



2017 ANNUAL DRINKING WATER SYSTEM SUMMARY REPORT Embro Water System

1. GENERAL INFORMATION

Oxford County prepares a report summarizing system operation and water quality for every municipal drinking water system annually. The reports detail the latest water quality testing results, water quantity statistics and any adverse conditions that may have occurred for the previous year. They are available for review by the end of February on the Oxford County website at www.oxfordcounty.ca/drinkingwater or by contacting the Public Works Department.

All efforts have been made to ensure the information presented in this report is accurate. If you have any questions or comments concerning the report please contact the County of Oxford at the address and phone number listed below or by email at publicworks@oxfordcounty.ca.

Drinking Water System:	Embro Water System
Drinking Water System Number:	220000656
Drinking Water System Owner & Contact Information:	Oxford County Public Works Department Water Services P.O. Box 1614 21 Reeve Street Woodstock, ON N4S 7Y3 Telephone: 519-539-9800 Toll Free: 866-537-7778 Email: publicworks@oxfordcounty.ca
Reporting Period:	January 1, 2017 – December 31, 2017

1.1. System Description

The Embro Water System is a Large Municipal Water system as defined by Regulation 170/03 and serves a population of approximately 841. The system consists of 2 well sources which are secure groundwater wells. The water is treated by filtration to remove iron and sodium hypochlorite for disinfection. In 2017, approximately 1.7 m³ of sodium hypochlorite was used in the water treatment process. The chemical is certified to meet standards set by the Standards Council of Canada or American National Standards Institute.

The treatment facility houses two anthracite filter beds, pumps, treatment equipment and a 350 m³ reservoir. A standby generator is available to run the facility in the event of a power failure. The system is maintained by licensed water system operators, who operate treatment and monitoring equipment and collect samples as specified by the Regulation. Alarms automatically notify operators in the event of failure of critical operational requirements.

1.2. Major Expenses

The Embro Water System is one of 14 water systems that have revenues and expenses pooled for economy of scale purposes. The systems are combined into the Township Water financial system and in 2017 had forecasted operating and maintenance expenditures of approximately \$1,980,000. In addition to regular operational and maintenance expenditures approximately \$1,300,000 was spent to install or upgrade water meters in the Township systems.

2. MICROBIOLOGICAL TESTING

2.1. *E. coli* and Total Coliform

Bacteriological tests for *E. coli* and total coliforms are required weekly on the raw and treated water at the facility and in the distribution system. Extra samples are taken after major repairs or maintenance work. Any *E. coli* or total coliform results above 0 in treated water must be reported to the Ministry of Environment and Climate Change (MOECC) and Medical Officer of Health (MOH). Resamples and any other required actions are taken as quickly as possible. The results from the 2017 sampling program are shown on the table below. There were two adverse test results from 169 treated water samples in this reporting period.

	<i>Number of Samples</i>	<i>Range of E. coli Results Min - Max MAC = 0</i>	<i>Range of Total Coliform Results Min - Max MAC = 0</i>
Raw	104	0	0
Treated	52	0	0
Distribution	117	0	0 – 5

2.2. Heterotrophic Plate Count (HPC)

HPC analyses are required from the treated and distribution water. The tests are required weekly for treated water and for 25% of the required distribution system bacteriological samples. HPC should be less than 500 colonies per 1 mL. Results over 500 colonies per 1 mL may indicate a change in water quality but it is not considered an indicator of unsafe water. 2017 results are shown in the table below.

	<i>Number of Samples</i>	<i>Range of HPC Min - Max</i>
Treated	52	0 - 15
Distribution	39	0 - 36

3. CHEMICAL TESTING

The Safe Drinking Water Act requires periodic testing of the water for approximately 70 different chemical parameters. The latest results for all parameters are provided in Appendix A. The sampling frequency varies for different types and sizes of water systems. If the concentration of a parameter is above half of the Maximum Allowable Concentration (MAC) under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by the Regulation. Where concerns regarding a parameter exist, the MOECC can also require additional sampling be undertaken.

Information on the health effects and allowable limits of components in drinking water may be found on the MOECC web page through the link provided in Appendix A. Additional information on common chemical parameters specific to the Embro system is provided below.

