PUBLIC WORKS

DATE: February 13, 2018 **REPORT NO. PW2018-009**

TO: Chair and Members
Committee of the Whole – Operations and Administration

FROM: E. (Beth) Goodger, General Manager
Public Works Commission

1.0 TYPE OF REPORT **CONSENT ITEM [X]**
ITEM FOR CONSIDERATION [ ]

2.0 TOPIC:

City of Brantford Water System 2017 Annual Summary Report

3.0 RECOMMENDATION

THAT Report No. PW2018-009 titled "City of Brantford Water System 2017 Annual Summary Report", BE RECEIVED.

4.0 PURPOSE

To inform Council about the operation and performance of the municipal water treatment and distribution system as required by Schedule 22 of Ontario Regulation 170/03 under the Safe Drinking Water Act. The 2017 performance is outlined in Appendix "A" City of Brantford Water System 2017 Annual Summary Report.

5.0 BACKGROUND

Schedule 22 of Ontario Regulation 170/03 under the Safe Drinking Water Act requires that a Drinking Water Annual Summary Report be prepared and submitted to the members of municipal Council by March 31st of each year relating to the operation and performance of the municipal drinking water system for the preceding calendar year. The report must list any non-compliance issues that occurred in the previous year related to the drinking water regulation, drinking water works permit, municipal drinking water license and any orders applicable to the system. The report must also specify the duration of failure and measures taken to correct the issue. The report must also include information, such as the quantity of water supplied for the purpose of enabling the owner of the system to assess the capability of the system to meet existing and planned

uses of the system. The regulation requires that a copy of the report be provided to the County of Brant, which is a municipality that receives water from the City.

City Boundary Expansion

The Councils of the City of Brantford and the County of Brant formally approved the Boundary Adjustment Agreement for the transfer of 2,720 hectares of land from the County of Brant to the City of Brantford on June 28, 2016. The Minister of Municipal Affairs officially signed the Restructuring Order and the land was annexed to the City on January 1, 2017. At that time, the City assumed responsibility for providing services in the annexed areas including the provision of water.

Expansion of water services in the annexed areas will be determined through an update of the City's Official Plan and Water & Wastewater Master Servicing Plan. These updates are currently underway and are scheduled to be completed in the coming 12-16 months.

Existing water services within the annexed area include:

King George Rd.

On January 1, 2017 the City assumed the County of Brant's King George Rd. Distribution System. The distribution system was already connected directly to the City's distribution system at King George Rd and Powerline Rd. Former County residents were advised of the change via written correspondence and advised that they would not experience any changes in water quality.

Tutela Heights

On January 1, 2017 the City assumed the Tutela Heights area from the County of Brant. Working with the MOECC, the City and the County agreed that the County would continue to supply and maintain the Tutela Heights Water System until December 31, 2020. This was set out in an agreement ("Water Agreement") between the City and County and approved by both municipal Councils in March 2017 (Report PW2017-005 Boundary Expansion Transition - Water Agreement for the Tutela Heights Area). For operational and regulatory purposes, the Tutela Heights Water System was transferred to the County for nominal consideration for the term of the Water Agreement, and will be transferred back to the City for nominal consideration upon the termination of the Water Agreement. As a result, Brant County will be completing the regulatory reporting requirements for the Tutela Heights Water System and a copy of the report will be provided to the City.

6.0 CORPORATE POLICY CONTEXT

Not Applicable

7.0 INPUT FROM OTHER SOURCES

Not Applicable

8.0 ANALYSIS

The City of Brantford Water System 2017 Annual Summary Report is attached as Appendix “A” and outlines the performance of the City of Brantford Water System (including Treatment Plant & Distribution System) in 2017.

The report outlines:

- Background and Description of Drinking Water System
- List of Water Treatment Chemicals Used
- Major Expenses Related to Drinking Water Quality
- Summary of Reporting Adverse Test Results and Other Problems (Schedule 16)
- Holmedale Water Treatment Plant Flows
- Summary of Test Results Required Under O.Reg 170/03

Copies of the report will be available for the public at City Hall. This report will also be posted on the City website. A copy of the report will be provided to the County of Brant by March 31, 2018.

Additionally, the Ministry of the Environment & Climate Change (MOECC) conducted an annual inspection of the City of Brantford Water System in December 2017 and the City scored 96%.

9.0 FINANCIAL IMPLICATIONS

Not Applicable

10.0 CONCLUSION

In accordance with Schedule 22 of Ontario Regulation 170/03 under the Safe Drinking Water Act, it is recommended that the City of Brantford Water System - 2017 Annual Summary Report for the City of Brantford Water System, as prepared by the Environmental Services Department be received.

Selvi Kongara, P.Eng
Director, Environmental Services
Public Works Commission

E. (Beth) Goodger, General Manager
Public Works Commission

In adopting this report, is a by-law or agreement required? If so, it should be referenced in the recommendation section.

By-law required	**[ ] yes**	**[X] no**
Agreement(s) or other documents to be signed by Mayor and/or City Clerk	**[ ] yes**	**[X] no**
Is the necessary by-law or agreement being sent concurrently to Council?	**[ ] yes**	**[X] no**

City of Brantford Water System

2017 Annual Summary Report

Date: February 13, 2018

Table of Contents

A. Background

This report has been prepared in accordance with the terms and requirements set out in the Safe Drinking Water Act (2002), as Section 11 – Annual Reports and Schedule 22 – Summary Reports of Ontario Regulation 170/03. It covers the period from January 1st to December 31st, 2017.

