



Drinking Water System

2020 - Annual Report

322 Water Street
Deseronto, Ontario
K0K 1X0

Prepared: January 2021

Executive Summary

Major upgrading of the Town of Deseronto Water Treatment Plant continued into 2019. A full replacement of the treatment process was completed by the end of April 2019. In 2020 the new treatment plant ran through its one-year warranty period without any major issues. Refurbishment of the building interior/exterior continued and in early 2020. The new treatment process utilizes coagulation / flocculation and dissolved air flotation, followed by conventional sand / GAC filtration, and chlorine disinfection. The upgrades eliminate historic capacity limitations, making the process capable of processing the permitted 2,946 m³/d of raw water.

During 2020, the average treated water pumped to the community of 1072 m³/day represents the same daily flow when compared to 2019. The 2020 maximum day flow of 1848 m³/d occurred in December as the result of a water service leak found on Bayshore Road by the MBQ. The 2020 maximum day flow represents approximately 63 percent of the design capacity while the average day flow represented approximately 36 percent of design capacity.

Water samples collected throughout the process at varying frequencies are tested for approximately 70 different parameters to evaluate treatment efficiency and to ensure finished water quality. All samples met the requirements of the Ontario Drinking Water Quality Standards.

Table of Contents

Executive Summary i

Table of Contents ii

Key Words & Terms iv

Introduction 1

1 - Description of the Deseronto Water Treatment Process 2

 1.1 Origins and Types of Raw Water Contaminants2

 1.2 Raw Water Supply.....2

 1.3 Coagulation / Flocculation / Dissolved Air Floatation3

 1.4 Filtration3

 1.5 Chlorination / Disinfection4

 1.6 Elevated Storage Tank.....4

 1.7 Process Waste Residual Treatment.....5

 1.8 Multiple Barriers to Microbiological Pathogens5

 1.9 Laboratory Testing5

 1.10 Alarms and Staffing.....5

2 – Reports of Adverse Water and Other Deficiencies 7

3 - Flow Measurement and Analytical Results.....8

 3.1 Raw and Treated Water Flow8

 Table 1 – Raw and Treated Water Flow8

 3.2 Temperature, Colour, Alkalinity, pH, and Hardness10

 Table 2 – Temperature, pH, Alkalinity, Hardness, and Colour.....10

 3.3 Turbidity12

 Table 3 – Raw, Filtered, and Treated Water Turbidity13

 3.4 Disinfection and Bacteriological Testing14

 Table 4a – Treated Water Disinfection and Bacteriological Analytical Data15

 Table 4b – Distribution Water Disinfection and Bacteriological Data16

 Table 4c – Raw Water Pre-chlorination and Bacteriological Data17

 3.5 Process Chemical Addition17

 Table 5 – Treatment Process Chemical Use and Aluminum Residual.....18

 3.6 Other Organic and Inorganic Testing19

Table 6 – Schedule 23, Fluoride, Sodium, Nitrite, and Nitrate	20
Table 7 – Schedule 24 Parameter Concentration Data.....	21
Table 7 – Schedule 24 Parameter Data (2).....	22
3.7 Distribution System Lead Testing	23
Table 8 – Distribution Lead, pH, and Alkalinity.....	24
3.9 Microcystin Testing.....	24
3.10 Waste Clarifier Performance Monitoring	25
Table 9 – Waste Clarifier Performance Data	26
4 – System Maintenance and Improvements.....	26

Key Words & Terms

m³ /d	cubic metres per day, (1m ³ = 1000 litres)
mg/L	milligrams per litre, (1 part in 1,000,000)
µg/L	micrograms per litre, (1 part in 1,000,000,000)
ACU	apparent colour measurement units (standard unit to quantify colour in water)
NTU	nephelometric turbidity units (standard unit to quantify turbidity in water)
MAC	maximum acceptable concentration
IMAC	interim maximum acceptable concentration
AO	aesthetic objective (non-health related)

Coagulation / Flocculation refer to the water treatment chemical processes that convert small particles of suspended solids into larger, more settleable or floatable clumps.

Disinfection refers to the process that destroys disease-causing organisms in water, usually by the addition of chlorine.

Escherichia Coli (E. Coli) refers to a subgroup of fecal coliform bacteria that reside in the digestive systems of warm blooded animals. The presence of *E. Coli* in drinking water is a strong indicator of fecal contamination. *E. Coli* is rapidly destroyed by chlorine.

Heterotrophic Plate Count (HPC) is a microbial test method that quantifies levels of heterotrophic bacteria. Most bacteria, including those common in drinking water systems, are heterotrophs. Increases in the density of HPC bacteria in the distribution system are usually the result of bacterial re-growth which is influenced by the quality of the water entering the system, temperature, flow (i.e. stagnation), presence of a disinfectant residual, construction materials, and the availability of nutrients for growth. HPC in drinking water are not considered a direct health threat.

Inorganic refers to non-carbon based substances. Common inorganic substances in water include metals, minerals, nutrients, and salts.

ODWQS refers to the Ontario Drinking Water Quality Standards. The ODWQS define the standards, objectives, and guidelines to be followed for the provision of a safe and aesthetically acceptable drinking water supply.

Ontario Regulation 170/03 or O.Reg.170/03 refers to the Drinking Water Systems Regulation as amended.

Ontario Regulation 169/03 or O.Reg.169/03 refers to the ODWQS Regulation as amended.

Organic refers to a large group of carbon-based chemical compounds including all animal and vegetable matter plus many synthetic compounds such as pesticides and industrial solvents.

Raw Water is defined as surface (lakes, rivers) or ground water (wells) available as a source of drinking water that has not received any treatment.

Dissolved Air Flotation (DAF) refers to the treatment process that involves the use of microbubbles released from air saturated water to float flocculated suspended material to the surface of a flotation tank for removal by skimming.

Total Coliform Bacteria are a group of commonly occurring, mostly harmless bacteria that live in soil and water as well as the gut of animals. Their presence in a water sample may be indicative of inadequate filtration and/or inadequate disinfection.

Turbidity refers to a physical characteristic of water that causes a cloudy appearance. Turbidity is caused by the presence of suspended matter. The substances that cause turbidity can be a source of disease causing organisms and can shield potentially pathogenic organisms from disinfection.

THM's / HAA's refer to trihalomethanes and haloacetic acid compounds which are disinfection by-products formed when chlorine combines with organic substances in the water supply. Elevated concentrations are carcinogenic.

Introduction

The 2019 Annual Report for the Deseronto Water Treatment Plant summarizes treated water quality and process operating data with reference to the requirements of Ontario Regulation 170/03 (O. Reg. 170/03), Ontario Regulation 169/03 (O. Reg. 169/03), Municipal Drinking Water Licence 154-101, Drinking Water Works Permit 154-201, and Permit to Take Water 6262-98DPFG. This report consolidates the reporting requirements specified as “Annual Report” in O.Reg.170/03, Sec. 11, and “Summary Reports for Municipalities” in O.Reg.170/03, Schedule 22.

- Section 1 of the report provides a description of the water treatment process.
- Section 2 summarizes reports to the Ministry of the Environment, Conservation and Parks (MECP) under Subsection 18(1) of the Safe Drinking Water Act (notices of adverse water quality) or Schedule 16, Section 16-4 of O. Reg.170/03 (notice of inadequate disinfection).
- Section 3 summarizes process data including: accredited laboratory and “in-house” water quality laboratory testing, process flow measurement, and treatment process chemicals.
- Maintenance and upgrading projects carried out during 2019 are discussed in Section 4.

