



2016 ANNUAL DRINKING WATER SYSTEM SUMMARY REPORT Oxford South 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:	Oxford South Water System
Drinking Water System Number:	220000601
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, 2016 – December 31, 2016

1.1. System Description

The Oxford South Water System is a Large Municipal Water system as defined by Regulation 170/03 and serves a population of approximately 5,200. Transmission watermains connect Otterville to Springford and Springford to Norwich.

The system consists of 7 secure groundwater wells and four treatment facilities as follows:

<i>Treatment Facility</i>	<i>Location</i>	<i>Wells</i>	<i>Treatment</i>
Pitcher Street	Norwich	N2 N5	Filtration for iron removal and disinfection with sodium hypochlorite
Main Street	Norwich	N4	Iron sequestering with sodium silicate and disinfection with sodium hypochlorite
Otterville	Otterville	O3 O4	Disinfection with sodium hypochlorite
Springford	Springford	S4 S5	Disinfection with sodium hypochlorite Facility not in use in 2016

The treatment facilities each house high lift pumps, and monitoring and treatment equipment for the supply wells. A 1,818 m³ water tower at Norwich and a 1,440 m³ water tower in Otterville provide storage and maintain pressure in the system.

In 2016, approximately 14m³ of sodium hypochlorite and 2.5m³ of sodium silicate was used in the water treatment process. These chemicals are certified to meet standards set by the Standards Council of Canada or American National Standards Institute.

Standby generators are available at Norwich and Otterville to run the facilities 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 Oxford South 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 2016 had forecasted operating and maintenance expenditures of approximately \$2,660,000. In addition to regular operational and maintenance expenditures approximately \$1,360,000 was spent to install or upgrade water meters in the Township systems. Additionally approximately \$395,000 was spent on replacing aging watermains.

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 facilities 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 2016 sampling program are shown on the table below. There were no adverse test results from 339 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	255	0	0 - >200
Treated	156	0	0
Distribution	183	0	0

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. 2016 results are shown in the table below.

	<i>Number of Samples</i>	<i>Range of HPC Min - Max</i>
Treated	156	0 - 44
Distribution	47	0 - 46

3. CHEMICAL TESTING

The Safe Drinking Water Act requires periodic testing of the water for 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.

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 Oxford South water 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, sodium will not impair the taste of the water.

When sodium levels are above 20 mg/L the MOECC and Medical Officer of Health (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 levels in the system range from 19 to 44 mg/L, depending on which wells are in use.

3.2. Fluoride

Fluoride levels are sampled once every five years and levels above 1.5 mg/L must be reported to the MOECC and MOH. Levels under 2.4 mg/L are considered safe for consumption however at levels between 1.5 and 2.4 mg/L fluoride may cause staining or pitting of teeth in children less than 6 years old. Further information on fluoride can be found on the Oxford County Public Health web page at www.oxfordcounty.ca/healthyplaces/water/fluoride.aspx

Oxford County does not add fluoride to the water at any of its drinking water systems however the Springford wells have naturally occurring fluoride levels. The fluoride levels in the Springford wells are 1.66 mg/L. All the other wells in the system have fluoride levels below the reportable levels.

3.3. Hardness & Iron

These are aesthetic parameters that may affect the appearance of the water but are 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 Oxford South system depends on the wells being used. The water hardness ranges from 88 mg/L (equivalent to 6 grains) in the Springford wells, 235 mg/L (16 grains) in Norwich and 290 mg/L (20 grains) in Otterville. Levels of iron less than 0.30 mg/L (ppm) are not considered to cause aesthetic problems such as discoloured water. The iron level at Well N4 is 0.43 mg/L (ppm) and Sodium silicate is added to keep the iron in suspension. Iron is removed by filtration at Well N2 and N5. The other wells have iron less than 0.30 mg/L.

3.4. Additional Testing Required by MOECC

No additional testing is required for the Oxford South water system.