The 2017 Annual Summary Report will be available to the public without charge, beginning March 1st, 2018. A copy of this report can be obtained via the Internet (www.brantford.ca) and at Brantford City Hall (519) 759-4150 Ext. 5539).

B. Description of Drinking Water System

The City of Brantford Water System is owned and operated by the Corporation of the City of Brantford. The Drinking Water System is a Large Municipal Residential System consisting of a Class IV Water Treatment Plant (Holmedale Water Treatment Plant) and a Class III Distribution System. (Drinking Water System Number: 220003564, Municipal Drinking Water License (MDWL) 063-101 Issue #: 6, Issued February 22, 2017, Drinking Water Works Permit (DWWP) #063-201 Issue #: 4, Issued: February 22, 2017).

The Holmedale Water Treatment Plant is located at 324 Grand River Avenue in Brantford, Ontario. The City's raw water supply is drawn from the Grand River, at the Holmedale Canal.

The plant is responsible for the overall management of the production and distribution of Brantford's drinking water. Specifically, this includes the treatment of Grand River water, the maintenance of the distribution and metering systems and meeting and/or exceeding water quality requirements. The water treatment plant is permitted to produce drinking water up to 100 Megalitres per day (ML/d) (Permit to Take Water #6434-AM3PEJ Issued: May 8, 2017, expires May 31, 2027.). The plant contains the following treatment process units: screening, coagulation, sand ballasted flocculation (John Meunier's Actiflo™), sedimentation, ozonation, biological filtration, UV disinfection, chlorination and chloramination.

Three reservoirs (in addition to an in-plant reservoir), one booster pumping station and an elevated tank are used in the distribution system to equalize water demand, to reduce pressure fluctuations and to provide reserves for firefighting, power outages and other emergencies. A Residue Management Facility (RMF) disposes of the waste generated during treatment in an environmentally sound manner. Treatment consists of concentrating the waste by three gravity settler thickeners and two belt filter presses.

The City of Brantford Water System sold water to one drinking water system, which is the Town of Cainsville Distribution System (Drinking Water System #: 260002616, Class I) which is owned and managed by the County of Brant.

Fluoridation

The City of Brantford was the first municipality in Canada and in North America to add fluoride to its drinking water which began on June 20, 1945. The City's drinking water is fluoridated to help prevent tooth decay of residents as directed by Brant County's Medical Officer of Health.

The City had added fluoride to the drinking water by adding a small dose of sodium silicofluoride powder. Since the Holmedale Water Treatment Plant upgrades were completed, which included a new fluoride batching system, there has been issues with particulate fluoride settling out of solution downstream from the injection point. The accumulation of solids had the potential to cause significant damage to the existing fluoridation system and other downstream infrastructure (i.e. piping, meters, sensors, etc.) at the WTP.

In May 2016 Council approved the switch from sodium silicofluoride powder to hydrofluosilicic acid. A pilot system was commissioned in June 2016 with a full scale system scheduled to be installed in March 2018.

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December 31, 2020. This was set out in an agreement ("Water Agreement") between the City and County and approved by both municipal Councils in March 2017 (Report PW2017-005 Boundary Expansion Transition - Water Agreement for the Tutela Heights Area). For operational and regulatory purposes, the Tutela Heights Water System was transferred to the County for nominal consideration for the term of the Water Agreement, and will be transferred back to the City for nominal consideration upon the termination of the Water Agreement. As a result, Brant County will be completing the regulatory reporting requirements for the Tutela Heights Water System and a copy of the report will be provided to the City.

C. List of Water Treatment Chemicals Used

- Polyaluminum chloride (primary coagulant)
- Flopam AN 934 PWG (settling aid)
- Micro-sand (settling aid)
- Liquid oxygen (primary chemical for ozone generation)
- Chlorine gas (primary disinfectant)
- Ammonia gas (in combination with free chlorine for secondary disinfection)
- Hydrofluosilicic Acid (fluoridation)
- Sulfur dioxide (gas) (dechlorination)

D. Major Expenses Related to Drinking Water Quality

Line Description	Cost($)
UPS Replacement Program	$190,430
4 New RMF Sludge Bins	$103,600
Low Lift Pump #3 Upgrade	$81,340
New Hydrocyclones	$35,701
Belt Press Spare Parts (Rollers, Bearings, Belts, wire and retainer rings)	$33,876
Annual SCADA iFix Operating System Support	$31,011
Annual Preventative Maintenance - Ozone	$24,500
New Diesel Tank for Low Lift	$22,795
Augers with shafts for RMF Belt Presses	$20,507
Ammonia Tank Valve Replacement	$16,724
New Dechlorination System	$14,622
Annual Preventive Maintenance - Chlorination & Dechlorination	$10,599
Park Road Reservoir Pump Repair	$8,531
Actuator for Tollgate Rd Reservoir Inlet Valve	$8,126
Annual Preventative Maintenance - UV	$6,847
Back Pressure Regulator Valve Ozone System	$6,529
Encore Metering Pump	$5,640
Amperometric Titrator	$5,278

E. Summary of Reporting Adverse Test Results and Other Problems (Schedule 16)

i. Adverse Bacteriological or Combined Chlorine Residual Results and Corrective Actions Results

January-March

During the 1st quarter of 2017, there were no adverse results to report.

April-June

There were 417 bacteriological samples taken in the second quarter of 2017. Five (5) of the samples taken had adverse test results.

