



City of Orillia

**2018 Annual Drinking Water System
and Summary Report**

February 2019
Operations Division
Environmental Services and Operations Department
Revised: May 2019
(See Section 9.0)

Table of Contents

1.0	Introduction.....	3
1.1	Drinking Water System Information.....	3
1.2	Report Availability	3
1.3	Drinking Water Quality Management System.....	4
2.0	Description of the Orillia Drinking Water System.....	4
2.1	Overview	4
2.2	Supply	4
2.3	Treatment.....	4
2.4	Disinfection.....	5
2.5	Storage	5
2.6	Distribution System	5
2.7	Emergency Backup	6
3.0	Significant Expenses	6
4.0	Adverse Water Quality Incident (AWQI) Reports.....	6
5.0	Non-Compliance and Corrective Actions.....	6
6.0	Treatment Chemicals	7
7.0	Rated Capacity Assessment	8
8.0	Water Quality Analysis	10
8.1	Testing Required Under Schedules 10 and 7 of O. Reg. 170/03	10
8.2	Chemical Testing Required under Schedules 13 and 15.1 of O. Reg. 170/03	12
9.0	Revisions	14

List of Figures

Figure 1:	Summary of Chemicals Used in 2018	7
Figure 2:	System Summary	8
Figure 3:	WFP Summary for 2018.....	8
Figure 4:	West Orillia Well Summary for 2018	9
Figure 5:	2018 Microbiological Sample Results Required under Schedule 10 of O. Reg. 170/03	10
Figure 6:	2018 Operational Testing Required Under Schedule 7 of O. Reg. 170/03.....	11
Figure 7:	Water Filtration Plant – Treated Single Sample for 2018	12
Figure 8:	West Orillia Well – Treated Single Sample for 2018	13
Figure 9:	Multiple Samples through Reporting Period for 2018.....	14

1.0 Introduction

This report has been prepared by the City of Orillia pursuant to Section 11 and Schedule 22 of Ontario Regulation (O. Reg.) 170/03. Section 11 of O.Reg 170/03 requires the preparation of an Annual Report on the drinking water system no later than February 28 of the following year. Schedule 22 of O.Reg 170/03 requires the preparation of a Summary Report no later than March 31 of the following year. The Annual Report is to discuss the overall drinking water system, water treatment chemicals used, testing results and sampling points, corrective actions taken and major expenses incurred. The Summary Report is to discuss the drinking water system's approval (permit and licence), any orders applicable to the system that were not met, and a discussion of the quantities and flow rates of the water supplied to understand the capability of the system to meet existing and planned uses of the system. This consolidated report discusses the requirements of both the Annual Report and the Summary Report.

1.1 Drinking Water System Information

Drinking Water System Name:	Orillia Drinking Water System
Drinking Water System Number:	220001183
Drinking Water System Owner:	The Corporation of the City of Orillia
Drinking Water System Category:	Large Municipal Residential
Municipal Drinking Water Licence Number:	125-101
Issue Date:	August 22, 2016
Expiry Date:	June 6, 2021
Drinking Water Works Permit Number:	125-201
Issue Date:	June 29, 2016
Wells (West Orillia Well, Well 1, 2 and 3) Permit to Take Water:	7638-84FMT2
Issue Date:	April 21, 2010
Expiry Date:	March 31, 2020
Lake Couchiching Permit to Take Water:	91-P-3036
Issue Date:	May 23, 2011
Expiry Date:	February 28, 2021
Operational Plan Number:	125-401
Reporting Period:	January 1, 2018 to December 31, 2018
Population:	31,128

1.2 Report Availability

This annual report is available to the public at no charge on the City of Orillia's website, <https://www.orillia.ca/en/living-here/waterqualityreports.aspx> and upon request for printed copies. Accessible formats or communication supports are also available upon request. To access the report in person, or for assistance, please visit:

**City of Orillia
City Centre, 1st Floor Reception
50 Andrew St. S., Suite 300
Orillia, ON L3V 7T5**

1.3 Drinking Water Quality Management System

The City of Orillia has a Drinking Water Quality Management System (DWQMS) in place and is committed to maintaining the highest quality of service and water supply through this quality management system. Information relating to the Quality Management System can be found on the City of Orillia website at <https://www.orillia.ca/en/living-here/drinkingwaterqualitymanagementstandard.aspx>.

The City of Orillia is an accredited Operating Authority, as designated by the Ministry of Environment, Conservation and Parks.

