Halifax Water

2015/16

STEWARDSHIP REPORT

www.HalifaxWater.ca

FRONT COVER:
Pockwock Wind Turbine Farm

In This Issue

A Message from the General Manager

April 1, 2016 marks the 20th anniversary for Halifax Water as a regional utility following the transfer of water assets from Dartmouth and the County of Halifax to Halifax Water on April 1, 1996. Much has been accomplished over the last 20 years including the construction of a new treatment plant at Lake Major in 1999 to serve residents of the greater Dartmouth area. Coincident with this milestone, Halifax Water adopted an international best practice to stem leakage in the distribution systems of the utility to become a world leader in water loss control. Since adoption of the best practice in 1999, Halifax Water has recovered over 40 million litres per day in leakage, indicative of its social, environmental and fiscal stewardship. With this stewardship track record in mind, Halifax Regional Council gave the utility more responsibility in 2007 with the transfer of wastewater and stormwater assets from the Municipality to Halifax Water. Since 2007, Halifax Water has completed several strategic initiatives to ensure a sustainable approach to service delivery. This approach is well documented in the utilty's 30 year integrated resource plan, five year business plan [2015/16 to 2019/20] and 2016/17 annual business plan, all of which are available on our website at www.halifaxwater.ca. With these three guiding documents completed under the direction of the Halifax Water Board, we are well positioned to deliver water, wastewater and stormwater services in a socially responsible, cost effective and environmentally sound manner. Central to these business plans was the recognition that significant investment is necessary to upgrade aging wastewater infrastructure and conform to new federal wastewater regulations. To that end, after the intial $330 million was invested in the Harbour Solutions project, an additional $61 million was spent to upgrade the Eastern Passage wastewater facility, and this year approximately $21 million is earmarked for an upgrade to the Aerotech wastewater facility serving the Halifax Stanfield International Airport. The Aerotech project is being supported by $14 million of federal and provincial funding as part of the Canada Building Fund. We are also pleased to report that further funding of $31 million for infrastructure upgrades has recently been approved through the federal/ provincial Clean Water and Wastewater Fund. These programs serve our society well as they fund vital infrastructure to support the health and economic well-being of our communities, including local job creation.

This report also highlights many other capital and operational improvements being carried out by the utility, including seasonal disinfection of wastewater, our progressive lead service replacement, wet weather management, and energy efficiency programs. Halifax Water will continue to take a long term view to ensure sustainability for delivery of water, wastewater and stormwater services. We appreciate the good will and support of our customers as we pursue our mission "to provide world class services for our customers and our environment".

Please feel free to contact our office on any aspect of our service delivery through our website, direct email, or telephone and we will be sure to respond in a timely and professional manner.

Yours in service,

Carl Yates

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

Drinking Water Quality

Providing our customers with safe, 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. For example, two new modern membrane treatment plants were commissioned in Collins Park and Middle Musquodoboit. These new plantswere built in response to Nova Scotia Environment's drinking water strategy.

In order to ensure quality control is optimized, we maintain International Organization for Standardization (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 in suburban/rural areas of the municipality.

Approximately 3,600 tests for total coliform bacteria are conducted each year. Results of 99.9% of samples with bacteria absent are consistently achieved, as shown in the table to the right:

Drinking Water Compliance Summary

Total Coliform Sample Results

	April 2015 to March 2016	
Systems	**% Absent**	**# of Samples**
HFX/Pockwock	99.5%	1009
HFX/Pockwock Central	99.7%	592
Lake Major	99.9%	1197
Bennery	100.0%	157
Five Islands	100.0%	105
Silver Sands	99.0%	105
Middle Musquodoboit	98.1%	106
Collins Park	100.0%	104
Miller Lake	100.0%	105
Bomont*	100.0%	104
Totals		3584
Absent		3573
Present		11
All Sites - % Absent		99.7%
*from January 1st onwards		

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.
- Quarterly sampling of treated water at 2-3 locations within the distribution system for approximately 40 chemical 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 advance, in the unlikely event of a disruption in water quality.

Nothing if not global

Few challenges are more global than water. Rivers and lakes cross national boundries while oceans are shared resources. Droughts, floods and climate change cut across continents.

ISO provides global tools to help us manage our shared water resources equitably and durably - which are not only crucial for our quality of life, but vital for our very survival.

Get The Lead Out

The events in Flint Michigan that resulted in excessive corrosion and subsequent lead exposure of residents, have reinforced the importance of having an effective corrosion control program. Halifax Water manages lead exposure in several ways and is continually evaluating its program to ensure it meets best practices, minimizes corrosion and works towards getting all lead out of the system.

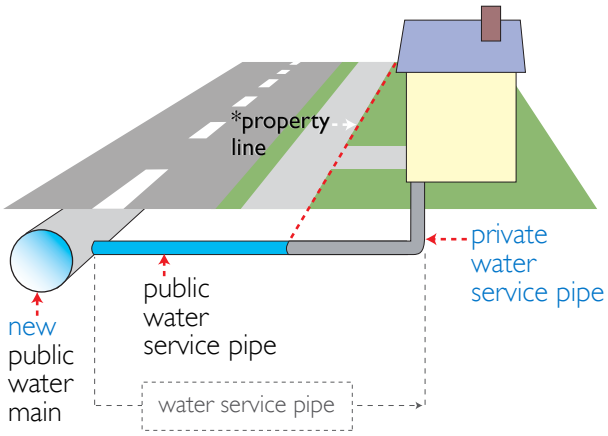
Water in the distribution system is lead-free, but lead can be picked up in the service line between the main and the customer's house, and within the house itself. Houses built prior to 1960 may have a lead service line, and any soldering done prior to the 1980's could contain lead/tin solder.

In 2015, Halifax Water conducted a best practice review of its corrosion control program. Results of the review recommended that Halifax Water change the corrosion inhibitor that was being used to one which would provide greater corrosion control without negatively impacting cost.

In order to monitor the effectiveness of this change, a new Residential Corrosion Control Research Program has been initiated. The new Residential Corrosion Control Research Program involves monitoring lead concentrations in customers' homes that have lead service lines. Forty homes with lead service lines have been identified to be a part of the program. Tests will be conducted on a bimonthly basis for a period of one year and began in April 2016.

Getting the lead out to provide high quality water.

Getting the lead out of the distribution system is the responsibility of both Halifax Water and the homeowner. Halifax Water is responsible for the public portion of a lead service line while the customer is responsible for the private portion, as indicated on the sketch below. Research with Dalhousie University showed that replacing only a portion of the lead service line could lead to increased lead exposure post-replacement, so Halifax Water will promote the replacement of the public portion in conjunction with the homeowner replacement of the private portion.



Halifax Water will also replace the public portion of lead service lines if there is water main maintenance or repair in an area with lead service lines which makes replacement of the service unavoidable. When this occurs, significant effort is made to educate homeowners on the benefits of replacing the private portion of their service line at the same time.

Halifax Water is currently reviewing the lead service line replacement program to ensure that resources are allocated in a way to minimize risks while getting lead out of the system. For more information on our programs, visit our website or email lead@halifaxwater.ca.

Wastewater Flow Monitoring

Wastewater systems are prone to wet weather influences. Combined sewer systems by definition convey both sanitary and surface stormwater; sanitary sewers are intended to convey only sanitary flows. However, sanitary systems are often subjected to extraneous flows due to inflow and infiltration.

