Dungannon Drinking Water System
2023 Operation and Maintenance
Annual Report

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PREPARED BY

Veolia Water
100 Cove Rd.
Goderich, ON
N7A 3Z2

TO

Township of Ashfield-Colborne-Wawanosh,
82133 Council Line, R.R.#5,
Goderich, ON
N7A 3Y2

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1.0 INTRODUCTION AND BACKGROUND

The purpose of the 2023 Annual Report is to document the operation and maintenance data for the Dungannon Drinking Water System for review by the Ministry of the Environment, Conservation and Parks (MECP) in accordance with O. Reg. 170/03. This report covers January 1, 2023 to December 31, 2023. A copy of this report will be submitted to the owner to be uploaded to the township's website and can be provided to interested parties upon request.

2.0 DESCRIPTION OF WATER SYSTEM

The Dungannon Drinking Water System (DWS **#260007842**), consists of one drilled well, Well # 2-02 was constructed in December 2002 in accordance with construction standards as identified in the Ontario Regulation 903/03 made under the Ontario Water Resources Act. Well # 2 is a 203 mm diameter, 87 m deep drilled groundwater well (Water well record number 3007430) located south of the Well House.

Well # 1 was removed from service to the drinking water system and abandoned on April 3, 2017.

Well # 2 water quality monitoring results confirm this well meets the Ontario Drinking Water Quality Standards. (O Reg 169/03). Only Well # 2 provides water supply to the system. Arsenic regulation change from 25µg/L to 10µg/L on January 1, 2018 has caused Well #2 to be at or above the limit. The MECP is aware of this.

The Dungannon Well Supply is designated as a Large Municipal Residential drinking-water system that obtains water from a raw water source that is groundwater. The treatment and distribution system was commissioned in 2003 and provides potable water to an estimated population of 250 residents in the village of Dungannon.

The treatment process consists of a disinfection system using 12% sodium hypochlorite and an iron sequestering system using diluted sodium silicate.

The rated capacity of the treatment system is 657 m3/day as identified in the facility's Municipal drinking water license.

The water treatment equipment is designed to be capable of achieving, at all times, primary disinfection in accordance with the Ministry's Procedure for Disinfection of Drinking Water in Ontario, including at least 99 per cent removal or inactivation of viruses by the time the water enters the distribution system. Secondary disinfection is provided by residual chlorine from the primary disinfection process.

The distribution system does not include any storage facilities and has no fire hydrants. There are 7 blow off valves in the distribution system to accommodate flushing.

The chlorine dosages range varies with the chlorine demand of the raw water. The free chlorine residual is monitored at the point of entry to the distribution system, by an on-line chlorine analyzer, with a target residual of > 1.00 mg/L and < 1.30 mg/L.
The systems pressure ranges from 44- 65psi.

3.0 SUMMARY OF WATER QUALITY MONITORING

3.1 Water Treatment Equipment Operation and Monitoring as per Schedule 7, O. Reg. 170/03

3.1.1 Point of Entry Chlorine Residual

Chlorine residuals are continuously measured using a HACH CL17 online chlorine analyzer and verified for accuracy using hand-held HACH pocket colorimeter. **Table 1** shows the monthly average of free chlorine residual values on the treated water at the point of entry.

3.1.2 Distribution Chlorine Residual

Chlorine residuals in the distribution system are checked daily using a HACH pocket colorimeter, 364 distribution chlorine residuals were recorded.

Table 1. – Treated and Distribution Chlorine Residuals for Dungannon Drinking Water System

Date	Average Treated Chlorine Residual (mg/L)	Average Distribution Chlorine Residual (mg/L)
Jan	1.26	1.20
Feb	1.28	1.18
Mar	1.38	1.26
Apr	1.33	1.25
May	1.20	1.35
Jun	1.27	1.16
Jul	1.25	1.13
Aug	1.28	1.11
Sep	1.37	1.21
Oct	1.38	1.19
Nov	1.31	1.16
Dec	1.29	1.09
Average	1.30	1.19
Min	0.79	0.22
Max	2.30	1.98
# Samples	364*	365

Operator was unable to take a TW sample as the analyzer was not working correctly - site was still on Hauled water

3.1.3 Turbidity

Turbidity is measured using a pocket turbidimeter. **Table 2** provides a summary of raw and treated turbidity results.