4. OPERATIONAL MONITORING

The Springford Water Treatment Facility was not operational in 2016 and therefore is not included in the operational monitoring summary.

4.1. Chlorine Residual

Free chlorine levels of the treated water are monitored continuously at the discharge point of the Water Treatment Facilities and in the distribution system, free chlorine is monitored continuously at various locations. 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. In 2016, there were no reportable incidents in 2016. A summary of the monitoring results for 2016 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 2016 is provided in the table below.

	<i>Number of Tests or Monitoring Frequency</i>	<i>Range of Results (Min – Max) and Average</i>
Chlorine Residual in Distribution mg/L	Continuous	(0.12 – 2.17) 1.03
Norwich Main St. E. WTF		
Chlorine Residual (mg/L)	Continuous	(0.27 – 1.91) 1.04
Turbidity (NTU)	Continuous	(0.02 – 3.87) 0.06
Norwich Pitcher St. WTF		
Chlorine Residual (mg/L)	Continuous	(0.57 – 3.30) 1.05
Turbidity (NTU)	Continuous	(0.02 – 3.20) 0.06
Otterville WTF		
Chlorine mg/L	Continuous	(0.18 – 3.46) 1.15
Turbidity NTU	Continuous	(0.03 – 4.00) 0.10

5. WATER QUANTITY

Continuous monitoring of flow rates from supply wells into the treatment systems 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 2016 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	6,054 m ³ /d
Municipal Drinking Water License Limit	6,573 m ³ /d
2016 Average Daily Flow	1,181 m ³ /d
2016 Maximum Daily Flow	2,831 m ³ /d
2016 Total Amount of Water Supplied	431,077 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 2016 MOECC Inspection for the Oxford South Water System was completed in October 2016. There was one non-compliance finding concerning the information in the Norwich Operations and Maintenance manual being out of date. The revised manual is currently being updated. The 2016 inspection rating received was 97%.

6.2. Adverse Results

There were no adverse or reportable occurrences in 2016.

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 & Location</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			1.0	0.003
Norwich Main St. WTF	ND	ND		
Norwich Pitcher St. WTF	ND	ND		
Otterville WTF	ND	ND		
Springford WTF	<i>Not Operational</i>			
Nitrate			10.0	0.006
Norwich Main St. WTF	ND	ND		
Norwich Pitcher St. WTF	ND – 0.008	0.006		
Otterville WTF	5.45 – 7.35	6.75		
Springford WTF	Not Operational			

A Trihalomethane (THM) sample is required every three months from the distribution system. THM is a by-product of the disinfection process.

<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)	2016	10	100	0.37

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 & Location</i>	<i>Sample Date</i>	<i>Result Value (mg/L)</i>	<i>MAC (mg/L)</i>	<i>MDL (mg/L)</i>
Sodium			20.0*	0.01
Norwich Main St. WTF	June 2/14	19.5		
Norwich Pitcher St. WTF	Dec 9/13	26.4		
Otterville WTF	June 2/14	24.5		
Springford WTF	June 15/09	43.8		
Fluoride			1.5**	0.06
Norwich Main St. WTF	Aug 22/16	1.09		
Norwich Pitcher St. WTF	"	0.96		
Otterville WTF	"	0.10		
Springford WTF	Sept 20/10	1.64		

*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	207 – 255	6	30 – 500 mg/L
Distribution pH	6.7 – 7.3	6	6.5 – 8.5
Distribution Lead 2015	ND – 2.27	6	10 ug/L MAC

The following Tables summarize the most recent test results for Schedule 23. Testing is required every 3 years for secure groundwater wells.

