Dunnville Drinking Water System
2019 Annual Water Quality Report

January 1, 2019 – December 31, 2019

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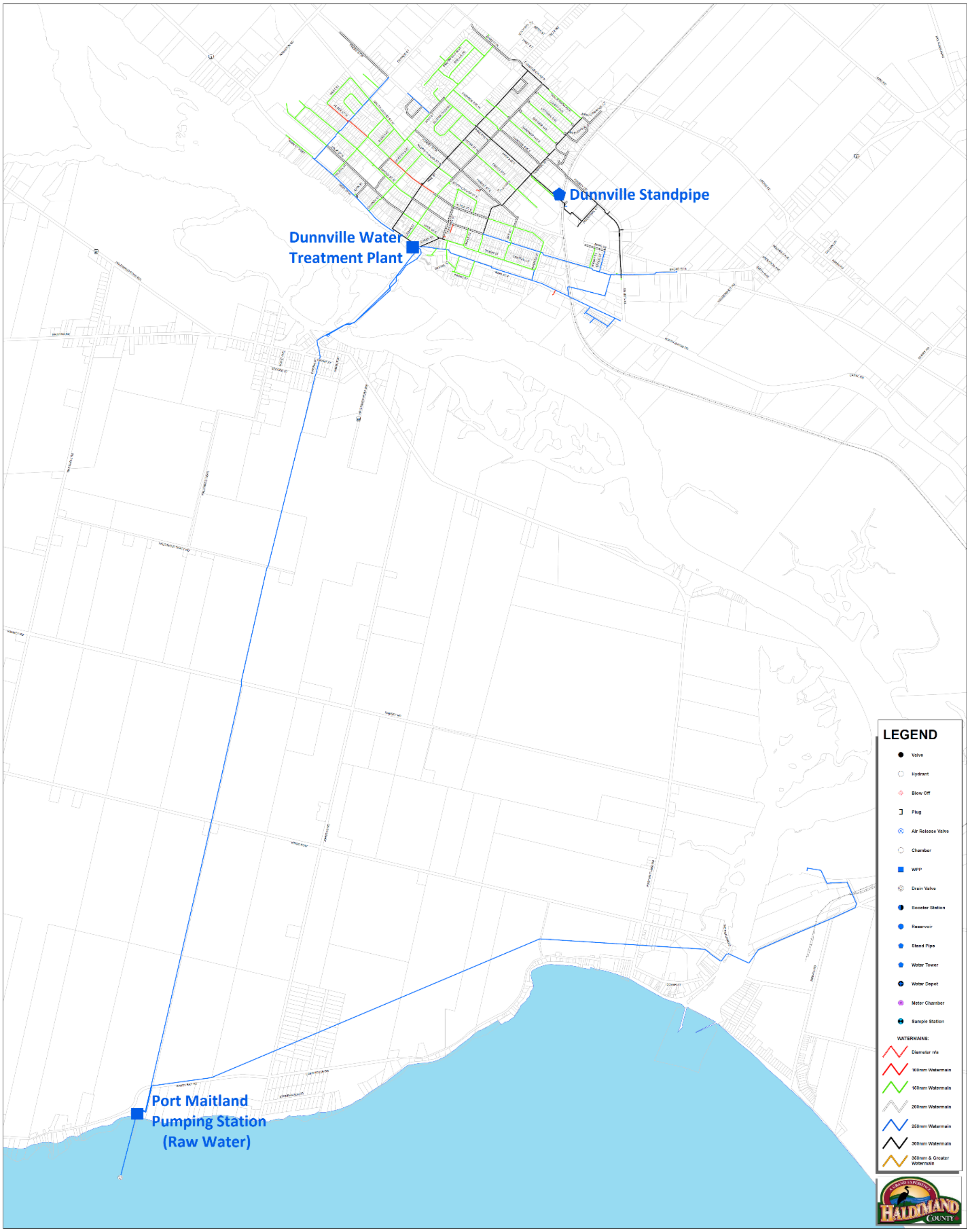
DUNNVILLE DRINKING WATER SYSTEM



Dunnville Drinking Water System Overview

The Dunnville Drinking Water System's primary raw water source is Lake Erie. Raw water is drawn into the Port Maitland Low Lift Pumping Station where it can be pre-chlorinated with sodium hypochlorite for zebra mussel control. Raw water is then pumped through approximately ten kilometres of raw water transmission watermain to the Dunnville Water Treatment Plant. Raw water is also supplied to industrial users in Port Maitland.

There is also a raw water intake located in the Grand River. This raw water source has not been used since the early 2000's, however it is available for use in an emergency situation.