3.1. Sodium

Sodium levels in drinking water are tested once every five years. The aesthetic objective is 200 mg/L meaning at levels less than this, the sodium will not impair the taste of the water. When sodium levels are above 20 mg/L the MOECC and MOH are notified. Oxford County Public Health and Emergency Services maintain an information page on sodium in drinking water at www.oxfordcounty.ca/healthyplaces/water/sodium.aspx in order to help people on sodium restricted diets control their sodium intake. The sodium level in Embro is 21.3 mg/L.

3.2. Hardness

This is an aesthetic parameter that may affect the appearance of the water but is not related to health. Well water commonly has high levels of hardness and other minerals from being in contact with underground rock formations. Many households have water softeners to help reduce white calcium

deposits and improve the efficiency of soaps. This information is included here to help set the water softener at the level recommended by the manufacturer. The Hardness in the Embro System is 457 mg/L (equivalent to 32 grains).

3.3. Additional Testing Required by MOECC

Additional testing is not required for the Embro Water system.

4. OPERATIONAL MONITORING

4.1. Chlorine Residual

Free chlorine levels of the treated water are monitored continuously at the discharge point of the Water Treatment Facility and in the distribution system. As a target, free chlorine residual within the distribution system should be above 0.20 mg/L. A free chlorine level lower than 0.05 mg/L must be reported and corrective action taken. There were no reportable incidents in 2017. A summary of the chlorine residual readings is provided in the table below.

4.2. Turbidity

Turbidity of treated water is continuously monitored at the treatment facility, as a change in turbidity can indicate an operational problem. The turbidity of untreated water from each well is checked weekly. Turbidity is measured in nephelometric turbidity units (NTU). Under Regulation 170/03 turbidity in groundwater is not reportable however turbidity should be < 1 NTU at the treatment plant and < 5 NTU in the distribution system. A summary of the monitoring results for 2017 is provided in the table below.

<i>Parameter</i>	<i>Monitoring Frequency</i>	<i>Range of Results (Min – Max) and Average</i>
Chlorine residual in distribution (mg/L)	Continuous	(0.55 – 1.72) 1.12
Chlorine residual after treatment (mg/L)	Continuous	(0.77 – 2.37) 1.29
Turbidity after treatment (NTU)	Continuous	(0.59 – 4.00) 0.56

5. WATER QUANTITY

Continuous monitoring of flow rates from supply wells into the treatment system and from the facility into the distribution system is required by Regulation 170/03. The Municipal Drinking Water License and Permit to Take Water issued by the MOECC regulate the amount of water that can be utilized over a given time period. A summary of the 2017 flows are provided in the Table below and presented graphically in Appendix B.

<i>Flow Summary</i>	<i>Quantity</i>
Permit to Take Water Limit	917 m ³ /d
Municipal Drinking Water License Limit	916 m ³ /d
2017 Average Daily Flow	191 m ³ /d
2017 Maximum Daily Flow	508 m ³ /d
2017 Average Monthly Flow	5,798 m ³
2017 Total Amount of Water Supplied	69,579 m ³

A review of the available supply capacity and the anticipated growth forecasted for the community indicates that the system has sufficient capacity over the 20 year planning horizon.

6. NON-COMPLIANCE FINDINGS AND ADVERSE RESULTS

This section documents any known incidents of non-compliance or adverse results and the associated correction actions taken to resolve the issue. Non-compliance issues are typically identified by either the Operating Authority or the MOECC Drinking Water Inspectors. The issues and associated required

actions are documented by the Inspectors in the system's Annual Inspection Report. All non compliance issues are investigated, corrective actions taken and documented using the County's Drinking Water Quality Management System (DWQMS) procedures.

6.1. Non-Compliance Findings

The annual MOECC Inspection for the Embro Water System took place in August 2017. There was one non-compliance finding. A bacteriological sample was not taken following a repair to piping within the treatment facility. The Inspection Report rating was 100%.

6.2. Adverse Results

Any adverse results from bacteriological, chemical samples or observations of operational conditions that indicate adverse water quality are reported as required and corrective actions taken. There were two adverse results in 2017. Two treated water samples collected from different locations on June 5, 2017 for bacteriological parameters, had positive findings of 1 and 5 cfu/100ml for total coliforms. The resamples taken June 7, 2017 were negative for total coliforms and no further actions were required.