2.0 Description of the Orillia Drinking Water System

2.1 Overview

The Orillia Water Filtration Plant (WFP) is designed to obtain raw water from a surface source (Lake Couchiching) and from two groundwater sources (Wells 1 and 2). An additional high quality groundwater source (West Orillia Well) is also used for supply to the system. All source water is disinfected and delivered through the distribution system to three pressure zones (Zone 1, Zone 2 and Zone 3). Zone 1 supply is managed from the WFP and the Rosemary Road Reservoir. Zone 2 supply is managed from the WFP, the West Orillia Well, and the Harvie Hill Reservoir. Zone 3 is supplied directly from Zone 2.

2.2 Supply

Lake Couchiching is a relatively shallow lake with a maximum depth of 12 m and an average depth of 6 m. The intake for the plant is located approximately 374 m from shore and 3.3 m below the surface. The raw water intake pipe extends into Lake Couchiching and begins at a concrete filled wooden cribbed structure. There is also a standby raw water intake, located approximately 85 m from shore. The supply from Lake Couchiching has a rated capacity of 27,280 m³/day.

Well 1 and Well 2, with a combined capacity of 5,762 m³/day, are located within 160 m of Lake Couchiching shore and are approximately 170 m apart. The combined rated capacity of the WFP (lake based and wells) is 33,042 m³/day. West Orillia Well is rated at a maximum daily flow of 6,550 m³/day.

2.3 Treatment

Using gravity, raw lake water travels through the intake to the WFP. As it enters the WFP, the water passes through a fixed screen and a travelling screen to remove any heavy debris. There are four vertical turbine low-lift pumps used to move the water from the wet well to the remainder of the process in the WFP. The raw water is then mixed with a coagulant (polyaluminum chloride) and coagulant aid (polymer) prior to the three parallel concrete flocculation tanks. From the flocculation tanks, the water travels through the filtration system.

The filtration system is comprised of four dual media (sand with granular activated carbon) filters including a backwash system. The filter effluent then combines with the discharge effluent of the Well 1 and/or 2, if online, to be disinfected. The water passes through the contact chambers and clearwell where it is delivered to the distribution system, using high-lift pumps. Three vertical turbine pumps are dedicated to delivering water to Zone 1, and three vertical turbine pumps are dedicated to delivering water to Zone 2.

Prior to the introduction at the WFP, the raw water from the Well 1 and Well 2 is treated using an air stripping process for the removal of trichloroethylene (TCE) and tetrachloroethylene (PCE).

2.4 Disinfection

The gas chlorination system consists of five chlorinators dedicated for pre-chlorination, post-chlorination and post-post chlorination. Redundancy of the chlorinators is built in to the design (duty/standby). Two 0.909 tonne cylinders of liquefied chlorine are kept on-line at all times with two vacuum regulators and an automatic cylinder switchover system.

The raw water from Lake Couchiching is pre-chlorinated at the intake in the summer months for zebra mussel control, and in-plant at all other times. The effluent from the filters, as well as the wells, is combined for chlorine disinfection (secondary) at the WFP. Additional disinfection can be added prior to entering the distribution system if required.

The primary disinfection method of the drinking water is through three flow-through ultraviolet (UV) reactors (one duty for each zone, and one standby). The UVs are located after the high-lift pumps and prior to discharge to the distribution system.

The West Orillia Well is disinfected using sodium hypochlorite.

2.5 Storage

The WFP has storage of approximately 4,110 m³ between the chlorine contact chambers and clearwell. This storage supplies both Zone 1 and Zone 2. Rosemary Road Reservoir (two tanks) has a total storage capacity of 10,500 m³ and supplies Zone 1. Harvie Hill Reservoir has a storage capacity of 7,800 m³ and supplies Zone 2 and Zone 3.

2.6 Distribution System

The distribution system is a network of approximately 160 kilometres of various sized piping servicing the approximately 31,166 people, businesses and facilities within Orillia throughout the three pressure zones.

The system also contains 931 municipal fire hydrants, 276 private hydrants, 2,621 control valves, 54 air relief valves, 6 pressure reducing valves (to allow flow between

Zone 2 to Zone 1 and Zone 2 to Zone 3), 10 blow offs, 4 permanent auto-flushers and 17 sampling stations.

The Zone 3 Booster Pumping Station boosts the pressure from Zone 2 to deliver to the Zone 3 using two booster pumps and two high flow pumps.

