Appendix 1

City of Brantford Water System

2019 Annual Summary Report

2019 Annual Summary Report – Executive Summary

The Annual Summary Report is prepared by City Staff in order to fulfill the duty to report to the public as outlined in the Safe Drinking Water Act (2002), and Ontario Regulation 170/03.

The City of Brantford incurred $487,182 for major expenses related to drinking water quality in 2019.

Summary of Reporting Adverse Test Results and Other Problems (Refer to Section E of the Annual Summary Report for further details)

In total 1633 bacteriological samples were tested in 2019, out of which 17 had adverse results.

1. 14 of 17 adverse results were from one water main which required disinfection in order to be resolved. None of the homes in this area were occupied at the time.
2. There were 3 additional bacteriological Adverse Water Quality Incidents (AWQIs) from 2 different locations. Each AWQI was resampled according to the MECP requirements, all of which produced satisfactory results.
3. A reportable low chlorine on a water main installed in a new development resulted in an AWQI that will require an increased flushing frequency.
4. Sodium concentration reflects the level found in the Grand River. Both raw and treated samples were over the Maximum Acceptable Concentration (MAC) 20 mg/L as outlined in O. Regulation 170/03, but below the aesthetic objective of 200 mg/L.

Holmedale Water Treatment Plant Flows

- Raw water flows did not exceed the limit that is set in the Permit to Take Water.
- Treated water flows did not exceed the limit that is set in the Municipal Drinking Water License.
- In order to monitor any impacts the water taking has on the Grand River, the plant flow is constantly compared to river flow and the highest percentage of flow taken from the river in 2019 was 1.93%, which is considered a low impact on the Grand River water supply.

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

- In addition to bacteriological testing, operational parameters as well as Schedule 23 (Inorganic) and 24 (Organic) parameters were also tested and within regulatory limits.
- Total Suspended Solids are tested to monitor the discharge from the thickeners in the RMF. The annual average of 2.61 mg/L was well below the compliance limit of 25 mg/L.

2019 Annual Summary Report

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, 2019.

The 2019 Annual Summary Report will be available to the public without charge, beginning March 1st, 2020. A copy of this report can be obtained via the Internet (www.brantford.ca) and at Brantford City Hall by contacting (519) 759-4150 Ext. 5539.

B. Description of Drinking Water System

Drinking Water System Number	#220003564
Owner	The Corporation of the City of Brantford
Classification	Large Municipal Residential
Treatment	Class IV
Distribution	Class III
Supply	Grand River (Holmedale Canal)
DWS Location	324 Grand River Ave.
Municipal Drinking Water License (MDWL)	063-101 Issue # 8, Issued November 13, 2019
Drinking Water Works Permit (DWWP)	#063-201 Issue # 5, Issued: November 13, 2019
Permit to Take Water	# 6434-AM3PEJ
	Town of Cainsville Distribution System (Drinking Water System #: 260002616, Class I) which is owned and managed by the County of Brant.

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 # 8, Issued November 13, 2019, Drinking Water Works Permit (DWWP) #063-201 Issue # 5, Issued: November 13, 2019).

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, chloramination and fluoridation.

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 of waste consists of concentrating the waste by three gravity settler thickeners and dewatering by two belt filter presses. Dewatered waste (sludge) is disposed at the Brantford Landfill.

The City of Brantford Water System sells 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.

C. List of Water Treatment Chemicals Used

- Polyaluminum chloride (primary coagulant)
- Flopam AN 934 PWG (settling aid)
- Microsand (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

• Low Lift Pump Station Upgrades	$173,353
• RMF Sludge Tank Cleaning	$27,236
• High Lift Pumps	$30,273
• Tollgate Pump	$17,919
• Chlorinator PM's	$12,395
• Fluoride Carrier Lines	$9214
• Quinquennial Generator PM's	$8330
• Post CL2/SO2 Automation	$70,652
• PLC Replacements	$103,890
• UPS Upgrades	$19,920
• Sample Stations	$14,000

The City of Brantford incurred $487,182 for major expenses related to drinking water quality in 2019.