Measuring flows to better manage the wastewater system.

Inflow is when surface water (resulting from rain) enters the wastewater system through a direct connection. Sources include a variety of improperly connected drains (roof, foundation, driveway), downspouts, sump pumps, even catchbasins.

Infiltration is groundwater that enters the wastewater system through gaps in the infrastructure. These gaps may be the result of age based deterioration, joints without gaskets, poor design, poor installation, tree roots, or damage.

Inflow and infiltration (I&I) contributions create excessive flows in the system during wet weather. These can result in wastewater releases to the environment (pump station overflows, surcharging manholes, combined sewer overflows, and by-passing of wastewater treatment facilities).

Understanding wastewater flows is vital to understanding overall wastewater system performance, compliance to regulations, and system constraints that may impact capacity. Halifax Water has initiated a corporate flow monitoring program aimed at enhancing system knowledge through overflow monitoring, permanent flow monitoring, and temporary or short-term flow monitoring.

Overflow Monitoring

Driven by federal regulatory requirements, Halifax Water needs to report any instance of overflows from the combined system. Combined sewer overflows (CSOs) are reported using elevations, weir calculations and modelling where practical to identify volume and frequency of wastewater releases. Given the impact to freshwater, sanitary sewer overflows (SSOs) are a priority for Halifax Water. In 2014, SSOs were also monitored for discharges to establish a baseline and enable monitoring of changes over time.

Permanent Flow Monitoring

Halifax Water has created strategic flow metering zones (FMZs) throughout the wastewater system. In a staged approach over a few years, Halifax Water intends to install permanent flow meters to allow long-term monitoring of the network. The FMZs will be instrumental in gathering data that can then be used to support corporate and programs including sewer system hydraulic modelling, wet weather management, long-term planning, system capacity analysis, and sewershed environmental risk prioritization.

Temporary or Short-term Monitoring

In the event a greater level of detail is required to address specific flow concerns, Halifax Water may install temporary or short-term meters. This type of temporary or short-term monitoring may be needed in order to conduct a more targeted investigation into the source of extraneous flows in a particularly troublesome zone. Temporary or short-term meters are also used in some areas to help quantify the impact of I&I reduction projects. In addition to providing data for the corporate flow monitoring program, operational groups also use meters to determine how the system is responding to rainfall events and how quickly that response comes. Where sources originate on private property, Halifax Water will investigate further.

Wastewater flow monitoring enables Halifax Water to identify the sources of I&I entering the system and then develop plans to address these sources or manage the flows. Program emphasis for the 2014/15 fiscal year was for Halifax Water to develop the corporate flow monitoring program needs. In advancing the program, Halifax Water issued Request for Proposals for data collection and analysis in 2016. Using a phased approach, the first round of meters will be installed for both the FMZs and the wet weather program

Operational needs for the I&I Program will continue with in-house meter installations to confirm response to rainfall in the wastewater system.

No Wipes in Your Pipes

So-called "flushable" wipes are creating expensive problems for wastewater treatments plants and collection systems across Canada.

"Flushable" wipes aren't flushable.

They're clogging sewer systems from coast to coast and costing Canadian ratepayers at least $250 million a year.

Some paper products and wipes are advertised as 'flushable' but they aren't. They may flush down, but they may not flush all the way out. This can lead to expensive plumbing and clean up bills for you if you have a sewer back up and additional costs for Halifax Water once that wipe reaches the public system.

Sewer backup onto the street. A potential public and environmental health risk.

Wipes don't decompose. They get caught up in wastewater treatment plant screens and filters, and wrap around pumps, leading to expensive repairs and replacement, and possible sewage overflows into your home or nearby lakes, rivers and our harbour.

Sewer backup into the home. A costly and potentially dangerous situation.

Wipes are creating serious problems as they work their way through Halifax Water's sewage systems on their way to treatment plants.

Please help protect water quality, our environment, your property and prevent costly wastewater collection system and treatment plant repairs by not flushing 'flushable' wipes.

Your toilet is not a garbage can. Don't flush that wipe, toss it in the garbage.

What should people NOT be flushing down their toilets or sinks?

- cigarette butts
- tampons
- tampon applicators
- sanitary napkins
- condoms
- cotton swabs
- dental floss
- bandaids
- so-called flushables including baby wipes, disinfectant wipes etc.

Energy Efficiency

Energy use in municipal water and wastewater/stormwater treatment facilities 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 foot print.

- The Energy Management Plan was updated to identify specific annual energy reduction targets and activities to be completed in 2016/17.
- A number of energy reduction opportunities have or will be implemented during the 2015/16 fiscal year, while others will be explored in further detail in the coming months and years depending on the technical and financial feasibility of each opportunity.
- A utility wide Energy Management Information System was launched in 2015/16, accurately capturing all of Halifax Water's energy data in one accessible location. With this tool, employees can research facility energy use data, visualize annual usages, normalize energy usage based on weather data, and measure, verify and track energy savings resulting from capital, process and/or operational improvements.
- Various equipment and infrastructure upgrades were completed in 2015/16, resulting in over 2,700,000 kWhe in annual energy savings. These projects include lighting upgrades, insulation upgrades, HVAC upgrades and retro-commissioning, the installation of odour control by-pass ductwork and variable frequency drives at Halifax, Dartmouth and Herring Cove WWTFs and an innovative ventilation air heat recovery system at the Herring Cove WWTF.
- Development of a third COMFIT renewable energy project has also continued. A feasibility study and preliminary design has been completed for a combined heat and power project at Mill Cove WWTF. Detailed design is expected to be complete in early 2016/17, with construction and commissioning to be completed by Q3 2017/18. Other operational projects include the Pockwock Community Wind Farm, located on Halifax Water lands near the J.D. Kline water supply facility, and the Orchard in-line energy recovery turbine, located in Bedford, NS.
- When appropriate, Halifax Water has also taken advantage of Provincial energy efficiency rebate programs being offered by Efficiency Nova Scotia, which help reduce capital costs and improve project payback.

Overall results for 2015/16 were good, with an overall energy intensity reduction of -2.4%, despite an aggregate increase in water and wastewater flows of +4.2%. A focus on further energy efficiency and operational improvements to existing infrastructure and energy audits in the rest of our facilities 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.

In 2007, Halifax Regional Council transferred responsibility for municipal wastewater facilities to Halifax Water, excluding the new Halifax Harbour Solutions Project facilities, which were later transferred in 2010. Some of the older wastewater facilities – 12 in total – were in need of upgrading and/or over-stressed by the volume of wastewater, and therefore often non-compliant with NS Environment effluent limits.

Since becoming responsible for these facilities, Halifax Water has completely reconstructed the Wellington Wastewater Treatment Facility, and has completed a $61 million expansion and upgrade to the Eastern Passage Facility. The wastewater collection systems for two treatment facilities – Wellington and Frame – were both completely replaced, resulting in significant improvements to the performance of both treatment facilities. Also, the treatment processes at several other facilities have been significantly improved through optimization efforts on the part of Halifax Water staff.

