

Annual Report

For the 2017 Operating Year

Benmiller Drinking Water System 2017 Operation and Maintenance Annual Report

PREPARED BY

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TO

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1.0 INTRODUCTION AND BACKGROUND

The purpose of the 2017 Annual Report is to document the operation and maintenance data for the Benmiller Drinking Water System for review by the Ministry of the Environment in accordance with O. Reg. 170/03. This report covers January 1, 2017 to December 31, 2017. A copy of this report will be submitted to the owner to be uploaded to the township's website and can be supplied to interested parties upon request.

2.0 DESCRIPTION OF WATER SYSTEM

The Benmiller Drinking Water System (DWS # **220007588**), is characterized as a "secure ground water" system and is classified as a small municipal residential system. The system consists of one well with a rated capacity of 196 m³/day, with chlorination treatment. The entire system is located on Concession 1, Part Lot 1, Eastern Division of Ashfield-Colborne-Wawanosh Township. The distribution system serves the community of Benmiller with a population of approximately 50 residents, with approximately 18 customer services, and a 47 guest room Inn.

The system consists of a Limited Drinking Water System, which is owned by the Township of Ashfield-Colborne-Wawanosh and operated by Veolia Water Canada, the Operating Authority.

Well # 2 was put into service in January 2016, replacing # 1 well. It is a 150 mm drilled well, 70.1 m deep, originally drilled as a monitoring well in 2006. Well # 2 is equipped with a submersible vertical turbine pump rated at 2.5 L/s at 56.4 m TDH.

The well house is equipped with well pump, flow restrictor limiting flow to 2.27 litres/second, back-up diesel generator, chlorinators, a chlorine contact reservoir, on-line monitoring and alarm generation and auto-dialer.

Back-up power is supplied by one 20 KW, 25 kVA diesel standby generator with automatic transfer switch and 340 L double wall sub-base fuel tank, all installed in an external weatherproof and acoustic enclosure on a concrete pad.

The well house and its equipment have a daily maximum capacity to deliver 196 cubic metres of potable water per day to the Benmiller community. The current water source is one secure deep bed rock well. The well is located on the well house site with a dedicated raw water main feeding the well house.

The water from the well is pumped to a chlorine contact / storage reservoir (7.6 m x 4.6 m x 3.8 m deep) to provide adequate chlorine contact time at maximum flow and before the first consumer, complete with a sampling / service water connection feed back to the pump house.

The well house is monitored by an alarm dialer and is equipped with a data logger that tracks chlorine residuals on the treated water.

The attached distribution system is constructed with a combination of galvanized steel and PVC piping with polyethylene services.

There is no elevated storage to maintain pressure and the system pressure is maintained using pressure tanks and 3 pressure pumps.

The system has no fire hydrants and lacks the capacity to provide fire flows.

Disinfection is achieved on the Benmiller well supply through the use of 6% sodium hypochlorite. In the well house this chemical is added prior to the water entering the chlorine contact reservoir at dosages high enough to achieve both primary and secondary disinfection objectives.

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 Benmiller well supply has 1 PTTW (Permit To Take Water) # 2408-9LWNVZ, issued July 25, 2014, with an expiry date of March 8, 2020, which allows 196 cubic metres per day to be pumped from the well.

The Benmiller Drinking Water System (treatment Subsystem) has maximum flows as specified in the Municipal Drinking Water Licence (MDWL) 080-104 and Drinking Water Works Permit (DWWP) 080-204 (previously C of A # 8710-5TMSL). The maximum total daily flow is 196 cubic meters per day.

The treated water is monitored by an on-line chlorine analyzer.

Distribution piping typically ranges in size from 50 mm to 100 mm, and consists of galvanized or PVC piping, with polyethylene service connections.

A 100 mm diameter discharge watermain outside the pump house supplies treated water to the Benmiller Estates Subdivision, and two 50 mm discharge watermain supply treated water to the Benmiller Inn.

Typical system pressure ranges from 40 P.S.I to 60 P.S.I.

3.0 SUMMARY OF WATER QUALITY MONITORING

3.1 Water Treatment Equipment Operation and Monitoring

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 colourimeters. **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 colourimeter. In 2017, 365 distribution chlorine residuals were recorded.

