2016 ANNUAL DRINKING WATER SYSTEM SUMMARY REPORT
Tillsonburg 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:	Tillsonburg Water System
Drinking Water System Number:	220000683
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 Tillsonburg Water System is a Large Municipal Water system as defined by Regulation 170/03 and serves a population of approximately 16,600. The system consists of ten well sources, seven of which are classified as GUDI (Groundwater Under Direct Influence of surface water) and three are secure groundwater wells. The treatment for each site is summarized below.

Treatment Facility	*Wells*	*Treatment*
Mall Road WTF	1A & 2	Filtration for iron removal and disinfection with ultraviolet light (UV) and chlorine gas.
Fairview WTF	4 & 5	Disinfection with UV and chlorine gas. Sodium hypochlorite is added for secondary disinfection.
Plank Line WTF	6A	Disinfection with chlorine gas.

Treatment Facility	*Wells*	*Treatment*
Broadway WTF	7A	Well not operational in 2016. Used for distribution monitoring.
Bell Mill Road WTF	9, 10 & 11	Filtration for iron removal and disinfection with UV and chlorine gas.
Rokeby Road WTF	12	Disinfection with chlorine gas.

The treatment facilities each house high lift pumps, monitoring and treatment equipment for the supply wells. Three standby generators are available to run facilities in the in the event of a power failure. Water storage is provided by a 9,100 m^3 reservoir located north of the Town.

In 2016, approximately 4,900 kg of chlorine gas and 2.0 m^3 of sodium hypochlorite were used in the water treatment process. The chemicals are certified to meet standards set by the Standards Council of Canada or American National Standards Institute.

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

In 2016 The Tillsonburg Water System had forecasted operation and maintenance expenditures of approximately $2,380,000. Capital expenditures were as follows:

- $272,000 on watermain replacement
- $7,300 on well rehabilitation
- $1,350,000 on replacement or upgrading of water meters

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 each 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 the 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 three adverse test results from 571 treated water samples in this reporting period.

	Number of Samples	*Range of E. coli Results Min - Max MAC = 0*	*Range of Total Coliform Results Min - Max MAC = 0*
Raw	434	0	0 - 2
Treated	238	0	0 - 2
Distribution	333	0	0 - 2

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.

	Number of Samples	*Range of HPC Min - Max*
Treated	238	0 - 2
Distribution	74	0 - 63

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 Tillsonburg 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 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 Tillsonburg system range from 2.4 to 42.1 mg/L depending on the wells 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 Medical Officer of Health. 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 Tillsonburg well 6A at Plank Line has naturally occurring fluoride levels of 1.51 mg/L. Well 6A discharges into the large reservoir at Plank Line where it mixes with other water that has lower fluoride levels.

3.3. 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. Hardness ranges from 222 to 342 mg/L (equivalent to 16 - 25 grains) depending on the wells in use.

3.4. Additional Testing Required by MOECC

None.

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 Facilities 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 2016. 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 2016 is provided in the table below.

Parameter and Location	*Monitoring Frequency*	*Range of Results (Min – Max) and Average*
Chlorine Residual in Distribution mg/L	Continuous	(0.08 – 1.87) 0.94
Bell Mill Road WTF		
Chlorine mg/L	Continuous	(0.35 – 2.03) 1.31
Turbidity NTU	Continuous	(0.02 – 1.05) 0.05
Fairview WTF/North St W.		
Chlorine mg/L	Continuous	(0.34 – 2.71) 1.20
Turbidity NTU	Continuous	(0.01 – 1.52) 0.05
Mall Road WTF		
Chlorine mg/L	Continuous	(0.63 – 1.51) 1.11
Turbidity NTU	Continuous	(0.02 – 1.41) 0.04
Plank Line WTF		
Chlorine mg/L	Continuous	(0.17 – 3.19) 1.22
Turbidity NTU	Continuous	(0.05 – 3.62) 0.22
Rokeby Road WTF		
Chlorine mg/L	Continuous	(0.49 – 2.19) 1.02
Turbidity NTU	Continuous	(0.03 – 3.10) 0.09

4.3. Ultra Violet (UV) Disinfection

Supply wells that have been classified as being GUDI require “enhanced disinfection” through ultra violet light (UV) followed by chlorination. A minimum UV dosage of 40 mj/cm^2 is maintained to inactivate any microorganisms that may be present from contact with surface water. Insufficient dosage of UV must be reported as inadequate disinfection. There were no occurrences of inadequate UV disinfection in 2016.