In 2013, the federal government published the Wastewater System Effluent Regulations (WSER). These regulations set national minimum standards for CBOD and TSS in treated wastewater effluent effective January 1, 2015. All of Halifax Water's wastewater treatment facilities are expected to meet these standards, although the Halifax and Dartmouth advanced-primary treatment facilities will require upgrading to meet WSER discharge limits of 25 mg/L for CBOD and TSS, and 0.02 mg/L for total residual chlorine (TRC), for facilities using chlorine disinfection. The WSER adopted these effluent limits for all wastewater facilities discharging >100m3 average daily flow. The WSER also set a limit of 1.25 mg/L for un-ionized ammonia.

The WSER provides for defined periods to allow required upgrades to take place, based upon a system for ranking the environmental risk of each facility. Under this risk ranking, the Halifax and Dartmouth facilities must be upgraded by 2040.

During 2015, NS Environment completed the process of changing the Approval requirement that 80% of samples collected must meet the effluent limits for each facility, to a requirement that average values must meet the effluent limits. All Approvals have been updated to use average values as of 2016.

Performance assessments for the 5 larger wastewater facilities are based upon monthly averages. Results for April 2015 to March 2016 are presented below:

Wastewater Treatment Facility Compliance Summary
April 2015 to March 2016

WWTF	Apr-15				May-15				Jun-15			
	$CBOD_5$	TSS	F. coliform / E. coli	pH	$CBOD_5$	TSS	F. coliform / E. coli	pH	$CBOD_5$	TSS	F. coliform / E. coli	pH
Halifax	21	44	10,068	N/A	40	20	2185	N/A	23	14	476	N/A
Herring Cove	10	21	1,471	N/A	12	6	230	N/A	7	8	431	N/A
Dartmouth	22	63	13,364	N/A	27	34	3936	N/A	14	13	266	N/A
Eastern Passage	7	9	100	N/A	10	15	74	N/A	5	6	169	N/A
Mill Cove	12	12	539	N/A	13	10	200	6.9	9	8	47	6.7
	Jul-15				Aug-15				Sep-15			
Halifax	60	11	3541	N/A	36	14	4989	N/A	54	25	15,716	N/A
Herring Cove	11	3	764	N/A	13	7	571	N/A	30	14	2,091	N/A
Dartmouth	29	15	2185	N/A	20	10	1541	N/A	33	16	15,308	N/A
Eastern Passage	9	10	49	N/A	8	7	40	N/A	13	12	13	N/A
Mill Cove	14	9	18	6.8	8	6	126	6.7	12	8	631	6.7
	Oct-15				Nov-15				Dec-15			
Halifax	33	15	7,720	N/A	30	20	6,699	N/A	36	24	4931	N/A
Herring Cove	16	9	590	N/A	13	6	38	N/A	14	15	73	N/A
Dartmouth	20	11	5,336	N/A	23	30	4,029	N/A	26	31	2702	N/A
Eastern Passage	10	7	38	N/A	6	7	59	N/A	7	6	14	N/A
Mill Cove	17	28	1,721	6.9	14	18	2,000	6.8	11	16	118	6.8
	Jan-16				Feb-16				Mar-16			
Halifax	36	22	15,636	6.8	34	26	12,855	6.8	30	24	* N/A	6.9
Herring Cove	17	16	1,386	7.0	19	19	760	6.9	18	15	* N/A	6.8
Dartmouth	28	36	5,891	7.0	32	58	4,217	7.2	26	35	* N/A	7.1
Eastern Passage	11	12	29	7.3	6	8	30	7.2	15	10	* N/A	7.3
Mill Cove	13	16	700	6.9	18	17	2,300	7.0	15	16	69	6.5

* N/A due to seasonal disinfection variance

Performance assessments for the 10 smaller wastewater facilities are based upon quarterly averages. Results for April 2015 to March 2016 are presented below:

Wastewater Treatment Facility Compliance Summary

Q1 - April to June 2015

WWTF	$CBOD_5$	TSS	F. coliform / E. coli	Phosphorus	o-Phosphate	Ammonia	pH	Dissolved Oxygen	Aluminum	Chlorine
AeroTech	8	5	13	0.14	N/A	12	7.4	N/A	N/A	N/A
Belmont	19	29	10	N/A	N/A	N/A	7.3	N/A	N/A	1.77
Frame	8	35	103	N/A	N/A	N/A	9.0	N/A	N/A	1.43
Lakeside-Timberlea	9	19	63	2.09	N/A	9	6.9	9	N/A	0.11
Lockview-MacPherson	5	6	57	0.17	N/A	13	7.0	N/A	N/A	N/A
Middle Musquodoboit	8	14	70	N/A	N/A	N/A	7.5	N/A	N/A	N/A
North Preston	5	8	10	N/A	0.1	0.79	7.3	N/A	N/A	N/A
Springfield	5	6	14	N/A	N/A	N/A	---	N/A	N/A	---
Steeves (Wellington)	5	1	46	N/A	0.3	0.11	7.5	N/A	N/A	N/A
Uplands Park	12	10	79	N/A	N/A	N/A	7.2	N/A	N/A	N/A

Q2 - July to September 2015

	$CBOD_5$	TSS	F. coliform / E. coli	Phosphorus	o-Phosphate	Ammonia	pH	Dissolved Oxygen	Aluminum	Chlorine
AeroTech	4	6	31	0.31	N/A	2	7.3	N/A	N/A	N/A
Belmont	7	25	148	N/A	N/A	N/A	7.2	N/A	N/A	0.84
Frame	9	30	75	N/A	N/A	N/A	6.5	N/A	N/A	1.02
Lakeside-Timberlea	7	17	10	1.39	N/A	6	7.1	7	N/A	0.12
Lockview-MacPherson	8	29	114	0.86	N/A	9	7.0	N/A	N/A	N/A
Middle Musquodoboit	3	12	70	N/A	N/A	N/A	7.4	N/A	N/A	N/A
North Preston	4	2	5	N/A	0.2	0.55	7.4	N/A	N/A	N/A
Springfield	4	5	63	N/A	N/A	N/A	7.5	N/A	N/A	0.28
Steeves (Wellington)	6	2	34	N/A	0.2	0.29	7.6	N/A	N/A	N/A
Uplands Park	6	10	25	N/A	N/A	N/A	6.4	N/A	N/A	N/A

Q3 - October to December 2015

	$CBOD_5$	TSS	F. coliform / E. coli	Phosphorus	o-Phosphate	Ammonia	pH	Dissolved Oxygen	Aluminum	Chlorine
AeroTech	4	7	10	0.24	N/A	0.32	7.3	N/A	N/A	N/A
Belmont	30	59	1,842	N/A	N/A	N/A	7.1	N/A	N/A	0.17
Frame	16	64	6,900	N/A	N/A	N/A	6.6	N/A	N/A	0.11
Lakeside-Timberlea	9	17	14	1.15	N/A	12	7.3	9	N/A	0.15
Lockview-MacPherson	7	16	16	0.77	N/A	3	7.6	N/A	N/A	N/A
Middle Musquodoboit	5	18	381	N/A	N/A	N/A	7.4	N/A	N/A	N/A
North Preston	5	2	10	N/A	0.1	0.29	7.3	N/A	N/A	N/A
Springfield	5	2	2,296	N/A	N/A	N/A	8.6	N/A	N/A	0.24
Steeves (Wellington)	5	2	10	N/A	0.1	8	7.7	N/A	N/A	N/A
Uplands Park	9	2	17	N/A	N/A	N/A	7.0	N/A	N/A	N/A

