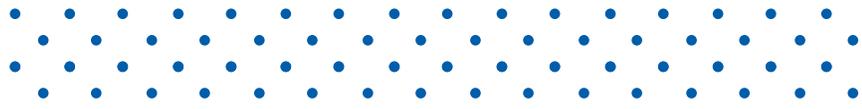
Existing deteriorated pipe

Following extensive consultation with the Department of Fisheries and Oceans, as well as feedback from the community, in 2015 a pre-design report was completed. The report recommended a system of engineered open channels to provide for mandated fish passage, while still providing a stormwater system designed to handle stormwater flows associated with a 1 in 100 year storm event (which has been adjusted to account for climate change).



Phase 1 design featuring engineered open channels for fish passage





Mill Cove Wastewater Treatment Facility Upgrades

The Mill Cove Wastewater Treatment Facility (WWTF) has been operating in the community since 1969. For nearly 50 years Mill Cove staff has prided themselves on running a well maintained facility, being a good neighbor, and helping to improve the water quality of the Bedford Basin and Halifax harbour.

In order to keep the facility operating at peak performance, Halifax Water has invested over \$5,000,000 to enhance the short and long term operation of the Mill Cove WWTF.

Enhancements

Odour Control System

Odour control is key to the successful operation of any wastewater treatment facility located within a community. Significant improvements in overall odour reduction at Mill Cove were achieved with the installation of a new odour control system, as well as enhancements to the existing odour system, in an area of the facility known as the Clarifiers.



New UV System improves disinfection and saves energy



South primary air scrubber

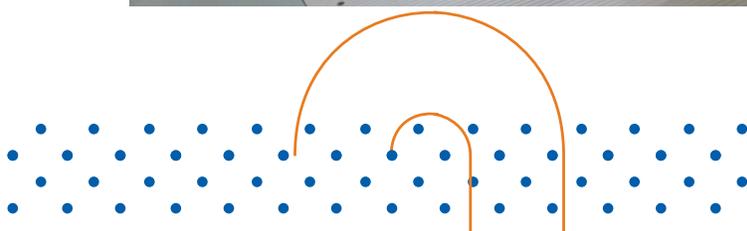
Wastewater Pumping Station Upgrade

The Mill Cove/Bedford wastewater pumping station, which is located within the Mill Cove WWTF compound, required upgrades to its electrical and mechanical systems located inside the building.

These upgrades helped improve the reliability and capacity of the pumping station and reduces the number of unscreened wastewater overflows that occur in high rainfall events.

Ultra Violet Disinfection System

The ultra violet (UV) Disinfection System that reduces bacteria in the incoming wastewater before the treated wastewater is discharged to the Bedford Basin was two decades old and due for replacement. The new system provides improved disinfection of the wastewater being released into Bedford Basin and significantly reduces electrical consumption through the use of more energy efficient UV lamp technology.



Lake Major

A Community Works Together to Support Mandatory Water Consumption Restrictions

The summer of 2016 saw prolonged hot, dry weather across the Halifax Regional Municipality and Nova Scotia. This drought resulted in wells drying up across the province, and historic low water levels in Lake Major. Lake Major serves the communities of Dartmouth, Cole Harbour, Westphal, North Preston and Eastern Passage.

In order to conserve water, on September 19, 2016 Halifax Water instituted mandatory water conservation measures for all residents and businesses supplied by the Lake Major Water Treatment Plant. This was the first such water use restriction the utility has ever had to implement. The water conservation measures included:

- no lawn, garden or plant watering
- no pool filling or other outside water usage
- no car/RV or other vehicle washing at home.

The water restrictions were implemented to maintain essential water service for all customers in the Lake Major service area and to help avoid a potentially serious situation involving future water outages.



Customers served by Lake Major responded to the call to conserve right away conserving approximately 3million litres/day during the water restriction period.

Following a number of rain events, including 68mm on October 22nd, water levels at Lake Major were restored to sustainable seasonal levels and the water use restrictions were lifted on October 24th.

Halifax Water thanks all customers for their community minded effort to conserve water and maintain critical water supplies to everyone served by Lake Major.

You can find [tips on how to conserve water](#) on the Halifax Water website. You can also find out [where your water comes from](#).





FAT OIL & GREASE

Fats, oil and grease (FOG) are a by-product of food preparation. We are all familiar with the grease that comes from bacon, cooking oils and meats, but it can also be found in creamy sauces, mayonnaise and garvies.

FOG discharged to your plumbing system may clog sewers, causing sewage overflows into the environment and may be harmful to our harbour, lakes and aquatic life.

Blockages in your sewer may cause raw sewage to discharge onto your property, your neighbour's property or into your home or business. This can be a serious health hazard and may be a very costly problem.

Never pour grease down the sink, drains or toilets.

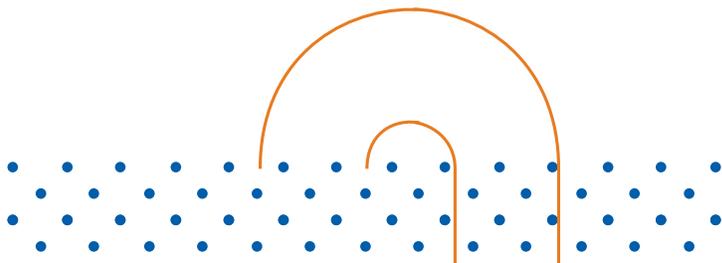
Scrape grease and food scraps off your plates, utensils, pots, pans, food preparation & cooking areas and place them in your green bin or compost pile.

Learn how to [Bacon Responsibly](#)



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