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 2016 flows are provided in the table below and presented graphically in Appendix B.

Flow Summary	*Quantity*
Permit to Take Water Limit	17,913 m^3/d
Municipal Drinking Water License Limit	17,440 m^3/d
2016 Average Daily Flow	4,977 m^3/d
2016 Maximum Daily Flow	8,499 m^3/d
2016 Total Amount of Water Supplied	1,816,524 m^3

In order to meet the long term growth need of the Town, the County intends to construct a transmission main from Tillsonburg to the Oxford South system in Springford. The construction is currently anticipated to occur within 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 was completed in December 2016. There were no non-compliance findings and 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. Below is a summary of the three adverse/reportable occurrences for 2016 along with the corresponding resolution.

Incident / Date	*Corrective Action*	*Resolution / Date*
Treated or Distribution Water Sample with Positive Test for Total Coliform		
2 cfu/100mL - treated water sample April 13, 2016	Reported and resamples were taken	Resample results acceptable April 15, 2016
2 cfu/100mL - distribution sample November 16, 2016	Reported and resamples were taken	Resample results acceptable November 18, 2016
Chemical Sampling		
Fluoride of 1.51 mg/L taken August 17, 2016 from Plank Line well 6A	Reported and a resample was taken for confirmation	Resample result was confirmed (1.57 mg/L) August 26, 2015

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 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 nitrate samples are required every 3 months in normal operation.

Parameter & Location	*Result Range Min – Max (mg/L)*	*Average Result (mg/L)*	*MAC (mg/L)*	*MDL (mg/L)*
Nitrite			1.0	0.003
Bell Mill Rd WTF	ND	ND		
Fairview WTF	ND	ND		
Mall Road WTF	ND	ND		
Plank Line WTF	ND	ND		
Rokeby Road WTF	ND	ND		
Nitrate			10.0	0.006
Bell Mill Rd WTF	2.65 – 2.74	2.70		
Fairview WTF	7.65 – 8.74	8.19		
Mall Road WTF	ND – 2.05	1.97		
Plank Line WTF	ND – 1.11	0.37		
Rokeby Road WTF	5.34 – 5.90	5.54		

A Trihalomethane (THM) sample is required every 3 months from the distribution system. THM is a by-product of the disinfection process.

Parameter	*Annual Average*	*Result Value (ug/L)*	*MAC (ug/L)*	*MDL (ug/L)*
Trihalomethane (THM)	2016	16	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.

Parameter & Location	*Sample Date*	*Result Value (mg/L)*	*MAC (mg/L)*	*MDL (mg/L)*
Sodium			20.0*	0.01
Bell Mill Rd WTF	August 22/16	5.93		
Fairview WTF	June 2/14	31.3		
Mall Road WTF	August 22/16	11.5		
Plank Line WTF	August 22/16	39.3		
Rokeby Road WTF	August 22/16	2.46		
Fluoride			1.5**	0.06
Bell Mill Rd WTF	August 22/16	0.10		
Fairview WTF	June 16/14	0.22		
Mall Road WTF	August 22/16	0.08		
Plank Line WTF	August 22/16	1.51		
Rokeby Road WTF	August 22/16	0.08		

*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.

Parameter	*Result Range (Min – Max)*	*Number of Samples*	*Acceptable Level*
Distribution Alkalinity	183 – 247	8	30 – 500 mg/L
Distribution pH	6.9 – 7.1	8	6.5 – 8.5
Distribution Lead 2015	ND – 0.18	8	10 ug/L MAC

The following Tables summarize the most recent test results for Schedule 23. Testing is required annually for GUDI wells and every 3 years for Non GUDI wells.

