



Dunnville Drinking Water System 2023 Annual Water Quality Report

January 1, 2023 – December 31, 2023

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Quality Management System Policy

The Corporation of Haldimand County owns, maintains and operates various drinking water systems. Haldimand County is committed to:

- Ensuring our drinking water systems comply with all current legislation and regulatory requirements for the safe supply of drinking water;
- Ensuring financial support is provided to maintain infrastructure integrity to allow safe and consistent delivery of drinking water to our water customers;
- Reviewing, maintaining and continually improving our Quality Management System and to communicate the Plan with our water customers.



Haldimand County Quality Management System Summary

Haldimand County's Quality Management System (QMS) is legislated under the Drinking Water Quality Management Standard (DWQMS) through the Safe Drinking Water Act. To maintain operating authority accreditation, the Ministry of the Environment, Conservation and Parks (MECP) mandate tasks that must be completed annually. These activities include:

- Conducting an internal audit of the Quality Management System.
- Conducting a Management Review meeting.
- Participating in an external audit conducted by a third-party Accreditation Body
- Updating the Quality Management System Operational Plan.
- Updating Council of the status of the County's Quality Management System.

The QMS Operational Plan was reviewed and updated in 2023, with focus on Document and Records Control (Element 5), conforming to the DWQMS standards and Continual Improvement (Element 21) all while incorporating organizational changes within the County.

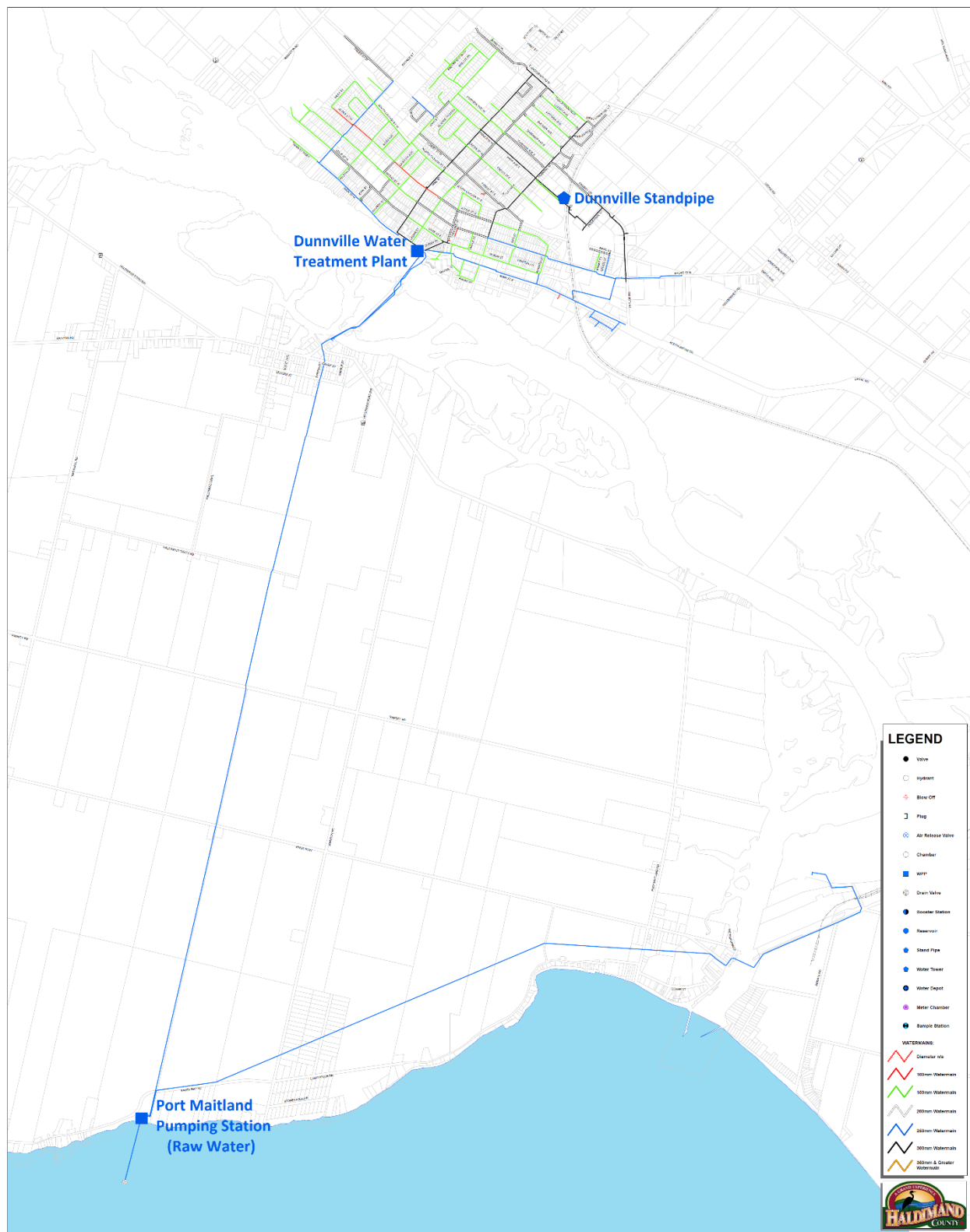
Internal audits were completed with support from Water and Wastewater Operations staff. Extra support from other County staff during internal audits would increase the coverage to ensure the system is conforming and efficient. No non-conformities were identified as a result of the internal audit. The audit report did note two areas for opportunities for improvement.