Q4 - January to March 2016										
	$CBOD_5$	TSS	F. coliform / E. coli	Phosphorus	o-Phosphate	Ammonia	pH	Dissolved Oxygen	Aluminum	Chlorine
AeroTech	5	13	30	0.37	N/A	2	7.1	N/A	N/A	N/A
Belmont	10	17	70	N/A	N/A	N/A	7.3	N/A	N/A	0.52
Frame	14	36	58	N/A	N/A	N/A	6.9	N/A	N/A	0.40
Lakeside-Timberlea	7	15	17	1.99	N/A	7	7.0	10	N/A	0.10
Lockview-MacPherson	5	5	19	0.19	N/A	0.22	7.0	N/A	N/A	N/A
Middle Musquodoboit	13	17	1,554	N/A	N/A	N/A	7.5	N/A	N/A	N/A
North Preston	5	8	10	N/A	0.2	0.60	7.7	N/A	N/A	N/A
Springfield	6	7	2,500	N/A	N/A	N/A	7.5	N/A	N/A	0.11
Steeves (Wellington)	5	1	10	N/A	0.1	0.05	7.6	N/A	N/A	N/A
Uplands Park	12	10	766	N/A	N/A	N/A	6.8	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
--- samples missed

Seasonal Disinfection

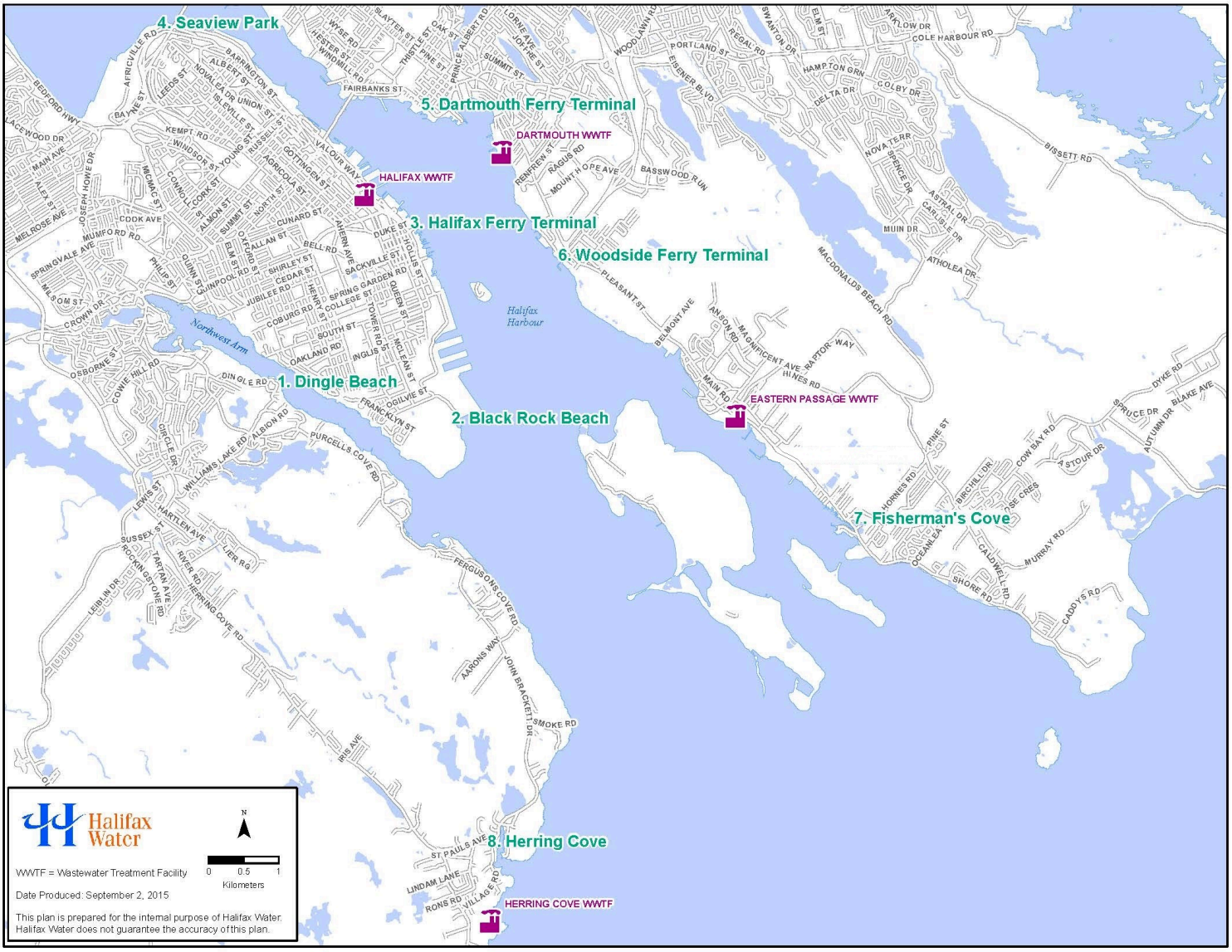
The final stage in the process of sewage (wastewater) treatment involves disinfection of wastewater by Ultraviolet (UV) lights. In March 2016, following approval from Nova Scotia Environment and public/stakeholder outreach, Halifax Water undertook a pilot seasonal disinfection program. The pilot seasonal disinfection program saw UV disinfection systems shut down at the Halifax, Dartmouth, Herring Cove and Eastern Passage wastewater treatment facilities (WWTFs) from March 1-April 30, 2016. Full screening of floatables and all other treatment processes continued to operate during that period.

So why does Halifax Water want to implement seasonal disinfection? Ultraviolet lights use large amounts of energy and are difficult to service when in operation. Shutting off the UV systems during the winter months (proposed from November 1 to March 31) would reduce electricity usage, lower greenhouse gas emissions related to UV light power consumption, potentially extended UV equipment life and allow for an annual maintenance overhaul of the UV systems at these facilities. Numerous jurisdictions in Canada and the US allow for seasonal disinfection.

Throughout the pilot program the clarity of the water in the harbour was not affected, nor was there any smell related to the implementation of seasonal disinfection.

Residents enjoy Dingle Beach on the Northwest Arm.

In order to have baseline data with and without UV disinfection in place, sampling began in October 2015. Halifax Water continued monitoring bacteria levels monthly at selected sites around Halifax Harbour to assess the results of seasonal disinfection. These sites were chosen based on use of the harbour and the likelihood of public contact with the waters.



Seasonal Disinfection Sampling Points

The results of the pilot seasonal disinfection program were very positive. Although the objective of the pilot program was not to keep bacteria levels below safe swimming levels, it was the case for all but a few samples.

Halifax Water has submitted the data collected from the pilot program to Nova Scotia Environment (NSE). As our environmental regulator, NSE will determine if a full seasonal disinfection program (proposed for November 1 to March 31) can be implemented.

Aerotech Wastewater Treatment Facility Update

The Aerotech Wastewater Treatment Facility (AWWTF) Expansion and Upgrade Project is an excellent example of Halifax Water's commitment to balance environmental, social and financial concerns that are integral to our service delivery.