Copies of the Annual Drinking Water Report are available to the public free of charge from Deseronto Town Hall at 331 Main Street in Deseronto. Reports are also available on-line at <https://www.deseronto.ca/residents/waterwaste-water/>.

Additional information on drinking water standards in Ontario is available from the MECP at: <https://www.ontario.ca/page/drinking-water>.

The Town of Deseronto is an accredited operating authority, conforming to the Ontario Drinking Water Quality Management Standard.

DWQMS Policy: The Town of Deseronto is committed to the supply of safe, reliable municipal drinking water and to abiding by all applicable legislation and regulations. That commitment is sustained by our dedication to the implementation, maintenance, and continual improvement of a Quality Management System that conforms to the Ontario Drinking Water Quality Management Standard.

1 - Description of the Deseronto Water Treatment Process

1.1 Origins and Types of Raw Water Contaminants

As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and can pick up substances resulting from the presence of animals or from human activity.

The types of contaminants that may be present in raw water include:

- Microbiological contaminants, such as pathogens, may come from septic systems, livestock, sewage treatment plants, and wildlife. Microbiological quality is the most important component of drinking water quality because of its ability to cause acute illness in consumers.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Organic contaminants can be naturally occurring, but most organic compounds of concern are man-made. Pesticides and herbicides are included in this group and may originate from a variety of sources such as agriculture, urban storm water runoff, and septic systems.

To ensure that tap water is safe to drink, the Ontario Ministry of the Environment, Parks and Conservation (MECP) prescribes treatment, monitoring, and reporting standards that apply to all drinking water systems in the Province.

The following describes the Deseronto treatment process and the monitoring that takes place to ensure the safety of our drinking water.

1.2 Raw Water Supply

Water is drawn from the Bay of Quinte through a 400 mm diameter intake pipe, extending 490 m offshore, submerged to a depth of approximately 6 m. Coarse screens at the intake crib and at the inlet to the low lift pumping station prevent large debris from passing into the treatment process. Following the screens, raw water flows by gravity into a tank at the low lift pumping station from where it is pumped to the treatment process.

1.3 Coagulation / Flocculation / Dissolved Air Floatation

Raw water pumped to the treatment plant first enters the dissolved air floatation (DAF) treatment units (2). DAF equipment includes two saturation tanks, duplex air compressor and tank, recirculation pumps (3), two-stage flocculation tanks (2), floatation tanks (2), float skimmer mechanisms (2), and float discharge hopper (2). The DAF units are operated in a parallel configuration.

Coagulants are injected into the raw water immediately upstream from the two-stage flocculation tanks. Coagulants are chemicals that cause the gathering of small colloidal and suspended material present in the raw water (measured as turbidity) to form more stable and distinct particles. Rapid mixing of the primary coagulant with the raw water occurs as the raw water passes through a static mixer. The raw water then enters the flocculation tanks where polymer is added, and gentle mixing takes place to promote the formation of sticky flock particles (flocculation). At the downstream end of the flocculation tanks, flow passes under a baffle to the DAF reaction zone and floatation tank. In the reaction zone a steady flow of air saturated water is distributed through a nozzle header, recycled from the effluent end of the floatation tank. Microscopic bubbles are released from the air saturated stream which adhere to the particles formed in the flocculation tanks and floats them to the surface of the floatation tank. The accumulated material on the surface of the floatation tank is referred to as float. The float is skimmed from the surface of the floatation tank and directed to a waste holding tank. The clear water below the float passes under a baffle, over a weir and on to the filtration process.

1.4 Filtration

The Deseronto WTP has three parallel gravity dual media filters, utilizing sand and granular activated carbon (GAC) media. Residual particulate matter carried over from the floatation process is trapped primarily in the sand portion of the filter. The GAC is effective in removing organic compounds, many of which are responsible for unpleasant taste and odour sometimes experienced during the warmer months. Filtered water passes through under-drain nozzles, located at the bottom of the filter media. The under-drain nozzles are designed to allow the passage of water while retaining the filter media.

Turbidity, a measure of the cloudiness of water, is measured continuously in the effluent from each

filter to monitor the effectiveness of the filtration process. If the turbidity rises above a set-point value, the plant automatically shuts off and an alarm warns staff that corrective actions are needed.

Accumulated debris on the filter media must be periodically removed by backwashing. During backwashing, a filter is isolated from the treatment process while water is forced in a reverse direction through the media. Compressed air is also introduced to agitate the media surface, loosening accumulated debris. The backwash flow flushes the accumulated debris to a waste holding tank.

1.5 Chlorination / Disinfection

Chlorine is typically added to the process in two locations; the raw water to control the accumulation of zebra mussels and other biological growth; and to the treated water for disinfection.

The addition of chlorine to the raw water is considered a pre-treatment measure and is referred to as pre-chlorination. Pre-chlorination can be applied at the intake crib (normal point of application) or into the low lift pump discharge header.

The intake crib was last inspected and cleaned in June of 2020. The inspection report confirmed successful operation of the zebra-mussel control system.

The second point of chlorine addition occurs at the treatment plant, immediately downstream from the dual media filters and GAC contactors and is referred to as post-chlorination. Post-chlorination disinfects the treated water, ensuring that any remaining, potentially pathogenic organisms are inactivated prior to entering the distribution system.

Sufficient chlorine is added at the treatment plant to maintain a residual concentration throughout the distribution system. Maintaining chlorine residual throughout the distribution system is referred to as secondary disinfection. Secondary disinfection is a regulated requirement which is necessary to prevent the growth of micro-organisms in the distribution system.

1.6 Elevated Storage Tank

Treated water is pumped from the clearwells into the distribution system. The treated water storage standpipe is connected to the distribution system grid. The 1135 m³ standpipe provides relatively

constant system pressure and a reserve volume of water for community fire protection.

1.7 Process Waste Residual Treatment:

Waste residuals generated through the treatment process, including filter backwash, settled floc removed from the reactor clarifier, and float skimmed from the DAF are directed to the waste holding tank. Wastewater from the holding tank is either pumped to the waste clarifier for treatment, or directly to the municipal wastewater treatment plant. The waste clarifier separates the waste stream solids by gravity sedimentation. The settled solids are pumped to the municipal wastewater treatment plant, and the treated overflow from the top of the clarifier is discharged to the Bay of Quinte.

1.8 Multiple Barriers to Microbiological Pathogens:

Potentially pathogenic organisms are removed from the raw water source by the following processes:

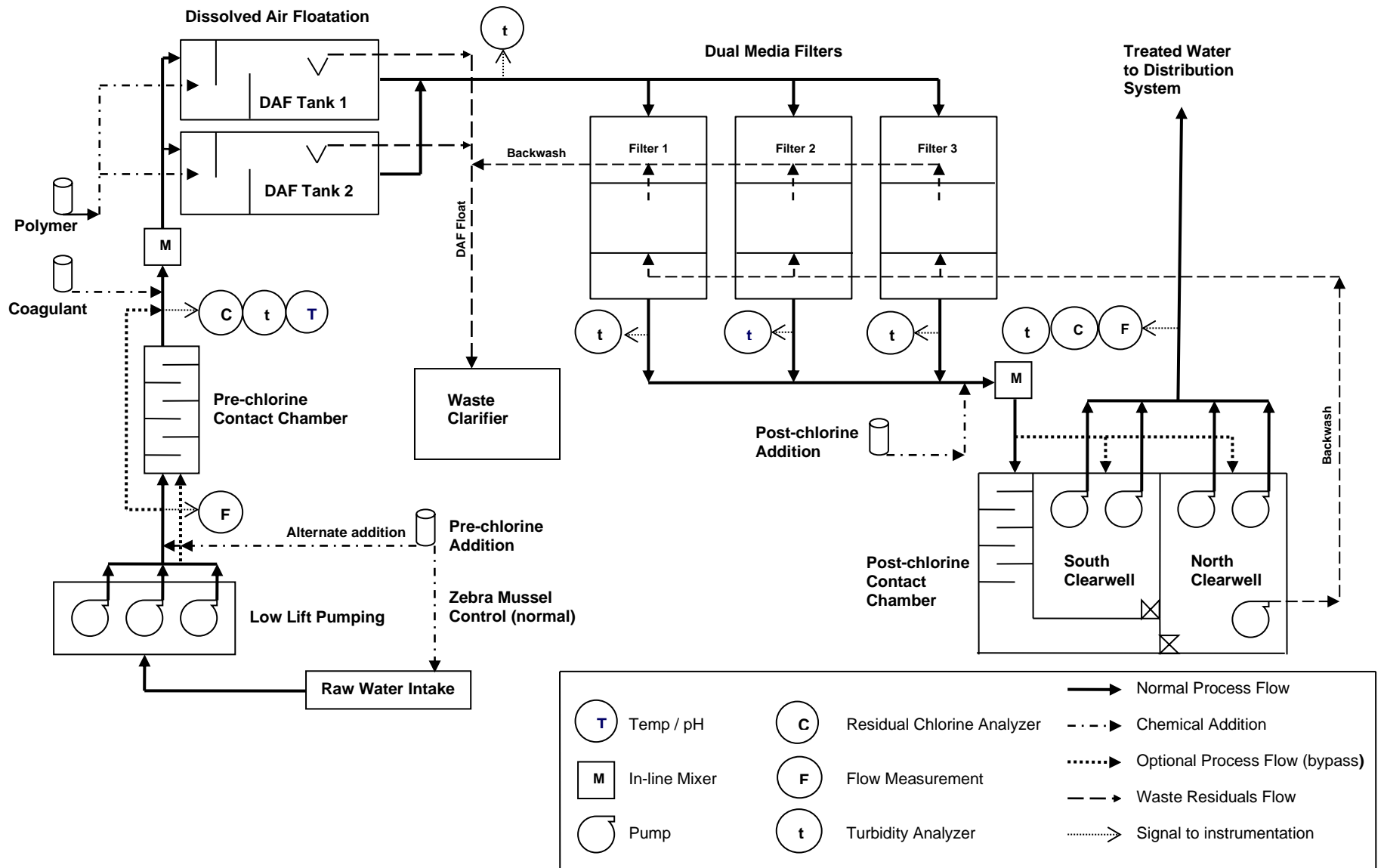
- pre-chlorination
- flocculation / dissolved air flotation
- filtration
- post-chlorination
- distribution system chlorine residual (secondary disinfection)

1.9 Laboratory Testing:

Ontario Regulation 170/03 dictates the sampling and monitoring requirements for the Deseronto facilities. Water quality is tested routinely throughout the treatment process and at the extremities of the distribution system. Analytical testing is conducted by an accredited laboratory.

1.10 Alarms and Staffing:

The Deseronto Water Treatment Plant is staffed during daytime hours on weekdays and is visited on weekends and holidays for routine system checks. During off-hours, process irregularities or building security breaches are detected by the plant alarm system and relayed to an on-call operator 24 hours per day, 7 days per week.



2 – Reports of Adverse Water and Other Deficiencies

Based on monitoring and sample results recorded in 2020, there was one adverse test result on June 2, 2020 when a sample collected from the sample hydrant at the west end of Dundas Street showed the presence of 9 total coliforms. Chlorine residuals were normal at the time of collection. Re-sampling and re-testing were completed the days after the adverse incident and results were clear of contaminated indicators. All the results were reported to the Health Unit and Spills Action Centre. No further actions were deemed necessary by the Health Unit.

3 – Flow Measurement and Analytical Testing

3.1 Raw and Treated Water Flow

Raw water is pumped to the treatment facility from the Bay of Quinte in accordance with the terms and conditions of Permit to Take Water 6262-98DPFG (expires June 1, 2023). During 2020, the permitted maximum day flow of 2946 m³/d and maximum instantaneous flow of 2050 L/min were not exceeded. Raw water flow to the treatment process averaged 1104 m³/d, with a maximum day flow of 1912 m³/day recorded on December 7th.

Raw and treated water flow data for 2020 are summarized in Table 1.

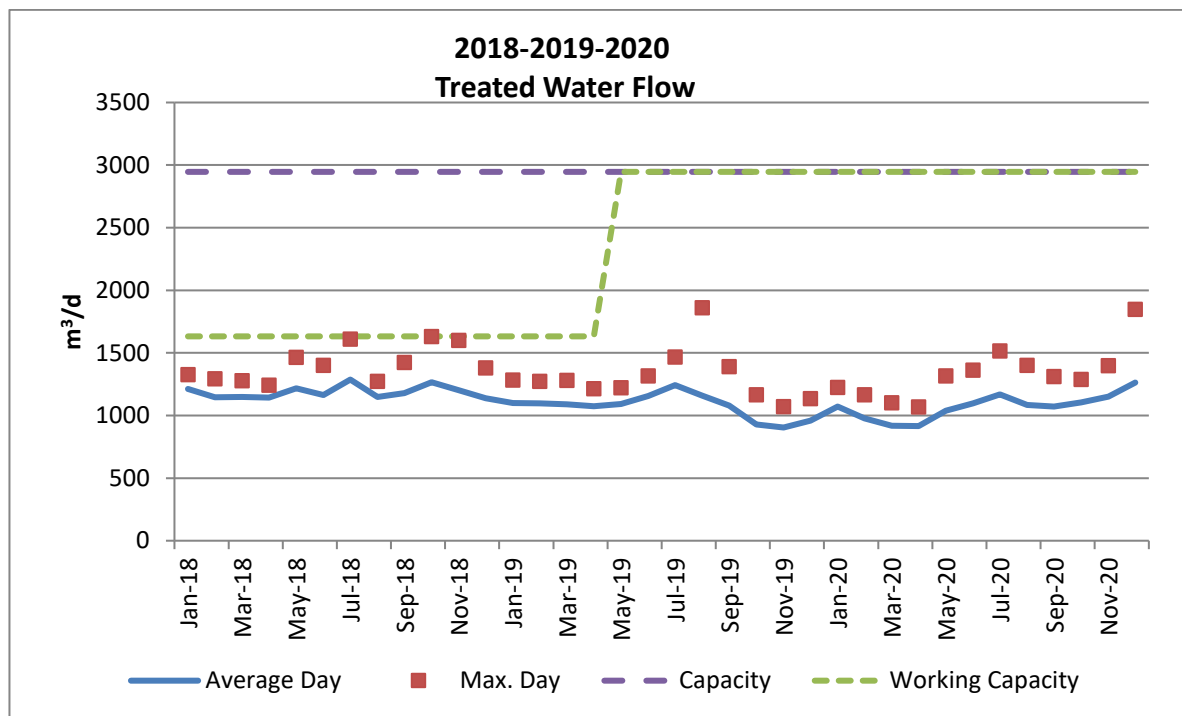
Table 1 – Raw and Treated Water Flow

Month	Raw Water				Treated Water			
	Minimum Daily Flow (m ³ /d)	Maximum Daily Flow (m ³ /d)	Average Daily Flow (m ³ /d)	Total Monthly Flow (m ³)	Minimum Daily Flow (m ³ /d)	Maximum Daily Flow (m ³ /d)	Average Daily Flow (m ³ /d)	Total Monthly Flow (m ³)
January	929	1408	1117	34622	879	1225	1072	33229
February	741	1193	1008	29231	707	1167	977	28338
March	799	1118	946	29324	787	1103	917	28420
April	722	1072	942	28257	753	1069	916	27487
May	803	1350	1065	33027	747	1318	1039	32198
June	898	1370	1127	33797	825	1362	1097	32915
July	929	1545	1213	37590	967	1515	1169	36251
August	922	1410	1123	34807	914	1400	1084	33611
September	886	1295	1103	33093	847	1312	1071	32127
October	938	1334	1139	35320	905	1288	1105	34269
November	970	1357	1175	35250	943	1399	1151	34520
December	879	1912	1287	39906	863	1848	1262	39129
Year Avg.			1104				1072	
Year Total				404223				392494
Year Max./Min.	722	1912			707	1848		
Permitted Capacity						2946		
Permit to Take Water		2946						

Treated water production averaged 1072 m³/d, which is the same as the 2019 average day flow. The maximum day treated water flow recorded during 2020 was 1848 m³/d, representing 63 percent of the permitted plant capacity of 2946 m³/d.