Table 2. – Raw and Treated Water Turbidities for Dungannon Drinking Water System

Date	Average Raw Turbidity (NTU)	Average Treated Turbidity (NTU)
Jan	0.69	0.29
Feb	0.43	0.24
Mar	0.44	0.20
Apr	0.38	0.21
May	0.34	0.19
Jun	0.34	0.18
Jul	0.48	0.21
Aug	0.47	0.18
Sep	0.45	0.21
Oct	0.49	0.24
Nov	0.39	0.24
Dec	0.23	0.19
Average	**0.43**	**0.22**
Min	**0.10**	**0.11**
Max	**0.88**	**0.61**
# Samples	**50**	**220**

3.2 Microbiological Sampling as per Schedule 10, O. Reg. 170/03

3.2.1 Raw Water Samples

Raw water samples are taken every week. A total of 50 samples were collected and analyzed for E. Coli and Total Coliforms this was due to water being hauled in to the site. Each E. Coli and Total Coliform results obtained were 0 cfu/100 ml in the raw water.

Table 3 provides a summary of bacteriological results performed on the raw water.

Table 3. – Microbiological Results for *Raw* Water at Dungannon Drinking Water System

	E. Coli			Total Coliform		
Date	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1
Jan	5	5	0	5	5	0
Feb	4	4	0	4	4	0
Mar	4	4	0	4	4	0
Apr	4	4	0	4	4	0
May	5	5	0	5	5	0
Jun	4	4	0	4	4	0
Jul	4	4	0	4	4	0
Aug	5	5	0	5	5	0
Sep	4	4	0	4	4	0
Oct	5	5	0	5	5	0
Nov	4	4	0	4	4	0
Dec	2*	2*	0	2*	2*	0
Total	**50**	**50**	**0**	**50**	**50**	**0**

Water was hauled in so no Raw samples could be taken as the hauled water is treated.

3.2.2 Treated Water (Point of Entry) Samples

One treated water sample from the point of entry is taken every week and analyzed for E.Coli, Total Coliforms and for Heterotrophic Plate Count (HPC). A total of 52 treated water samples were collected and analyzed for the above parameters. Each E. Coli and Total Coliform samples were found to be safe. The range of HPC results were 0 - 10 cfu/100 ml.

Table 4. provides a summary of all bacteriological results performed on treated water.

Table 4. – Microbiological Results for Point of Entry at Dungannon Drinking Water System

Date	E. Coli			Total Coliform			HPC		
	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1	# Samples	Safe	Deteriorating
Jan	5	5	0	5	5	0	5	5	0
Feb	4	4	0	4	4	0	4	4	0
Mar	4	4	0	4	4	0	4	4	0
Apr	4	4	0	4	4	0	4	4	0
May	5	5	0	5	5	0	5	5	0
Jun	4	4	0	4	4	0	4	4	0
Jul	4	4	0	4	4	0	4	4	0
Aug	5	5	0	5	5	0	5	5	0
Sep	4	4	0	4	4	0	4	4	0
Oct	5	5	0	5	5	0	5	5	0
Nov	4	4	0	4	4	0	4	4	0
Dec	4	4	0	4	4	0	4	4	0
Total	**52**	**52**	**0**	**52**	**52**	**0**	**52**	**52**	**0**

3.2.3 Distribution Samples

Distribution samples are collected weekly and tested for E.Coli, Total Coliform and for Heterotrophic Plate Count (HPC). A total of 102 distribution samples were collected and analyzed for the above parameters. The range of HPC results were 0 - <10 cfu/100 ml.
Table 5 provides a summary of all bacteriological samples taken in the distribution system.

Table 5. – Microbiological Results for Dungannon Distribution System

Date	E. Coli			Total Coliform			HPC		
	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1	# Samples	Safe	Deteriorating
Jan	10	10	0	10	10	0	5	5	0
Feb	8	8	0	8	8	0	4	4	0
Mar	8*	8*	0	8*	8*	0	4	4	0
Apr	8	8	0	8	8	0	4	4	0
May	10	10	0	10	10	0	5	5	0
Jun	8	8	0	8	8	0	4	4	0
Jul	8	8	0	8	8	0	4	4	0
Aug	10	10	0	10	10	0	5	5	0
Sep	8	8	0	8	8	0	4	4	0
Oct	8	8	0	8	8	0	4	4	0
Nov	8	8	0	8	8	0	4	4	0
Dec	8	8	0	8	8	0	4	4	0
Total	**102**	**102**	**0**	**102**	**102**	**0**	102	**102**	**0**