Parameter	*Results (ug/L) Bell Mill Rd Nov 21 / 16*	*Results (ug/L) Fairview WTF Nov 21 / 16*	*Results (ug/L) Mall Rd WTF Nov 21 / 16*	*MAC (ug/L)*	*MDL (ug/L)*
Antimony	0.10	0.10	0.16	6	0.02
Arsenic	ND	0.3	0.6	25	0.2
Barium	29.7	46.6	58.4	1000	0.01
Boron	10	39	14.0	5000	2.0
Cadmium	ND	0.010	0.006	5	0.003
Chromium	0.04	0.68	0.41	50	0.03
Mercury	ND	ND	ND	1	0.01
Selenium	0.19	0.52	0.09	10	0.04
Uranium	6.34	0.488	1.86	20	0.002

Parameter	*Results (ug/L) Plank Line June 6 /16*	*Results (ug/L) Rokeby Rd May 24 /16*	*MAC (ug/L)*	*MDL (ug/L)*
Antimony	ND	ND	6	0.02
Arsenic	10.0	0.2	25	0.2
Barium	52.4	24.4	1000	0.01
Boron	153	16	5000	2.0
Cadmium	ND	ND	5	0.003
Chromium	3.94	0.73	50	0.03
Mercury	ND	ND	1	0.01
Selenium	0.09	0.36	10	0.04
Uranium	0.185	1.48	20	0.002

Summary of Organic parameters in Schedule 24 sampled during this reporting period or the most recent sample results. Testing is required annually for GUDI wells and every 3 years for Non GUDI wells.

Parameter	*Results (ug/L) Bell Mill Rd Nov 21 /16*	*Results (ug/L) Fairview Nov 21 /16*	*Results (ug/L) Mall Road Nov 21 /16*	*MAC (ug/L)*	*MDL (ug/L)*
Alachlor	ND	ND	ND	5	0.02
Aldicarb *	ND	ND	ND	9	0.01
Aldrin + Dieldrin *	ND	ND	ND	0.7	0.01
Atrazine + N-dealkylatedmetobolites	ND	0.03	ND	5	0.01
Azinphos-methyl	ND	ND	ND	20	0.01
Bendiocarb *	ND	ND	ND	40	0.01
Benzene	ND	ND	ND	5	0.32
Benzo(a)pyrene	ND	ND	ND	0.01	0.004
Bromoxynil	ND	ND	ND	5	0.33
Carbaryl	ND	ND	ND	90	0.05
Carbofuran	ND	ND	ND	90	0.01
Carbon Tetrachloride	ND	ND	ND	5	0.16