North West Reservoir (June)

There were two (2) adverse results during this quarter at the North West Reservoir. On June 5, 2017, a routine bacteriological sample was collected from the North West Reservoir Inlet. The sample tested positive for one (1) e. coli and one (1) total coliform. On June 13, 2017 again during routine bacteriological sampling the North West Reservoir Outlet tested positive for one (1) total coliform. On both occasions fire hydrants were flushed in Pressure District 4 (PD-4) which the North West Reservoir is located in to improve water quality. PD-4 has historically had very low water usage even during the summer months. On both occasions resamples were collected along with samples from locations upstream and downstream from the adverse location as per O.Reg 170/03, all resamples were negative for bacteria (See Table 1.0).

Table 1.0: North West Reservoir Adverse Bacteriological Results and Corrective Actions

Location	Date	Total Coliform (per 100ml)	E. Coli (per 100ml)	Background (per 100ml)	HPC (per 1mL)	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Comments
North West Reservoir Inlet	5-Jun	**1**	**1**	0	0	0.03	2.13	
North West Reservoir Inlet	7-Jun	0	0	0	0	0.04	2.12	Resample
North West Reservoir Outlet	7-Jun	0	0	0	0	0.03	2.08	Downstream
Western Waffles	7-Jun	0	0	0	0	0.03	2.08	Downstream
Point of Entry	7-Jun	0	0	0	0	0.11	2.69	Upstream
North West Reservoir Inlet	8-Jun	0	0	0	0	0.05	2.61	Resample
North West Reservoir Outlet	8-Jun	0	0	0	0	0.04	2.09	Downstream
Western Waffles	8-Jun	0	0	0	0	0.03	2.09	Downstream
Point of Entry	8-Jun	0	0	0	0	0.10	2.81	Upstream
North West Reservoir Outlet	13-Jun	**1**	0	0		0.03	2.28	
North West Reservoir Inlet	15-Jun	0	0	0		0.03	2.61	Upstream
North West Reservoir Outlet	15-Jun	0	0	0		0.03	2.25	Resample
Savannah Oaks Ave.	15-Jun	0	0	0		0.03	2.32	Downstream
Point of Entry	15-Jun	0	0	0		0.12	2.62	Upstream

On June 15, 2017 a bacteriological sample collected following a service connection on a new watermain installation project tested positive for nine (9) total coliform. The location of the sample was not ideal due to the internal plumbing configuration. A resample was collected along with samples from locations upstream and downstream from the adverse location as per O.Reg 170/03, all resamples were negative for bacteria (See Table 2.0).

A routine bacteriological sample collected on June 20, 2017 at Centennial Grand-Woodlands School on Ellenson Dr. tested positive for one (1) total coliform. The location was resampled and samples were also collected from locations upstream and downstream from the adverse location as per O.Reg 170/03. The resample tested positive for two (2) total coliform, and the upstream and downstream samples were negative for bacteria. The location was resampled again on June 24 and 25, 2017 after the internal plumbing was flushed. The resamples were negative for bacteria (See Table 2.0).

Table 2.0: Adverse Bacteriological Results and Corrective Actions

Location	Date	Total Coliforms (per 100ml)	E. Coli (per 100ml)	Background (per 100ml)	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Comments
Frank St. A	15-Jun	**9**	0	0	0.03	2.64	
Frank St. A	17-Jun	0	0	0	0.08	2.62	Resample
Frank St. B	17-Jun	0	0	0	0.03	2.50	Upstream
Frank @ Webster BO	17-Jun	0	0	1	0.08	2.58	Downstream
Centennial Grand-Woodlands	20-Jun	**1**	0	0	0.09	1.38	
Centennial Grand-Woodlands	22-Jun	**2**	0	0	0.05	1.81	Resample
Ellenson A	22-Jun	0	0	0	0.06	2.14	Upstream
Ellenson C	22-Jun	0	0	0	0.04	2.04	Downstream
Ellenson A	24-Jun	0	0	0	0.03	2.06	Upstream
Ellenson B	24-Jun	0	0	0	0.04	2.00	Downstream
Centennial Grand-Woodlands	24-Jun	0	0	0	0.07	1.97	Resample
Ellenson A	25-Jun	0	0	0	0.06	2.17	Upstream
Ellenson D	25-Jun	0	0	0	0.06	2.20	Downstream
Centennial Grand-Woodlands	25-Jun	0	0	0	0.06	2.19	Resample

July-September

There were 445 samples were taken during the third quarter in 2017. Six (6) of the samples taken had adverse test results.

Low Chlorine Residuals – Elgin St. and Powerline Rd

On July 24, 2017, a low combined chlorine residual was recorded during bacteriological sample collection on Elgin St. The sample was required due to the watermain being shut down for a valve replacement on Elgin St. The cause of the low chlorine was an old 6" cast iron service which is oversized for the usage within the building. A fire hydrant was flushed on Elgin St. and the water service was flushed extensively to raise chlorine levels to acceptable levels (see Table 3.0). The results for the bacteriological sample collected were negative. It was recommended to the owner that the domestic water supply to the building be flushed daily to ensure water quality would not deteriorate.

On July 25, 2017, a low combined chlorine residual was recorded during bacteriological sample collection on Powerline Rd. It was discovered that the residents at the end of the water main were not home for an extended period of time. The water main was flushed as per O.Reg 170/03, results are outlined in Table 3.0.

Table 3.0: Adverse Combined Chlorine Residual and Corrective Actions

Location	Date	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Combined Chlorine (mg/L)	Comments
Elgin St Service	24-Jul	**0.04**	0.16	**0.12**	Very Low Usage
Elgin St Hydrant	24-Jul	0.06	2.44	2.38	Water service flushed
Elgin St Service	24-Jul	0.04	0.94	0.90	Resample
Powerline Rd.	25-Jul	**0.04**	0.20	**0.16**	Low Water Usage
Powerline Rd.	25-Jul	0.04	1.80	1.76	Resample

Adverse Bacteriological Results and Corrective Actions

On July 7, 2017 a bacteriological sample collected following a main break repair on Dublin Ave tested positive with seven (7) total coliforms. A resample was collected along with samples from locations upstream and downstream from the adverse location as per O.Reg 170/03, all resamples were negative for bacteria (See Table 4.0).