**One set of DW samples in March were UAL - unreliable, sample age exceeds normal limit.*

3.3 Chemical Sampling & Testing as per Schedule 13, O. Reg. 170/03

3.3.1 Inorganics

One treated water sample is taken every 36 months and tested for inorganics. The most recent samples for the Dungannon Drinking Water System were collected on December 07, 2022 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23. All parameters were found to be within compliance. Inorganics will be sampled and analyzed again in ***December 2025***.

Results from 2022 can be found in **Table 6a.**

Dungannon has been given relief for Arsenic testing at present which was extended to January 31, 2024. and must include quarterly updates on the project from the engineers. Arsenic for Treated Water is tested once every quarter and must be reported if it exceeds 25 µg/L
Results for the Treated Water arsenic testing can be found in **Table 6b.**

Table 6a. – Schedule 23 Results for Dungannon Drinking Water System

Parameter	Result (µg/L)	Maximum Allowable Concentration (µg/L)
Antimony	<0.06	6
Barium	154	1000
Boron	88	5000
Cadmium	0.003	5
Chromium	0.23	50
Mercury	<0.01	1
Selenium	<0.04	10
Uranium	1.00	20

Table 6b. – Arsenic Results for Dungannon Drinking Water System

Date	TW Arsenic µg/L
March 7	12.40
June 7	13.20
Sept 19	13.60
Dec 19	2.90

3.3.2 Lead

Schedule 15.1 of Ontario Regulation 170/03 requires that samples be taken during two seasons: once between December 15 and April 15 and once between June 15 and October 15. The Maximum Allowable Concentration for Lead is 0.01 mg/L.In the two previous lead sampling seasons, pH, alkalinity and lead samples were taken on March 14 and July 18, 2023. The next lead samples are due in the winter and summer 2024 schedule.

Results for pH and alkalinity can be found in **Table 7.**

Table 7. – Lead Sampling Program Results for Dungannon Drinking Water System

	Lead (mg/L)	pH	Alkalinity (mg/L)
Dec-Apr	0.06	8.13	214
Jun-Oct	0.07	8.10	211

3.3.3 Organics

One treated water sample is taken every 36 months and tested for schedule 24 organic parameters. The most recent samples were collected on December 07 2022. All parameters were found to be within compliance. Organics will be sampled and analyzed again in ***December 2025***.
The 2019 sample results can be found in **Table 8.**

Table 8. – Schedule 24 Results for Dungannon Drinking Water System

Parameter	Result (µg/L)	Maximum Allowable Concentration (µg/L)
Benzene	<0.32	1
Carbon Tetrachloride	<0.17	2
1,2-Dichlorobenzene	<0.41	200
1,4-Dichlorobenzene	<0.36	5
1,1-Dichloroethylene	<0.33	14
1,2-Dichloroethane	<0.35	5
Dichloromethane	<0.35	50
Monochlorobenzene	<0.3	80
Tetrachloroethylene	<0.35	30
Trichloroethylene	<0.44	50
Vinyl Chloride	<0.17	1
Diquat	<1	70
Paraquat	<1	10
Glyphosate	<1	280
Polychlorinated Biphenyls (PCBs)	<0.04	3
Benzo(a)pyrene	<0.004	0.01
2,4-dichlorophenol	<0.15	900
2,4,6-trichlorophenol	<0.25	5
2,3,4,6-tetrachlorophenol	<0.20	100
Pentachlorophenol	<0.15	60
Alachlor	<0.02	5
Atrazine+N-dealkylated metabolites	<0.01	5
Atrazine	<0.01	-
De-ethylated atrazine	<0.01	-
Azinphos-methyl	<0.05	20
Carbaryl	<0.05	90
Carbofuran	<0.01	90
Chlorpyrifos	<0.02	90
Diazinon	<0.02	20