Table continued

Parameter	*Results (ug/L) Bell Mill Rd Nov 21 /16*	*Results (ug/L) Fairview Nov 21 /16*	*Results (ug/L) Mall Road Nov 21 /16*	*MAC (ug/L)*	*MDL (ug/L)*
Chlordane (Total) *	ND	ND	ND	7	0.02
Chlorpyrifos	ND	ND	ND	90	0.02
Cyanazine *	ND	ND	ND	10	0.18
Chlorpyrifos	ND	ND	ND	20	0.02
Diazinon	ND	ND	ND	120	0.02
Dicamba	ND	ND	ND	200	0.20
1,2-Dichlorobenzene	ND	ND	ND	5	0.41
1,4-Dichlorobenzene	ND	ND	ND	30	0.36
Dichlorodiphenyltrichloroethane (DDT) + metabolites*	ND	ND	ND	5	0.01
1,2-Dichloroethane	ND	ND	ND	14	0.35
1,1-Dichloroethylene (vinylidene chloride)	ND	ND	ND	50	0.33
Dichloromethane	ND	ND	ND	900	0.35
2-4 Dichlorophenol	ND	ND	ND	100	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND	ND	ND	9	0.19
Diclofop-methyl	ND	ND	ND	20	0.40
Dimethoate	ND	ND	ND	10	0.03
Dinoseb *	ND	ND	ND	70	0.36
Diquat	ND	ND	ND	150	1
Diuron	ND	ND	ND	280	0.03
Glyphosate	ND	ND	ND	3	1
Heptachlor + Heptachlor Epoxide *	ND	ND	ND	4	0.01