APPENDIX A: SUMMARY OF CHEMICAL RESULTS

UNDERSTANDING CHEMICAL TEST RESULTS

The following tables summarize the laboratory results of the chemical testing Oxford County is required to complete. Different types of parameters are required to be tested for at different frequencies as noted below. Explanations on the health impacts of these parameters can be found at the MOECC web site link <http://www.ontla.on.ca/library/repository/mon/14000/263450.pdf> document # 4449e01 titled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines".

Results are shown as concentrations with units of either milligrams per litre (mg/L) or micrograms per litre (ug/L). 1 mg/L is equal to 1000 ug/L. The Maximum Acceptable Concentration (MAC) is the highest amount of a parameter that is acceptable in Municipal drinking water and can be found in the MOECC Drinking Water Standards. The Method Detection Limit (MDL) is the lowest amount to which the laboratory can confidently measure. A result of "ND" stands for "Not Detected" and means that the concentration of the chemical is lower than the laboratory's equipment is capable of measuring.

Nitrate and nitrite samples are required every 3 months in normal operation.

<i>Parameter</i>	<i>Result Range Min – Max (mg/L)</i>	<i>Average Result (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Nitrite	ND	ND	1.0	0.003
Nitrate	0.055 – 0.159	0.083	10.0	0.006

Trihalomethane (THM) and total Haloacetic Acids (HAA) are by-products of the disinfection process. The samples are required every 3 months from the distribution system.

<i>Parameter</i>	<i>Annual Average</i>	<i>Result Value (ug/L)</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Trihalomethane (THM)	2017	17	100	0.37
Haloacetic Acids (HAA)	2017	7.8	80	5.3

The following Table summarizes the most recent test results for Sodium and Fluoride. Testing and reporting any adverse results is required every 5 years.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Sodium	June 11/14	21.3	20.0*	0.01
Fluoride	Aug 23/16	1.37	1.5**	0.06

*Sodium levels between 20 – 200 mg/L must be reported every 5 years.

**Natural levels of fluoride between 1.5 – 2.4 mg/L must be reported every 5 years.

The following Table summarizes the most recent results for the Lead Testing Program. Lead samples are taken every 3 years. Levels of alkalinity and pH are monitored twice per year in the distribution system to ensure water quality is consistent and does not facilitate leaching of lead into the water.