Haldimand County must receive accreditation annually to operate the water distribution systems. Through a qualified third-party auditor, the County must demonstrate that its QMS (Quality Management System) meets the requirements of the DWQMS (Drinking Water Quality Management Standard). SAI Global conducted an external audit on December 1st, 2022. The County received one minor non-conformance. This was a result of an administrative issue and corrective action was implemented immediately to resolve the issue. The reaccreditation audit is scheduled for February 28, 2024.

Staff are required to conduct an annual Management Review meeting to evaluate the effectiveness of the QMS. Deficiencies and opportunities for improvement are identified and action items are developed to ensure follow-up. The County held their management review meeting on November 3, 2023.

As part of the agreement with the County and through the regulations, Ontario Clean Water Agency (OCWA) must obtain accreditation to operate the water treatment facilities on behalf of the County. In 2023 OCWA continued full scope accreditation under the requirements of DWQMS.

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 kilometers 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 to supply the treatment plant 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 m³/day. A coagulant (Aluminum Sulphate was used in 2023) 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.

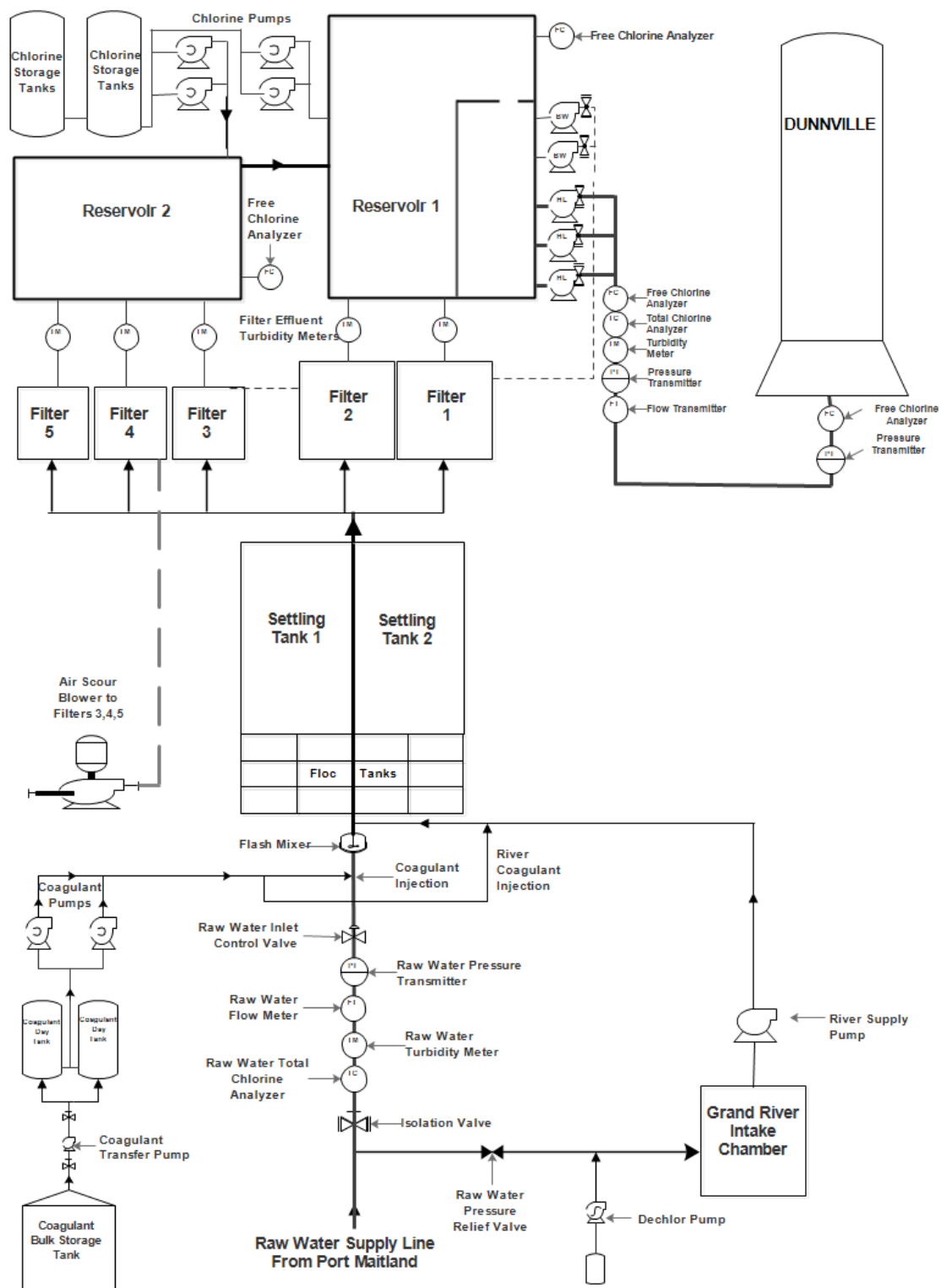


Figure 1: Dunnville Water Treatment Plant Schematic

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 5,907 people (2021 Census).

Ontario Clean Water Agency operates and maintains the raw water transmission mains, low lift pumping station, water treatment plant, and the standpipe. Haldimand County operates and maintains the distribution system, including the bulk water depots.

Expenditure Information

Haldimand County and its contract operators 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 2023 are identified in Table 1. All drinking water expenditure information is not included in this report.

Table 1: Dunnville Drinking Water System 2023 Expenditures

Raw Water Intake Repair	\$ 225,000
Dunnville WTP Upgrades	\$ 800,000
Leak Detection Project For Dunnville Distribution System	\$ 2000
Total Cost:	\$ 1,027,000

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).