The Dunnville Water Treatment Plant is a conventional water treatment plant with a rated capacity of 14,500 m^3/day. A coagulant (Aluminum Sulphate was used in 2019) is injected into raw water and undergoes flash mixing. Water then flows through a series of flocculation and sedimentation tanks to five dual media filters containing sand and granular activated carbon. Following filtration, the water is disinfected with sodium hypochlorite and stored in two reservoirs. High lift pumps deliver potable water to the Dunnville Water Distribution System.

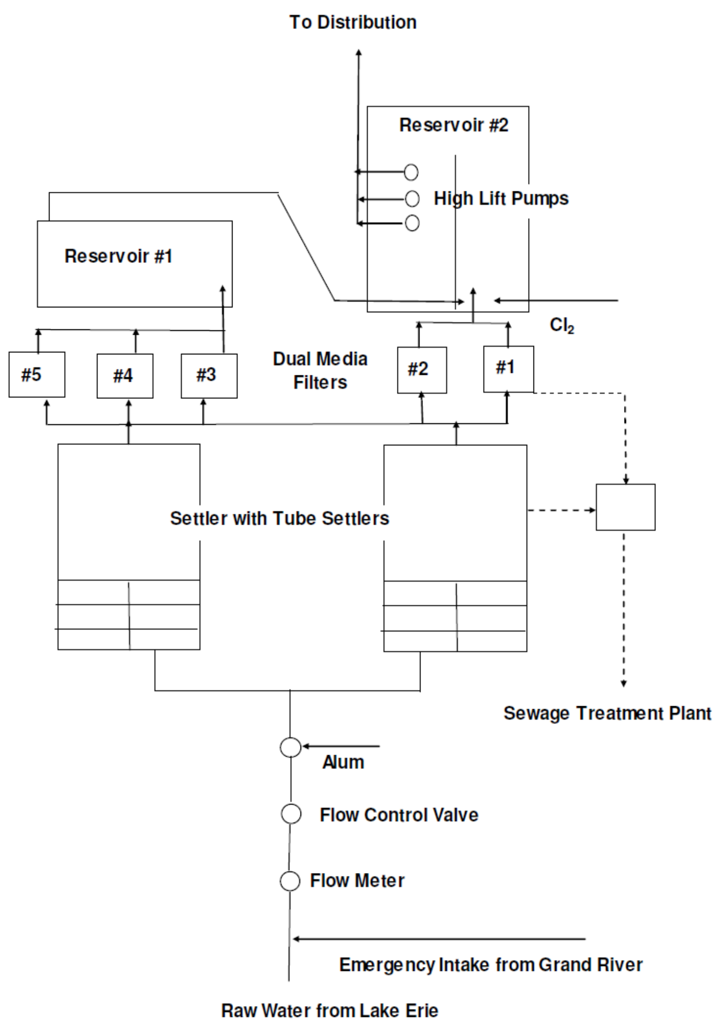


***Figure 1*: Dunnville Water Treatment Plant Schematic**

The water distribution system utilizes a standpipe for storage and to maintain water pressure. A bulk water depot provides potable water to rural residents and bulk water haulers.

The distribution system infrastructure services approximately 5,759 people (2016 Census).

Veolia Water is contracted to operate and maintain the raw water transmission mains, low lift pumping station, water treatment plant, and the standpipe. Haldimand County operates and maintains the distribution system and the bulk water depot.

Expenditure Information

Haldimand County and Veolia Water are diligent in prioritizing projects on an annual basis to eliminate unnecessary expenditures. Using the best available information at the time of this report, expenses incurred in the Dunnville Drinking Water System for 2019 are identified in Table 1. All drinking water expenditure information is not included in this report.

Table 1: Dunnville Drinking Water System 2019 Expenditures

Dunnville Drinking Water System:	
Port Maitland Low Lift Capital Repairs	
Port Maitland Genset Replacement	
Port Maitland Transformer Replacement	
WTP Static Mixer Replacement	
Backwash Valve Replacements	
Raw Water Isolation Valve Replacements	
Total Cost:	$1,814,459

Multi-Barrier Approach

Through the Walkerton Inquiry, Justice O'Connor recommended that drinking water is best protected by taking an approach that uses multiple barriers to prevent contamination from affecting our drinking water. The multi-barrier approach addresses potential threats by ensuring barriers are in place to either eliminate or minimize their impact. This holistic approach recognizes that each barrier may not be able to completely remove a contaminant, but by working together the barriers provide a high-level of protection. Typical barriers include:

- **Source Protection**
  - ***Source Protection Plans***
- **Treatment**
  - ***Treatment and Disinfection Goals***
- **Distribution System**
  - ***Chlorine Residual Maintenance***
- **Monitoring**
  - ***Sampling Programs***
- **Emergency Preparedness**
  - ***Emergency Plans***

Haldimand County has adopted the multi-barrier approach in ensuring safe, reliable drinking water. *Figure* 2 shows how administration, design, maintenance, and operation work together to establish and maintain multi-barrier protection (US EPA, 1998).