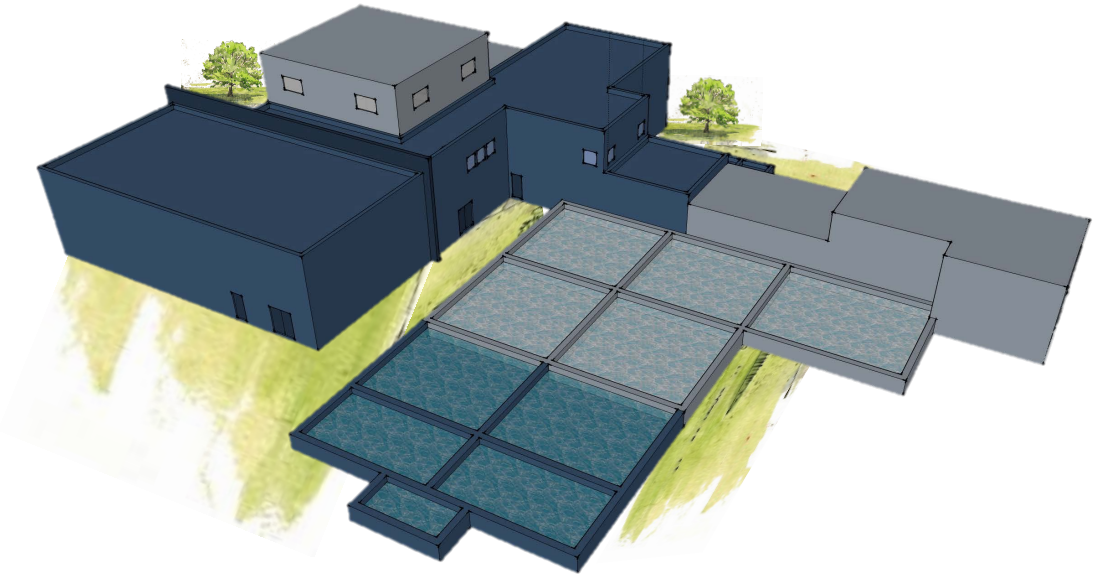
The AWWTF was originally constructed in 1986 and was further upgraded in 2006 to a capacity of 1,000 m3/day. The current proposed expansion and upgrade to the facility will provide a tertiary (advanced) level of treatment with a capacity of 3,000 m3/day.

The AWWTF will use membrane bioreactor technology to provide a tertiary level of treatment. This innovative and proven type of process will be compliant with the Wastewater System Effluent Regulations under the Fisheries Act.

Effluent quality requirements for the facility are defined in the operating permit as issued by Nova Scotia Environment. A thorough receiving water study was completed as part of the project work and was used to help identify effluent discharge objectives required to meet regulatory requirements as well as water quality objectives for the receiving water, Johnson River.

The project design is complete and will be tendered in the summer of 2016. Reducing the facility's energy foot print was integral to its design as well as ensuring that the facility is highly automated, reliable and consistently meets performance requirements.

Construction is scheduled to start in the fall of 2016 and be completed by the end of 2017.



Architectural Rendering of the New Aerotech WWTF

ISO Programs for Water and Wastewater Update

The International Standards Organization (ISO) sets standards for a variety of different processes and products. One of these is the ISO 14001 Standard, which sets the basic requirements for Environmental Management Systems. Under this standard, an organization or facility must define environmental goals, identify environmental impacts from its operations, document processes and procedures to reduce or control these impacts, and put in place procedures to audit performance. Audits are conducted by certified external auditors. There must also be a process to ensure continual improvement, based on the findings of each audit. The benefit of ISO registration is that it ensures good environmental stewardship and facility management for the public, for regulatory agencies, and for Halifax Water as a utility.

J.D. Kline (Pockwock) Water Treatment Plant

Halifax Water currently has three facilities registered under ISO 14001 for drinking water supply and treatment – Pockwock Lake, Lake Major and Bennery Lake. In April 2003, the J. Douglas Kline Water Supply Plant (Pockwock Lake) was the first plant (water or wastewater) in Atlantic Canada to receive ISO 14001 designation. In 2004, Lake Major followed and in 2010 Bennery Lake came on-board.

In 2015 the J. Douglas Kline, Lake Major and Bennery Lake Water Supply Plants went through a series of audits including a compliance review, a management review, stage 1 and stage 2 external audits, and were successful in being re-certified as having an Environmental Management System meeting the ISO 14001-2004 Standard.

Herring Cove Wastewater Treatment Facility

In 2013/14, Halifax Water began expansion of the ISO 14001 program into our wastewater program. The Herring Cove Wastewater Treatment Facility was selected as the initial wastewater facility for ISO 14001 registration. During 2013/14, an analysis was done of the environmental impacts of this facility's operations, standard operating procedures were documented to reduce or prevent these impacts, and staff training was provided on Environmental Management Systems and incident response.

In 2015 and early 2016, Halifax Water conducted an audit of the Herring Cove Wastewater Treatment Facility in order to have it registered under ISO 14001.

The Herring Cove facility is on track to be the first wastewater treatment facility in Atlantic Canada to fly the ISO 14001 banner. The ISO program will then be extended to additional wastewater treatment facilities.

Wet Weather Management Program

The amount of rainfall derived infiltration and inflow (RDII) that enters sanitary sewer systems is one of the biggest operational challenges facing Halifax Water. The burden that RDII places on Halifax Water's wastewater system can overwhelm the collection system and negatively impact processes within treatment facilities.

Halifax Water has developed a wet weather management program (WWMP) to mitigate system impacts and ensure protection of the environment. Halifax Water's WWMP is structured to gain location specific information to various wet weather management techniques. Once sufficient data has been collected and analyzed, Halifax Water applies that knowledge to make the most cost effective recommendation to manage wet weather flows for each sewershed. A phased approach is being followed to implement this strategy.

Phase I- Program Initiation

The initial phase of HW's WWMP involved initiation of the program and its structure. It was realized early that there is no 'one size fits all' solution to wet weather management and the program needed to reflect this when implementing strategies. The initial program organizational structure was comprised of a wet weather steering committee and a wet weather action committee.

Phase II-Prioritization

Phase II of the program required identifying individual sewersheds that demonstrated a need for wet weather management. There was limited flow information available to make informed prioritization decisions in the service area. In the absence of flow information pump station run time information was used as surrogate flow data. The entire service area was characterized using existing flow information and pump runtime data.

Phase III-Pilot Program

Pilot sewersheds were identified from the prioritization matrix from phase II. The pilots were selected strategically so that specific wet weather management techniques could be assessed. Pre and post project flows are being analyzed and compared in the individual sewersheds and a cost benefit analysis will be conducted on the projects. This pilot program is intended to gather sound information on the costs of various wet weather management techniques and the possible impact they can have on the flow response to wet weather.

Phase IV-Service Area Implementation

As information from phase III is matured it will be applied to the service area to recommend and implement wet weather management projects in specific sewersheds. This will allow staff to implement the most cost effective strategies to manage wet weather flows.

Sliplining - A cost effective, non-disruptive way to restore pipes.

While it is early in the data collection period, the pilot program has demonstrated a measurable reduction in RDII in response to wet weather events in the pilots sewersheds. For example the Stuart Harris sewershed has undergone mainline rehabilitation by trenchless technologies and since renewal the observed sanitary flows have remained below the systems available capacity.

At present the WWMP has three operating pilots with two more planned for integration in 2016. In addition to formal pilots there are six monitoring areas that are being researched for wet weather management techniques. The program is expected to mature the data set over the next two years and support location specific strategies in all sewersheds that are negatively impacted by wet weather generated flows.