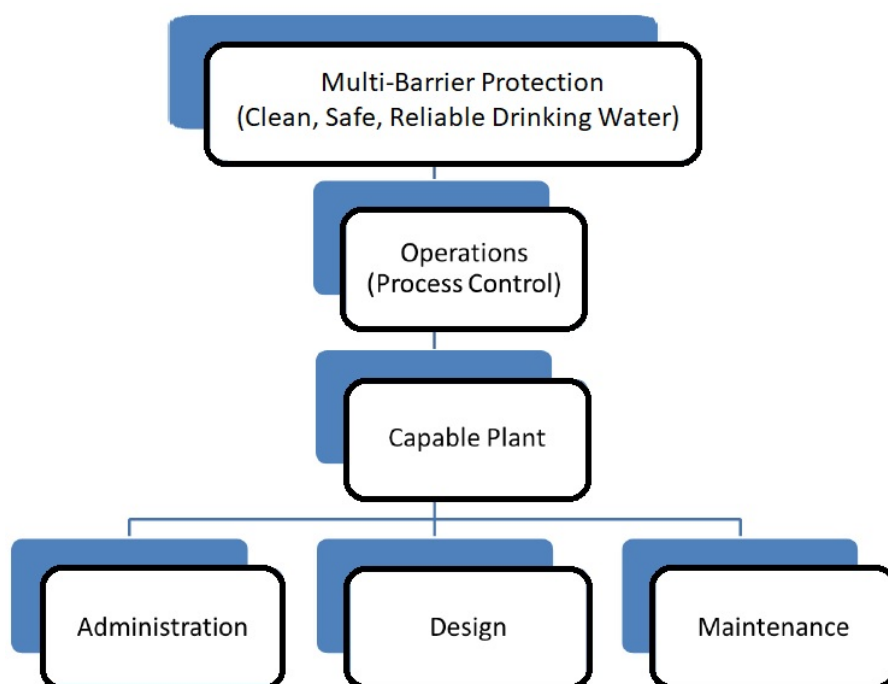


Figure 2: Responsibilities for Clean, Safe and Reliable Drinking Water

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 are 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 2023.

Table 2: 2023 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	51	2– 99999	1– 99999	N/A	N/A	N/A	N/A
Raw at WTP	51	1- 800	1 – 48000	N/A	N/A	N/A	N/A
Raw – Grand River	51	2 – 300	36 - 38000	N/A	N/A	N/A	N/A
Treated	159	0	0	159	0 - 16	159	0
Distribution System	208	0	0	42	0 - 31	208	0 - >200
Dunnville Standpipe	53	0	0	53	0-10	53	0

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

Operational Sampling

Operational sampling and monitoring are 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 2023.

Table 3: 2023 Dunnville Drinking Water System Operational Sampling

	Number of Grab Samples	Range of Results (mg/L)	Regulatory Requirement	Recommended Target
Raw Turbidity	8760	1.57 - 275	N/A	N/A
Settled Turbidity	8760	0.07 - 6	N/A	2.00 NTU
Filter Turbidity	8760	0 – 0.096	≤ 0.30 in 95% of all monthly readings	0.10 NTU
Treated Turbidity	8760	0.021 - 5	N/A	≤ 5.00 NTU
Free Chlorine High Lift	8760	0.83 – 2.02	≥ 0.05 mg/L	≥ 0.20 mg/L
Free Chlorine Distribution System	364	0.64 -1.6	≥ 0.05 mg/L	≥ 0.20 mg/L
Dunnville Standpipe	52	0.62 – 1.48	> 0.05 mg/L	> 0.20 mg/L

*Note: 8760 is used for continuous monitoring (24 samples per day * 365 days/year)

As result of public inquiries, a treated water hardness sampling program was initiated.

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 to have moderately hard water as taken from the Degree of Hardness Table above.

Table 5: 2023 Dunnville Drinking Water System Hardness Sampling

Parameter	Sample Date	Dunnville
Total Hardness (mg/L as CaCO₃)	May 9, 2023	116
	November 28, 2023	131
	2023 Average ----->	119

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 2023 sampling has been provided in Table 6.

Table 6: 2023 Dunnville Drinking Water System Lead Sampling

Location Type	Number of Samples	Range of Results (min) – (max)	Number of Exceedances
Distribution - Lead	4	0.13-0.32 µg/L	0
Distribution - pH	6	7.09 - 7.28	N/A
Distribution - Alkalinity	6	77 – 83 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 2023 disinfection byproduct sampling.

Table 8: 2023 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 6, 2023	5.3	5.3	80	No
	May 1, 2023	5.4			
	August 14, 2023	5.3			
	November 6, 2023	5.3			
Haloacetic Acids Dunnville Distribution	February 9, 2023	5.3	10.6	80	No
	May 11, 2023	13.7			
	August 9, 2023	15.9			
	November 14, 2023	7.6			
Trihalomethanes Dunnville WTP	February 6, 2023	8.5	9.1	100	No
	May 1, 2023	21			
	August 14, 2023	19			
	November 6, 2023	12			
Trihalomethanes Dunnville Distribution	February 9, 2023	13	21.5	100	No
	May 11, 2023	22			
	August 9, 2023	35			
	November 14, 2023	16			

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 2023 maximum raw water flow and the permit limits (*Figure 3*), 77.8% of Haldimand County's raw water allotment was available for use.