Treated water average and maximum day flows for each month of 2018, 2019 and 2020 are shown in the chart below.

Limitations to treated water production were experienced on the original process at the reactor clarifier and at the filters, particularly during backwash cycles. The working capacity of the original system is depicted on the chart at approximately 1600 m³/day. Upgrades to the process which commenced in 2018 and completed in 2019 eliminated those bottlenecks and restored the process to the original design capacity of 2946 m³/d. This is shown on the chart as of May 2019.



Maximum treated water demand was observed in December 2020. The cause is due to a service leak on Bayshore Road on MBQ. During 2020, there were no service leaks and no watermain break repairs. Repair or PM replacement of four customer service valves was also completed in 2020 along with three new service connections.

Locations of service leaks and main breaks can go undetected for extended periods of time as they often start slow and become worse over time. System leaks are typically located when water is observed on the surface of the ground or when customers report low pressure or noise from their

service lines. Leaking water doesn't easily surface due to the drainage provided by the fractured limestone geology underlying the Town. Undetected service breaks impose a significant burden on plant capacity. Single service leaks can waste as much as 20 percent of an average day of production.

The raw and treated water flow meters are calibrated annually by a qualified technician.

3.2 Temperature, Colour, Alkalinity, pH, and Hardness

Temperature, colour, alkalinity, and pH are measured in raw and treated water typically twice each week and are summarized for 2020 in Table 2. All are related to the operation of the coagulation and flocculation processes. Temperature and pH are also related to the effectiveness of the disinfection process. Hardness is a measure of dissolved minerals in water and is also included in Table 2. At elevated levels, hardness can create scaling on pipes, plumbing fixtures, and appliances.

Table 2 – Temperature, pH, Alkalinity, Hardness, and Colour

Month	Raw Water				Treated Water				
	Temp. (C)	pH	Alkalinity (mg/L CaCO ₃)	Colour (ACU)	Temp. (C)	pH	Alkalinity (mg/L CaCO ₃)	Hardness (mg/L)	Colour (ACU)
January	3.5	7.72	96	60	4.4	7.11	93.9	115.0	2.0
February	3.5	7.63	95	46	4.6	7.03	82.0	94.5	3.5
March	5.2	7.86	86	40	6.1	7.14	80.2	106.0	0.0
April	8.9	7.94	91	51	9.5	7.07	79.9	87.3	0.0
May	13.0	7.88	86	35	13.2	6.98	80.5	112.8	0.0
June	18.6	7.66	98	44	18.7	6.84	82.6	88.0	0.3
July	23.6	7.92	93	53	23.4	6.86	84.8	117.3	0.0
August	24.3	8.17	90	71	24.7	6.88	75.8	81.5	0.0
September	20.0	8.34	85	60	20.5	6.90	74.1	111.3	0.0
October	14.8	8.01	91	52	15.5	6.84	75.1	84.9	0.0
November	8.9	7.72	85	46	9.7	6.80	71.0	113.5	0.0
December	4.0	7.70	93	42	5.2	6.80	76.8	101.0	0.0
Annual Avg.	12.4	7.88	91	50	13.0	6.94	80	101	0.5
Aesthetic Obj.					<15	6.5 - 8.5	30 - 500	80 - 100	5

Notes:

-Aesthetic Obj. - refers to non-health related objectives from the ODWQS

-Expressed as monthly arithmetic mean values calculated from daily pH and temp (all others 2 samples/wk.)

Temperature: The data show that the raw water supply varies significantly in temperature over the course of the year. Raw and treated water temperatures measured daily ranged from approximately

3 C to 24 C. Temperature extremes can present challenges to the treatment process as some chemical coagulants react less quickly in cold water. At the other extreme, warm water promotes the growth of plants and algae in the raw water source, requiring higher chemical dosages and the potential for increased frequency of filter backwashing for effective treatment.

Colour: Colour develops in raw water sources most often from the decay of naturally occurring organic matter. The resulting colloidal and dissolved organic compounds react with coagulant chemicals and tend to increase dosage requirements. At the treatment plant, colour is removed by chemical oxidation during pre-chlorination, in the coagulation / flotation process, and through the granular activated carbon contactors.

Monthly average raw water colour measurements ranged from 35 ACU to 71 ACU. Effective removal was achieved through the treatment process as colour did not exceed the aesthetic objective of 5 NTU in any treated water samples collected during 2020.

The first week of November 2020 there were several customer complaints regarding coloured water. This happened at the same time as the watermain valves were being exercised in the distribution system. Routine maintenance was being performed and may have changed the flow pattern and some rust may have broken away from the valves being operated and released into the distribution system.

pH: pH has an impact on the performance of coagulants and on the effectiveness of the disinfection process. Both raw and treated water pH values remained relatively stable and within an acceptable range, averaging 7.9 and 6.9 respectively.

Alkalinity: Closely related to pH, alkalinity is a measurement of the acid buffering capacity of water. (The higher the alkalinity, the more acid that can be added before a change in pH occurs.) Several substances naturally present in raw water are measured as alkalinity, the majority of which are carbonate compounds. Coagulants, when added to water, combine with the alkalinity to produce insoluble metal hydroxides (floc particles) that play an important role in the flotation process. The primary coagulant used in the process is acidic and therefore decreases alkalinity. If too much natural alkalinity is consumed by the coagulant, there may be insufficient alkalinity remaining for optimal floc formation. Therefore, if a noticeable drop in pH (and alkalinity) is occurring, it may be

necessary to lower the coagulant dosage to conserve alkalinity or alter the process by adding alkalinity to the incoming raw water.

Raw and treated water alkalinities were relatively consistent through 2020 averaging 91 mg/L and 80 mg/L, respectively. All treated water alkalinity measurements were within the ODWQS recommended operational range.

Hardness: Hard water can cause scaling in pipes and fixtures while water that is low in hardness tends to be corrosive. According to the ODWQS, the ideal range is between 80 and 100 mg/L. Testing of treated water from the Deseronto process indicated moderate hardness (marginal potential for scaling), averaging 101 mg/L. Hardness in water is not a health concern, but rather an aesthetic characteristic.

3.3 Turbidity

Turbidity refers to a physical characteristic of water that causes a cloudy appearance. Turbidity is caused by the presence of suspended matter. It is of concern in treated water as it may include disease causing organisms, or material that can shield pathogens from disinfection. Adequate removal of turbidity through the treatment process is therefore necessary to ensure the effectiveness of the disinfection process.

Table 3 is a summary of turbidity measured in raw water as it enters the plant, effluent discharged from each filter, and in treated water prior to entering the distribution system.