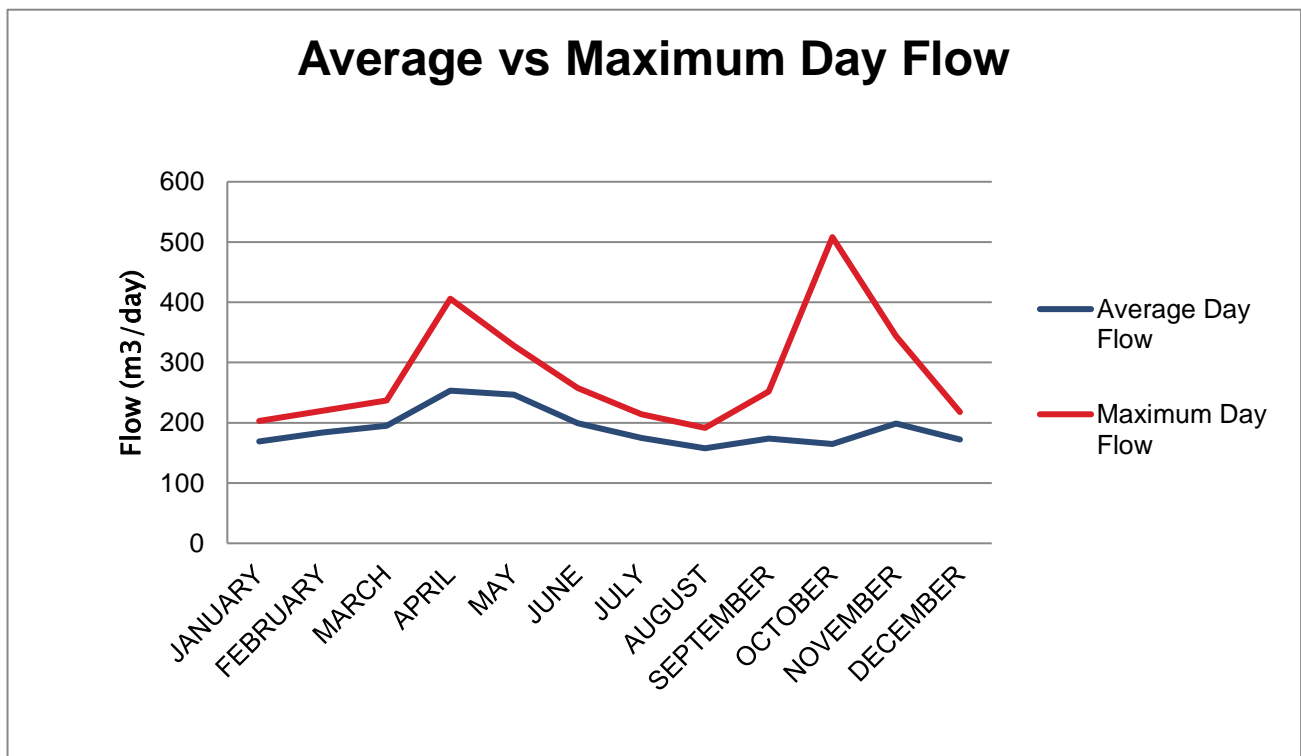
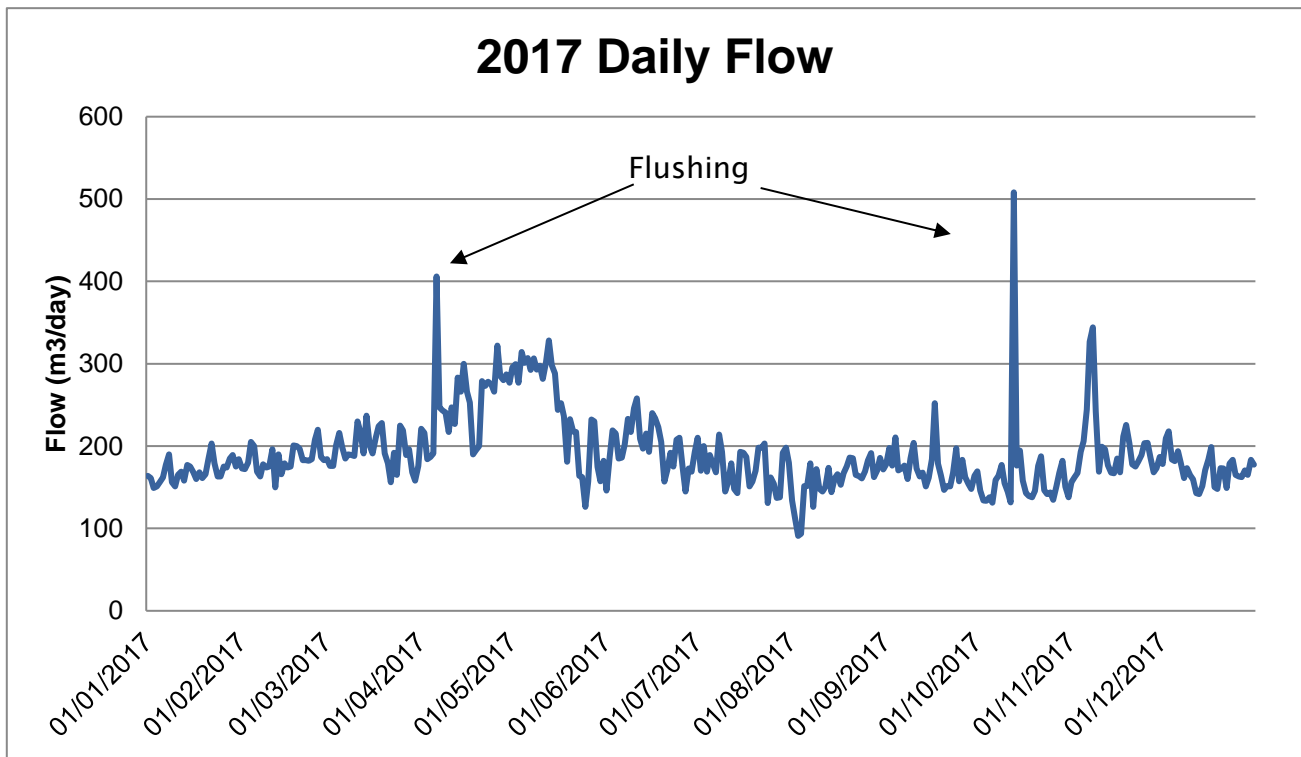
<i>Parameter</i>	<i>Result Range (Min – Max)</i>	<i>Number of Samples</i>	<i>Acceptable Level</i>
Distribution Alkalinity	194 – 202	4	30 – 500 mg/L
Distribution pH	7.4 – 7.5	4	6.5 – 8.5
Distribution Lead 2015	0.09 – 1.24	4	10 ug/L MAC