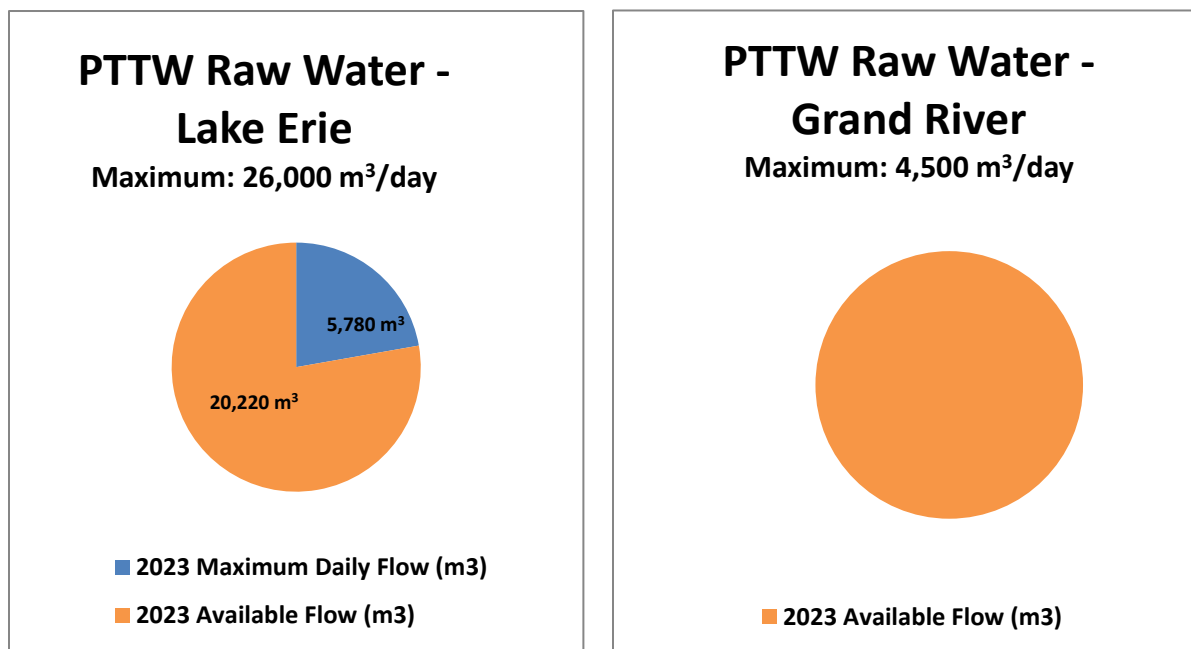


Figure 3: Dunnville Permit to Take Water (PTTW) Flow Comparisons

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 2023.

Table 9: 2023 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	79,163	2,553	3,441	49
	February	80,221	2,865	4,000	46
	March	81,269	2,622	3,639	42
	April	82,568	2,752	3,861	45
	May	102,404	3,303	4,639	54
	June	117,032	3,901	4,984	58
	July	113,039	3,646	4,757	55
	August	98,189	3,285	4,212	49
	September	87,480	2,916	3,600	42
	October	87,002	2,807	3,613	42
	November	83,690	2,790	3,389	39
	December	81,696	2,635	3,696	43

Figure 4 compares the monthly flows over the last five years at the Dunnville Water Treatment Plant. When comparing the average monthly flows for 2022 and 2023, there was a **2.65% decrease** in potable water supplied to the distribution system.