Table 3 – Raw, Filtered, and Treated Water Turbidity

Month	Raw Water Turbidity			Dual Media Filter #1			Dual Media Filter #2			Dual Media Filter #3			Treated Water Turbidity		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	1.10	3.70	2.22	0.058	0.166	0.066	0.031	0.113	0.034	0.038	0.144	0.046	0.023	0.327	0.031
February	0.59	1.89	0.97	0.056	0.163	0.064	0.025	0.094	0.032	0.031	0.138	0.047	0.023	0.870	0.040
March	0.75	1.63	1.30	0.061	0.126	0.071	0.025	0.087	0.032	0.031	0.094	0.038	0.029	0.951	0.043
April	0.68	4.53	1.54	0.059	0.141	0.063	0.031	0.100	0.035	0.038	0.106	0.041	0.040	0.174	0.049
May	0.47	2.23	0.97	0.060	0.141	0.065	0.031	0.125	0.040	0.038	0.150	0.047	0.033	0.448	0.048
June	1.39	2.62	2.07	0.060	0.150	0.071	0.038	0.125	0.047	0.044	0.138	0.055	0.039	0.999	0.072
July	2.01	6.04	3.95	0.055	0.171	0.065	0.038	0.194	0.046	0.044	0.175	0.062	0.035	0.848	0.072
August	3.98	7.15	5.93	0.060	0.186	0.070	0.038	0.150	0.053	0.056	0.200	0.071	0.032	0.717	0.052
September	3.81	5.36	4.48	0.065	0.179	0.080	0.050	0.163	0.067	0.056	0.175	0.073	0.045	1.000	0.061
October	2.81	4.84	3.88	0.044	0.250	0.057	0.038	0.213	0.050	0.044	0.181	0.062	0.033	0.190	0.044
November	1.36	7.89	3.44	0.043	0.168	0.050	0.038	0.113	0.047	0.044	0.113	0.051	0.026	0.999	0.037
December	1.07	4.95	2.40	0.046	0.113	0.049	0.038	0.106	0.045	0.038	0.113	0.046	0.023	0.438	0.029
Avg.			2.76			0.064			0.044			0.053			0.048
Max./Min.	0.47	7.89		0.043	0.250		0.025	0.213		0.031	0.200		0.023	1.000	
ODWS MAC					1.0			1.0			1.0			1.0	

Notes: Raw values are averages of grab samples collected 2x/week and measured using a Hach 2100P portable turbidity meter

Dual media filters and treated turbidity values are continuous measurements

Raw (untreated) water turbidity, based on monthly averages of bench top measurements during 2020, indicated a source water of moderately variable clarity, averaging 2.76 NTU and ranging from 0.47 NTU to 7.89 NTU.

Filtered water turbidity measured continuously in the effluent from filters 1,2 and 3 averaged 0.054 NTU, 0.044 NTU and 0.053 NTU respectively. Maximum values were 0.250 NTU for filter 1 and 0.213 NTU for filter 2 and 0.200 NTU for filter 3. Filter turbidity measurements consistently met the requirements of the Ontario Drinking Water Quality Standards.

The rules for disinfecting drinking water require that at least 95 percent of filtered water turbidity measurements in a given month are less than 0.3 NTU. Calculations confirmed that the rule was satisfied during each month of 2020. Treated water turbidity was typically less than 0.1 NTU, averaging 0.048 NTU.

Process alarms are installed at various stages of treatment to alert staff to abnormally high turbidity well in advance of significant process failure or the compliance limit. In the event that turbidity exceeds an alarm set point, the low lift pumps automatically shut off, halting the treatment process until the abnormal operating condition is corrected.

Accuracy of the raw, process, and treated water continuous monitoring instruments is verified at least twice weekly using portable bench top instrumentation. Both continuous and bench top measurement instruments are routinely maintained and calibrated in accordance with manufacturer recommendations.

3.4 Disinfection and Bacteriological Testing

Disinfection of the water supply protects public health by ensuring the inactivation of potentially harmful micro-organisms that may have passed through the treatment process or entered the distribution system by other means. A minimum free residual of 0.2 mg/L, maintained throughout the distribution system, is recommended in the *Procedure for Disinfecting Drinking Water in Ontario*. Less than 0.05 mg/L free residual is considered an adverse condition and may pose a potential threat to public health. Additionally, the *Guideline* requires that treated water must be mixed with the disinfectant and held for a minimum period of time before distributing to customers. This is referred to as CT which is calculated as the product of the disinfectant concentration and the amount of time the water is exposed to the disinfectant. CT is directly related to the rate of pathogen inactivation.

Chlorine residuals are monitored continuously in raw water (upstream from the treatment process) and in treated water. The treated water analyzer is equipped with alarms that alert the operators to process abnormalities and will shut down the process to prevent improperly disinfected water from entering the distribution system.

Disinfectant residuals and bacteriological results are summarized in Tables 4a, 4b, and 4c. Chlorine residual measurement instruments are routinely calibrated and maintained by operations staff according to manufacturer specifications.

Table 4a – Treated Water Disinfection and Bacteriological Analytical Data

Month	Treated Water								
	Free Cl ₂ Residual			Total Cl ₂ Residual			Total Coliforms (org./100mL)	E. Coli (org./100mL)	Heterotrophic Plate Count (org./1mL)
	Min (mg/L)	Max (mg/L)	Avg (mg/L)	Min (mg/L)	Max (mg/L)	Avg (mg/L)			
January	0.79	1.50	1.30	1.29	1.70	1.50	0	0	<10 - 10
February	1.03	1.46	1.28	1.34	1.72	1.49	0	0	<10
March	0.96	1.42	1.27	1.32	1.61	1.45	0	0	<10
April	1.04	1.45	1.27	1.20	1.53	1.36	0	0	<10-10
May	0.98	1.58	1.29	1.28	1.65	1.41	0	0	<10-10
June	0.88	1.73	1.39	1.32	1.94	1.57	0	0	<10
July	0.90	1.67	1.38	1.30	1.78	1.55	0	0	<10
August	0.95	1.57	1.32	1.27	1.75	1.49	0	0	<10-10
September	0.97	1.51	1.28	1.35	1.68	1.54	0	0	<10
October	1.11	1.63	1.35	1.44	1.75	1.62	0	0	<10-40
November	1.11	1.47	1.31	1.47	1.60	1.54	0	0	<10
December	0.99	1.59	1.31	1.33	1.69	1.53	0	0	<10-10
# of samples	continuous			366	366	366	53	53	52
Annual Min/Max/Avg	0.79	1.73	1.31	1.20	1.94	1.51			

Notes:

- total chlorine residual values are derived from bench-top analysis of grab samples collected daily
- free chlorine residual values represent on-line continuous measurements recorded every 5 minutes.

Free chlorine residual measured in treated water at the plant averaged 1.31 mg/L, which is a little lower than the average of 1.38 mg/l observed in 2019. It is important to note that chlorine residual typically declines in proportion to the distance from the point of application. Relatively high chlorine residuals are required leaving the plant to ensure that the guideline minimum residual of 0.2 mg/L is maintained throughout the distribution system. Testing of approximately 150 grab samples collected from sample stations located at the distant extremes of the distribution system as well as continuous monitoring from one remote location indicate that the minimum free chlorine residual measured in the distribution system during 2020 was 0.45 mg/L.

Verification of the disinfection process is demonstrated by testing treated water samples for indicators of bacteriological contamination. Throughout 2020 over 200 water samples were collected at the water treatment plant and from various locations in the distribution system. There was one adverse water quality measured in a sample collected June 2,2020 details above in Section 2-Reports of Adverse Water and other deficiencies.

