2016 ANNUAL REPORT

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Pickle Lake Drinking Water System

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Introduction

The **Pickle Lake Drinking Water System** (DWS# 210001157) is obligated to meet the requirements of Ontario's *Safe Drinking Water Act* (*the Act*) and the regulations therein, in addition to requirements associated with system approvals. Specifically, this system must meet extensive treatment and testing requirements in order to ensure that human health is protected.

This Annual Report has been prepared in accordance with both Schedule 22 and section 11 of Ontario Regulation 170/03. In this manner, the Summary Reports for Municipalities required by Schedule 22 and the Annual Reports required by section 11 have been consolidated into a single document. This Report is intended to brief the ownership and users of the Pickle Lake Drinking Water System on the system's performance over the past calendar year (January 1, 2016 to December 31, 2016).

A summary of this drinking water system is difficult to produce without the use of technical terms, some of which the reader may not be familiar with. It is recommended that the reader refer to the *Technical Support Document for Ontario Drinking Water Standards, Objectives, and Guidelines*. Within this document the reader will find information on provincial water quality standards, objectives and guidelines, rationale for monitoring, and a brief description of water quality parameters. This document can be found at the following website address:

https://www.ontario.ca/document/technical-support-document-ontario-drinking-water-standardsobjectives-and-guidelines

Users of this drinking water system are also encouraged to contact a representative of the Township of Pickle Lake for assistance in interpreting this Annual Report.

Report Availability

In accordance with section 11 of O. Reg. 170/03 this Annual Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public at the following locations:

(1) Town Office, 2 Anne Street, Pickle Lake
(2) Township of Pickle Lake Website (www.picklelake.org)

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of the municipal council. Section 19 (Standard of Care, Municipal Drinking-Water System) of *the Act* also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. Such municipal officials would be exercising diligence by reviewing this Annual Report.

System Overview

System Description

Classified as a large municipal residential system, this drinking water system (DWS) provides a potable water supply to the community of Pickle Lake. This DWS is composed of five (2) active groundwater wells (Wells 1 & 2), the Pickle Lake Water Tower and the Pickle Lake distribution system. As an operational subsystem, the Pickle Lake distribution system is owned and operated by the Corporation of the Township of Pickle Lake. The active wells and water tower comprise the Pickle Lake Well Supply System (treatment subsystem), which is also owned and operated by the Township of Pickle Lake. As a groundwater source, aquifer overburden and soil act as an effective filter that removes micro-organisms and other particles by straining and antagonistic effect, to a level where the water supply may already be potable but disinfection is required as an additional health risk barrier. All active wells utilize free chlorine residual disinfection to achieve primary disinfection.

Wells 1 and 2 are located within 15 meters of each other, on a hill above the community and obtain groundwater from the same aquifer. A single multi-stage vertical turbine pump at each active well is used to draw water from the aquifer. Each well also contains a disinfectant chemical feed system, such that disinfectant is injected as raw groundwater is pumped from the well and directed to a common (shared) discharge into the chlorine contact loop. The chlorine contact loop is designed to provide the necessary amount of time required to achieve primary disinfection, and is the last treatment step prior to water entering the distribution system. The wells include electrical equipment to allow the use of a standby power system during prolonged power interruptions, consisting of a portable diesel generator.

The wells typically operate on a timer, and begin filling the water tower at 8:00 am daily, and continue filling until the water level in the tower reaches the full set point. Alternately, if the water level in the tower reaches the start set point before 8:00 am, this too would initiate a fill cycle. The water tower provides stable system pressure and provides water during power outages and periods of high water demand, such as fire flows. The water tower has a capacity of 888 m^3 and is filled using timers in conjunction with programmable set points. A recirculation pump at the facility is used to prevent damage in the winter caused by water freezing.

The Pickle Lake distribution system is comprised of various sized diameter water mains consisting of cast iron, ductile iron, high density polyethylene and PVC, totalling approximately 6.6 km in length and including 31 fire hydrants. Secondary disinfection requirements in the distribution system are achieved by the maintenance of a residual as free chlorine.

System Overview (continued)

System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. Such major expenses for the Pickle Lake DWS are summarized in **Table 1**. Other expenses have also been provided within the table, including those expenses related to equipment inspections and acquiring spare equipment or parts.