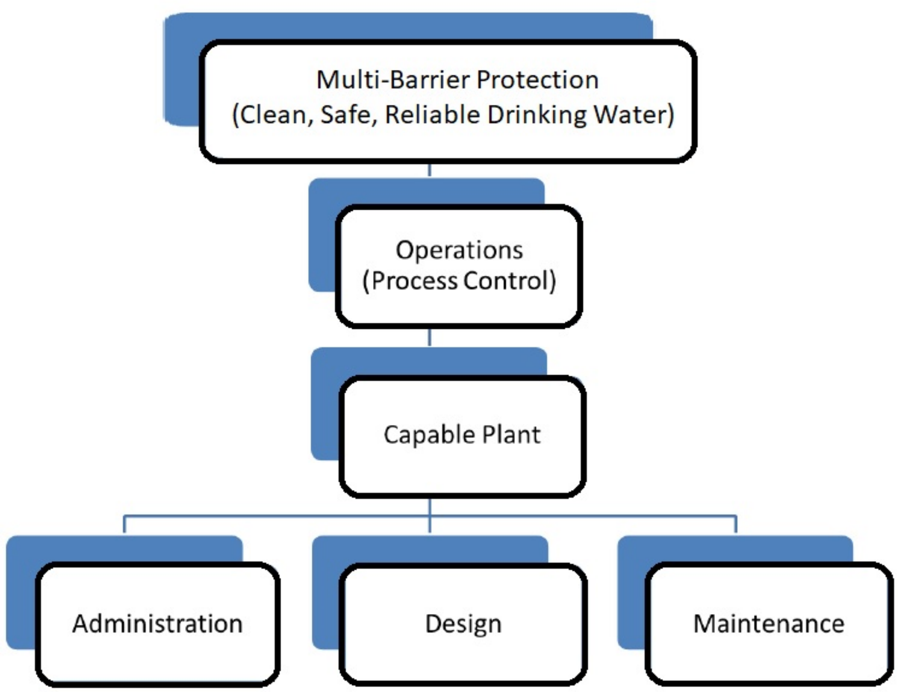


Figure 2: **Responsibilities for Clean, Safe and Reliable Drinking Water**

A description of the responsibilities in each area is summarized as follows:

- **Administration**: The administrators or managers of a water treatment system are responsible for providing the resources (budget and staff) and policies (hours of staffing, reporting requirements, training and certification requirements, etc.). Funding may also need to be justified and obtained if the design of a system is inadequate or major upgrades are required. Managers establish and maintain emergency response plans and communication procedures to ensure prompt response to unsafe drinking water.

- **Design**: The designer's responsibility is to provide the physical infrastructure (pipes, valves, tanks, meters, etc.) capable of reliably producing and distributing the quality and quantity of water required. The design must provide adequate flexibility and controllability to enable the operator to make appropriate adjustments.

- **Maintenance**: The system must be maintained in good working order with the key equipment functional at all times. Should a key piece of equipment break down then it should be repaired in a timely manner.

- **Operations**: Once a capable system is in place, then it is the operator's responsibility to deliver safe drinking water through monitoring, testing and process control (for example by changing the setting on the dosing pumps). Operators are also responsible for maintaining records (log books, data forms, etc.), which aid in troubleshooting and design of upgrades. A further, and commonly unrecognized responsibility of the operator is to communicate the needs of the facility to administrators for possible action.

WATER SAMPLING

To comply with drinking water legislation, drinking water systems are required to monitor their water quality. Haldimand County has committed to providing safe, reliable drinking water and is diligent in ensuring that sampling and monitoring programs effectively characterize water quality. All samples are taken by certified operators and tests performed by accredited, licensed laboratories.

Microbiological Sampling

Microbial quality is one of the primary indicators for the safety of a drinking water supply. Of all contaminants in drinking water, human and/or animal feces present the greatest danger to public health. Pathogenic or disease causing micro-organisms (including certain protozoa, bacteria or viruses) may be found in untreated water supplies. Bacteriological monitoring and testing is a way to detect and control pathogenic bacteria in treated drinking water supplies. Heterotrophic Plate Count (HPC) samples are monitored to identify potential changes in water quality and are not used as an indicator of adverse human health effects. Table 2 provides a summary of microbiological sampling completed in the Dunnville Drinking Water System during 2019.