Table 4b – Distribution Water Disinfection and Bacteriological Data

Month	Distribution Water					
	Distribution Free Cl ₂			Total Coliforms (org./100mL)	E. Coli (org./100mL)	HPC (org./1mL)
	Min (mg/L)	Max (mg/L)	Avg (mg/L)			
January	0.85	1.71	1.35	0	0	<10 - 40
February	0.77	1.52	1.30	0	0	<10
March	0.82	1.57	1.24	0	0	<10 - 10
April	0.63	1.52	1.17	0	0	<10
May	0.42	1.69	1.19	0	0	<10
June	0.26	2.05	1.22	9	0	<10
July	0.30	1.85	1.10	0	0	<10 - 10
August	0.27	2.03	1.17	0	0	<10
September	0.34	1.70	1.15	0	0	<10 - 10
October	0.21	1.73	1.30	0	0	<10
November	0.69	1.49	1.19	0	0	<10
December	0.57	1.57	1.14	0	0	<10
# of samples	continuous			157	157	52
Annual Min/Max/Avg	0.21	2.05	1.21			

Notes:

Reported average and maximum free chlorine residual values represent continuous measurements recorded every 5 minutes

Reported minimum free chlorine residual values represent continuous measurements and analysis of grab samples collected from 3 locations each week

Samples for bacteriological testing are collected typically from 3 of 4 dedicated sample hydrants once each week

Verification of the disinfection process is demonstrated by testing treated water samples for indicators of bacteriological contamination. Throughout 2020 over 200 water samples were collected at the water treatment plant and from various locations in the distribution system. With only one sample showing indicator of adverse water quality.

Raw water (untreated source water from the Bay of Quinte is chlorinated at the intake crib to control the growth of zebra mussels and to prevent other growth in the intake pipe prior to entering the treatment process. Chlorine residual in raw water is continuously measured immediately upstream from the treatment process to verify dosage. Grab samples of raw water are also collected daily and tested for free and total chlorine residual.

An underwater inspection and cleaning of the intake crib conducted in June 2020 indicated successful operation of the pre-chlorination / zebra mussel control system. The intake crib is inspected and cleaned at a frequency of every three to five years.

The bacteriological quality of raw water is routinely tested to detect changes in source water quality. Bacteriological quality tends to deteriorate when water temperature is warm due to increased rate of growth, and during heavy rainfall events when surface contaminants are washed into the source water. Raw water bacteriological results and chlorine residuals were relatively consistent with those observed in 2019.

Table 4c – Raw Water Pre-chlorination and Bacteriological Data

Month	Raw Water			Pre-chlorinated Raw Water					
	Total Coliforms (org./100mL)	E. Coli (org./100mL)	HPC (org./1mL)	Free Cl ₂ Residual			Total Cl ₂ Residual		
				Min (mg/L)	Max (mg/L)	Avg (mg/L)	Min (mg/L)	Max (mg/L)	Avg (mg/L)
January	21 - 155	1 - 4	>2000	0.01	0.13	0.06	0.04	0.24	0.16
February	1 - 3	0	80 - >2000	0.01	0.17	0.08	0.11	0.26	0.19
March	3 - 12	0	30	0.01	0.11	0.05	0.09	0.25	0.17
April	0 - 27	0	70	0.02	0.09	0.05	0.11	0.21	0.15
May	0 - 25	0	200	0.02	0.10	0.04	0.08	0.21	0.14
June	12 - >200	0 - 2	340 - 820	0.02	0.12	0.06	0.08	0.31	0.18
July	46 - OG	0 - OG	>2000	0.02	0.16	0.08	0.05	0.23	0.16
August	5 - 64	1 - 6	40	0.06	0.14	0.10	0.11	0.26	0.18
September	0 - 14	0 - 1	270	0.05	0.11	0.07	0.11	0.19	0.14
October	0 - 30	0	660	0.04	0.11	0.06	0.09	0.20	0.16
November	8 - 60	0	100	0.02	0.10	0.05	0.12	0.18	0.14
December	0 - 18	0	170	0.01	0.15	0.08	0.15	0.30	0.20
# of samples	52	52	14	366					
Min/Max/Avg				0.01	0.17	0.06	0.04	0.31	0.17
Range	0 - OG	0 - OG	30 - >2000						

Notes:

Reported free and total chlorine residuals are measured in daily grab samples

3.5 Process Chemical Addition:

Three chemicals are used in the treatment process including a poly-aluminum chloride blend, anionic polymer, and chlorine. Table 5 summarizes the use of those chemicals during 2020.

Table 5 – Treatment Process Chemical Use and Aluminum Residual

Month	Coagulant			Polymer		Pre Chlorine Gas		Post Chlorine Gas	
	Monthly Usage (L)	Average Dosage (mg/L)	Treated Water Al residual (ug/L)	Monthly Usage (L)	Average Dosage (mg/L)	Monthly Usage (kg)	Average Dosage (mg/L)	Monthly Usage (kg)	Average Dosage (mg/L)
January	3133.18	35.18	0.011	3864.66	0.112	15.61	0.45	94.40	2.85
February	2503.88	33.16	0.024	2978.60	0.102	9.70	0.33	78.60	2.77
March	2731.29	36.18	0.013	2995.56	0.103	9.34	0.32	66.60	2.35
April	2598.81	35.66	0.021	2865.55	0.163	9.16	0.32	65.60	2.39
May	2969.77	34.71	0.022	3532.46	0.107	13.34	0.40	82.80	2.58
June	3579.21	40.97	0.022	3498.60	0.103	19.42	0.57	91.80	2.80
July	4204.05	43.13	0.036	3984.62	0.106	20.33	0.54	95.60	2.64
August	4007.51	44.81	0.037	3555.12	0.102	14.33	0.41	82.60	2.46
September	3981.03	46.63	0.037	3509.91	0.106	12.42	0.38	79.80	2.48
October	3707.24	40.65	0.020	3702.07	0.105	14.88	0.42	82.80	2.42
November	3596.85	39.57	0.023	3577.71	0.101	14.52	0.41	79.00	2.29
December	3674.13	35.40	0.016	4007.27	0.100	21.41	0.54	96.80	2.50
Average	3391	38.8	0.023	3506	0.109	14.5	0.42	83.0	2.54
Year Total	40687			42072		174.4		996.4	

The average dosage of coagulant during 2020 was 39 mg/L (expressed as mg active ingredient/L), increased by approximately 14 percent when compared to that observed in 2019 (34 mg/L). Although dosage remained consistent with 2019, experience with the new process is required to optimize dosage and performance.

Polymer dosage in 2020 averaged 0.11 mg/L which was consistent with that observed in 2019 (0.12 mg/l).

Dissolved aluminum is measured in the treated water due to the necessary addition of aluminum-based coagulant in the treatment process. Optimized process control is recommended to reduce residual aluminum to under the operational guideline of 0.100 mg/L. High residual aluminum can cause scaling of the pipes in the distribution system, interference with certain industrial processes, and re-flocculation in the distribution system. Aluminum residuals measured in treated water samples collected during 2020 averaged 0.023 mg/L showing a marginal crease in the average observed the previous year (0.019 mg/L). Aluminum residual measurements did not exceed the ODWQS operational guideline. Monthly average treated water aluminum residuals are summarized in Table 5.

The total mass of chlorine used in the treatment process decreased by approximately 6 percent when compared to 2019. Dosage of treated water distributed to customers decreased by 8 percent from 2019.

3.6 Other Organic and Inorganic Testing:

Analyses of approximately 70 additional organic and inorganic parameters in the treated water are required at various frequencies. The majority of those substances, listed as Schedules 23 and 24 in O.Reg.170/03, must be tested at least annually. Testing for nitrite, nitrate, THMs, and HAAs is required quarterly, while sodium and fluoride must be tested once every five years. The results of those analyses are summarized in Tables 6 and 7.