Table 8 Continued

Parameter	Result (µg/L)	Maximum Allowable Concentration (µg/L)
Dimethoate	<0.06	20
Diuron	<0.03	150
Malathion	<0.02	190
Metolachlor	<0.01	50
Metribuzin	<0.02	80
Phorate	<0.01	2
Prometryne	<0.03	1
Simazine	<0.01	10
Terbufos	<0.01	1
Triallate	<0.01	230
Trifluralin	<0.02	45
2,4-dichlorophenoxyacetic acid	<0.19	100
Bromoxynil	<0.33	5
Dicamba	<0.20	120
Diclofop-methyl	<0.40	9
MCPA	<0.00012	0.00012
Picloram	<1	190

3.3.4 Trihalomethanes and Haloacetic Acids

One distribution sample is taken every three months from a point in the distribution system and tested for Trihalomethanes (THMs) and Haloacetic Acids (HAAs). In 2023 samples were collected during the months of March, June, September and November. The Ontario Drinking Water Quality Standard (ODWQS) has set a Maximum Allowable Concentration (MAC) of 100 µg/L for THMs and it is expressed as a running annual average (RAA). The RAA for THMs was found to be 13.95 µg/L, which is within compliance. The HAA MAC is 80µg/L.
Refer to **Table 9** for the summary of trihalomethane and haloacetic acid results.

3.3.5 Nitrate & Nitrite

One treated water sample is taken every three months and tested for nitrate and nitrite. In 2023, samples were collected during the months of March, June, September and December. The Ontario Drinking Water Quality Standard (ODWQS) has set a Maximum Allowable Concentration (MAC) of 1 mg/L for nitrites and 10 mg/L for nitrates. The results were found to be within compliance.
Refer to **Table 9.**

Table 9. – Nitrate, Nitrite, THM and HAA Results at Dungannon Drinking Water System

	Nitrate		Nitrite		THMs		HAAs	
Date	**# Samples**	**Result (mg/L)**	**# Samples**	**Result (mg/L)**	**# Samples**	**Result (µg/L)**	**# Samples**	**Result (µg/L)**
March 7	1	<0.006	1	<0.003	1	8.8	1	<5.3
June 7	1	<0.006	1	<0.003	1	17	1	<5.3
Sept. 19	1	<0.006	1	<0.003	1	15	1	<5.3
Dec. 19	1	<0.006	1	<0.003	1	15	1	<5.3
Total	**4**		**4**		**4**		**4**	
Average		**<0.006**		**<0.003**		**RAA 13.95**		**<5.3**
Maximum		**0.007**		**<0.003**				

3.3.6 Sodium

One treated water sample is collected every 60 months and tested for Sodium. O. Reg 170/03 has set a Maximum Acceptable concentration (MAC) of 20 mg/L for Sodium which requires the Medical Office of Health be notified if the concentration exceeds the MAC. These samples were last collected on June 15, 2021 and were found to be 15.6 mg/L, which is within compliance. The next water sample for Sodium will be collected and analyzed on or before June 21, 2026.

3.3.7 Fluoride

One treated water sample is collected at least once in every 60 months and tested for Fluoride. The Ontario Drinking Water Quality Standards (ODWQS) have set a MAC of 1.5 mg/L. In November and again in December, 2022 a sample was collected for this analysis. The both samples were found to be above the MAC with a concentration of 1.52 mg/L and 1.55 mg/L. This is due to high levels of naturally occurring fluoride in the aquifer. An information letter was supplied from the HPPH about the naturally occurring fluoride in the drinking water The next water sample for Fluoride will be collected and analyzed in November, 2028**.** For more information see:
http://www.acwtownship.ca/wordpress/wp-content/uploads/2013/09/DungannonWaterQualityInformation.pdf.

4.0 WATER AND CHEMICAL USAGE

4.1 Chemical Usage

A total of 73.07 kg of 12% Sodium Hypochlorite was used to ensure proper disinfection in the distribution system with an average dosage of 3.57 mg/L. 67.09 kg of Sodium Silicate was used to reduce the concentration of dissolved iron with an overage dose of 3.17 mg/L for the 2023 year.