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

Date	Average Treated Chlorine Residual (mg/L)	Average Distribution Chlorine Residual (mg/L)
Jan	1.30	1.24
Feb	1.38	1.36
Mar	1.41	1.39
Apr	1.47	1.40
May	1.40	1.30
Jun	1.44	1.30
Jul	1.43	1.23
Aug	1.35	1.25
Sep	1.25	1.17
Oct	1.42	1.31
Nov	1.25	1.13
Dec	1.36	1.21
Average	1.37	1.27
Min	0.67	0.70
Max	2.06	1.59
# Samples	8760	365

3.1.3 Turbidity

Turbidity is measured using a pocket turbidimeter. **Table 2.** provides a summary of raw and treated turbidity results. The maximum turbidity measured in the treated water was 0.72 NTU.

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

Date	Average Raw Turbidity (NTU)	Average Treated Turbidity (NTU)
Jan	0.7	0.44
Feb	0.61	0.43
Mar	0.42	0.44
Apr	0.68	0.45
May	0.64	0.45
Jun	0.65	0.56
Jul	0.65	0.51
Aug	0.67	0.5
Sep	0.69	0.52
Oct	0.81	0.55
Nov	0.7	0.55
Dec	0.76	0.53
Average	0.66	0.49
Min	0.41	0.29
Max	0.93	0.72
# Samples	25	284

3.2 Microbiological Sampling

3.2.1 Raw Water Samples

Raw water samples are taken every two weeks. In 2017, a total of 26 samples were collected and analyzed for E. coli and Total Coliforms. Each E. coli and Total Coliform result obtained was 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 Benmiller Drinking Water System

Date	E. coli			Total Coliform		
	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1
Jan	2	2	0	2	2	0
Feb	2	2	0	2	2	0
Mar	2	2	0	2	2	0
Apr	2	2	0	2	2	0
May	3	3	0	3	3	0
Jun	2	2	0	2	2	0
Jul	2	2	0	2	2	0
Aug	2	2	0	2	2	0
Sep	2	2	0	2	2	0
Oct	3	3	0	3	3	0
Nov	2	2	0	2	2	0
Dec	2	2	0	2	2	0
Total	26	26	0	26	26	0

3.2.2 Treated Water (Point of Entry) Samples

One treated water sample from the point of entry is taken every two weeks and analyzed for E.Coli, Total Coliforms and for Heterotrophic Plate Count (HPC). A total of 26 treated water samples were collected and analyzed for the above parameters. All samples were found to be safe. Each E. coli and total coliform result from the treated water was 0 cfu/100 ml. The range of HPC results were 0 - 1 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 Benmiller Drinking Water System

Date	E. coli			Total Coliform			HPC		
	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1	# Samples	Safe	Deteriorating
Jan	2	2	0	2	2	0	2	2	0
Feb	2	2	0	2	2	0	2	2	0
Mar	2	2	0	2	2	0	2	2	0
Apr	2	2	0	2	2	0	2	2	0
May	3	3	0	3	3	0	3	3	0
Jun	2	2	0	2	2	0	2	2	0
Jul	2	2	0	2	2	0	2	2	0
Aug	2	2	0	2	2	0	2	2	0
Sep	2	2	0	2	2	0	2	2	0
Oct	3	3	0	3	3	0	3	3	0
Nov	2	2	0	2	2	0	2	2	0
Dec	2	2	0	2	2	0	2	2	0
Total	26	26	0	26	26	0	26	26	0

3.2.3 Distribution System

Distribution samples are collected every two weeks and tested for E.Coli, Total Coliform and for Heterotrophic Plate Count (HPC). In 2017, a total of 26 distribution samples were collected and analyzed for the above parameters and all samples were found to be safe. All E. coli and total coliform result from the treated water were 0 cfu/100 ml. The range of HPC results were 0 - 2 cfu/100 ml. **Table 5.** provides a summary of all bacteriological samples taken in the distribution system.