<i>Parameter</i>	<i>Result Value (ug/L) Norwich Pitcher St Dec 10/14</i>	<i>Result Value (ug/L) Norwich Main Street Dec 10/14</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Antimony	0.03	0.04	6	0.02
Arsenic	1.0	2.2	25	0.2
Barium	145	175	1000	0.01
Boron	86.1	57.2	5000	2
Cadmium	ND	ND	5	0.003
Chromium	ND	ND	50	0.03
Mercury	ND	ND	1	0.01
Selenium	ND	ND	10	1
Uranium	0.092	0.264	20	0.001

<i>Parameter</i>	<i>Result Value (ug/L) Otterville WTF May 24/16</i>	<i>Result Value (ug/L) Springford WTF Dec 6/11</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Antimony	ND	ND	6	0.02
Arsenic	0.3	4.1	25	0.2
Barium	32.6	73.3	1000	0.01
Boron	30	218	5000	2
Cadmium	0.008	0.006	5	0.003
Chromium	0.65	0.5	50	0.03
Mercury	ND	ND	1	0.01
Selenium	0.38	ND	10	0.04
Uranium	0.560	0.054	20	0.002

The following Tables summarize the most recent test results for Schedule 24. Testing is required every 3 years for secure groundwater wells.

<i>Parameter</i>	<i>Result Value (ug/L) Norwich Pitcher St Dec 10/14</i>	<i>Result Value (ug/L) Norwich Main St Dec 10/14</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Alachlor	ND	ND	5	0.02
Aldicarb	ND	ND	9	0.01
Aldrin + Dieldrin	ND	ND	0.7	0.01
Atrazine + N-dealkylated metabolites	ND	ND	5	0.01
Azinphos-methyl	ND	ND	20	0.02
Bendiocarb	ND	ND	40	0.01
Benzene	ND	ND	5	0.32
Benzo(a)pyrene	ND	ND	0.01	0.004
Bromoxynil	ND	ND	5	0.33
Carbaryl	ND	ND	90	0.01
Carbofuran	ND	ND	90	0.01
Carbon Tetrachloride	ND	ND	5	0.16
Chlordane (Total)	ND	ND	7	0.01
Chlorpyrifos	ND	ND	90	0.02
Cyanazine	ND	ND	10	0.03

<i>Parameter</i>	<i>Result Value (ug/L) Norwich Pitcher St Dec 10/14</i>	<i>Result Value (ug/L) Norwich Main St Dec 10/14</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Diazinon	ND	ND	20	0.02
Dicamba	ND	ND	120	0.20
1,2-Dichlorobenzene	ND	ND	200	0.36
1,4-Dichlorobenzene	ND	ND	5	0.36
Dichlorodiphenyltrichloroethane (DDT) + metabolites	ND	ND	30	0.01
1,2-Dichloroethane	ND	ND	5	0.35
1,1-Dichloroethylene (vinylidene chloride)	ND	ND	14	0.33
Dichloromethane	ND	ND	50	0.35
2,4 Dichlorophenol	ND	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND	ND	100	0.19
Diclofop-methyl	ND	ND	9	0.40
Dimethoate	ND	ND	20	0.03
Dinoseb	ND	ND	10	0.36
Diquat	ND	ND	70	1
Diuron	ND	ND	150	0.003
Glyphosate	ND	ND	280	6
Heptachlor + Heptachlor Epoxide	ND	ND	3	0.01
Lindane (Total)	ND	ND	4	0.01
Malathion	ND	ND	190	0.02
Methoxychlor	ND	ND	900	0.01
Metolachlor	ND	ND	50	0.01
Metribuzin	ND	ND	80	0.02
Monochlorobenzene	ND	ND	80	0.30
Paraquat	ND	ND	10	1
Parathion	ND	ND	50	0.02
Pentachlorophenol	ND	ND	60	0.15
Phorate	ND	ND	2	0.01
Picloram	ND	ND	190	0.25
Polychlorinated Biphenyls(PCB)	ND	ND	3	0.04
Prometryne	ND	ND	1	0.03
Simazine	ND	ND	10	0.01
Temephos	ND	ND	280	0.01
Terbufos	ND	ND	1	0.01
Tetrachloroethylene	ND	ND	30	0.44
2,3,4,6-Tetrachlorophenol	ND	ND	100	0.14
Triallate	ND	ND	230	0.01
Trichloroethylene	ND	ND	5	0.44
2,4,6-Trichlorophenol	ND	ND	5	0.25
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	ND	ND	280	0.22
Trifluralin	ND	ND	45	0.02
Vinyl Chloride	ND	ND	2	0.17