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

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

In 2019, 1633 bacteriological samples were taken with 17 adverse results. 14 of 17 AWQIs were from one water main and there were 3 additional AWQI's from 2 different locations.

Munro Circle

A bacteriological sample was collected from a fire hydrant on Munro Circle on July 10th, 2019 following a water main shut down. Sampling protocol was followed according to City of Brantford procedure. The sample tested positive for total coliforms (See Table 1.0 below).

Resamples were taken on July 12th, according to O. Reg 170/03. The upstream, downstream and resampled hydrant all tested positive for total coliforms. Additional sampling occurred on July 14th and 15th, and the result was more positive results for total coliforms.

City staff, along with representatives from the developer of the subdivision and in conjunction with the MECP and BCHU decided to isolate the contaminated water main from the distribution system and it was swabbed and chlorinated according to Ontario's Watermain Disinfection Procedure. None of the homes in this area were occupied at the time.

The developer hired a contractor to disinfect the water main and preparations began on July 22. A total of 14 samples were taken on both July 31st and August 1st, 24h apart as per City of Brantford Linear Specification Manual and Ontario's Watermain Disinfection Procedure. All results following disinfection tested negative for bacteria and the water main was placed back into service.

Water Distribution staff flushed this location biweekly until 2020 and will continue to flush until the majority of the homes are occupied. In the future the street will be added to the biannual flushing program.

Table 1.0: Adverse Bacteriological Results and Corrective Actions for Munro Circle

Location	Date	Total Coliform	E Coli	Background	Free Chlorine Residual (mg/L)	Total Chlorine Residual (mg/L)	Turbidity (NTU)
						>1.00	
		0	0	<20	<0.20	<2.95	<1.00
Munro Circle Hydrant	10-Jul-19	48	0	2	0.02	1.11	
Munro Circle H3328 (upstream)	12-Jul-19	1	0	0	0.03	2.28	
Munro Circle H3327 (resample)	12-Jul-19	12	0	0	0.03	2.29	
Munro Circle H3326 (downstream)	12-Jul-19	35	0	0	0.01	2.23	
Munro Circle H3325	14-Jul-19	0	0	0	0.07	2.22	
Munro Circle H3326	14-Jul-19	0	0	0	0.04	2.47	
Munro Circle H3327	14-Jul-19	0	0	0	0.04	2.27	
Munro Circle H3328	14-Jul-19	14	0	0	0.04	2.41	
Munro Circle H3329	14-Jul-19	0	0	0	0.04	2.60	
Munro Circle H3330	14-Jul-19	0	0	0	0.06	2.36	
91 Longboat	14-Jul-19	0	0	0	0.09	2.30	
Longboat H3246	14-Jul-19	0	0	0	0.07	2.27	
Munro Circle H3325	15-Jul-19	6	0	0	0.05	2.31	
Munro Circle H3326	15-Jul-19	3	0	0	0.05	2.34	
Munro Circle H3327	15-Jul-19	9	0	0	0.04	2.45	
Munro Circle H3328	15-Jul-19	11	0	0	0.05	2.35	
Munro Circle H3329	15-Jul-19	11	0	0	0.06	2.16	
Munro Circle H3330	15-Jul-19	8	0	0	0.06	2.46	
Wyndfield H-3329	17-Jul-19	44	0	0	0.04	2.18	0.35
Wyndfield H-3323	17-Jul-19	0	0	0	0.07	2.17	0.31
Wyndfield H-3325	17-Jul-19	16	0	0	0.05	2.38	0.21
Wyndfield H-3326	17-Jul-19	0	0	0	0.09	2.42	0.32
Wyndfield H-3327	17-Jul-19	20	0	0	0.04	2.27	0.36
Tait BO	17-Jul-19	0	0	0	0.03	2.17	0.11
Wyndfield #3328	17-Jul-19	0	0	0	0.06	2.34	0.21
Wyndfield #3330	17-Jul-19	0	0	0	0.08	2.35	0.13
Shellard #3073	17-Jul-19	0	0	0	0.09	2.60	0.21