Table 5. – Microbiological Results for Benmiller Distribution System

Date	E. coli			Total Coliform			HPC		
	# Samples	# Samples 0	# Samples ≥1	# Samples	# Samples 0	# Samples ≥1	# Samples	Safe	Deteriorating
Jan	2	2	0	2	2	0	2	2	0
Feb	2	2	0	2	2	0	2	2	0
Mar	2	2	0	2	2	0	2	2	0
Apr	2	2	0	2	2	0	2	2	0
May	3	3	0	3	3	0	3	3	0
Jun	2	2	0	2	2	0	2	2	0
Jul	2	2	0	2	2	0	2	2	0
Aug	2	2	0	2	2	0	2	2	0
Sep	2	2	0	2	2	0	2	2	0
Oct	3	3	0	3	3	0	3	3	0
Nov	2	2	0	2	2	0	2	2	0
Dec	2	2	0	2	2	0	2	2	0
Total	26	26	0	26	26	0	26	26	0

3.3 Chemical Sampling & Testing

3.3.1 Inorganics

One treated water sample is taken every 60 months and tested for inorganics. The most recent samples for the Benmiller Drinking Water System were collected on June 21, 2016 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 on or before June 21, 2021. Results from 2016 can be found in **Table 6**.

Table 6. – Schedule 23 Results for Benmiller Drinking Water System

Parameter	Result (µg/L)	Maximum Allowable Concentration (µg/L)
Antimony	0.02	6
Arsenic	3.1	25
Barium	85.7	1000
Boron	85	5000
Cadmium	<0.03	5
Chromium	0.36	50
Mercury	<0.01	1
Selenium	<0.04	10
Uranium	0.586	20

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, lead, pH and alkalinity samples were taken on March 28, 2017 and again on August 28, 2017. 2017 results can be found in **Table 7**.

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

	Lead (mg/L)	pH	Alkalinity (mg/L)
Dec-Apr	0.00013	7.73	208
Jun-Oct	0.00010	7.73	206

3.3.3 Organics

One treated water sample is taken every 60 months and tested for schedule 24 organic parameters. The most recent samples were collected on June 21, 2016. All parameters were found to be within compliance. Organics will be sampled and analyzed again on or before June 21, 2021. 2016 sample results can be found in **Table 8**.

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

Parameter	Result (µg/L)	Maximum Allowable Concentration (µg/L)
Benzene	<0.32	5
Carbon Tetrachloride	<0.16	5
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	<0.43	50
Vinyl Chloride	<0.17	2
Diquat	<1	70
Paraquat	<1	10
Glyphosate	<1	280
Polychlorinated Biphenyls	<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
Dimethoate	<0.03	20
Diuron	<0.03	150
Malathion	<0.02	190
Methoxychlor	<0.01	900
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 2017, samples were collected during the months of February, May, August and November. The Ontario Drinking Water Quality Standard (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for THMs and it is expressed as a running annual average. Currently there is no MAC for HAAs. In 2017, the average THM was found to be 7.25 µg/L, which is within compliance. 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 2017, samples were collected during the months of February, May, August and November. The Ontario Drinking Water Quality Standard (ODWQS) have 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 Benmiller Drinking Water System

Date	Nitrate		Nitrite		THMs		HAAs	
	# Samples	Result (mg/L)	# Samples	Result (mg/L)	# Samples	Result (µg/L)	# Samples	Result (µg/L)
Feb	1	0.008	1	<0.003	1	6.7	1	<5.3
May	1	<0.006	1	<0.003	1	6.5	1	<5.3
Aug	1	<0.006	1	<0.003	1	6.3	1	<5.3
Nov	1	<0.006	1	<0.003	1	9.5	1	<5.3
Total	4		4		4		4	
Average		<0.006		<0.003		7.25		<5.3
Maximum		0.008		<0.003		9.5		<5.3

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 21, 2016 and were found to be 18.2 mg/L, which is within compliance. The next water sample for Sodium will be collected and analyzed on or before June 21, 2021.

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. On August 22, 2017 and August 25, 2017 a sample was collected for this analysis. The samples were both found to have a concentration of 1.84 mg/L, which is greater than the MAC. This is due to high levels of naturally occurring fluoride in the aquifer. For more information see: <http://www.acwtownship.ca/wordpress/wp-content/uploads/2013/09/Benmiller.pdf>. The next water sample for Fluoride will be collected and analyzed on or before August 25, 2022.

4.0 WATER AND CHEMICAL USAGE

4.1 Chemical Usage

Refer to **Table 10**. From January 1, 2017 to December 31, 2017, 41.45 kg of sodium hypochlorite was used to ensure proper disinfection in the distribution system with an average dosage of 3.05 mg/L.