2.7 Emergency Backup

The WFP, West Orillia Well and the Zone 3 Booster Pumping Station are all protected with standby generators in the event of a power outage. The WFP and the Zone 3 Booster Pumping Station have an onsite generator dedicated for their use. The West Orillia Well is fed from the backup generator located at the nearby Champlain Sewage Pumping Station.

3.0 Significant Expenses

The following is a list of significant expenses incurred for the maintenance and operation of treatment and supply equipment.

- | | |
|-----------------------------------|----------|
| • West Orillia Well Roof | \$ 4,000 |
| • Mist Eliminators (Air Scrubber) | \$ 7,200 |
| • High Lift Pump Soft Starts | \$98,000 |
| • Chlorinators | \$23,000 |
| • UV Supplies | \$19,500 |

4.0 Adverse Water Quality Incident (AWQI) Reports

AWQI 143202, was an incident that occurred on September 24, 2018 as a result of producing approximately 47 m³ of water without coagulant addition. The event was triggered while a critical flow meter was being calibrated. The flow meter is used for determining the quantity of chemical to be added for coagulation, but as a result of the calibration, did not record flow while the process was operating. Once alerted to the situation, the treatment process was immediately shut down.

After an investigation the process was restarted and monitored to ensure that coagulant was being added. Bacteriological samples were collected and indicated no concerns. As well, the turbidity of the filter effluent was monitored and remained below 0.15 NTU in all filters.

5.0 Non-Compliance and Corrective Actions

As listed above, the instance of producing water without chemically assisted filtration, is considered a non-compliant event. The event was reported to the Ministry of Environment, Conservation and Parks (MECP) and all required corrective actions were taken. In addition, the City conducted discussions about the root cause of the problem, developed additional procedures and trained staff and the contractor to prevent a reoccurrence of the event.

The MECP, during the annual inspection, was satisfied with the response and noted this in their Inspection Report:

“Shortly after this incident occurred, the City created a Standard Operating Procedure for the flow meter calibration procedure which included steps to ensure that the affected process area is isolated prior to starting the calibration and that an Operator will attend the process area(s) with any third-party technician who is performing the calibration(s).

No further action is required.”

No Provincial Orders were issued during the reporting period.

6.0 Treatment Chemicals

Various chemicals are used throughout the treatment process from source to tap. Please refer the system description for further information on the use of the chemicals throughout the treatment process.

Figure 1: Summary of Chemicals Used in 2018

Month	Water Filtration Plant			West Orillia Well
	Polyaluminum Chloride (L)	Magnafloc LT (L)	Liquefied Chlorine (kg)	Sodium Hypochlorite (L)
January	4,018	238	921	1,484
February	3,397	202	779	1,252
March	3,512	204	840	1,366
April	3,891	220	981	1,439
May	4,024	227	1,095	1,547
June	3,647	206	1,161	1,426
July	4,543	255	1,547	1,662
August	3,747	208	1,293	1,547
September	3,416	191	1,191	1,402
October	3,636	202	1,222	1,583
November	3,892	221	1,162	1,124
December	3,623	232	1,154	1,049
Totals	45,346	2,606	13,346	16,880

In the distribution system, sodium hypochlorite and sodium thiosulphate are used as needed and quantities are not tracked.

7.0 Rated Capacity Assessment

The three figures below illustrate the water supplied and the capacity of the system and its components.

Figure 2: System Summary

Item	2014	2015	2016	2017	2018	5 Yr. Avg.
Average Day Flow (m ³ /day)	11,363	11,809	11,464	10,618	10,944	11,240
Maximum Day Flow (m ³ /day)	14,272	14,492	15,748	12,394	16,797	14,741
Rated Capacity of System (m ³ /day)*	39,592					
Maximum Day/Rated Capacity (%)	36.0	37.0	40.0	31.0	42.4	N/A
Total Yearly WFP Flow (ML)	3,038	3,060	3,473	3,122	2,847	3,108
Total Yearly West Well Flow (ML)	1,110	1,250	712	755	1,214	1,008
Total Yearly System Flow (ML)	4,148	4,310	4,185	3,877	4,061	4,116

*This includes the rated capacities for the WFP and the West Orillia Well.