Location	Date	Total Coliform	E Coli	Background	Free Chlorine Residual (mg/L)	Total Chlorine Residual (mg/L)	Turbidity (NTU)
						>1.00	
		0	0	<20	<0.20	<2.95	<1.00
Wyndfield H-3321	18-Jul-19	0	0	0	0.06	2.19	0.13
Wyndfield H-3322	18-Jul-19	0	0	0	0.05	2.03	0.17
Wyndfield H-3320	18-Jul-19	0	0	0	0.07	2.09	0.22
Longboat H-3331	18-Jul-19	0	0	0	0.08	2.18	0.13
Munro SP2 (BFP) 0hr	1-Aug-19	0	0	0	0.08	2.28	
Munro SP3 0hr	1-Aug-19	0	0	0	0.08	2.16	
Munro SP4 0hr	1-Aug-19	0	0	0	0.07	2.15	
Munro SP5 0hr	1-Aug-19	0	0	0	0.07	2.16	
Munro SP6 0hr	1-Aug-19	0	0	0	0.08	2.10	
Munro SP7 0hr	1-Aug-19	0	0	0	0.10	2.10	
Munro SP8 0hr	1-Aug-19	0	0	0	0.05	2.13	
Munro SP9 0hr	1-Aug-19	0	0	0	0.05	2.15	
Munro SP10 0hr	1-Aug-19	0	0	0	0.08	2.11	
Munro SP11 0hr	1-Aug-19	0	0	0	0.09	2.09	
Munro SP12 0hr	1-Aug-19	0	0	0	0.08	2.04	
Munro SP13 0hr	1-Aug-19	0	0	0	0.08	2.04	
Munro SP14 0hr	1-Aug-19	0	0	0	0.10	2.16	
Munro SP15 0hr	1-Aug-19	0	0	0	0.09	2.09	
Munro SP2 (BFP) 24hr	2-Aug-19	0	0	0	0.05	2.05	
Munro SP3 24hr	2-Aug-19	0	0	0	0.12	1.84	
Munro SP4 24hr	2-Aug-19	0	0	0	0.08	1.89	
Munro SP5 24hr	2-Aug-19	0	0	0	0.08	1.84	
Munro SP6 24hr	2-Aug-19	0	0	0	0.03	1.89	
Munro SP7 24hr	2-Aug-19	0	0	0	0.02	1.85	
Munro SP8 24hr	2-Aug-19	0	0	0	0.06	1.82	
Munro SP9 24hr	2-Aug-19	0	0	0	0.01	1.85	
Munro SP10 24hr	2-Aug-19	0	0	0	0.06	1.73	
Munro SP11 24hr	2-Aug-19	0	0	0	0.07	1.90	
Munro SP12 24hr	2-Aug-19	0	0	0	0.08	1.74	
Munro SP13 24hr	2-Aug-19	0	0	0	0.09	1.67	
Munro SP14 24hr	2-Aug-19	0	0	0	0.08	1.72	
Munro SP15 24hr	2-Aug-19	0	0	0	0.08	1.83	

North West Reservoir

There were 2 adverse water quality results during the third quarter at the North West Reservoir, one on August 6th, and the other one on September 3rd, 2019. In each AWQI, routine bacteriological samples were collected from the North West Reservoir Outlet. On August 8th, 2019 the sample tested positive for three (3) total coliform cfu/100mL and on September 3rd, 2019 the sample tested positive for one (1) total coliform cfu/100mL. Upstream, downstream and initial adverse locations were sampled as per O.Reg 170/03. All resamples were negative for bacteria in both cases (See Table 2.0 and 2.1 below).