Where Does Your Water Come From?

Halifax Water provides water to 355,000 customers through operation of two large, one medium water supply plants, and six small community plants.

The J.D. Kline (Pockwock) Water Supply Plant is Halifax Water's largest with a design capacity of 220 Million Litres (ML)/day, average demand of 60 ML/day and serves approximately 200,000 people in Halifax, Bedford, Sackville, Fall River, Waverley and Timberlea. The J.D. Kline plant takes water from Pockwock Lake which is within a Protected Water Area, as stipulated through provincial regulations. Water is treated through coagulation and direct filtration. Chlorine, fluoride and a corrosion inhibitor are added to the water prior to being sent through 564 km of pipe to reach customers.

Pockwock Water Supply pumping station

The Lake Major Water Supply Plant has a design capacity of 90 ML/day, average demand of 36 ML/day and serves a population of approximately 103,000 in Dartmouth, Eastern Passage, Cole Harbour, Westphal, Cherry Brook and North Preston. The plant takes water from Lake Major which is in a Protected Water Area. Water is treated through coagulation, upflow clarification and filtration. Chlorine, fluoride and a corrosion inhibitor are added to the water prior to being sent through 531 km of pipe to reach customers.

The Bennery Lake water Supply System has a design capacity of 7.9 ML/day with an average demand of 3.4 ML/day and serves the Stanfield International Airport and Aerotech Park. The Bennery Lake plant takes water from Bennery Lake which is also in a Protected Water Area. Water is treated through coagulation, sedimendation and filtration. Chlorine, fluoride and a corrosion inhibitor are added to the water prior to being sent to customers.

Six small plants serve communities around Halifax municipality. These plants are located at Collins Park, Middle Musquodoboit, Bomont Subdivision, Silver Sands, Five Island Lake and Miller Lake. Collins Park and Middle Musquodoboit Water Supply Plants both treat surface water through ultra and nano filtration, with daily demands of 43 and 60 Cubic Metres(m3)/day, respectively. Bomont Water Supply Plant treats water from the Shubenacadie River through ultrafiltration and ion exchange with a daily demand of 11 m3/day. Five Islands, Silver Sands and Miller Lake are all groundwater supplies. Five Islands treats with UV disinfection for an average daily demand of 10 m3/day. Silver Sands uses greensand filtration to treat an average demand of 32 m3/day. Miller Lake removes arsenic with adsorptive media filtration for an average demand of 18 m3/day.

Private Outfall Elimination Program

The Private Outfall Elimination Program began in parallel with the Halifax Harbour Solutions Project in 2004. The objective of this program is to identify and eliminate privately owned wastewater pipes that are discharging directly into Halifax Harbour. The owner of each private outfall was required to construct a proper connection to the wastewater system, so that the wastewater is treated at one of Halifax Water's wastewater treatment facilities. Alternatively, the owners could implement an on-site system.

In 2015/16 the final two known private outfalls were repaired.

Since the Private Outfall Elimination Program began, an estimated 66 outfall pipes discharging approximately 3000 cubic metres of wastewater per day have been eliminated, which is equivalent to the volume of wastewater from about 9200 people.

Stormwater Management

Managing stormwater is critical for the protection of private and public property and the environment. Every year Halifax Water invests over $10 million in the operation, maintenance and upgrading of the stormwater system.

Managing stormwater, critical to the protection of property and the environment.

Halifax Water's (the public) stormwater system is comprised of pipes, manholes, roadside ditches, curbs, culverts, stormwater holding tanks, retention ponds, dams, or catch basins that eventually discharge into a local brook, river, lake or the ocean. This is infrastructure located on or within Halifax Water easements or public streets. Ditches/culverts that are found at the boundary of a property/driveway on public land are considered part of Halifax Water's stormwater system.

Halifax Water's stormwater system components may be directly adjacent to a resident's property, or they may be some distance away, in which case stormwater may have to flow overland, along roadways, or through watercourses (lakes, rivers, etc...) before reaching Halifax Water's stormwater system.

Repairing and upgrading ditches to improve stormwater service.

Halifax Water staff responds to all service requests, but focus their efforts on priority areas where there are chronic maintenance problems. We also do proactive ditching and culvert replacement, and catch basin maintenance and replacement.

Cross Connection Control Program

Halifax Water utilizes a 'multiple barrier approach' for water quality, which is a series of checks and balances to ensure high quality water is delivered from the source to the tap. This approach includes watershed protection, optimization of the treatment process, sound distribution system management, continuous testing, and cross connection control.

As part of this multiple barrier approach, Halifax Water's Cross Connection Control (CCC) Program is designed to minimize the risk of potential contaminants entering the distribution system from the customer's premises through backflow.

A cross connection is a permanent or temporary connection between the public water system and a source of water that may be contaminated or polluted due to backflow.

Backflow can occur if water is siphoned from a customer's premises due to a reduction in pressure in the distribution system or as a result of pressurized equipment being used on the customer's premises. The installation and maintenance of Backflow Prevention (BFP) devices on new domestic and sprinkler service lines ensures that potential contaminants will not flow back into the distribution system.

Installation of a backflow preventer at a local hospital

Cross connections can be found anywhere there is a connection to the public water system. Some examples are:

- Irrigation systems
- Laboratories
- Fire sprinkler systems
- Swimming pools
- Hospitals
- Coffee vending machines
- Car washes
- Sewage treatment plants.

Along with the CCC Program, customers can actively take steps to prevent water contamination at home. Over half of the nation's cross-connections are found on unprotected garden hoses. When a hose is submerged in water the contents of the hose and any substance that the hose is connected to can backflow into the piping system and contaminate your drinking water.

Vacuum breaker on outdoor tap

The following practices can reduce the risk of cross connections to protect your drinking water:

- Never leave the end of a hose where contaminants can be siphoned into your drinking water – this includes swimming pools, laundry tubs, and service sinks.
- Leave at least a one-inch gap between the end of a hose and a source of potential contamination.
- Attach a hose connection vacuum breaker to indoor and outdoor threaded taps and tell your neighbours to do the same. These inexpensive devices can be found at most building or plumbing supply stores.

Protecting the water quality in your home and across the distribution system is critical.