Lindane (Total) *	ND	ND	ND	190	0.01
Malathion	ND	ND	ND	900	0.02
Methoxychlor *	ND	ND	ND	50	0.01
Metolachlor	ND	ND	ND	80	0.01
Metribuzin	ND	ND	ND	80	0.02
Monochlorobenzene	ND	ND	ND	10	0.30
Paraquat	ND	ND	ND	50	1
Parathion *	ND	ND	ND	60	0.02
Pentachlorophenol	ND	ND	ND	2	0.15
Phorate	ND	ND	ND	190	0.01
Picloram	ND	ND	ND	3	1
Polychlorinated Biphenyls(PCB)	ND	ND	ND	1	0.04
Prometryne	ND	ND	ND	10	0.03
Simazine	ND	ND	ND	280	0.01
Temephos *	ND	ND	ND	1	0.01
Terbufos	ND	ND	ND	30	0.01
Tetrachloroethylene	ND	ND	ND	100	0.35
2,3,4,6-Tetrachlorophenol	ND	ND	ND	230	0.14
Triallate	ND	ND	ND	5	0.01
Trichloroethylene	ND	ND	ND	5	0.43
2,4,6-Trichlorophenol	ND	ND	ND	280	0.25
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)*	ND	ND	ND	45	0.22
Trifluralin	ND	ND	ND	2	0.02
Vinyl Chloride					0.17

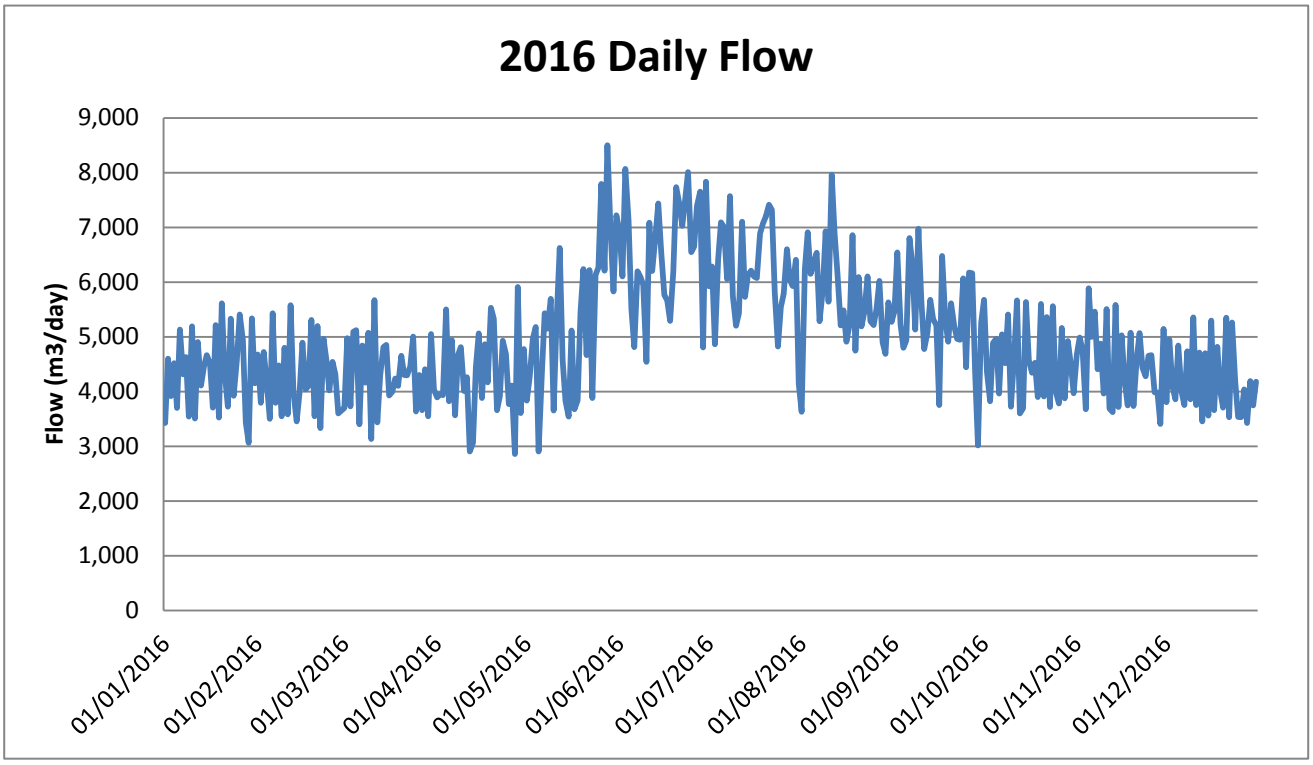
**Note: Parameter removed from Schedule 24 sample requirements in 2016. Last sampled Dec 8/15.*