A routine bacteriological sample collected on July 25, 2017 at Nicol's Florist tested positive for one (1) total coliform. The location was resampled and samples were also collected from locations upstream and downstream from the adverse location as per O.Reg 170/03, all resamples were negative for bacteria (See Table 4.0).

On August 18th, 2017 a sample was collected from a blowoff on a newly installed water main on Gillrie St following a final connection to the existing distribution system. The sample tested positive for one (1) total coliform. In consultation with the BCHU, bottled water was provided to the five (5) homes that were connected to the water main because there was a history of adverse bacteriological results from samples collected during water main commissioning. The location was resampled and samples were also collected upstream and downstream from the adverse location as per O.Reg 170/03. The resamples were negative for bacteria (See Table 4.0). The residents were notified by the City on August 21 that the water was safe to consume.

Table 4.0: Adverse Bacteriological Results and Corrective Actions

Location	Date	Total Coliforms (per 100ml)	E. Coli (per 100ml)	Background (per 100ml)	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Comments
Dublin A	7-Jul	**7**	0	200	0.05	1.98	
Dublin B	10-Jul	0	0	0	0.07	1.99	Upstream
Dublin A	10-Jul	0	0	0	0.07	2.07	Resample
Dublin C	10-Jul	0	0	0	0.07	2.09	Downstream
Nicol's Florist	25-Jul	**1**	0	0	0.04	1.92	
Nicol's Florist	27-Jul	0	0	0	0.06	2.02	Resample
Hampton A	27-Jul	0	0	0	0.05	1.98	Downstream
Hampton B	27-Jul	0	0	0	0.05	1.98	Upstream
Gillrie 6in	18-Aug	**1**	0	80	0.01	1.61	Connection
Gillrie 2in	21-Aug	0	0	0	0.01	1.81	Downstream
Gillrie 6in	21-Aug	0	0	0	0.02	1.73	Resample
Gillrie A	21-Aug	0	0	0	0.01	1.48	Upstream
Gillrie B	21-Aug	0	0	0	0.03	1.28	Upstream

North West Reservoir (July)

On July 25, 2017 a routine bacteriological sample collected at the North West Outlet tested positive for seventy-eight (78) total coliform. A resample was collected along with samples from locations upstream and downstream from the adverse location as per O.Reg 170/03. All resamples were negative for bacteria (See Table 5.0). It was determined that maintenance conducted earlier in the day on one of the pumps in the station could have been the issue. Due to the previous failures at the North West Reservoir as well as the issue with low water demand in the PD-4 the following operational changes were implemented:

- The duty pump in the reservoir is changed daily to ensure water in the pump wells remains fresh.
- Auto flushers located on Fen Ridge Dr. are programmed to flush daily for 6 hours
- Two (2) fire hydrants are flushed weekly for up to 6 hours to ensure water in the transmission watermain from the water treatment plant to the North West reservoir does not stagnant.

Since operational changes were implemented, chlorine residuals were increase by 0.20 to 0.30mg/L at the North West Reservoir. Also, no other bacteriological failures occurred during the rest of 2017. In 2018 a capital project will be completed which will expand PD-4 to increase water demand.

Table 5.0: North West Reservoir Adverse Bacteriological Results and Corrective Actions

Location	Date	Total Coliforms (per 100ml)	E. Coli (per 100ml)	Background (per 100ml)	HPC (per 1mL)	Free Chlorine (mg/L)	Total Chlorine (mg/L)	Comments
North West Reservoir Outlet	25-Jul	**78**	0	0	5	0.02	2.17	Maintenance
Zatonski Ave.	27-Jul	0	0	0	0	0.06	1.81	Downstream
North West Reservoir Inlet	27-Jul	0	0	0	0	0.06	2.40	Upstream
North West Reservoir Outlet	27-Jul	0	0	0	1	0.04	2.19	Resample
Point of Entry	27-Jul	0	0	0	0	0.11	2.86	Upstream

October-December

During the 4th quarter of 2017, there were no adverse results to report.

ii. Adverse Chemical Results & Corrective Actions

Sodium

Samples collected from treated water & distribution system had an annual sodium average of 50.2 mg/L & 43.0 mg/L respectively. According to O.Reg 170/03, despite an aesthetic objective of 200 mg/l, any concentration above 20 mg/l is considered an adverse result. The City of Brantford Water System is required to report the results to the MOECC and the BCHU once every 57 months. The sodium results were last reported to both agencies in November 2017. Sodium concentration in our drinking water supply reflects the level found in the Grand River and cannot be removed by conventional treatment methods.

iii. Non-Compliance Events With Provincial Regulations, Municipal Drinking Water License, Municipal Drinking Water Works Permit, And Other Official Documents

Heterotrophic Plate Count (HPC) not collected as required by Schedule 10-3 of O.Reg. 170

Schedule 10-3 of O.Reg. 170 requires at least one treated water sample be taken every week and tested for Escherichia coli (E.coli), total coliforms and general bacteria population expressed as colony counts on a heterotrophic plate count (HPC). Unlike E.coli and total coliform, HPC does not have a Maximum Acceptable Concentration (MAC), however, a sample must be collected on a weekly basis.