Concentrations of most tested substances were either below the analytical method detection limits (either not present or in trace levels too low to quantify) or well below the maximum acceptable concentrations listed in the ODWQS.

The 4-quarter average concentrations of THMs and HAAs (by-products of the disinfection process) in 2020 remained below the ODWQS maximum acceptable concentrations.

Table 6 – Schedule 23, Fluoride, Sodium, Nitrite, and Nitrate

Parameter	Limit mg/L	Limit Type	Date Sampled	# of samples	Treated Maximum Conc. mg/L	Limit Exceeded?
Antimony	0.006	IMAC	29-Jan-19	1	<0.0001	no
Arsenic	0.025	IMAC	29-Jan-19	1	0.0002	no
Barium	1	MAC	29-Jan-19	1	0.036	no
Boron	5	IMAC	29-Jan-19	1	<0.005	no
Cadmium	0.005	MAC	29-Jan-19	1	<0.000015	no
Chromium	0.05	MAC	29-Jan-19	1	<0.002	no
Fluoride	1.5	MAC	20-Jan-15	1	0.04	no
Mercury	0.001	MAC	29-Jan-19	1	<0.00002	no
Selenium	0.01	MAC	29-Jan-19	1	<0.001	no
Sodium	200	AO	20-Jan-15	1	12.1	no
Uranium	0.02	MAC	29-Jan-19	1	<0.00005	no

NOTES:

Nitrate and nitrite values are maximum concentrations measured in quarterly samples.

MAC - ODWS maximum acceptable concentration

IMAC - ODWS interim maximum acceptable concentration

AO - ODWS aesthetic objective

Quarterly Nitrate / Nitrite Results (mg/L)

	Q1	Q2	Q3	Q4	Maximum	MAC
Date	Jan 29th	Apr 2nd	Jul 23rd	Oct 15th		
Nitrate	0.4	0.4	0.2	<0.1	0.3	10.0
Nitrite	<0.1	<0.1	<0.1	<0.1	<0.1	1.0

Table 7 – Schedule 24 Parameter Concentration Data

Parameter	Units	ODWS		Date Sampled	# of spls	Result	Limit Exceeded
		Limit	Type				
Alachlor	µg/L	5	IMAC	29-Jan-19	1	<0.3	no
Atrazine + Metabolites	µg/L	5	IMAC	29-Jan-19	1	<0.5	no
Azinphos-methyl	µg/L	20	MAC	29-Jan-19	1	<1	no
Benzene	µg/L	1	MAC	29-Jan-19	1	<0.5	no
Benzo(a)pyrene	µg/L	0.01	MAC	29-Jan-19	1	<0.005	no
Bromoxynil	µg/L	5	IMAC	29-Jan-19	1	<0.5	no
Carbaryl	µg/L	90	MAC	29-Jan-19	1	<3	no
Carbofuran	µg/L	90	MAC	29-Jan-19	1	<1	no
Carbon tetrachloride	µg/L	2	MAC	29-Jan-19	1	<0.2	no
Chlorpyrifos	µg/L	90	MAC	29-Jan-19	1	<0.5	no
Diazinon	µg/L	20	MAC	29-Jan-19	1	<1	no
Dicamba	µg/L	120	MAC	29-Jan-19	1	<10	no
1,2-dichlorobenzene	µg/L	200/3	MAC/AO	29-Jan-19	1	<0.5	no
1,4-dichlorobenzene	µg/L	5/1	MAC/AO	29-Jan-19	1	<0.5	no
1,2-dichloroethane	µg/L	5	IMAC	29-Jan-19	1	<0.5	no
1,1-dichloroethene	µg/L	14	MAC	29-Jan-19	1	<0.5	no
Dichloromethane	µg/L	50	MAC	29-Jan-19	1	<5	no
2,4-dichlorophenol	µg/L	900/0.3	MAC/AO	29-Jan-19	1	<0.1	no
2,4-dichlorophenoxy acetic acid	µg/L	100	IMAC	29-Jan-19	1	<10	no
Diclofop-methyl	µg/L	9	MAC	29-Jan-19	1	<0.9	no
Dimethoate	µg/L	20	IMAC	29-Jan-19	1	<1	no
Diquat	µg/L	70	MAC	29-Jan-19	1	<5	no
Diuron	µg/L	150	MAC	29-Jan-19	1	<5	no
Glyphosate	µg/L	280	IMAC	29-Jan-19	1	<25	no
Malathion	µg/L	190	MAC	29-Jan-19	1	<5	no
MCPA	µg/L	100	MAC	29-Jan-19	1	<10	no
Metolachlor	µg/L	50	IMAC	29-Jan-19	1	<3	no
Metribuzin	µg/L	80	MAC	29-Jan-19	1	<3	no
Monochlorobenzene	µg/L	80/30	MAC/AO	29-Jan-19	1	<0.5	no
Paraquat	µg/L	10	IMAC	29-Jan-19	1	<1	no
Pentachlorophenol	µg/L	60, 30	MAC/AO	29-Jan-19	1	<0.1	no
Phorate	µg/L	2	IMAC	29-Jan-19	1	<0.3	no
Picloram	µg/L	190	IMAC	29-Jan-19	1	<15	no
Polychlorinated Biphenyls (PCB's)	µg/L	3	IMAC	29-Jan-19	1	<0.05	no
Prometryne	µg/L	1	IMAC	29-Jan-19	1	<0.1	no
Simazine	µg/L	10	IMAC	29-Jan-19	1	<0.5	no
Terbufos	µg/L	1	IMAC	29-Jan-19	1	<0.5	no
Tetrachloroethylene	µg/L	10	MAC	29-Jan-19	1	<0.5	no
2,3,4,6-Tetrachlorophenol	µg/L	100/1	MAC/AO	29-Jan-19	1	<0.1	no

Table 7 – Schedule 24 Parameter Data (2)

Parameter	Units	ODWS		Date Sampled	# of samples	Result	Limit Exceeded
		Limit	Type				
Triallate	µg/L	230	MAC	29-Jan-19	1	<10	no
Trichloroethylene	µg/L	5	MAC	29-Jan-19	1	<0.5	no
2,4,6-Trichlorophenol	µg/L	5, 2	MAC, AO	29-Jan-19	1	<0.1	no
Trifluralin	µg/L	45	IMAC	29-Jan-19	1	<0.5	no
Vinyl Chloride	µg/L	1	MAC	29-Jan-19	1	<0.2	no

NOTES:

Samples for THM & HAA analysis collected from distribution sample hydrant
 THM and HAA MAC is based on 4-quarter running average

Quarterly THM Results (µg/L)

	Q1	Q2	Q3	Q4		
Date	Jan 14th	Apr 7th	Jul 7th	Oct 6 th	Average	MAC
Bromodichloromethane	3.0	3.0	3.0	7.0	4.0	
Bromoform	<5.0	<5.0	<5.0	<5.0	<5.0	
Chloroform	33.0	28.0	36.0	30.0	31.8	
Dibromochloromethane	<2.0	<2.0	<2.0	<2.0	<2.0	
Total THMs	33.0	31.0	45.0	37.0	36.5	100

Quarterly HAA Results (µg/L)

	Q1	Q2	Q3	Q4		
Date	Jan 14th	Apr 7th	Jul 7th	Oct 6 th	Average	MAC
Chloroacetic Acid	<4.7	<4.7	<4.7	<4.7	<4.7	
Bromoacetic Acid	<2.9	<2.9	<2.9	<2.9	<2.9	
Dichloroacetic Acid	12.4	14.8	17.8	13.8	14.7	
Dibromoacetic Acid	<2.0	<2.0	<2.0	<2.0	<2.0	
Trichloroacetic Acid	18.9	23.1	18.6	17.5	19.5	
Total HAAs	31.3	37.9	36.4	31.3	34.2	80

3.7 Distribution System Lead Testing

Lead can be present in drinking water systems as the result of corrosion of lead solder, lead in brass fittings/fixtures, or lead pipes in plumbing or building service lines. Although most of those sources of lead have been eliminated from modern construction materials, elevated concentrations are periodically detected in water samples collected in older neighborhoods where lead service lines still exist. As a result, in 2007 the Province imposed mandatory lead testing at all municipal drinking water systems. This precautionary testing was primarily focused on protecting the health of the vulnerable population which, in the case of lead contamination, is young children (<6 yrs.) and pregnant women. While drinking water is a minor contributor to blood lead levels, municipal lead testing helps identify potential sources of contamination and will provide opportunities to further improve the high quality of public water supplies.