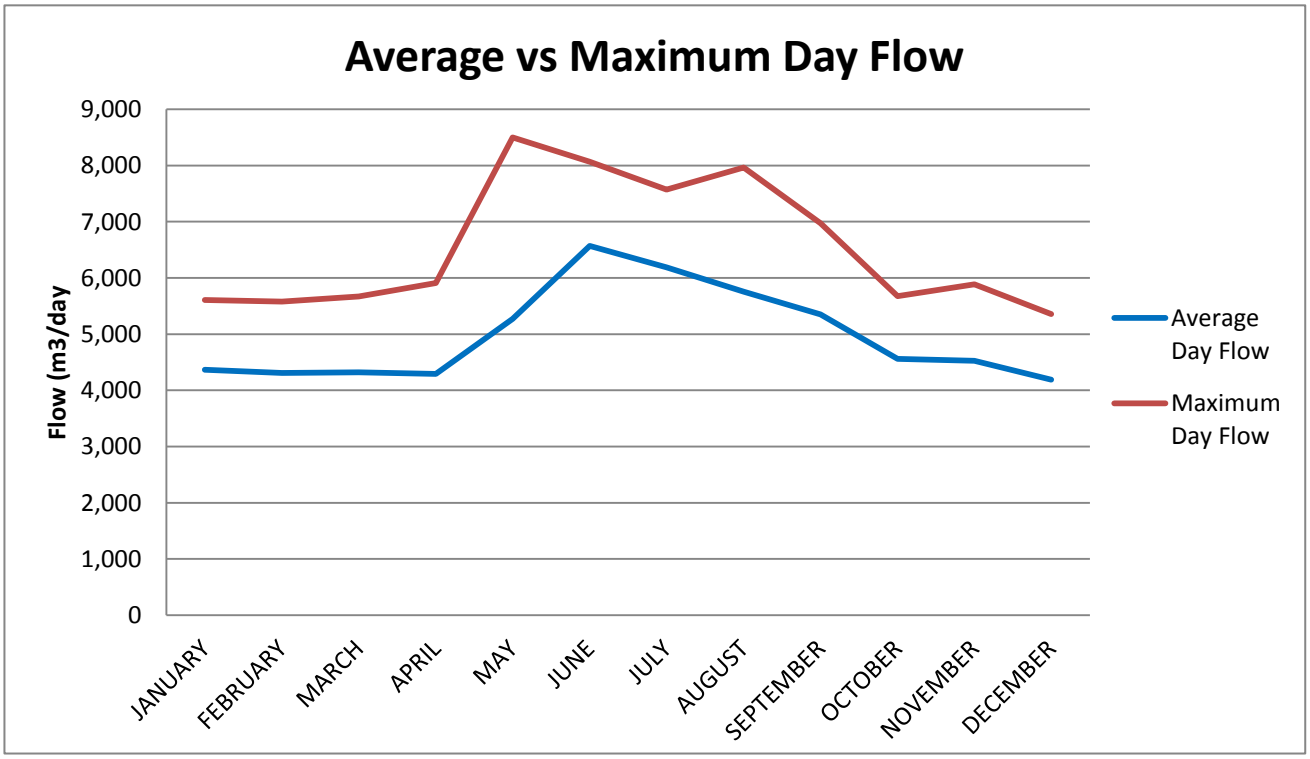
Parameter	*Results (ug/L) Plank Line June 8 /16*	*Results (ug/L) Rokeby Rd June 08/15*	*MAC (ug/L)*	*MDL (ug/L)*
Alachlor	ND	ND	5	0.02
Aldicarb *	ND	ND	9	0.01
Aldrin + Dieldrin *	ND	ND	0.7	0.01
Atrazine + N-dealkylatedmetobolites	ND	0.02	5	0.01
Azinphos-methyl	ND	ND	20	0.01
Bendiocarb *	ND	ND	40	0.01
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	0.05
Carbofuran	ND	ND	90	0.01
Carbon Tetrachloride	ND	ND	5	0.16
Chlordane (Total) *	ND	ND	7	0.02
Chlorpyrifos	ND	ND	90	0.02
Cyanazine *	ND	ND	10	0.18
Chlorpyrifos	ND	ND	20	0.02
Diazinon	ND	ND	120	0.02
Dicamba	ND	ND	200	0.20
1,2-Dichlorobenzene	ND	ND	5	0.41
1,4-Dichlorobenzene	ND	ND	30	0.36
Dichlorodiphenyltrichloroethane (DDT) + metabolites*	ND	ND	5	0.01
1,2-Dichloroethane	ND	ND	14	0.35
1,1-Dichloroethylene (vinylidene chloride)	ND	ND	50	0.33
Dichloromethane	ND	ND	900	0.35
2-4 Dichlorophenol	ND	ND	100	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND	ND	9	0.19
Diclofop-methyl	ND	ND	20	0.40
Dimethoate	ND	ND	10	0.03
Dinoseb *	ND	ND	70	0.36
Diquat	ND	ND	150	1
Diuron	ND	ND	280	0.03
Glyphosate	ND	ND	3	1
Heptachlor + Heptachlor Epoxide *	ND	ND	4	0.01
Lindane (Total) *	ND	ND	190	0.01
Malathion	ND	ND	900	0.02
Methoxychlor *	ND	ND	50	0.01
Metolachlor	ND	ND	80	0.01
Metribuzin	ND	ND	80	0.02
Monochlorobenzene	ND	ND	10	0.30
Paraquat	ND	ND	50	1
Parathion *	ND	ND	60	0.02
Pentachlorophenol	ND	ND	2	0.15
Phorate	ND	ND	190	0.01
Picloram	ND	ND	3	1
Polychlorinated Biphenyls(PCB)	ND	ND	1	0.04
Prometryne	ND	ND	10	0.03
Simazine	ND	ND	280	0.01
Temephos *	ND	ND	1	0.01
Terbufos	ND	ND	30	0.01
Tetrachloroethylene	ND	ND	100	0.35
2,3,4,6-Tetrachlorophenol	ND	ND	230	0.14
Triallate	ND	ND	5	0.01
Trichloroethylene	ND	ND	5	0.43