During the week of September 11th, 2017, microbiological samples were taken and tested for E.coli, total coliforms and background; however, the samples were not tested for HPC. A different chain of custody was used rather than the saved template which contributed to the error. The City took corrective actions and implemented a procedure whereby staff will send out submission forms electronically for other staff to verify before samples are submitted.

F. Holmedale Water Treatment Plant Flows

i. Drinking Water Flows

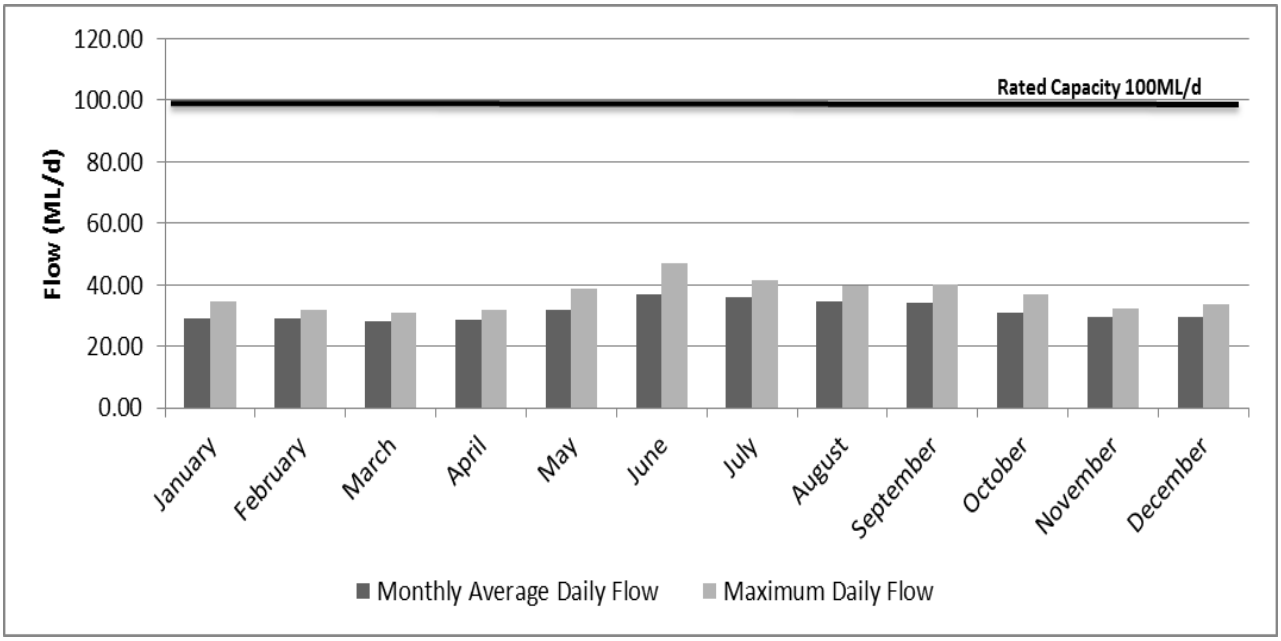
According to the City of Brantford Water System's Municipal Drinking Water License Schedule C, the maximum daily volume of treated water that flows from the Holmedale Water Treatment Plant into the distribution system must not exceed 100 ML/d.

At the Holmedale Water Treatment Plant, the treated water flow is measured by continuous on-line flow meters and monitored and controlled via a SCADA computer system. The daily average flow for 2017 was 31.45 ML/d,

Figure 1.0 outlines the monthly average daily flow and maximum total daily flow of treated water for the Holmedale Water Treatment Plant in 2017. The monthly average daily flow was calculated by averaging the total daily flows for a given month. The monthly maximum daily flow corresponds to the highest daily average flow for that month.

Figure 1.0 indicates that the monthly average daily flow and maximum total daily flow never exceeded the rated capacity in 2017. The highest monthly average daily flow was 36.99 ML/d and the highest maximum daily flow was 46.75 ML/d both of which occurred in June.

Figure 1.0: Drinking Water Flows (millions of liters per day)



ii. Grand River Flow Intake

The City of Brantford Water System's Permit to Take Water (# 6434-AM3PEJ) for the Water Treatment Plant allows the City of Brantford to withdraw up to 260 ML/d of raw water from the Grand River on a daily basis at a peak flow not to exceed 181,000 L/min.

At the Holmedale Water Treatment Plant, the raw water flow is measured by continuous on-line flow meters and monitored and controlled via SCADA computer system. The daily average flow for 2017 was 34.49 ML/d.

Figure 2.0 outlines the monthly average daily flow, maximum daily flow and % Grand River Flow of raw water for the Holmedale Water Treatment Plant in 2017. The monthly average daily flow was calculated by averaging the total daily flows for a given month. The monthly maximum daily flow corresponds to the highest daily average flow for that month. The City's Permit to Take Water requires monitoring of any impacts the water taking has on the Grand River. To ensure there are no negative effects to the Grand River, the City monitors the % of Grand River Flow Taken. The % Grand River Flow Taken is calculated by dividing the daily average flow by the Grand River flow measured at the Grand River Conservation Authority (GRCA) Brant Park monitoring station.