<i>Parameter</i>	<i>Result Value (ug/L) Otterville WTF June 1/15</i>	<i>Result Value (ug/L) Springford WTF Dec 6/11</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Alachlor	ND	ND	5	0.02
Aldicarb	ND	ND	9	0.01
Aldrin + Dieldrin	ND	ND	0.7	0.01
Atrazine + N-dealkylated metabolites	ND	ND	5	0.01
Azinphos-methyl	ND	ND	20	0.02

<i>Parameter</i>	<i>Result Value (ug/L) Otterville WTF June 1/15</i>	<i>Result Value (ug/L) Springford WTF Dec 6/11</i>	<i>MAC (ug/L)</i>	<i>MDL (ug/L)</i>
Bendiocarb	ND	ND	40	0.01
Benzene	ND	ND	5	0.32
Benzo(a)pyrene	ND	ND	0.01	0.004
Bromoxynil	ND	ND	5	0.33
Carbaryl	ND	ND	90	0.01
Carbofuran	ND	ND	90	0.01
Carbon Tetrachloride	ND	ND	5	0.16
Chlordane (Total)	ND	ND	7	0.01
Chlorpyrifos	ND	ND	90	0.02
Cyanazine	ND	ND	10	0.03
Diazinon	ND	ND	20	0.02
Dicamba	ND	ND	120	0.20
1,2-Dichlorobenzene	ND	ND	200	0.36
1,4-Dichlorobenzene	ND	ND	5	0.36
Dichlorodiphenyltrichloroethane (DDT) + metabolites	ND	ND	30	0.01
1,2-Dichloroethane	ND	ND	5	0.35
1,1-Dichloroethylene (vinylidene chloride)	ND	ND	14	0.33
Dichloromethane	ND	ND	50	0.35
2-4 Dichlorophenol	ND	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND	ND	100	0.19
Diclofop-methyl	ND	ND	9	0.40
Dimethoate	ND	ND	20	0.03
Dinoseb	ND	ND	10	0.36
Diquat	ND	ND	70	1
Diuron	ND	ND	150	0.003
Glyphosate	ND	ND	280	6
Heptachlor + Heptachlor Epoxide	ND	ND	3	0.01
Lindane (Total)	ND	ND	4	0.01
Malathion	ND	ND	190	0.02
Methoxychlor	ND	ND	900	0.01
Metolachlor	ND	ND	50	0.01
Metribuzin	ND	ND	80	0.02
Monochlorobenzene	ND	ND	80	0.30
Paraquat	ND	ND	10	1
Parathion	ND	ND	50	0.02
Pentachlorophenol	ND	ND	60	0.15
Phorate	ND	ND	2	0.01
Picloram	ND	ND	190	0.25
Polychlorinated Biphenyls(PCB)	ND	ND	3	0.04
Prometryne	ND	ND	1	0.03
Simazine	ND	ND	10	0.01
Temephos	ND	ND	280	0.01
Terbufos	ND	ND	1	0.01
Tetrachloroethylene	ND	ND	30	0.35
2,3,4,6-Tetrachlorophenol	ND	ND	100	0.14
Triallate	ND	ND	230	0.01
Trichloroethylene	ND	ND	5	0.44
2,4,6-Trichlorophenol	ND	ND	5	0.25
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	ND	ND	280	0.22
Trifluralin	ND	ND	45	0.02
Vinyl Chloride	ND	ND	2	0.17