Table 2: 2019 Dunnville Drinking Water System Microbiological Sampling

	Number of Samples	Range of E.coli Results (cfu/100ml)	Range of Total Coliform Results (cfu/100ml)	Number of HPC Samples	Range of HPC Results (cfu/ml)	Number of Background Samples	Range of Background Results (cfu/ml)
Raw – Lake Erie	53	0 - 400	29 – 54,000	0	N/A	N/A	N/A
Raw at WTP	53	0 - 110	0 – 29,000	0	N/A	N/A	N/A
Raw – Grand River	53	1 – 6,300	30 – 171,000	0	N/A	N/A	N/A
Treated	159	0	0	159	0-8	159	0-1
Distribution System	261	0	0	105	0 - 5	53	0 - 104

*****Note: At a minimum, 25% of all drinking water samples must be analyzed for HPC.

Operational Sampling

Operational sampling and monitoring is important in maintaining the integrity of each barrier in the multi-barrier approach. Schedule 7 and 8 of Ontario Regulation 170/03 specify requirements for operational checks that municipalities must follow. Table 3 provides a summary of operational samples taken for the drinking water system. Regulatory requirements were consistently achieved for filtered water turbidity and efforts continue to consistently achieve recommended settled and filter targets. Disinfection regulatory requirements and operational targets were consistently achieved in 2019.

Table 3: 2019 Dunnville Drinking Water System Operational Sampling

	Number of Grab Samples	Range of Results	Regulatory Requirement	Recommended Target
Raw Turbidity	8760	2.06 – 439	N/A	N/A
Settled Turbidity	8760	0.00 – 6.00	N/A	2.00 NTU
Filter Turbidity	8760	0.030 - 0.271	≤ 0.30 in 95% of all monthly readings	0.10 NTU
Treated Turbidity	8760	0.00 - 0.92	N/A	≤ 5.00 NTU
Free Chlorine High Lift	8760	0.84 – 1.87	≥ 0.05 mg/L	≥ 0.20 mg/L
Free Chlorine Distribution System	409	0.34 - 1.42	≥ 0.05 mg/L	≥ 0.20 mg/L

*****Note: 8760 is used for continuous monitoring

As result of public inquiries, a quarterly treated water hardness sampling program was initiated in the County.

The term hardness was originally applied to waters that were hard to wash in, referring to the soap wasting properties of hard water. Hardness prevents soap from lathering by causing the development of an insoluble curdy precipitate in the water; hardness typically causes the buildup of hardness scale (such as seen in cooking pans). Dissolved calcium and magnesium salts are primarily responsible for most scaling in pipes and water heaters and can cause numerous problems in laundry, kitchen, and bath. Hardness is usually expressed in grains per gallon (or ppm) as calcium carbonate equivalent.

The degree of hardness standard as established by the American Society of Agricultural Engineers (S-339) and the Water Quality Association (WQA) is shown in the following table:

Table 4: Standard Degree of Hardness

Degree of Hardness	Grains per Gallon (gpg)	Ppm (mg/L)
Soft	< 1.0	< 17.0
Slightly Hard	1.0 – 3.5	17 - 60
Moderately Hard	3.5 – 7.0	60 - 120
Hard	7.0 – 10.5	120 - 180
Very Hard	> 10.5	> 180

The sample results in Table 5 indicate that the average value for Dunnville is considered hard water as taken from the Degree of Hardness Table above.

Table 5: 2019 Dunnville Drinking Water System Hardness Sampling

Parameter	Sample Date	Dunnville
Total Hardness (mg/L as $CaCO_3$)	March 5, 2019	178
	May 24, 2019	144
	September 3, 2019	160
	November 19, 2019	144
	2019 Average ----->	**157**

Lead Sampling

The community lead testing program is a requirement of O. Reg. 170/03 under the Safe Drinking Water Act, 2002. Haldimand County is exempt from sampling private residences due to having less than 10% of plumbing sample locations exceed the standard for two consecutive periods of reduced sampling. Annual pH and alkalinity samples are taken, as well as distribution system lead samples, every three years. There are no regulatory limits for alkalinity and pH, however Haldimand County sample results are within the operational guidelines provided by the MECP. A summary of 2019 sampling has been provided in Table 6.

Table 6: 2019 Dunnville Drinking Water System Lead Sampling

Location Type	Number of Samples	Range of Results (min) – (max)	Number of Exceedances
Plumbing - Lead	Exempt By Regulation		
Distribution - Lead	Not Required By Regulation in 2019		
Distribution - pH	6	7.22 – 7.45	N/A
Distribution - Alkalinity	6	79 – 84 mg/L	N/A

Organic Sampling

To protect drinking water from pathogens, a disinfectant (usually chlorine) is added to the drinking water. Disinfectants can react with naturally-occurring materials in the water to form disinfection byproducts (DBP), which may pose health risks.