Figure 3: WFP Summary for 2018

Month	Total Flow (m ³)	Minimum (m ³ /day)	Maximum (m ³ /day)	Maximum Day/Rated Capacity (%)
January	231,372	5,892	10,087	30.5
February	208,604	5,738	9,699	29.4
March	221,312	5,333	10,166	30.8
April	213,730	4,700	9,001	27.2
May	248,081	5,464	10,812	32.7
June	262,774	5,962	12,254	37.1
July	285,615	5,515	13,240	40.1
August	249,080	5,284	11,733	35.5
September	238,629	5,941	10,473	31.7
October	216,605	5,066	9,742	29.5
November	233,950	5,431	10,258	31.0
December	236,709	5,219	10,519	31.8

Note: Rated capacity for WFP is 33,042 m³/day

Figure 4: West Orillia Well Summary for 2018

Month	Total Flow (m³)	Minimum (m³/day)	Maximum (m³/day)	Maximum Day/ Rated Capacity (%)
January	101,038	1,976	4,161	63.5
February	88,670	1,619	4,075	62.2
March	105,559	1,690	4,230	64.6
April	100,916	1,801	4,324	66.0
May	112,639	2,245	4,367	66.7
June	106,999	2,500	4,564	69.7
July	117,603	2,997	5,314	81.1
August	111,927	2,094	4,419	67.5
September	108,713	2,222	4,712	71.9
October	107,314	1,254	4,615	70.5
November	79,232	1,232	1,232	18.8
December	74,336	0	3,914	59.8

Note: Rated capacity for the West Orillia Well is 6,550 m³/day

8.0 Water Quality Analysis

The following five figures illustrate the water quality analysis conducted on the drinking water system for various parameters.

No inorganic or organic parameters exceeded half the standard as prescribed in Schedule 2 of O. Reg. 169/03 for this reporting period.

8.1 Testing Required Under Schedules 10 and 7 of O. Reg. 170/03

Figure 5: 2018 Microbiological Sample Results Required under Schedule 10 of O. Reg. 170/03

Facility	Parameter	Source	Number of Samples	Number of Detections
Water Filtration Plant	E. Coli	Raw (Lake Couchiching)	52	10
		Raw (Well 1)	49	0
		Raw (Well 2)	40	0
		Treated	104	0
	Total Coliforms	Raw (Lake Couchiching)	52	35
		Raw (Well 1)	49	9
		Raw (Well 2)	40	0
		Treated	104	0
	HPC	Treated	104	8
	West Orillia Well	E. Coli	Raw	52
Treated			52	0
Total Coliforms		Raw	52	0
		Treated	52	0
HPC		Treated	52	10
Distribution System	E. Coli		520	0
	Total Coliforms		520	0
	HPC		155	92

Note: HPC – Heterotrophic Plate Count

Figure 6: 2018 Operational Testing Required Under Schedule 7 of O. Reg. 170/03

Facility	Parameter	Source	Type	Number of Samples	Range of Results (Minimum to Maximum)
Water Filtration Plant	Turbidity (NTU)	Raw (Lake Couchiching)	C	8,760	0.00 – 9.81
			G	249	0.30 – 1.52
		Raw (Well 1)	G	49	0.05 – 0.23
		Raw (Well 2)	G	40	0.07 – 0.52
	Free Chlorine (mg/L)	Treated	C	8,760	0.00 – 5.00
			G	494	1.31 – 2.28
West Orillia Well	Turbidity (NTU)	Raw	G	50	0.06 – 0.20
	Free Chlorine (mg/L)	Treated	C	8,760	0.00 – 5.00
			G	249	0.64 – 1.85
Distribution System	Free Chlorine (mg/L)		G	879	0.24 – 2.07

Notes: C = Continuous Monitoring

G = Grab Sample

Continuous monitoring equipment is recorded as 8,760 samples.