Table 2.0: 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
Northwest Reservoir Outlet	6-Aug-19	3	0	1	0	0.06	2.32	Initial Adverse
Brantford POE	8-Aug-19	0	0	0		0.13	2.76	Upstream
Northwest Reservoir Inlet	8-Aug-19	0	0	0		0.05	2.23	Upstream
Northwest Reservoir Outlet	8-Aug-19	0	0	0		0.02	2.10	Resample
H2218 Hardy RD	8-Aug-19	0	0	0		0.07	2.08	Downstream

Table 2.1: 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
Northwest Reservoir Outlet	3-Sep-19	1	0	43	0	0.08	2.02	Initial Adverse
Northwest Reservoir Inlet	5-Sep-19	0	0	0		0.06	2.34	Upstream
Point of Entry	5-Sep-19	0	0	0		0.10	2.75	Upstream
Northwest Reservoir Outlet	5-Sep-19	0	0	0		0.11	1.96	Resample
Tallgrass Sample Station	5-Sep-19	0	0	0		0.10	1.23	Downstream

338 King George Rd.

A routine water sample was collected on Sept. 3rd, 2019 from a private water service. The sample tested positive for one (1) total coliform cfu/100mL. Upstream, downstream and initial adverse locations were sampled as per O.Reg 170/03. All resamples were negative for bacteria (See Table 2.2 below). The results indicate that sample mishandling was the most likely cause of contamination.

Table 2.2: 338 King George Rd. 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
338 King George Rd	3-Sep-19	1	0	0	0	0.10	1.81	
338 King George Rd	5-Sep-19	0	0	0		0.11	1.74	Resample
King George @ Powerline hydrant	5-Sep-19	0	0	0		0.05	1.78	Downstream
Hydrant @ Nissan Parking Lot	5-Sep-19	0	0	0		0.09	1.76	Upstream

Low Chlorine on Shellard Lane 400mm End

A reportable low chlorine was discovered during routine flushing on a 400mm watermain on October 17th, 2019. Total chlorine was 0.21 mg/L and free chlorine was 0.1 mg/L. The water main was flushed resulting with total and free chlorine residuals of 2.22 mg/L and 0.02 mg/L respectively.

The watermain was installed to service the future elevated water tank but does not currently supply water to any users. Corrective actions included increasing the flushing frequency to twice per week and an autoflusher is scheduled to be installed in 2020.

i. Adverse Chemical Results & Corrective Actions

Sodium

Samples collected from treated water & distribution system had an annual sodium average of 46.58 mg/L & 48.55 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 MECP 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 water treatment methods.

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

No non-compliance events were reported in 2019.

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 2019 was 33.07 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 2019. 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: Drinking Water Flows (millions of liters per day)