A challenge for water systems is balancing pathogen control and disinfection byproduct formation. It is important to provide protection from pathogens while minimizing health risks from disinfection byproducts. More information on each byproduct is summarized in Table 7.

Haldimand County sample for haloacetic acids (HAA) and trihalomethanes (THM) at the water treatment plant and in the distribution system where there is an elevated potential for the formation of these byproducts. Although a treatment sample is not required by regulation, the sample is used to monitor byproduct formation within the drinking water system.

Table 7: Disinfection Byproduct Information

Disinfection Byproduct	How it is formed?	Health Effects
Trihalomethanes	Trihalomethanes occur when naturally-occurring organic and inorganic materials in the water react with the disinfectants, chlorine and chloramine.	Some people who drink water containing total trihalomethanes in excess of the MCL over many years could experience liver, kidney, or central nervous system problems and an increased risk of cancer.
Haloacetic Acids	Haloacetic acids occur when naturally-occurring organic and inorganic materials in the water react with the disinfectants, chlorine and chloramine.	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.

Regulatory reporting is based on a running annual average of quarterly sample results. The calculated THM and HAA averages were below the maximum allowable concentrations (MAC) permitted by the MECP. Table 8 provides a summary of 2019 disinfection byproduct sampling.

Table 8: 2019 Dunnville Drinking Water System DBP Sampling

Parameter	Sample Date	Sample Results (ug/L)	Annual Average (ug/L)	Regulatory MAC (ug/L)	Exceedance
Haloacetic Acids Dunnville WTP	February 4, 2019 May 6, 2019 August 6, 2019 November 4, 2019	5.3 16.3 11.2 10.1	10.7	80	No
Haloacetic Acids Dunnville Distribution	February 13, 2019 May 10, 2019 August 6, 2019 November 12, 2019	5.3 17 6.9 7	9.1	80	No
Trihalomethanes Dunnville WTP	February 4, 2019 May 10, 2019 August 6, 2019 November 4, 2019	10.4 22.5 19.8 14.2	16.7	100	No
Trihalomethanes Dunnville Distribution	February 13, 2019 May 10, 2019 August 6, 2019 November 12, 2019	18 35 33 26	28	100	No

Additional sample results for organic and inorganic parameters can be found in the appendices.

WATER USE

Raw Water

The Dunnville Drinking Water System's raw water source is Lake Erie. A Permit to Take Water (PTTW) specifies the maximum volume of raw water that can be taken from the water source and conveys MECP site-specific regulatory requirements. When comparing the 2019 maximum raw water flow and the permit limits (*Figure* 3), the County's maximum daily flow for 2019 represented 25.5% of its PPTW raw water allotment for Lake Erie and 18.4% of its allotment for the Grand River. All Grand River water taken was utilized for trial purposes and was not treated and distributed to customers.

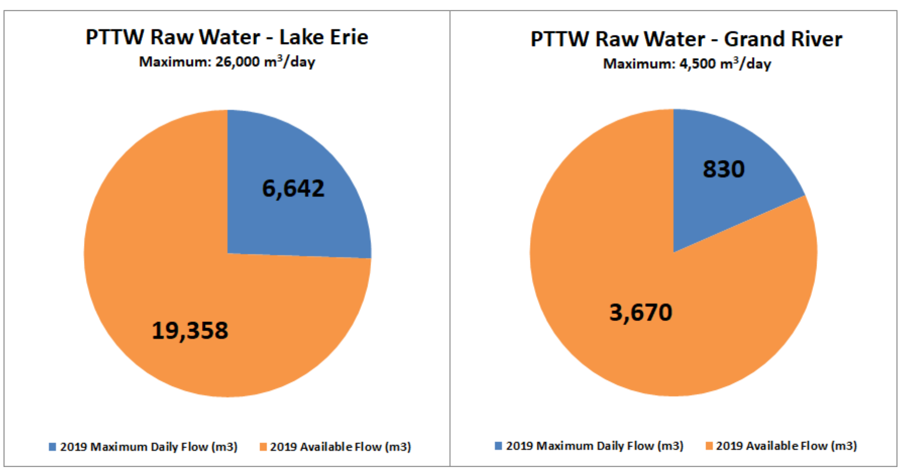


***Figure 3*: Dunnville Permit to Take Water (PTTW) Flow Comparisons**

Potable Water

As required by Schedule 22 of Ontario Regulation 170/03, Table 9, Table 10 and *Figure* 3 are intended to provide a summary of potable water supplied by the Dunnville Drinking Water System in 2019.