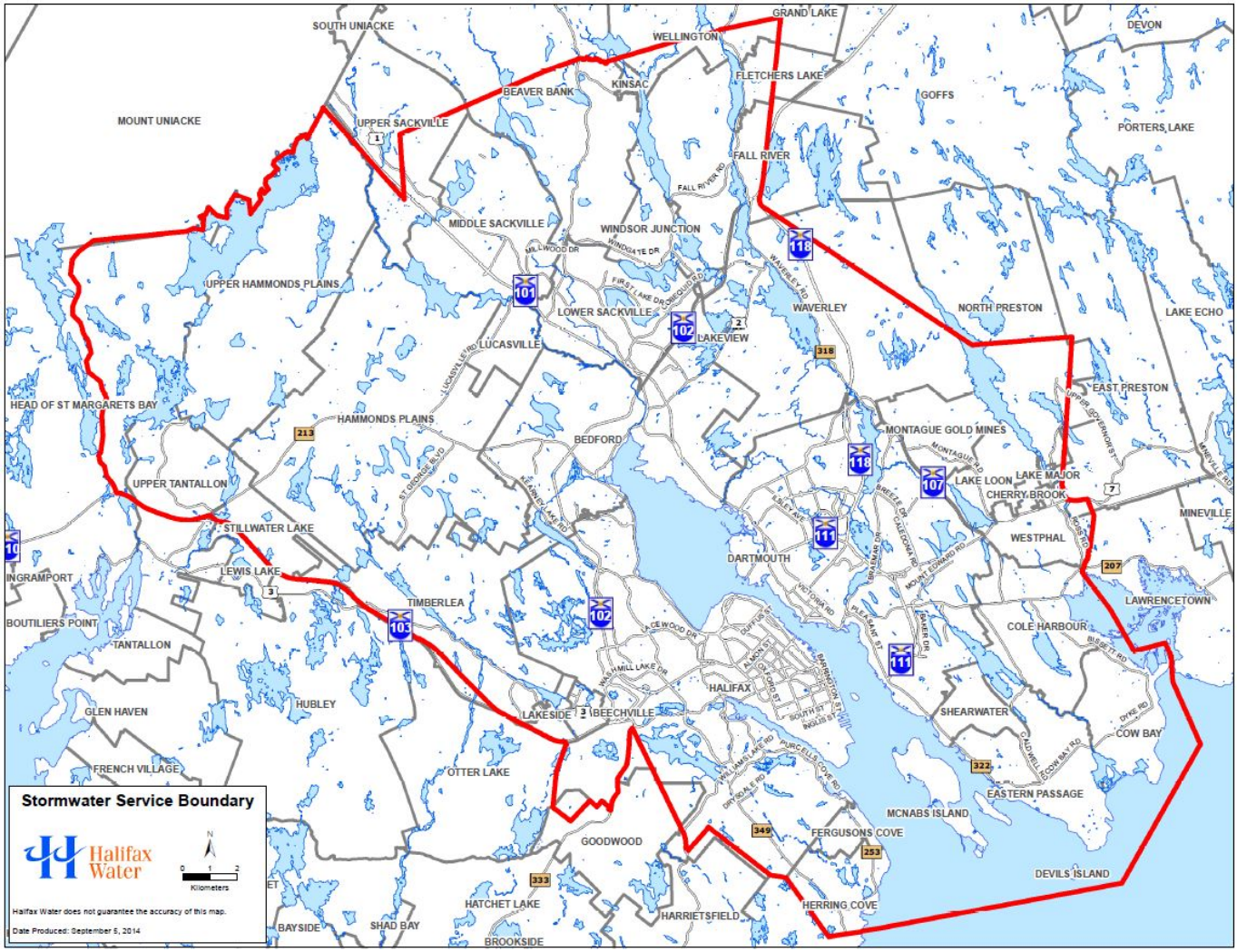
Stormwater Billing

In 2013, the Nova Scotia Utility and Review Board (NSUARB) approved rates for water, wastewater and stormwater services. The approved rate structure also separated the stormwater charge from the combined wastewater/ stormwater charge to provide a more equitable user pay system.

After two years of implementation and experience administering the stormwater rates, Halifax Water conducted a review of the current Cost of Service Methodology for stormwater service including a comparison to industry best practice, with a view to enhancing equity and improving administration of the charge. Based on the results of this review, Halifax Water proposed modifications to the approach used to develop rates for Stormwater Service.

Halifax Water filed a Stormwater Cost of Service and Rate Design Application with the NSUARB October, 2015. This application did not seek to increase stormwater rates, but was focused on ensuring equity in the application of stormwater fees and improving customer service and administrative processes. In other words, this application was not about asking for a bigger pie, but how to ensure equity in the distribution of the existing pie.

The NSUARB recently issued their Decision and staff will be filing Compliance Orders and preparing revised Rules and Regulations to reflect the changes.



Water Research Programs

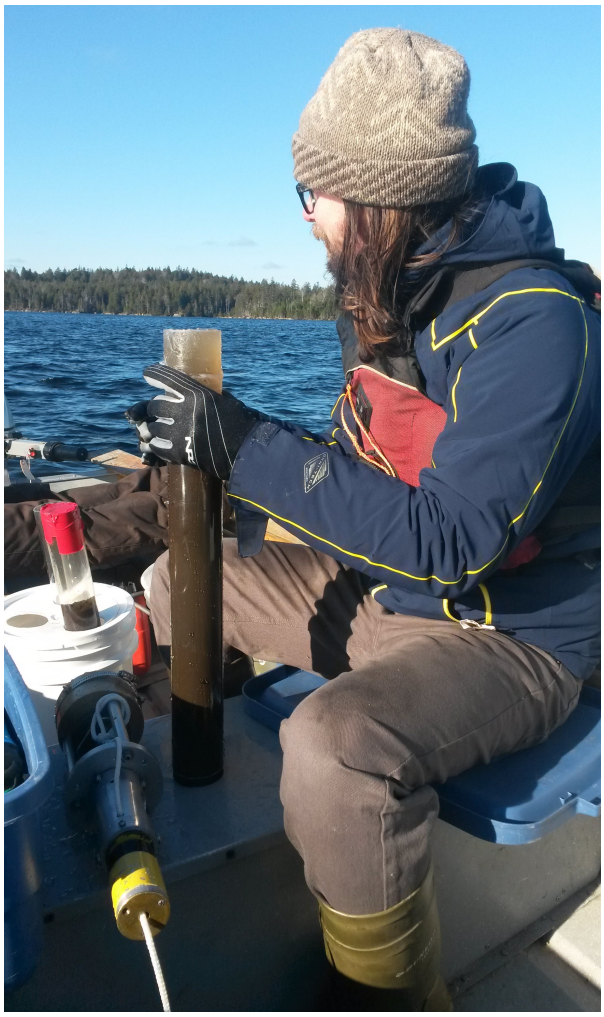
Halifax Water has been a partner with Dr. Graham Gagnon at Dalhousie University through the NSERC/ Halifax Water Industrial Research Chair in Water Quality and Treatment since 2007. Dr. Gagnon is a renowned researcher in the North American drinking water industry and involvement in this program keeps Halifax Water on the leading edge of water quality science.

water studies..

This partnership has truly created a hub of drinking water research excellence in Atlantic Canada. Since 2007, 20 PhD students, 50 Masters students and 6 postdoctoral students have been trained through this research partnership.

Many of these highly qualified personnel are now working for Halifax Water, consultants both locally and nationally, governments including Nova Scotia Environment and Health Canada, and as professors both locally and internationally.

Research from the Chair program has resulted in over 100 research papers being presented at conferences, over 45 journal articles being published and over 1000 citations of these papers. The impact of this research to our customers is that Halifax Water is at the forefront of development of best practices and is proactive in planning for upcoming regulatory changes. This saves money in the long run and ensures the adoption of cost effective practices that protect public health.



Water sampling at Lake Major - Part of the NSERC Engagement Program

Geosmin Update

Similar to 2014, Geosmin occurance in 2015 was minimal, with detection in treated water only in August and September.

In 2015, a study was conducted of treatment options for geosmin and associated costs. Each treatment option requires significant capital investment and increased operating costs. Research with Dalhousie University is currently exploring some of these alternatives at the bench scale and pilot testing will evaluate any potential impacts on the current treatment process. Research to study these alternatives will take several years.