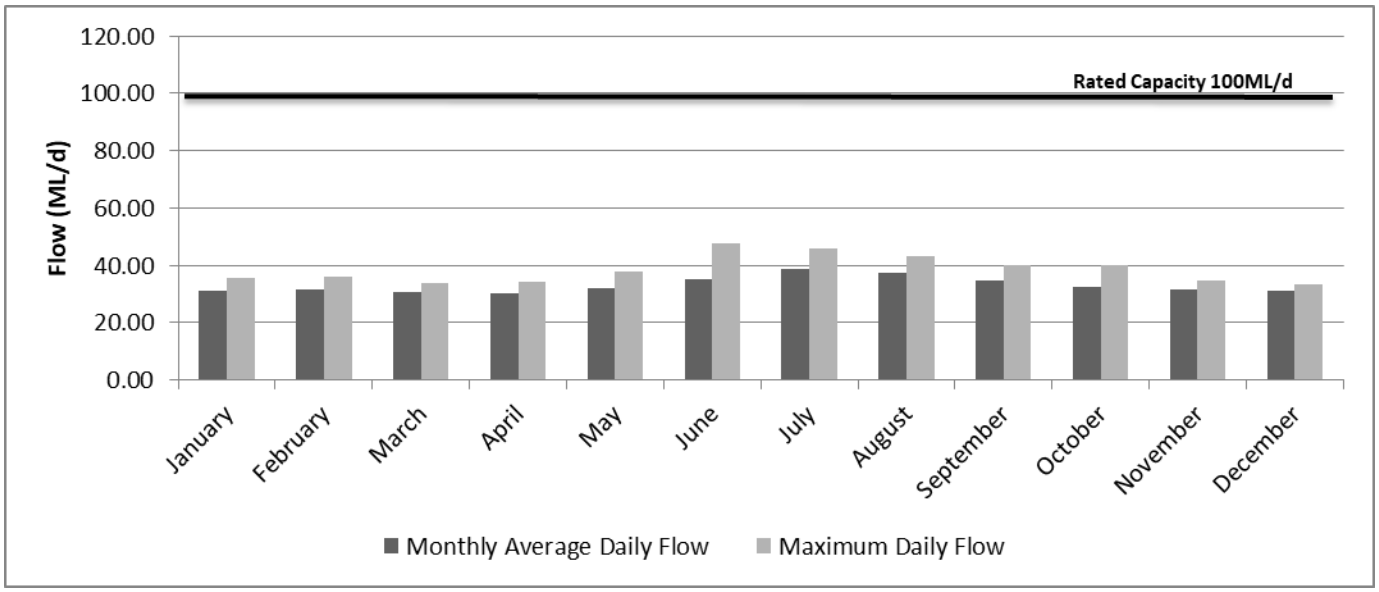

Figure 1.0 indicates that the monthly average daily flow and maximum total daily flow never exceeded the rated capacity in 2019. The highest monthly average daily flow was

38.75 ML/d, which occurred in July and the highest maximum daily flow was 47.61 ML/d, which occurred in June.

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 a SCADA computer system. The daily average raw water flow for 2019 was 37.74 ML/d.

Figure 2.0 outlines the monthly average daily flow, maximum daily flow and % Grand River Flow Taken for the Holmedale Water Treatment Plant in 2019. 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)