Table 9: 2019 Dunnville Monthly Potable Water Flow Data

System	Month	Monthly Total m^3	Daily Average m^3	Maximum Day m^3	Maximum Daily Flow Rate L/s
Dunnville Drinking Water System	**January**	76,432	2,466	3,166	176.2
	February	72,528	2,590	3,774	184.1
	March	88,525	2,856	3,776	123.3
	April	78,578	2,619	3,285	103.2
	May	91,195	2,942	4,258	112.7
	June	108,033	3,601	4,823	105.5
	July	115,023	3,710	4,814	111.3
	August	100,560	3,244	5,190	214.0
	September	81,721	2,724	4,045	105.5
	October	78,572	2,535	3,637	114.2
	November	74,844	2,495	3,363	107.8
	December	75,481	2,435	3,105	187.1

Figure 4 compares the monthly flows over the last five years at the Dunnville Water Treatment Plant. When comparing the average monthly flows for 2018 and 2019, there was a 2.9% increase in potable water supplied to the distribution system.

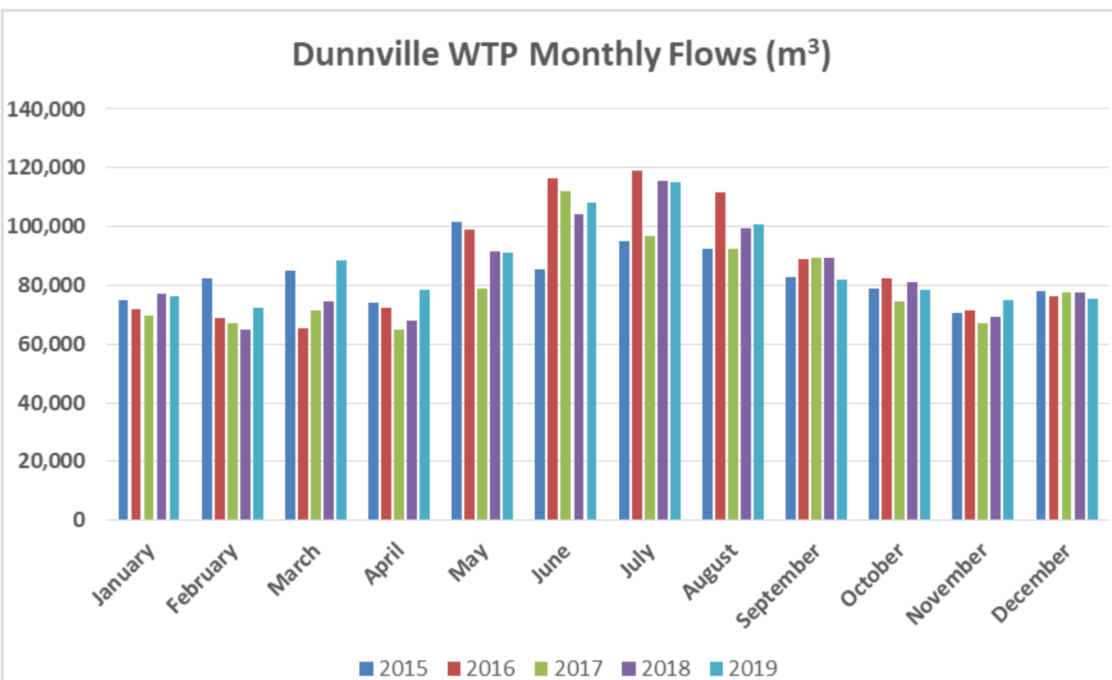


***Figure 4*: Dunnville Water Treatment Plant Five Year Monthly Potable Flow Comparison**

The Dunnville Water Treatment Plant has a rated capacity of 14,500 cubic metres per day. When compared against the maximum daily flow for 2019, the Dunnville Water Treatment Plant operated at approximately 36% of design capacity, however this calculation does not take into account any operational and infrastructure limitations.

Table 10: Comparison of Rated Capacity and 2019 Maximum Flow Rate

System and Municipal Drinking Water License	Rated Capacity	Maximum Daily Flow (m^3 / day)	Percentage of Capacity
Dunnville 066-101	14,500 m^3/day	5,190 m^3/day	35.8 %

To ensure the water treatment facility is capable of meeting current and projected demands, Haldimand County staff annually review plant capability and performance and update development allocation accordingly.