Figure 2.0: Raw Water Flows (millions of liters per day)

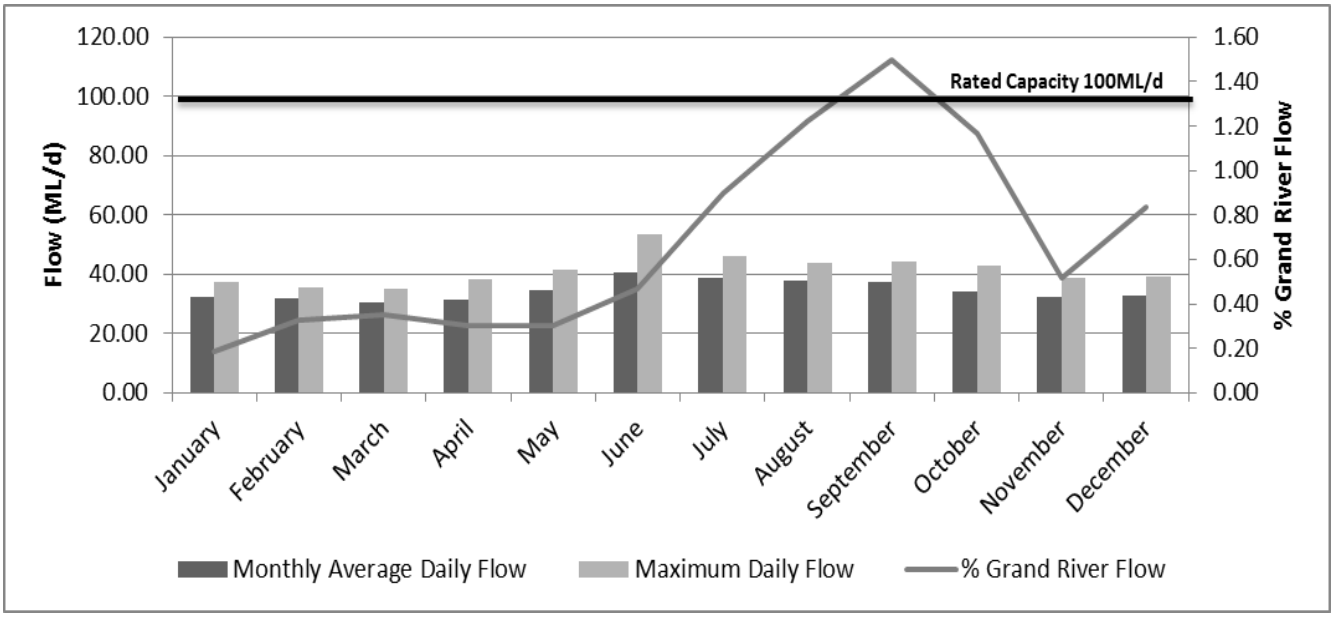


Figure 2.0 indicates that the highest monthly average daily flow was 40.37 ML/d and the highest maximum daily flow was 53.59 ML/d both of which occurred in June. The maximum daily flow did not exceed the daily flow requirement of 260ML/d as outlined in the City's Permit to Take Water. The % of Grand River Flow taken from the Grand River peaked at 1.50 % in September. The peak in September can be attributed to a very dry and warm month. There were no reported complaints to the City of Brantford as a result of its water taking activities.

G. Summary of Test Results Required Under O.Reg 170/03

i. Operational Testing Required Under Schedule 7

Appendix A summarizes the Operational Testing required under Schedule 7, tests were conducted at the required frequency and all results were within compliance limits in 2017.

ii. Bacteriological Testing Required Under Schedule 10

Appendix B summarizes the Bacteriological Testing required under Schedule 10; samples were conducted at the required frequency. Results above the regulatory requirements are summarized in Section E of this report.

iii. Summary of Inorganic Results Required Under Schedule 23

Appendix C summarizes the Inorganic Results required under Schedule 23; samples were conducted at the required frequency and all results where within compliance limits in 2017.

iv. Summary of Organic Results required under Schedule 24

Appendix D summarizes the Organic Results required under Schedule 24; samples were conducted at the required frequency and all results where within compliance limits in 2017.

v. Summary of Additional Testing, Sampling or Reporting Required by an Order or Other Legal Instrument

RMF – Total Suspended Solids (TSS)

Under the City of Brantford Water System's Municipal Drinking Water License, the annual average concentration of TSS discharged from the thickeners in the RMF must be below 25 mg/L. Table 8.0 outlines the Monthly Average TSS for 2017. Each month was well below the 25mg/L compliance limit with an annual average of **2.45 mg/L** for 2017.

Table 8.0: Monthly Average TSS

Month	TSS (mg/L)
January	2.69
February	4.00
March	2.40
April	2.10
May	2.70
June	1.70
July	1.50
August	2.30
September	1.30
October	1.90
November	2.90
December	3.90
Annual Average	**2.45**

Appendix A

City Of Brantford Water System

Operational Parameter Summary

2017

Holmedale Water Treatment Plant							
Location	**Parameter**	**Unit**	**MAC**	**O.Reg 170/03 Limit**	**Minimum**	**Maximum**	**Average**
Grand River	Turbidity	NTU			3.76	21.05	11.08
Filter 1	Turbidity	NTU			0.038	0.058	0.049
Filter 2	Turbidity	NTU			0.035	0.050	0.044
Filter 3	Turbidity	NTU			0.041	0.069	0.057
Filter 4	Turbidity	NTU		<1.00	0.033	0.048	0.041
Filter 5	Turbidity	NTU			0.036	0.061	0.052
Filter 6	Turbidity	NTU			0.039	0.060	0.050
Filter 7	Turbidity	NTU			0.033	0.052	0.043
Filter 8	Turbidity	NTU			0.035	0.050	0.044
CCC Effluent	Log Removal			>3.00	8.93	23.02	14.98
Brantford POE	Combined Chlorine	mg/L	3.00		2.58	2.70	2.62
Brantford POE	Turbidity	NTU			0.044	0.070	0.059
Brantford POE	Pressure	psi		>20	94.68	95.22	95.06
Brantford POE	Fluoride	mg/L	1.50		0.610	0.700	0.660
Distribution System							
Tollgate Reservoir	Total Chlorine	mg/L	3.00		2.18	2.58	2.42
Park Rd. Reservoir	Total Chlorine	mg/L			2.12	2.51	2.33
Northwest Reservoir	Total Chlorine	mg/L			2.20	2.44	2.32
Albion St. Booster	Pressure	psi			89.28	91.55	90.31
Tollgate Reservoir	Pressure	psi			57.12	58.81	57.84
Park Rd. Reservoir	Pressure	psi			78.74	80.66	79.31
Northwest Reservoir	Pressure	psi			83.48	85.94	85.13
Bell Lane	Pressure	psi		>20	47.94	49.22	48.90
Fifth Ave	Pressure	psi			101.13	102.15	101.60
Lawren Harris	Pressure	psi			61.95	64.04	63.03
St. Andrews	Pressure	psi			81.58	83.39	82.47
Empey St.	Pressure	psi			80.45	83.60	82.41