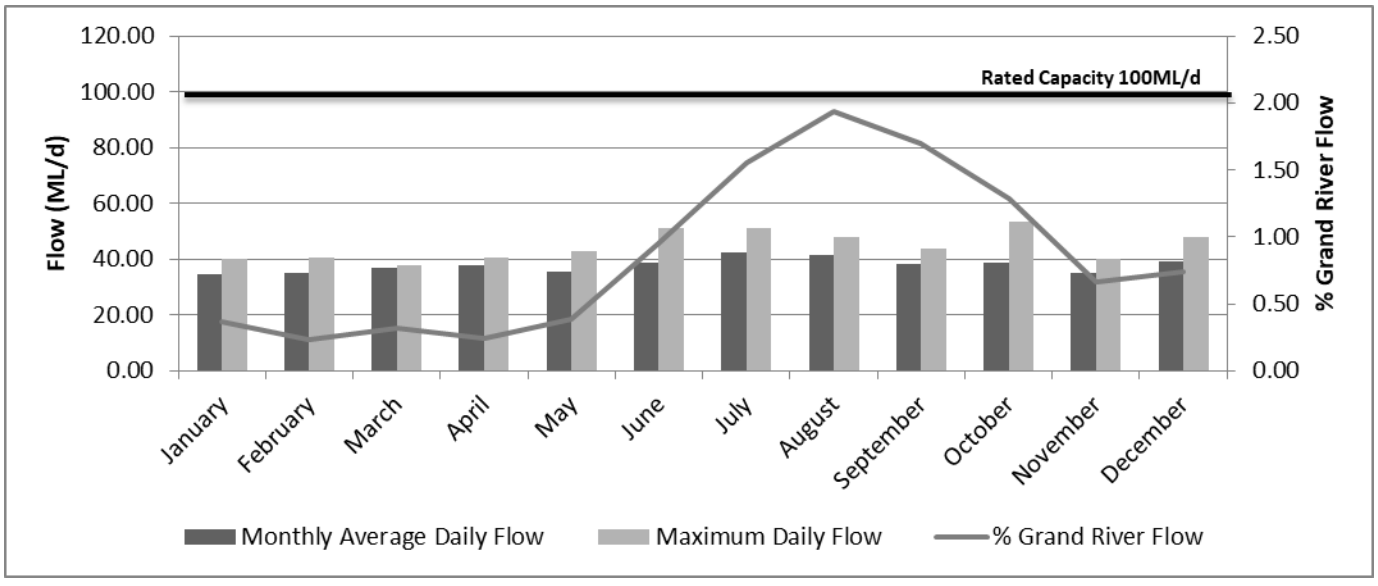

Figure 2.0 indicates that the highest monthly average daily flow was 42.23 ML/d which occurred in July and the highest maximum daily flow was 53.49 ML/d which occurred in October. The maximum daily flow was well below the daily flow limit of 260ML/d as outlined in the City's Permit to Take Water. The % of Grand River Flow taken from the Grand River peaked at 1.93 % in August. The peak in August 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.

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. Water quality tests were conducted at the required frequency and all results were within compliance limits in 2019.

ii. Bacteriological Testing Required Under Schedule 10

Appendix B summarizes the Bacteriological Testing required under Schedule 10; All tests were conducted at the required frequency. Adverse results are summarized in Section E of this report. All corrective actions were taken as per provincial requirements and guidelines. No further actions were required.

iii. Summary of Inorganic Results Required Under Schedule 23

Appendix C summarizes the Inorganic Results required under Schedule 23; Samples were tested at the required frequency and all results where within compliance limits in 2019. Two samples collected for nitrate on and November 29 from the POE (5.96 mg/L) and from the Distribution system (5.70 mg/L) were above half the maximum acceptable concentration (MAC) of 5 mg/L. No corrective actions are required when a water quality parameter is above half the MAC (and below the MAC).

iv. Summary of Organic Results required under Schedule 24

Appendix D summarizes the Organic Results required under Schedule 24; Samples were tested at the required frequency and all results where within compliance limits in 2019.

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 3.0 outlines the Monthly Average TSS for 2019. Each month was well below the 25mg/L compliance limit with an annual average of **2.61 mg/L** for 2019.

Table 3.0: Monthly Average TSS

Month	TSS (mg/l)	Exceedance?
January	2.60	NO
February	3.30	NO
March	4.40	NO
April	2.90	NO
May	2.30	NO
June	2.50	NO
July	1.40	NO
August	1.40	NO
September	3.40	NO
October	2.00	NO
November	1.80	NO
December	3.30	NO
Average	2.61	

Appendix A

City Of Brantford Water System

Operational Parameter Summary

2019

Holmedale Water Treatment Plant								
Location	**Parameter**	**Unit**	**MAC**	**O.Reg 170/03 Limit**	**Minimum**	**Maximum**	**Average**	**Within Regulatory Limit**
Grand River	Turbidity	NTU			4.85	21.50	9.40	
Filter 1	Turbidity	NTU		<1.00	0.032	0.056	0.046	Yes
Filter 2	Turbidity	NTU			0.038	0.069	0.055	Yes
Filter 3	Turbidity	NTU			0.037	0.064	0.051	Yes
Filter 4	Turbidity	NTU			0.037	0.070	0.052	Yes
Filter 5	Turbidity	NTU			0.026	0.071	0.049	Yes
Filter 6	Turbidity	NTU			0.041	0.069	0.054	Yes
Filter 7	Turbidity	NTU			0.026	0.057	0.044	Yes
Filter 8	Turbidity	NTU			0.036	0.075	0.053	Yes
CCC Effluent	Log Removal			>3.00	6.51	26.52	13.50	Yes
Brantford POE	Combined Chlorine	mg/L	3.00		2.53	2.63	2.58	
Brantford POE	Turbidity	NTU			0.053	0.079	0.067	
Brantford POE	Pressure	psi		>20	94.51	94.72	94.61	Yes
Brantford POE	Fluoride	mg/L	1.50		0.59	0.75	0.68	
Distribution System								
Tollgate Reservoir	Total Chlorine	mg/L	3.00		2.02	2.55	2.33	
Park Rd. Reservoir	Total Chlorine	mg/L			1.82	2.52	2.27	
Northwest Reservoir	Total Chlorine	mg/L			2.23	2.61	2.46	
Albion St. Booster	Pressure	psi		>20	89.72	90.45	90.09	Yes
Tollgate Reservoir	Pressure	psi			58.46	60.25	59.55	Yes
Park Rd. Reservoir	Pressure	psi			79.02	79.29	79.18	Yes
Northwest Reservoir	Pressure	psi			84.09	86.39	85.23	Yes
Bell Lane	Pressure	psi			46.02	48.84	47.98	Yes
Fifth Ave	Pressure	psi			98.97	100.93	99.88	Yes
Lawren Harris	Pressure	psi			64.14	65.15	64.69	Yes
St. Andrews	Pressure	psi			91.44	93.92	92.96	Yes
Empey St.	Pressure	psi			82.15	83.04	82.48	Yes