Table 1; 2016 System Expenses:

Items	New	Repair	Replace	Inspection	Spare	Expense
Hooker Lane Capital Project		x				$10,175.18
Flow Meter Calibrations				X		
Back Flow Preventers				X		
Maintenance supplies		x				$4,858.15
Capital Expenses Hooker			x			$2,987.81
HMI Upgrades			x			$3,917.58
Well 1 Inspection				X		$16.247.52
Radio re-newel licence		X				$355.60
Fire extinguisher safety inspection				X		$700.69
ORO / OIC Coverage	X					$125,349.00

Water Quality

In accordance with section 11 (Annual Reports) of O.Reg. 170/03, this Annual Report must summarize the results of tests required by regulations, approvals, and orders. The results of such water quality analyses are provided within the following sections.

Operational Parameters:

The Pickle Lake DWS employs an in-house **TABLE 2:**

OPERATIONAL PARAMETERS[1,2,3] testing program which includes analyses of Parameter Units Min. Max. Avg. water quality indicators beyond that required by *the Act*. Such analyses are conducted on source and treated water, and include testing for turbidity and residual free chlorine. Approximately 1,000 routine in-house water quality tests were conducted with respect to this system in 2016. In accordance with Schedules 6 & 7 of O. Reg. 170/03, the free chlorine residual required to achieve primary disinfection is continuously monitored at the active wells. Additionally, raw and treated water turbidity are analyzed on a weekly basis at each well. The results of continuous monitoring and in-house analyses are provided in **Table 2.**

1. FCR = Free Chlorine Residual
2. Minimum, maximum, and average values for the parameter turbidity (raw) are derived from the results of in-house analyses (i.e. bench tests). Minimum and maximum values are expressed as the minimum and maximum monthly averages of these results.
   Average values for free chlorine residual are derived from daily instantaneous readings of continuous monitoring equipment. Minimum and maximum values are expressed as minimum and maximum monthly averages, and results greater than the
3. maximum value and less than the minimum value do occur within a given year. Refer to the Compliance section for more information concerning instances of low free chlorine residual and inadequate primary disinfection.

Table 2 Parameters 2016:

Parameters	Units	Low	Max	Avg
Turbidity Well 1	NTU	0.05	.82	0.08
Turbidity Well 2	NTU	0.05	.56	0.08
Free-Chlorine-Residual-Pre Contact	Mg/L	0	5.0	2.5
Free-Chlorine-Residual- Post Contact	Mg/L	0.41	2.41	0.95
Free-Chlorine-Residual-Distribution	Mg/L	0.27	1.49	0.68

Microbiological Parameters

Microbiological analyses are performed on raw, treated, and distribution system water. A total of 260 routine water samples were collected for bacteriological analysis by an accredited laboratory in 2015, as required by Schedule 10 of O. Reg. 170/03. These water samples were collected on a weekly basis, and included tests for E. coli, total coliforms, and heterotrophic plate counts. Results from both routine and non-routine microbiological analyses are provided in **Table 3**. All results were below the associated Ontario Drinking Water Quality Standards.

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameters in a treated or distribution sample is an exceedance.
2. EC = E. Coli; TC = Total Coliforms; HPC = Heterotrophic Plate Count.
3. Well # 1 was out-of-service for repairs on March 3, 2015 when bacteriological samples were collected. Well # 2 was not operated between November 24, 205 and December 8, 2015. It was therefore not sampled on December 1, 2016.
4. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameters in a treated or distribution sample is an exceedance.
5. EC = E. Coli; TC = Total Coliforms; HPC = Heterotrophic Plate Count.
6. Well # 1 was out-of-service for repairs on March 3, 2015 when bacteriological samples were collected. Well # 2 was not operated between November 24, 205 and December 8, 2015. It was therefore not sampled on December 1, 2016.

TABLE 3: MICROBIOLOGICAL SAMPLING RESULTS[1] 2016:

Sample Type	Number of Samples	EC2 Results (MPN/100ml)	TC2 Results (MPN/100ml)	Number of HPC2 Samples	HPC Results (CFU/ml)
Raw Well1	52	Absent	Absent	None	-
Raw Well2	52	Absent	Absent	None	-
Treated Well 1+2	52	Absent	Absent	52	7
Distribution-Routine	105	Absent	Absent	52	10

Water Quality (continued)

Nitrate and Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 of O. Reg. 170/03. Nitrate and nitrite results are provided in **Table 4**. All results were below the associated Ontario Drinking Water Quality Standards (ODWQS). All results are provided in mg/L.