REGULATORY COMPLIANCE

Adverse Water Quality Incidents

Regulatory compliance includes reporting any adverse water quality incidents to the Ministry of Health (MOH) and the MECP. In all instances, corrective action is initiated to resolve any issues or concerns. In 2019, there were no adverse events in the Dunnville Drinking Water System.

Annual Drinking Water Inspection

The MECP annually confirms compliance with drinking water legislation by conducting inspections on drinking water systems. All aspects of the drinking water system are reviewed, including treatment equipment, disinfection, training records, and operational data required under the Safe Drinking Water Act, Ontario Regulations 170/03, 169/03 and 128/04. These inspections provide Haldimand County and Veolia an opportunity to review best management practices and work towards continually improving the operation and management of the drinking water systems. Any issues of regulatory non-compliance are identified and corrective actions issued.

The Dunnville Drinking Water System inspection occurred on August 20, 2019. Below is a summary of key inspection findings:

Dunnville Drinking Water System – Waterworks # 220003555

There was one instance of non-compliance identified during the 2019 inspection period. As a result of the non-compliance, the County received a **95.44%** inspection rating from the MECP.

The following issues were identified during the drinking water inspection:

1. During the inspection period, a new 50mm diameter watermain was installed on Forest St. East. The owner failed to demonstrate that the new watermain was

disinfected in accordance with Section 2.3 in Schedule B of the Drinking Water Works Permit #066-201.

County Follow-Up: The County was required to develop a procedure for disinfection of watermains in accordance with Schedule B of the Drinking Water Works Permit, submit it to the Provincial Officer and provide distribution operators training on the procedure. The County revised their existing procedure to ensure that all distribution watermains would be disinfected in accordance with Schedule B and submitted the documentation to the MECP and staff have been trained on the revised procedure.

During each inspection, the Ministry may provide recommendations and best practices specific to each drinking water system. It is recommended that owner's and operators develop an awareness of the identified items and consider measures to address them. The following item was identified during the 2019 drinking water inspection:

1. The Owner indicated during the physical inspection that internal checks were completed on Hach Pocket Colorimeters, however they were not completed as per manufacturer recommendations.

   Recommendation: It is recommended that the owner conducts internal calibration checks on the Hach Pocket Colorimeters every three months using secondary standards. This is recommended from Hach's document ID: TE6258.

   County Follow-Up: Veolia were conducting calibration checks, however were not using two standards. A second standard has been obtained and checks adhere to manufacturer recommendations.

2. During the physical inspection, the owner/operating authority did not have an SOP outlining their sampling procedures for harmful algae blooms.

   Recommendation: It is recommended that the owner/operating authority develops an SOP outlining information such as; sampling techniques, frequency and location(s) for harmful algae blooms.

   County Follow-Up: The County currently requires Veolia to monitor for microcystin as per recommendations provided in an MECP annual notification. A monitoring program is being developed and will address the recommendations provided by the MECP.

3. During a watermain installation project, free chlorine residuals were collected and tested off a temporary watermain. The results recorded without the operator's name/initial of the person who took the sample. The operator's name/initials was indicated on the work order form.

   Recommendation: It is recommended that the operators record their names/initials on the same document on which the result is being recorded.

   County Follow-Up: Staff were briefed on the recommendations provided and advised to document the name of the sampler on any distribution system sample collected.

Haldimand County continues to work closely with regulatory bodies to ensure a continued supply of safe, reliable drinking water to its users. All recommendations have been addressed and communicated to the MECP.

REPORT AVAILABILITY

This report can be viewed online at:

https://www.haldimandcounty.ca/drinking-water/

Reports can also be obtained upon request at any Haldimand County Satellite Office:

Cayuga Administration Building
45 Munsee Street North
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For more information on report content, please contact the Haldimand County Environmental Operations Division at:

Email: wwwops@haldimandcounty.on.ca

Telephone: 905-318-5932

Appendix A

Inorganic and Organic Sample Results

Inorganic Parameters:

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Antimony	March 11 2019	ND	ug/L	No
Arsenic	March 11 2019	ND	ug/L	No
Barium	March 11 2019	21	ug/L	No
Boron	March 11 2019	ND	ug/L	No
Cadmium	March 11 2019	ND	ug/L	No
Chromium	March 11 2019	ND	ug/L	No
Fluoride	April 1 2019	ND	mg/L	No
Mercury	March 11 2019	ND	mg/L	No
Nitrite	February 4 2019 May 6 2019 Aug 6 2019 November 4 2019	ND	mg/L	No
Nitrate	February 4 2019 May 6 2019 Aug 6 2019 November 4 2019	0.445 1.89 0.283 0.415	mg/L	No
Selenium	March 11 2019	ND	ug/L	No
Sodium	April 1 2019	16.1	mg/L	No
Uranium	March 11 2019	ND	ug/L	No