In the meantime, Halifax Water is initiating a study this summer to further characterize the sources of geosmin and factors that lead to its production. Gaining a better understanding of the mechanisms driving its presence could lead to options for mitigating its production or controlling it at the source. Understanding where it is coming from, why and potentially how often, will help to inform decisions to resolve this seasonal problem.

Harbour Water Quality

Halifax harbour is one of the largest ice free port in the world and the economic and recreational centre piece of our region. An asset we should all be proud of.

After 2008 the Harbour Solutions Project (HSP) has treated the wastewater that was previously flowing untreated into our harbour since Halifax's founding. Harbour water testing undertaken during HSP construction and after completion show that water quality improved rapidly and dramatically once the flow of raw sewage was stopped.

Residents enjoying the benefits of a clean harbour.

In the summer of 2008 Black Rock and Dingle Beaches opened to supervised swimming for the first time in decades. A true milestone.

The main issue affecting activities such as swimming is fecal coliform bacteria. The swimming guideline limit is 200 bacteria per 100ml. The Harbour Solutions Project uses ultraviolet light to disinfect the treated wastewater before it's released into the harbour. Halifax Municipality, as the supervisor of the two harbour beaches, is responsible to test the water quality, which it does on a weekly basis during the supervised swimming season. Following heavy rain events when flow volumes are above four times the average dry weather flow, some screened wastewater must be overflowed at points around the harbour. Following these overflow events, bacteria levels can increase.

Halifax Municipality closes the beach/es, samples the water and reopens the beach/es once levels are back to safe swimming levels. Past history has shown that water quality improves to allow swimming in as little as one-two days.

It is very important to remember that wastewater treatment facilities are designed to treat human waste only. The best way you can help our harbour, environment and watersheds is to not pour chemicals, medicines, paints, solvents and other hazardous materials down your sink, toilet or storm drain at home or work.

In the minds of some the harbour will always be unsafe for swimming boating or other contact activities. But the reality is we have dramatically improved the water quality. A walk along the waterfront on all sides of the harbour shows the clarity, cleanliness and fresh saltwater smell that comes from a harbour that is no longer subject to untreated wastewater.

Northwest Arm, a popular beach and boating area.

Enjoy your harbour and REMEMBER, ONLY RAIN IN THE STORM DRAIN.

Advanced Metering Infrastructure (AMI) The Backbone of the Utility of the Future

In 2013/14, Halifax Water completed an Advance Metering Infrastructure (AMI) Technology Assessment & Feasibility Study.

In 2014/15 Halifax Water completed additional work to evaluate potential conversion to monthly or bi-monthly billing and develop a plan to implement new metering technology over a three to four year period.

In spring 2016 Halifax Water filed an application with the Nova Scotia Utility and Review Board (NSUARB) requesting approval of a $25.4million AMI Project.

Typical resident 5/8" water meter

Advanced Metering Infrastructure (AMI) refers to a system where meter data is collected remotely by a communications network linked to radio devices on the meter. Existing meters provide water consumption data only when read, typically on a quarterly basis. AMI meters will provide wireless two-way digital communication between the meter, the utility and customers. Water consumption data will be transmitted to the utility at hourly intervals in comparison to meter readings which are currently taken on a monthly or quarterly basis. AMI meters provide many benefits in terms of customer service and system operation such as:

Enhanced Service and Increased Customer Convenience

- After meter installation, the need for indoor or on-premise access will be greatly reduced.
- Halifax Water will be more responsive to customer inquiries based on better data, as well as provide more timely notification of possible leakage within the customer's premise
- Moving to monthly billing.
- AMI will allow customers the ability to track and manage their water usage on an hourly basis.
- Minimal estimated reads, which allows customers to manage their budgets more effectively.

Improved Water Infrastructure and Environmental Stewardship

- Advanced meters will allow for more efficient system operations, and are part of improving the overall water infrastructure.
- Halifax Water will reduce its environmental footprint due to reductions in vehicle travel to read meters and perform other basic services, which will be completed remotely once the meters are installed.

Taps into Technology & Builds for the Future

- Advanced metering technology will enable Halifax Water to take advantage of future industry developments, such as providing customers secure access to data that will allow them to manage their water usage and costs.

Wireless technology bringing better information to customers

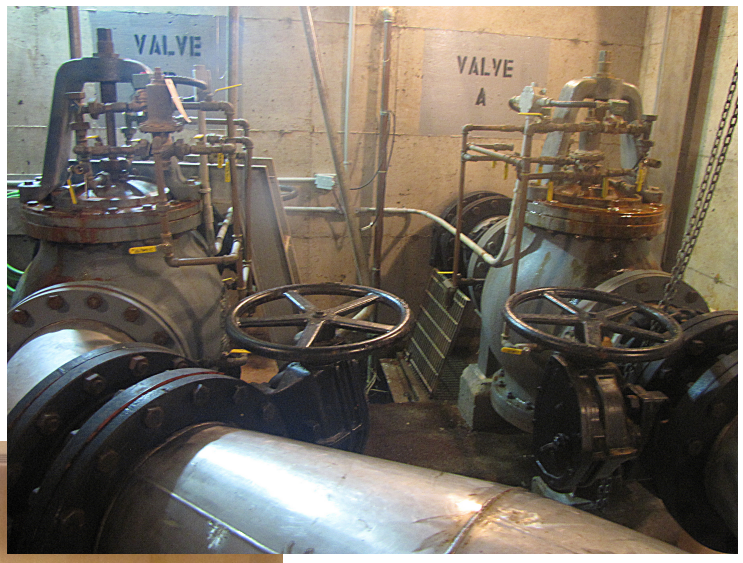
Upon approval by the NSUARB, the AMI project would start with an initial rollout to a few hundred customers late in 2016. Based on results in this pilot phase, meter installation would start in the rest of the Municipality in 2017.

Halifax Water Recognized for Excellence in Innovation (Civil Engineering Award)

In May 2014, Halifax Water was awarded the "CSCE-CANAM Excellence in Innovation in Civil Engineering Award" at the Annual General Meeting and Conference of the Canadian Society of Civil Engineering (CSCE). The winning innovation was "Advanced Pressure Management Utilizing Automated Pressure Reducing Valve Control in a Dual Supply District Metered Area." The award recognizes Halifax Water's position as a world leader in water loss control.

Since the implementation of the water loss control in 1999, Halifax Water has reduced leakage in the water distribution system by 40 million litres per day, which represents $600,000 in annual savings.

Recognizing the importance of pressure management to control leakage, Halifax Water has conducted research and refined its approach to make further inroads in leakage reduction. The latest technological breakthrough at Halifax Water is a testament to the dedication of staff and their stewardship of water resources.



Orchard Control-Pressure Reducing Valve Chamber

Halifax Water General Manager Carl Yates (second from right) with CSCE- CANAM Excellence in Innovation in Civil Engineering award. From left: CSCE representatives Bob Millburn, Dr. George Akhras and Tony Bégin

Contact Us

If you have questions, comments, or suggestions for future editions of The Stewardship Report, please contact Communications & Public Relations Coordinator James Campbell at campbej@halifaxwater.ca or call 902-490-4604. You can also email or call the Customer Care Centre at CustomerService@halifaxwater.ca or 902-490-4820, fax us at 902-490-4749, write us at PO Box 8388, RPO CSC , Halifax, NS B3K 5M1. You can also reach us via Twitter at @HalifaxWater.

Please visit our website at www.halifaxwater.ca for a full range of information related to Halifax Water.