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

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

MAC - Maximum Acceptable Concentration

Appendix B

City Of Brantford Water System

Bacteriological Summary

2019

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	5	780	14100	16	140	2200	220000	5	700	5000
February	5	1100	29000	30	90	3500	62000	5	830	8700
March	4	3000	120000	12	400	5800	2700000	4	3700	8600
April	5	880	21000	20	200	7800	105000	5	1400	5000
May	4	550	2600	16	120	800	12100	4	870	1400
June	4	270	2100	60	170	380	3200	4	610	2300
July	5	1000	2100	60	120	3500	5500	5	770	1900
August	4	1200	2600	60	150	3200	7000	4	1240	2800
September	5	1600	2100	40	300	3200	7300	5	1790	4400
October	4	380	3600	30	400	1600	28000	4	1900	5000
November	4	1500	35000	22	700	2700	135000	4	1010	36000
December	5	1900	65000	16	110	4600	109000	5	1000	3800

* - General bacteria population expressed as Background

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

Variablilty in the Raw Water Bacteriological results is dependant on upstream activities and seasonal conditions.

Treated Water (Brantford POE)

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

Distribution System

		Total Coliform (colonies per 100ml)		E.Coli (colonies per 100ml)		Background (colonies per 100ml)		HPC				Complies with Regulation
	# of Samples	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	# of Samples	% HPC	(colonies per 1ml) Minimum	(colonies per 1ml) Maximum	
January	136	0	0	0	0	0	19	80	59%	0	7	YES
February	117	0	0	0	0	0	0	64	55%	0	8	YES
March	124	0	0	0	0	0	0	62	50%	0	18	YES
April	145	0	0	0	0	0	0	79	54%	0	3	YES
May	117	0	0	0	0	0	7	61	52%	0	6	YES
June	127	0	0	0	0	0	27	64	50%	0	7	YES
July	174	0	48	0	0	0	2	81	47%	0	5	YES
August	117	0	3	0	0	0	1	61	49%	0	1	YES
September	135	0	1	0	0	0	43	69	51%	0	3	YES
October	141	0	0	0	0	0	6	67	48%	0	2	YES
November	129	0	0	0	0	0	71	64	50%	0	7	YES
December	118	0	0	0	0	0	27	68	58%	0	13	YES

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

*** Corrective actions have been completed as per O. Reg 170/03 where applicable

Appendix C

City Of Brantford Water System

Inorganic Parameter Summary

2019

Parameter	Recent Sample	Unit of Measure	MAC	MDL	Treated Water	Within Regulatory Limit
Bromate		mg/L	0.01	0.003	<0.003	YES
Bromide		mg/L		0.001	0.056	YES
Nitrite (as Nitrogen)		mg/L	1	0.003	0.006	YES
Nitrate (as Nitrogen)		mg/L	10	0.006	5.96	YES
Antimony		ug/L	6	0.020	0.09	YES
Arsenic		ug/L	25	0.2	0.3	YES
Barium		ug/L	1000	0.02	31.4	YES
Boron		ug/L	5000	0.2	31.0	YES
Cadmium		ug/L	5	0.003	0.010	YES
Chromium		ug/L	50	0.03	0.19	YES
Mercury		ug/L	1	0.01	<0.01	YES
Sodium		mg/L	20	0.01	55.8	NO*
Selenium		ug/L	10	0.040	0.16	YES
Uranium		ug/L	20	0.002	0.679	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