8.2 Chemical Testing Required under Schedules 13 and 15.1 of O. Reg. 170/03

Figure 7: Water Filtration Plant – Treated Single Sample for 2018

Parameter	Units	Result	Date of Sample
Alachlor	µg/L	<0.02	June 4, 2018
Antimony	µg/L	0.11	June 4, 2018
Arsenic	µg/L	0.5	June 4, 2018
Atrazine + N-dealkylated metabolites	µg/L	<0.01	June 4, 2018
Azinphos-methyl	µg/L	<0.05	June 4, 2018
Barium	µg/L	59.5	June 4, 2018
Benzene	µg/L	<0.32	June 4, 2018
Benzo(a)pyrene	µg/L	<0.004	June 4, 2018
Boron	µg/L	35	June 4, 2018
Bromoxynil	µg/L	<0.33	June 4, 2018
Cadmium	µg/L	<0.003	June 4, 2018
Carbaryl	µg/L	<0.05	June 4, 2018
Carbofuran	µg/L	<0.01	June 4, 2018
Carbon Tetrachloride	µg/L	<0.16	June 4, 2018
Chlorpyrifos	µg/L	<0.02	June 4, 2018
Chromium	µg/L	0.59	June 4, 2018
Diazinon	µg/L	<0.03	June 4, 2018
Dicamba	µg/L	<0.20	June 4, 2018
1,2-Dichlorobenzene	µg/L	<0.41	June 4, 2018
1,4-Dichlorobenzene	µg/L	<0.36	June 4, 2018
1,2-Dichloroethane	µg/L	<0.35	June 4, 2018
1,1-Dichloroethylene (vinylidene chloride)	µg/L	<0.33	June 4, 2018
Dichloromethane	µg/L	<0.35	June 4, 2018
2,4-Dichlorophenol	µg/L	<0.1	June 4, 2018
2,4-Dichlorophenoxyacetic acid (2,4-D)	µg/L	<0.19	June 4, 2018
Diclofop-methyl	µg/L	<0.40	June 4, 2018
Dimethoate	µg/L	<0.03	June 4, 2018
Diquat	µg/L	<1	June 4, 2018
Diuron	µg/L	<0.03	June 4, 2018
Fluoride	mg/L	0.06	June 4, 2018
Glyphosate	µg/L	<1	June 4, 2018
Malathion	µg/L	<0.02	June 4, 2018

Parameter	Units	Result	Date of Sample
Mercury	µg/L	0.02	June 4, 2018
MCPA (2-methyl-4-chlorphenoxyacetic acid)	mg/L	<0.00012	June 4, 2018
Metolachlor	µg/L	<0.01	June 4, 2018
Metribuzin	µg/L	<0.02	June 4, 2018
Monochlorobenzene	µg/L	<0.3	June 4, 2018
Paraquat	µg/L	<1	June 4, 2018
Pentachlorophenol	µg/L	<0.15	June 4, 2018
Phorate	µg/L	<0.01	June 4, 2018
Picloram	µg/L	<1	June 4, 2018
Polychlorinated Biphenyls (PCB)	µg/L	<0.04	June 4, 2018
Prometryne	µg/L	<0.03	June 4, 2018
Selenium	µg/L	0.33	June 4, 2018
Simazine	µg/L	<0.01	June 4, 2018
Sodium	mg/L	38.6	June 4, 2018
Terbufos	µg/L	<0.01	June 4, 2018
Tetrachloroethylene	µg/L	<0.35	June 4, 2018
2,3,4,6-Tetrachlorophenol	µg/L	<0.20	June 4, 2018
Triallate	µg/L	<0.01	June 4, 2018
Trichlorethylene	µg/L	<0.44	June 4, 2018
2,4,6-Trichlorophenol	µg/L	<0.25	June 4, 2018
Trifluralin	µg/L	<0.5	June 4, 2018
Uranium	µg/L	0.347	June 4, 2018
Vinyl Chloride	µg/L	<0.17	June 4, 2018

Figure 8: West Orillia Well – Treated Single Sample for 2018

Parameter	Units	Result	Date of Sample
Fluoride	mg/L	<0.06	June 4, 2018
Sodium	mg/L	26.4	June 4, 2018

Figure 9: Multiple Samples through Reporting Period for 2018

Parameter	Source	Unit	Average	Minimum	Maximum	Number of Samples
Nitrate	WFP	mg/L	0.45	0.04	1.05	4
	WOW		3.03	2.96	3.07	4
Nitrite	WFP	mg/L	0.003	<0.003	<0.003	4
	WOW		0.003	<0.003	<0.003	4
Lead	Distribution	µg/L	0.13	0.04	0.38	8
Alkalinity		mg/L	207	123	267	8
pH			7.85	7.50	8.70	8
THM		µg/L	32.1	6.7	62.0	4
HAA		µg/L	22.7	5.3	38.1	4

9.0 Revisions

The following are a list of revisions made to this report after its original release.

1. The West Orillia Well Total Monthly Flow (Figure 4) for December is 74,336 m³, not 7,392 m³. This revision also impacts the System Summary (Figure 2) with the following changes:
 - a. Total West Well Flow for 2018 is 1,214 ML;
 - b. Total West Well Flow 5 Year Average is 1,008 ML;
 - c. Total System Flow for 2018 is 4,061 ML;
 - d. Total System Flow 5 Year Average is 4,116 ML.
2. The West Orillia Well Maximum Daily Use (Figure 4) for December is 3,914 m³/day, not 1,017 m³/day.
3. The West Orillia Well Maximum Day/Rated Capacity (Figure 4) for December is 59.8% not 15.5%.