From 2008 through 2010, a total of 120 samples were collected from residential and non-residential plumbing. Of those, only 6 exceeded the standard. Additional testing at the sites where the standard was exceeded clearly indicated that minimal lead remained in the water after flushing for as little as several seconds.

Residential lead testing was not required during 2011 and 2012 as past results from the Deseronto system demonstrated a very low health risk.

The lead sampling program resumed at a reduced rate in 2013, with results from all tested locations well below the ODWQS maximum acceptable concentration.

Based on the favorable past results, residential lead sampling is no longer required unless significant changes in other water characteristics are observed; specifically, pH and alkalinity. Testing of pH and alkalinity in the distribution system continues to be a semi-annual requirement while lead in the distribution system must be measured once every three years. Analytical data for distribution system lead, pH, and alkalinity from 2013 to 2019 are provided in Table 8.

Table 8 – Distribution Lead, pH, and Alkalinity

Sample Date	West Sample Hydrant			North Sample Hydrant			East Sample Hydrant		
	Lead mg/l	pH	Alkalinity mg/l	Lead mg/l	pH	Alkalinity mg/l	Lead mg/l	pH	Alkalinity mg/l
25-Feb-13	0.00031	7.0	92	0.00050	7.0	92			
25-Sep-13	0.00079	6.8	67	0.00092	6.8	67			
14-Jan-14		6.9	86					6.9	86
12-Aug-14		6.9	82					7.0	82
20-Jan-15		7.0	94					7.0	96
07-Jul-15		6.8	90					6.7	91
26-Jan-16	0.00044	7.1	97				0.00032	7.1	97
26-Jul-16	0.00067	6.6	82				0.00034	6.8	84
10-Jan-17		7.4	89					7.3	89
11-Jul-17		7.2	83					7.2	83
23-Jan-18		7.3	91					7.3	91
17-Jul-18		6.4	72					6.8	73
02-Apr-19	0.00013	7.2	81	0.00009	7.2	78			
23-Jul-19	0.00010	6.9	83	0.00016	6.9	106			
14-Jan-20	0.00008	7.2	81				0.00009	7.2	84
21-Jul-20	0.00007	7.0	78				0.00017	7.0	77
Limit / Objective	0.01	6.5 - 8.5	30 - 500	0.01	6.5 - 8.5	30 - 500	0.01	6.5 - 8.5	30 - 500

3.9 Microcystin Testing

Blooms of blue-green algae are common in the Bay of Quinte during warm summer and early fall months. When blue-green algae decays it releases toxic compounds called microcystins.

To monitor for microcystins in Deseronto drinking water, samples of both raw and treated water are sampled and tested weekly from June to October. Measurable concentrations of microcystins in the raw untreated Bay water are seasonally common but are typically below the drinking water standard of 1.5 µg/L as microcystin-LR. During 2020 the maximum concentration of microcystin-DM measured in untreated water was 3.33 µg/L on July 21, 2020. That result is higher than the maximum observed in 2019 (1.95 µg/L). Microcystin standard is based on microcystin-LR which is a small portion of the reported value as microcystin-DM.

Microcystins are removed through the Deseronto treatment process by oxidation (chlorine) and by adsorption in the granular activated carbon filter media. The treatment process has been effective in removing microcystins from the raw water as it was not detected in any treated water sample collected in 2020.

3.10 Waste Clarifier Performance Monitoring

The waste clarifier treats the waste generated from the water treatment process including filter backwash, and sludge from the flotation process. Treated effluent from the waste clarifier is discharged to the Bay of Quinte. The waste clarifier was put back into service in July after completion of the upgrade construction. While out of service, all waste was pumped directly to the raw sewage wet well at the wastewater treatment plant.

Effluent from the waste clarifier, when in operation, is sampled at least once per month and tested for total suspended solids (TSS). The annual average concentration of TSS was 5.3 mg/L which is well below the maximum permitted average concentration of 25 mg/L. Flow to the waste clarifier during 2020 did not exceed the design capacity of 350 m³/d. Performance data for the waste clarifier is provided in Table 9.

Table 9 – Waste Clarifier Performance Data

Month	Avg. Flow (m ³ /d)	Max. Flow (m ³ /d)	TSS (mg/L)
January	115.1	188.2	3
February	66.2	127.5	3
March	79.6	139.1	7
April	96.3	150.6	4
May	90.6	162.1	4
June	73.7	156.8	19
July	65.5	114.0	5
August	64.1	125.5	3
September	68.7	146.4	3
October	74.8	148.5	5
November	67.8	118.2	4
December	65.5	115.0	3
Maximum		188.2	19
Average	77.3		5.3
DWWP Limit			25

where:
 Avg. Flow - Average daily flow for each month.
 Max. Flow - Maximum day flow measured each month.
 TSS - total suspended solids
 DWWP TSS limit based on annual average of monthly splles

4 – System Maintenance and Improvements

Major upgrading of the water treatment plant commenced in May 2018 and was substantially completed in August 2019, with the warranty period ending in August 2020.

The upgrades include:

- new low lift pumps and controls,
- replacement of the reactor clarifier with twin dissolved air flotation processes,
- replacement of 2 dual media filters and 2 granular activated carbon contactors with 3 conventional sand filters incorporating a granular activated carbon media cap, complete with backwash pump, air scour blower and piping and pressure controls for back-up backwash from the distribution system,
- replacement of motors and controls on 2 of 4 high lift pumps,
- replacement of the stainless-steel pipe header from the high lift pumps to the distribution system, complete with a new in-plant isolation valve,

-
- new SCADA process control system,
 - replacement of the low lift and treatment plant chlorine disinfection systems with associated monitoring instrumentation and controls,
 - new lighting, and HVAC systems,
 - refurbishment of the office, control room, lab, and lunch/meeting rooms,
 - new MCC with automatic transfer switch to the emergency power generator,
 - structural reinforcement, insulation, windows, doors, and cladding of the WTP building.

The upgrades will address design deficiencies, remove existing capacity bottlenecks, and improve the overall efficiency and reliability of the treated water supply for the Town and neighbouring Mohawks of the Bay of Quinte (MBQ).

This project was 2/3rds funded by the Federal and Provincial governments under the Small Communities Fund. The remaining third was funded by the Town (65%) and the MBQ (35%), proportional to the capacity allocated to each community.

Through the first year of full operation the plant has performed very well. With new equipment and routine maintenance, the process should continue to perform well for many years to come. The four high lift pumps are one of the original pieces of equipment. Currently on a cycle to re-build one every year. High lift #1 was rebuilt and installed in 2019, with high lift #3 scheduled this year.