ND = Not Detectable

Organic Parameters:

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	March 11 2019	ND	ug/L	No
Atrazine + Metabolites	March 11 2019	ND	ug/L	No
Azinphos-methyl	March 11 2019	ND	ug/L	No
Benzene	March 11 2019	ND	ug/L	No
Benzo(a)pyrene	March 11 2019	ND	ug/L	No
Bromoxynil	March 11 2019	ND	ug/L	No
Carbaryl	March 11 2019	ND	ug/L	No
Carbofuran	March 11 2019	ND	ug/L	No
Carbon Tetrachloride	March 11 2019	ND	ug/L	No
Chlorpyrifos	March 11 2019	ND	ug/L	No
Diazinon	March 11 2019	ND	ug/L	No
Dicamba	March 11 2019	ND	ug/L	No
1,2-Dichlorobenzene	March 11 2019	ND	ug/L	No
1,4- Dichlorobenzene	March 11 2019	ND	ug/L	No
1,2- Dichloroethane	March 11 2019	ND	ug/L	No
1,1- Dichloroethylene	March 11 2019	ND	ug/L	No
Dichloromethane	March 11 2019	ND	ug/L	No
2,4- Dichlorophenol	March 11 2019	ND	ug/L	No
2,4- Dichlorophenoxy acetic acid (2,4-D)	March 11 2019	ND	ug/L	No
Diclofop-methyl	March 11 2019	ND	ug/L	No
Dimethoate	March 11 2019	ND	ug/L	No
Diquat	March 11 2019	ND	ug/L	No
Diuron	March 11 2019	ND	ug/L	No
Ethylbenzene	March 11 2019	ND	ug/L	No
Glyphosate	March 11 2019	ND	ug/L	No
Malathion	March 11 2019	ND	ug/L	No
MCPA	March 11 2019	ND	ug/L	No
Metolachlor	March 11 2019	ND	ug/L	No
Metribuzin	March 11 2019	ND	ug/L	No
Monochlorobenzene	March 11 2019	ND	ug/L	No
Paraquat	March 11 2019	ND	ug/L	No
Pentachlorophenol	March 11 2019	ND	ug/L	No
Phorate	March 11 2019	ND	ug/L	No
Picloram	March 11 2019	ND	ug/L	No
Prometryne	March 11 2019	ND	ug/L	No
Simazine	March 11 2019	ND	ug/L	No
Terbufos	March 11 2019	ND	ug/L	No
Tetrachloroethylene	March 11 2019	ND	ug/L	No
2,3,4,6- Tetrachlorophenol	March 11 2019	ND	ug/L	No
Toluene	March 11 2019	ND	ug/L	No
Total PCBs	March 11 2019	ND	ug/L	No
Triallate	March 11 2019	ND	ug/L	No
Trichloroethylene	March 11 2019	ND	ug/L	No
2,4,6- Trichlorophenol	March 11 2019	ND	ug/L	No
Trifluralin	March 11 2019	ND	ug/L	No
Vinyl Chloride	March 11 2019	ND	Ug/L	No
Xylenes (Total)	March 11 2019	ND	Ug/L	No

ND = Not Detectable

Microcystin Sample Results

Parameter	Sample Date	Raw Water Results		Treated Water Results	Unit of Measure	Exceedance
		Lake Erie	Grand River			
Microcystin	May 6 2019	ND	ND	ND	ug/L	No
	May 13 2019	ND	ND	ND		
	May 21 2019	ND	ND	ND		
	May 27 2019	ND	ND	ND		
	June 3 2019	ND	ND	ND		
	June 10 2019	ND	ND	ND		
	June 17 2019	ND	ND	ND		
	June 24 2019	ND	ND	ND		
	July 1 2019	ND	ND	ND		
	July 8 2019	ND	ND	ND		
	July 15 2019	ND	ND	ND		
	July 22 2019	ND	ND	ND		
	July 29 2019	ND	ND	ND		
	August 5 2019	ND	ND	ND		
	August 12 2019	ND	ND	ND		
	August 19 2019	ND	ND	ND		
	August 26 2019	ND	ND	ND		
	Sept. 2 2019	ND	ND	ND		
	Sept. 9 2019	ND	ND	ND		
	Sept. 16 2019	ND	ND	ND		
	Sept. 23 2019	ND	ND	ND		
	Sept. 30 2019	ND	ND	ND		
	October 7 2019	ND	ND	ND		
	October 14 2019	ND	ND	ND		
	October 21 2019	ND	ND	ND		
	October 28 2019	ND	ND	ND		

ND = Not Detectable