Parameter	*Results (ug/L) Plank Line June 8 /16*	*Results (ug/L) Rokeby Rd June 08/15*	*MAC (ug/L)*	*MDL (ug/L)*
2,4,6-Trichlorophenol	ND	ND	280	0.25
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)*	ND	ND	45	0.22
Trifluralin	ND	ND	2	0.02
Vinyl Chloride	ND	ND		0.17

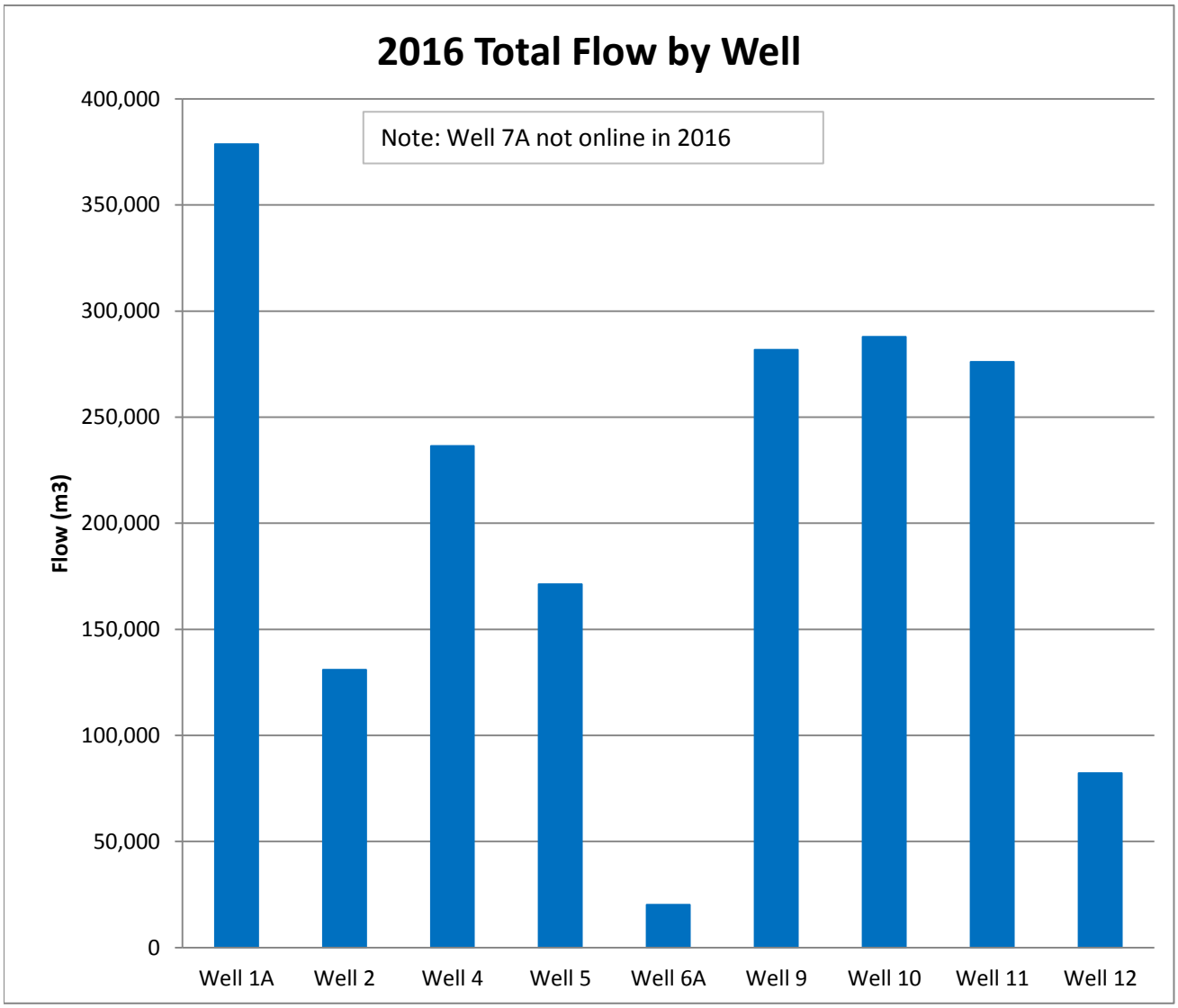
**Note: Parameter removed from Schedule 24 sample requirements in 2016. Last sampled June 16/12*

APPENDIX B: 2016 WATER QUANTITY SUMMARY





Tillsonburg Water System Capacity 17,440 m^3/d



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