Definitions:

POE - Point of Entry to the Distribution System (Treated Water)

CCC - Chlorine Contact Chambers

Log Removal – a shorthand term for $\log_{10}$ removal, used in reference to the physical-chemical treatment of water to remove, kill, or inactivate pathogenic organisms.

Combined Chlorine - The concentration of residual chlorine that is combined with ammonia (NH3), organic nitrogen, or both in water as chloramine, yet is still available to oxidize organic matter and act as a disinfectant. Combined chlorine can be accurately estimated as the difference between the measured total chlorine and measure or known

MAC - Maximum Acceptable Concentration

Appendix B

City Of Brantford Water System

Bacteriological Summary

2017

Raw Water (Grand River)

		Total Coliform (colonies per 100ml)		E.Coli (colonies per 100ml)		Background (colonies per 100ml)		HPC (colonies per 1ml)		
	# of Samples	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	# of Samples	Minimum	Maximum
January	10	2700	29000	80	250	4100	37000	5	390	4900
February	4	990	21600	6	80	700	10600	4	1120	5000
March	4	180	4800	2	48	1200	3400	3	910	1360
April	4	660	3800	4	160	1500	3300	4	810	1190
May	5	550	10600	18	200	1300	6500	5	1020	5000
June	4	770	36000	30	400	2100	49000	4	1350	6700
July	5	1500	2700	50	160	2200	32000	5	920	1640
August	4	580	1600	54	240	2500	9200	4	1090	2500
September	4	900	4300	90	290	2500	5000	3	280	1530
October	4	860	3800	30	350	2500	7500	4	1040	2600
November	4	660	7100	34	500	1200	107000	4	920	5000
December	4	500	5800	8	22	1800	5100	4	760	2900

Treated Water (Brantford POE)

		Total Coliform (colonies per 100ml)		E.Coli (colonies per 100ml)		Background (colonies per 100ml)		HPC (colonies per 1ml)		
	# of Samples	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	# of Samples	Minimum	Maximum
January	5	0	2	0	0	0	0	5	0	0
February	4	0	0	0	0	0	0	4	0	2
March	4	0	0	0	0	0	0	4	0	0
April	4	0	0	0	0	0	0	4	0	1
May	5	0	0	0	0	0	0	5	0	1
June	7	0	0	0	0	0	0	7	0	1
July	7	0	0	0	0	0	0	7	0	1
August	4	0	0	0	0	0	1	4	0	1
September	4	0	0	0	0	0	0	3	0	0
October	4	0	0	0	0	0	0	4	0	7
November	4	0	0	0	0	0	0	4	0	3
December	4	0	0	4	0	0	4	0	0	4

Distribution System

		Total Coliform (colonies per 100ml)		E.Coli (colonies per 100ml)		Background (colonies per 100ml)		HPC			
	# of Samples	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	# of Samples	% HPC	(colonies per 1ml) Minimum	(colonies per 1ml) Maximum
January	140	0	0	0	0	0	1	68	49%	0	3
February	118	0	0	0	0	0	0	61	52%	0	8
March	106	0	0	0	0	0	1	62	58%	0	5
April	118	0	0	0	0	0	3	55	47%	0	2
May	151	0	0	0	0	0	0	72	48%	0	2
June	148	0	9	0	1	0	1	61	41%	0	6
July	149	0	78	0	0	0	200	76	51%	0	9
August	158	0	1	0	0	0	80	59	37%	0	13
September	138	0	0	0	0	0	5	57	41%	0	5
October	161	0	0	0	0	0	26	80	50%	0	13
November	133	0	0	0	0	0	1	67	50%	0	7
December	110	0	0	0	0	0	1	49	45%	0	7

Regulatory Limits: Total Coliform - <1 colony /100ml
E.coli - <1 colony /100ml

* - General bacteria population expressed as Background
** HPC - Heterotrophic Plate Count - General bacteria population expressed as colony counts on a heterotrophic plate count