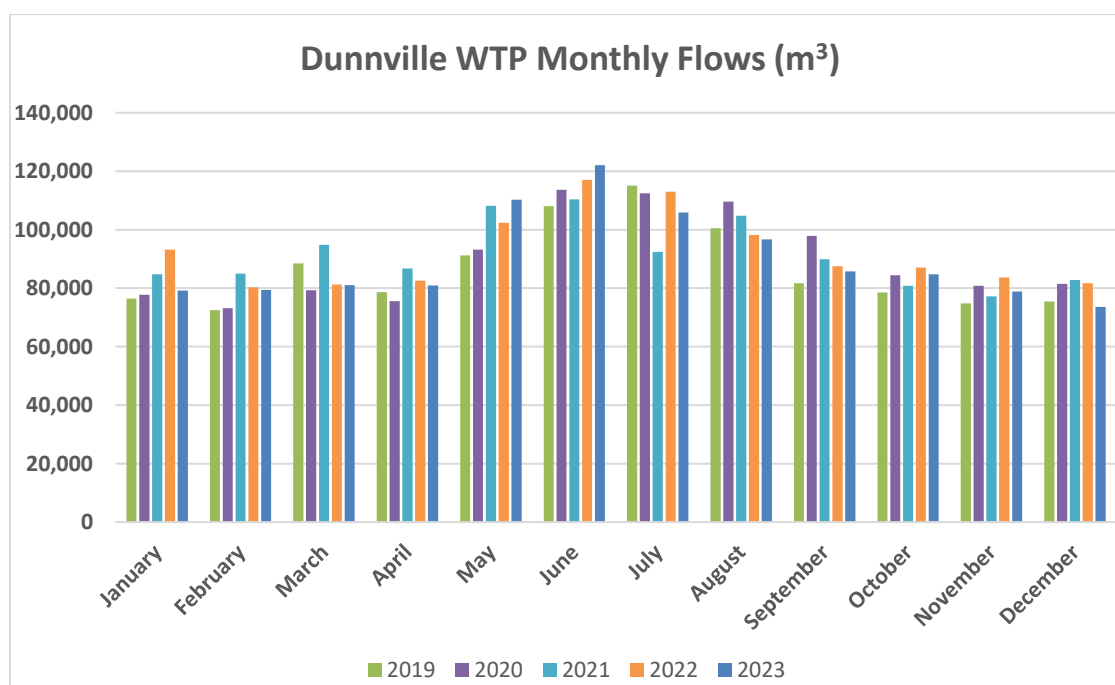


Figure 4: Dunnville Water Treatment Plant Five Year Monthly Potable Flow Comparison

According to the Dunnville Water Treatment Plant's Engineer's Report, the facility has a rated capacity of 14,500 cubic meters per day. When compared against the maximum daily flow for 2023, the Dunnville Water Treatment Plant is operating at approximately 34.4% of design capacity, however this calculation does not take into account any operational and infrastructure limitations.

Table 10: Comparison of Rated Capacity and 2023 Maximum Flow Rate

System and Municipal Drinking Water License	Rated Capacity	Maximum Daily Flow (m³ / day)	Percentage of Capacity
Dunnville 066-101	14,500 m ³ /day	4,984 m ³ /day	34.4 %

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 requires reporting adverse water quality incidents to the Ministry of Health (MOH) and the Ministry of the Environment, Conservation and Parks (MECP). In all instances, corrective action is initiated to resolve the issue. Over the 2023 period there were no adverse water quality incidents to report.

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 OCWA 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 findings for the 2023 annual drinking water system inspection is included in this report. Below is a summary of the key findings for the inspection:

Dunnville Drinking Water System – DWS# 220003555

There were no non-compliance items identified during the 2023 inspection period. The County received a **100%** inspection rating from the MECP.

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 the Haldimand County Administration Building:



Cayuga Administration Building

53 Thorburn St.

Cayuga, ON

N0A 1E0

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 14, 2023	ND	ug/L	No
Arsenic	March 14, 2023	ND	ug/L	No
Barium	March 14, 2023	23.9	ug/L	No
Boron	March 14, 2023	24	ug/L	No
Cadmium	March 14, 2023	ND	ug/L	No
Chromium	March 14, 2023	0.15	ug/L	No
Mercury	March 10, 2023	ND	ug/L	No
Nitrate	February 16, 2023 May 1, 2023 August 14, 2023 November 6, 2023	0.228 1.12 0.333 0.135	mg/L	No
Selenium	March 14, 2023	0.16	ug/L	No
Uranium	March 14, 2023	0.034	ug/L	No

ND = Not Detectable (below detection limit)

Organic Parameters:

Parameter	Sample Date	Result Value	Unit of Measure	Exceedance
Alachlor	March 13, 2023	ND	ug/L	No
Atrazine + Metabolites	March 13, 2023	0.02	ug/L	No
Azinphos-methyl	March 13, 2023	ND	ug/L	No
Benzene	March 13, 2023	ND	ug/L	No
Benzo(a)pyrene	March 13, 2023	ND	ug/L	No
Bromoxynil	March 13, 2023	ND	ug/L	No
Carbaryl	March 13, 2023	ND	ug/L	No
Carbofuran	March 13, 2023	ND	ug/L	No
Carbon Tetrachloride	March 13, 2023	ND	ug/L	No
Chlorpyrifos	March 13, 2023	ND	ug/L	No
Diazinon	March 13, 2023	ND	ug/L	No
Dicamba	March 13, 2023	ND	ug/L	No
1,2-Dichlorobenzene	March 13, 2023	ND	ug/L	No
1,4- Dichlorobenzene	March 13, 2023	ND	ug/L	No
1,2- Dichloroethane	March 13, 2023	ND	ug/L	No
1,1- Dichloroethylene	March 13, 2023	ND	ug/L	No
Dichloromethane (Methylene Chloride)	March 13, 2023	ND	ug/L	No
2,4- Dichlorophenol	March 13, 2023	ND	ug/L	No
2,4- Dichlorophenoxy acetic acid (2,4-D)	March 13, 2023	ND	ug/L	No
Diclofop-methyl	March 13, 2023	ND	ug/L	No
Dimethoate	March 13, 2023	ND	ug/L	No
Diquat	March 13, 2023	ND	ug/L	No
Diuron	March 13, 2023	ND	ug/L	No
Glyphosate	March 13, 2023	ND	ug/L	No
Malathion	March 13, 2023	ND	ug/L	No
MCPA	March 13, 2023	ND	ug/L	No
Metolachlor	March 13, 2023	ND	ug/L	No
Metribuzin	March 13, 2023	ND	ug/L	No
Monochlorobenzene (Chlorobenzene)	March 13, 2023	ND	ug/L	No
Paraquat	March 13, 2023	ND	ug/L	No
Pentachlorophenol	March 13, 2023	ND	ug/L	No
Phorate	March 13, 2023	ND	ug/L	No
Picloram	March 13, 2023	ND	ug/L	No
Prometryne	March 13, 2023	ND	ug/L	No
Simazine	March 13, 2023	ND	ug/L	No
Terbufos	March 13, 2023	ND	ug/L	No
Tetrachloroethylene	March 13, 2023	ND	ug/L	No
2,3,4,6- Tetrachlorophenol	March 13, 2023	ND	ug/L	No
Total PCBs	March 13, 2023	ND	ug/L	No
Triallate	March 13, 2023	ND	ug/L	No
Trichloroethylene	March 13, 2023	ND	ug/L	No
2,4,6- Trichlorophenol	March 13, 2023	ND	ug/L	No
Trifluralin	March 13, 2023	ND	ug/L	No
Vinyl Chloride	March 13, 2023	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	June 5, 2023	0.1	0.1	0.1	ug/L	No
	June 12, 2023	0.1	0.1	0.1		
	June 19, 2023	0.1	0.1	0.1		
	June 26, 2023	0.1	0.1	0.1		
	July 3, 2023	0.1	0.1	0.1		
	July 10, 2023	0.1	0.1	0.1		
	July 17, 2023	0.1	0.1	0.1		
	July 24, 2023	0.1	0.1	0.1		
	July 31, 2023	0.1	0.1	0.1		
	August 7, 2023	0.1	0.1	0.1		
	August 14, 2023	0.1	0.1	0.1		
	August 21, 2023	0.1	0.1	0.1		
	August 28, 2023	0.1	0.1	0.1		
	September 4, 2023	0.1	0.1	0.1		
	September 11, 2023	0.1	0.1	0.1		
	September 18, 2023	0.1	0.1	0.1		
	September 25, 2023	0.1	0.1	0.1		
	October 2, 2023	0.1	0.1	0.1		
	October 9, 2023	0.1	0.1	0.1		
	October 16, 2023	0.1	0.1	0.1		
	October 23, 2023	0.1	0.1	0.1		
	October 30, 2023	0.1	0.1	0.1		

ND = Not Detectable