The following Table summarizes the most recent test results for Schedules 23 and 24. Testing is required every 3 years for secure groundwater wells.

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (ug/L)</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Antimony	May 23/16	ND	6	0.02
Arsenic	"	0.4	25	0.2
Barium	"	53.4	1000	0.01
Boron	"	96	5000	2
Cadmium	"	ND	5	0.003
Chromium	"	0.33	50	0.03
Mercury	"	ND	1	0.02
Selenium	"	ND	5	0.04
Uranium	"	0.041	20	0.002

<i>Parameter</i>	<i>Sample Date</i>	<i>Result Value (ug/L)</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Alachlor	June 3/15	ND	5	0.11
Aldicarb	"	ND	9	0.30
Aldrin + Dieldrin	"	ND	0.7	0.067
Atrazine + N-dealkylatedmetabolites	"	ND	5	0.12
Azinphos-methyl	"	ND	20	0.21
Bendiocarb	"	ND	40	0.13
Benzene	"	ND	1	0.37
Benzo(a)pyrene	"	ND	0.01	0.004
Bromoxynil	"	ND	5	0.33
Carbaryl	"	ND	90	0.16
Carbofuran	"	ND	90	0.37
Carbon Tetrachloride	"	ND	2	0.41
Chlordane (Total)	"	ND	7	0.11
Chlorpyrifos	"	ND	90	0.18
Cyanazine	"	ND	10	0.18
Diazinon	"	ND	20	0.081
Dicamba	"	ND	120	0.20
1,2-Dichlorobenzene	"	ND	200	0.50
1,4-Dichlorobenzene	"	ND	5	0.21
Dichlorodiphenyltrichloroethane (DDT) + metabolites	"	ND	30	0.14
1,2-Dichloroethane	"	ND	5	0.43
1,1-Dichloroethylene(vinylidene chloride)	"	ND	14	0.41
Dichloromethane	"	ND	50	0.34
2-4 Dichlorophenol	"	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	"	ND	100	0.19
Diclofop-methyl	"	ND	9	0.40
Dimethoate	"	ND	20	0.12
Dinoseb	"	ND	10	0.36
Diquat	"	ND	70	1
Diuron	"	ND	150	0.87
Glyphosate	"	ND	280	6
Heptachlor + Heptachlor Epoxide	"	ND	3	0.11
Lindane (Total)	"	ND	4	0.056
Malathion	"	ND	190	0.091
Methoxychlor	"	ND	900	0.014
Metolachlor	"	ND	50	0.092
Metribuzin	"	ND	80	0.12
Monochlorobenzene	"	ND	80	0.58
Paraquat	"	ND	10	1
Parathion	"	ND	50	0.18
Pentachlorophenol	"	ND	60	0.15
Phorate	"	ND	2	0.11
Picloram	"	ND	190	0.25
Polychlorinated Biphenyls(PCB)	"	ND	3	0.04
Prometryne	"	ND	1	0.23
Simazine	"	ND	10	0.15
Temephos	"	ND	280	0.31
Terbufos	"	ND	1	0.12
Tetrachloroethylene	"	ND	10	0.45
2,3,4,6-Tetrachlorophenol	"	ND	100	0.14
Triallate	"	ND	230	0.10
Trichloroethylene	"	ND	5	0.38
2,4,6-Trichlorophenol	"	ND	5	0.25
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	"	ND	280	0.22
Trifluralin	"	ND	45	0.12
Vinyl Chloride	"	ND	1	0.17

APPENDIX B: 2017 WATER QUANTITY SUMMARY



Embro Water System Capacity 916 m³/d

2017 Total Production by Well