Refer to **Table 10.**

Table 10. – Chemical Usage at Dungannon Drinking Water System

Date	Sodium Hypochlorite		Sodium Silicate	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dose (mg/L)
Jan	6.84	3.08	7.90	3.62
Feb	4.74	3.28	4.81	3.51
Mar	4.47	3.80	4.26	3.57
Apr	5.66	4.47	4.49	3.57
May	5.39	3.43	5.56	3.63
Jun	6.12	3.30	6.47	3.52
Jul	5.59	3.26	6.54	3.79
Aug	5.39	3.20	6.47	3.79
Sep	8.16	3.15	9.82	3.76
Oct	6.60	3.78	5.79	2.89
Nov	5.27	3.09	5.39	3.05
Dec	4.88	3.79	3.55	1.08
Total	**73.07**		**67.09**	
Average		**3.57**		**3.17**

4.2 Annual Flows

A summary of the water supplied to the distribution system is provided in **Table 11.**
This Table provides a breakdown of the monthly flows provided to the distribution system.

Flow meters were calibrated on August 10, 2023 by Advanced Meter Services

Table 11. – Treated Water Flows for Dungannon Drinking Water System

Date	Average Daily Flow (m^3)	Maximum Daily Flow (m^3)	Total Monthly Flow (m^3)
Jan	71	127	2136
Feb	51	102	1427
Mar	38	51	1185
Apr	42	59	1262
May	49	119	1527
Jun	61	113	1834
Jul	56	80	1724
Aug	55	76	1702
Sep	88	136	2631
Oct	66	83	2060
Nov	59	94	1763
Dec	64	344	1510
Average	**58.33**		
Max		**344**	
Total			**20 761**

5.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE

The following summarizes water system improvements and routine and preventative maintenance for the Dungannon Drinking Water System:

- Stenner pump roller assembly was replaced
- Replaced the analyzer
- Hydrant flushing was completed
- Cl17 analyzer was calibrated by Cleartech
- Backflow preventer was certified by Fergusons
- New generator was installed
- new reservoir was filled and the new filter system is online
- Upgrades ongoing

6.0 MINISTRY OF THE ENVIRONMENT INSPECTIONS AND REGULATORY ISSUES

T**his section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues.**

The Dungannon Drinking Water System was inspected by The Ministry of Environment, Conservation and Parks. The inspection was completed by Ron Burrell on May 17, 2023 and was given 87.31%.

There was five instances of noncompliance:

- All microbiological water quality monitoring requirements prescribed by legislation for *distribution* samples in a large municipal residential system were not being met.-No action required
- All microbiological water quality monitoring requirements prescribed by legislation for *treated* samples were not being met. No action required
- All microbiological water quality monitoring requirements prescribed by legislation for *raw* water samples were not being met.-No action required
- The owner was not in compliance with all conditions of the PTTW. -No action required
- Corrective actions (as per Schedule 17), including any other steps that were directed by the Medical Officer of Health, had not been taken to address adverse conditions. -No action required

There was 1 instances of adverse water quality in 2023:

- AWQI #161501 - Arsenic Exceedance - This was a false adverse as Dungannon has Arsenic relief, the Lab was given the updated paperwork.

There was 2 notices of Precautionary Boil Water in 2023:

- December 5th and the 15 due to system upgrades

7.0 MECP Regulatory Changes

- Proposed amendments to drinking water operator and water quality analyst certification regulations have been issued to address the impacts of emergencies. These include:
    - allowing the Ministry to act quickly to ensure the Province's drinking water is protected during an emergency
    - extending Operator certificates and allowing certain qualified but non-certified staff to temporarily maintain system operations, and would only be enacted during an emergency
    - allowing temporary relief from training and certification requirements

    This proposal has been registered with the Environmental Registry of Ontario and the consultation process was closed on July 2, 2021. The outcome of this proposal is expected to be published in 2022.

- Proposed updates to the Director's Directions - Minimum Requirements for Operational Plans - May 2021. The Director's Directions have updated the following:
    - Content Requirements - all referenced documents will be considered part of the Operational Plan.
    - Procedures for version control - version number and revision date is to be embedded in ever electronic copy, and recorded on every page of any physical copy
    - Completed copy of Subject System Description Form in Schedule "C" of the Director's Directions
    - Operational Plans are to be submitted to the Director electronically
    - Retention of Operational Plans - Operational Plans that were the subject of an audit by an auditor for the accreditation body shall be retained for a minimum of 10 years
    - Public Disclosure of Operational Plans - shall be made available for viewing by the public either electronically (website) or at the principal place of business, but not in a manner that would threaten the safety, health or quality of the drinking water, or create significant prejudice with the contractual obligations of the Operating Authority or other organization.
    - Operational Plans shall be updated to meet the requirements of the Director's Directions no later than April 1, 2022.