Table 10. – Chemical Usage at Benmiller Drinking Water System

Date	Sodium Hypochlorite	
	Usage (kg)	Average Dosage (mg/L)
Jan	3.09	3.28
Feb	2.55	2.98
Mar	3.11	3.08
Apr	2.92	3.07
May	3.16	2.82
Jun	4.19	2.92
Jul	4.95	3.47
Aug	5.02	2.85
Sep	3.64	3.05
Oct	3.31	3.33
Nov	2.35	2.79
Dec	3.17	3.00
Total	41.45	
Average		3.05

4.2 Annual Flows

A summary of the water supplied to the distribution system in 2017 is provided in **Table 11**. This Table provides a breakdown of the monthly flow provided to the distribution system.

Flow meters were calibrated on July 12, 2017 by Corix and were found to be acceptable.

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

Date	Average Daily Flow (m³)	Maximum Daily Flow (m³)	Total Monthly Flow (m³)
Jan	30.35	43.00	941.00
Feb	30.57	82.00	856.00
Mar	32.48	48.00	1,007.00
Apr	31.63	45.00	949.00
May	36.16	64.00	1,121.00
Jun	47.80	77.00	1,434.00
Jul	46.00	66.00	1,426.00
Aug	56.74	164.00	1,759.00
Sep	39.77	64.00	1,193.00
Oct	32.10	71.00	995.00
Nov	28.07	48.00	842.00
Dec	34.10	64.00	1,057.00
Average	37.21		
Max		164.00	
Total			13,580.00

5.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE

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

- Valve turning and distribution system flushing completed on May 17, 2017
- Backflow preventer tested on August 22nd, 2017
- Phone line repaired September 27th, 2017
- Distribution system flushed on October 23rd, 2017
- New heater installed in well house on November 10th, 2017

6.0 MINISTRY OF THE ENVIRONMENT INSPECTIONS AND REGULATORY ISSUES

The most recent Ministry of Environment inspection was completed by Rhonda Shannon on August 4, 2017.

There were no non-compliances noted. The Inspection Rating was 100%.

Instances of adverse water quality:

AWQI #135891 – on August 24, 2017 a treated water fluoride sample came back as 1.84 mg/L which is over the Maximum Acceptable Concentration (MAC). A re-sample was taken that came back over the MAC again at 1.84 mg/L. The Huron County Health Unit was notified and a notification was developed to inform the water users about the health effects of elevated fluoride levels in drinking water.

7.0 MOECC Regulatory Changes

It should be noted that there will be some upcoming changes to Ontario Regulation 170/03 and Ontario Regulation 169/03 that strengthen standards and clarify testing requirements as follows:

- Strengthen standards for Arsenic, Carbon Tetrachloride, Benzene, and Vinyl Chloride;
- Adopt new standards for Chlorate, Chlorite, 1-Methyl-4-Chlorophenoxyacetic acid (MCPA) and Haloacetic Acids (HAAs); (NOTE: Chlorate and Chlorite testing is only required for Municipal Drinking Water Systems using Chlorine Dioxide treatment equipment.)
- Clarify/optimize testing, sampling and reporting requirements for Trihalomethanes (THMs) and HAAs; and
- Remove 13 pesticides from testing requirements.

The aforementioned amendments will be phased in over the next four years to allow system owners and/or operators the opportunity to collect baseline information and complete required system upgrades. Currently, the new sampling, testing, reporting and re-sampling requirements, and the removal of 13 pesticides came into effect January 1, 2016. As well, testing requirements for HAAs and updates to standards for Carbon Tetrachloride, Benzene, Vinyl Chloride, Chlorate, Chlorite, and MCPA came into effect January 2017. Refer to **Table 12** for the new Regulatory Requirements. Subsequent phase-in dates are:

- January 1, 2018: Updates to standards for Arsenic come into effect / require reporting
- January 1, 2020: New standards for HAAs and HAAs testing optimization rule for smaller systems will come into effect / require reporting.

Table 12 – Regulatory Requirements

Parameter	Current Requirement		Amended Requirement	
	MAC	½ MAC	MAC	½ MAC
Arsenic	25 µg/L	12.5 µg/L	10 µg/L	5 µg/L
Benzene	5 µg/L	2.5 µg/L	1 µg/L	0.5 µg/L
Carbon Tetrachloride	5 µg/L	2.5 µg/L	2 µg/L	1 µg/L
Vinyl Chloride	2 µg/L	1 µg/L	1 µg/L	0.5 µg/L