2019

Parameter	Recent Sample	Unit of Measure	MAC	MDL	Treated Water	Within Regulatory Limit
Benzene		ug/L	5	0.32	<0.32	YES
Carbon tetrachloride		ug/L	5	0.17	<0.17	YES
1,2-Dichlorobenzene		ug/L	200	0.41	<0.41	YES
1,4-Dichlorobenzene		ug/L	5	0.36	<0.36	YES
1,1-Dichloroethylene		ug/L	14	0.33	<0.33	YES
1,2-Dichloroethane		ug/L	5	0.35	<0.35	YES
Dichloromethane		ug/L	50	0.35	<0.35	YES
Monochlorobenzene		ug/L	80	0.3	<0.3	YES
Tetrachloroethylene		ug/L	30	0.35	<0.35	YES
Trichloroethylene		ug/L	5	0.44	<0.44	YES
Vinyl Chloride		ug/L	2	0.17	<0.17	YES
olychlorinated Biphenyls (PCBs) - Total		ug/L	2	0.04	<0.04	YES
Benzo(a)pyrene		ug/L	3	0.004	<0.004	YES
Alachlor		ug/L	5	0.02	<0.02	YES
Atrazine + N-dealkylated metabolites		ug/L	5	0.01	0.03	YES
Atrazine		ug/L	5	0.01	0.02	YES
Desethyl atrazine		ug/L		0.01	0.01	YES
Azinphos-methyl		ug/L		0.05	<0.05	YES
Carbaryl		ug/L	20	0.05	<0.05	YES
Carbofuran		ug/L	90	0.01	<0.01	YES
Chlorpyrifos		ug/L	90	0.02	<0.02	YES
Diazinon		ug/L	90	0.02	0.02	YES
Dimethoate		ug/L	20	0.06	<0.06	YES
Diuron		ug/L	20	0.03	<0.03	YES
Malathion		ug/L	150	0.02	<0.02	YES
Metolachlor		ug/L	190	0.01	0.03	YES
Metribuzin		ug/L	50	0.02	<0.02	YES
Phorate		ug/L	80	0.01	<0.01	YES
Prometryne		ug/L	2	0.03	<0.03	YES
Simazine		ug/L	1	0.01	<0.01	YES
Terbufos		ug/L	10	0.01	<0.01	YES
Triallate		ug/L	1	0.01	<0.01	YES
Trifluralin		ug/L	230	0.02	<0.02	YES
2,4-dichlorophenoxyacetic acid (2,4-D)		ug/L	5	0.19	<0.19	YES
Bromoxynil		ug/L	5	0.33	<0.33	YES
Dicamba		ug/L	120	0.2	<0.2	YES
Diclofop-methyl		ug/L	9	0.4	<0.4	YES
MCPA		ug/L	---	0.00012	<0.00012	YES
Picloram		ug/L	190	1	<1	YES
2,4-dichlorophenol		ug/L	900	0.15	<0.15	YES
2,4,6-trichlorophenol		ug/L	5	0.25	<0.25	YES
2,3,4,6-tetrachlorophenol		ug/L	100	0.2	<0.2	YES
Pentachlorophenol		ug/L	60	0.15	<0.15	YES
Haloacetic Acids		ug/L		5.3	11.1	YES
THMs (total)		ug/L	100	0.37	29	YES
NDMA N-Nitrosodimethylamine		ug/L	9	0.0008	0.0012	YES
MIB		ng/L		3	<3	YES
Geosmin		ng/L		3	<3	YES
Diquat		ug/L	70	1	<1	YES
Paraquat		ug/L	10	1	<1	YES
Glyphosate		ug/L	290	1	<1	YES

Definitions:

MDL - Method Detection Limit

MAC - Maximum Acceptable Concentration