Appendix C

City Of Brantford Water System

Inorganic Parameter Summary

2017

Parameter	Recent Sample	Unit of Measure	MAC	MDL	Treated Water	Within Regulatory Limit
Bromate	23-Nov-17	mg/L	0.01	0.003	0.003	YES
Bromide	23-Nov-17	mg/L		0.001	0.026	YES
Nitrite (as Nitrogen)	23-Nov-17	mg/L	1	0.003	0.004	YES
Nitrate (as Nitrogen)	23-Nov-17	mg/L	10	0.006	5.52	YES
Antimony	23-Nov-17	ug/L	6	0.020	0.12	YES
Arsenic	23-Nov-17	ug/L	25	0.200	0.2	YES
Barium	23-Nov-17	ug/L	1000	0.010	24.5	YES
Boron	23-Nov-17	ug/L	5000	2.000	31.0	YES
Cadmium	23-Nov-17	ug/L	5	0.003	0.010	YES
Chromium	23-Nov-17	ug/L	50	0.030	0.16	YES
Mercury	23-Nov-17	ug/L	1	0.010	0.01	YES
Sodium	23-Nov-17	mg/L	20	0.010	27.5	NO*
Selenium	23-Nov-17	ug/L	10	0.040	0.18	YES
Uranium	23-Nov-17	ug/L	20	0.002	0.516	YES

Definitions:

MDL - Method Detection Limit

MAC - Maximum Acceptable Concentration

* refer to Section E. iii. Adverse Chemical Results & Corrective Actions of the Annual Summary Report

Appendix D

City Of Brantford Water System

Organic Parameter Summary

2017

Parameter	Recent Sample	Unit of Measure	MAC	MDL	Treated Water	Within Regulatory Limit
Benzene	23-Nov-17	ug/L	5	0.32	0.32	YES
Carbon tetrachloride	23-Nov-17	ug/L	5	0.16	0.16	YES
1,2-Dichlorobenzene	23-Nov-17	ug/L	200	0.41	0.41	YES
1,4-Dichlorobenzene	23-Nov-17	ug/L	5	0.36	0.36	YES
1,1-Dichloroethylene	23-Nov-17	ug/L	14	0.33	0.33	YES
1,2-Dichloroethane	23-Nov-17	ug/L	5	0.35	0.35	YES
Dichloromethane	23-Nov-17	ug/L	50	0.35	0.35	YES
Monochlorobenzene	23-Nov-17	ug/L	80	0.30	0.30	YES
Tetrachloroethylene	23-Nov-17	ug/L	30	0.35	0.35	YES
Trichloroethylene	23-Nov-17	ug/L	5	0.44	0.44	YES
Vinyl Chloride	23-Nov-17	ug/L	2	0.17	0.17	YES
Polychlorinated Biphenyls (PCBs) - Tota	23-Nov-17	ug/L	2	0.04	0.04	YES
Benzo(a)pyrene	23-Nov-17	ug/L	3	0.004	0.004	YES
Alachlor	23-Nov-17	ug/L	5	0.02	0.02	YES
Atrazine + N-dealkylated metabolites	23-Nov-17	ug/L	5	0.01	0.06	YES
Atrazine	23-Nov-17	ug/L	5	0.01	0.04	YES
Desethyl atrazine	23-Nov-17	ug/L		0.01	0.02	YES
Azinphos-methyl	23-Nov-17	ug/L		0.05	0.05	YES
Carbaryl	23-Nov-17	ug/L	20	0.05	0.05	YES
Carbofuran	23-Nov-17	ug/L	90	0.01	0.01	YES
Chlorpyrifos	23-Nov-17	ug/L	90	0.01	0.02	YES
Diazinon	23-Nov-17	ug/L	90	0.02	0.02	YES
Dimethoate	23-Nov-17	ug/L	20	0.03	0.03	YES
Diuron	23-Nov-17	ug/L	20	0.03	0.03	YES
Malathion	23-Nov-17	ug/L	150	0.02	0.02	YES
Metolachlor	23-Nov-17	ug/L	190	0.01	0.02	YES
Metribuzin	23-Nov-17	ug/L	50	0.02	0.02	YES
Phorate	23-Nov-17	ug/L	80	0.01	0.01	YES
Prometryne	23-Nov-17	ug/L	2	0.03	0.03	YES
Simazine	23-Nov-17	ug/L	1	0.01	0.01	YES
Terbufos	23-Nov-17	ug/L	10	0.01	0.01	YES
Triallate	23-Nov-17	ug/L	1	0.01	0.01	YES
Trifluralin	23-Nov-17	ug/L	230	0.02	0.02	YES
2,4-dichlorophenoxyacetic acid (2,4-D)	23-Nov-17	ug/L	5	0.19	0.19	YES
Bromoxynil	23-Nov-17	ug/L	5	0.33	0.33	YES
Dicamba	23-Nov-17	ug/L	120	0.20	0.20	YES
Diclofop-methyl	23-Nov-17	ug/L	9	0.40	0.40	YES
MCPA	23-Nov-17	ug/L	---	0.00012	0.00012	YES
Picloram	23-Nov-17	ug/L	190	1	1	YES
2,4-dichlorophenol	23-Nov-17	ug/L	900	0.15	0.15	YES
2,4,6-trichlorophenol	23-Nov-17	ug/L	5	0.25	0.25	YES
2,3,4,6-tetrachlorophenol	23-Nov-17	ug/L	100	0.20	0.20	YES
Pentachlorophenol	23-Nov-17	ug/L	60	0.15	0.15	YES
Haloacetic Acids	23-Nov-17	ug/L		5.3	9.3	YES
THMs (total)	23-Nov-17	ug/L	100	0.37	19	YES
NDMA N-Nitrosodimethylamine	23-Nov-17	ug/L	9	0.0008	0.0024	YES
MIB	16-Aug-17	ng/L		3	3	N/A
Geosmin	16-Aug-17	ng/L		3	3	N/A
Diquat	16-Aug-17	ug/L		1	1	N/A
Paraquat	16-Aug-17	ug/L		1	1	N/A
Glyphosate	16-Aug-17	ug/L		1	1	N/A

Definitions:

MDL - Method Detection Limit

MAC - Maximum Acceptable Concentration