TABLE 4: NITRATE AND NITRITE RESULTS 2016:

Sample Date	Parameter	ODWQS (mg/L)	Treated Water
January 6	Nitrate	10	0.185
	Nitrite	1	<0.010
	Nitrate + Nitrite	10	0.185
April 12	Nitrate	10	0.167
	Nitrite	1	<0.010
	Nitrate + Nitrite	10	0.167
July 12	Nitrate	10	0.242
	Nitrite	1	<0.010
	Nitrate + Nitrite	10	0.242
October 12	Nitrate	10	0.150
	Nitrite	1	<0.010
	Nitrate + Nitrite	10	0.150

Inorganic Parameters

Inorganic parameters are sampled every three (3) years in treated water from each well in accordance with Schedules 13 and 23 of O. Reg. 170/03. With respect to the Pickle Lake DWS, required sampling for inorganic parameters was previously conducted on April 08, 2014. All inorganic parameter sampling

results are provided in **Table 5**; since the two wells share a common discharge, there is only one treated water sample point. All results were below the associated Ontario Drinking Water Quality Standards

TABLE 5: INORGANIC SAMPLING RESULTS

Parameter Treated Water	Units	Result	ODWQS
Antimony	µg/L	<0.60	6
Arsenic	µg/L	<1.0	25
Barium	µg/L	18	1000
Boron	µg/L	<50	5000
Cadmium	µg/L	<0.10	5
Chromium	µg/L	<1.0	50
Mercury	µg/L	<0.10	1
Selenium	µg/L	<1.0	10
Uranium	µg/L	<2.0	20

Sodium and Fluoride

Sodium and fluoride are sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. With respect to the Pickle Lake DWS, required sampling for sodium and fluoride was previously conducted on April 12, 2016. All sodium and fluoride sampling results are provided in **Table 6**. All results were below the associated Ontario Drinking Water Quality Standards.

[1] This value for the parameter sodium is not a water quality standard as prescribed in O. Reg. 169/03, although an exceedance of this value is associated with reporting requirements and corrective actions.

Table 6: Sodium & Fluoride Results:

Parameter (Treated Water)	Units	Result	ODWQS
Fluoride	mg/L	0.036	1.5
Sodium	mg/L	3.26	20[1]

Lead Sampling

The Pickle Lake DWS previously qualified for reduced lead sampling and ultimately became exempt from sampling at plumbing locations, in accordance with Schedule 15.1 of O.Reg. 170/03. Two (2) distribution system samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these distribution system samples must be analyzed for lead in every third 12-month period after the plumbing sample exemption was activated. **Table 7** summarizes the results of community lead sampling and related required tests.

. As 2015 was the third 12-month period since reduced sampling began, this sample should have been analyzed for lead, but was not. This resulted in Issue of Non-compliance - Item # 2 described in greater detail on previous annual report, in Compliance section. To make up for the missed sample, lead will be tested in distribution samples during the period corresponding to December 15, 2015 to April 15, 2016.

TABLE 7: DISTRIBUTION LEAD SAMPLING RESULTS

Sample Date (2016)	Sample Location	pH	Alkalinity (mg/L as $CaCO_3$)	Lead Result (µg/L)
April 12	Hydrant-WTP	8	178	<10
July 19	Hydrant- School bus loop	7.82	181	N/A

Trihalomethanes:

Trihalomethanes (THMs) are required to be sampled on a quarterly basis from the farthest point in the distribution system, in accordance with Schedule 13 of O. Reg. 170/03. Compliance with the provincial standard for trihalomethane concentrations is determined by calculating a running annual average (with a Maximum Acceptable Concentration of 0.100 mg/L or 100 µg/L). In 2016, the running annual average was 24.8 µg/L. Total THM (TTHM) results are summarized in **Table 8**.

Table 8-Trihalomethanes:

Sample Date	TTHM Results (ug/L)	ODWQS
January 12	16.9	100
April 12	39	100
July 12	11.7	100
October 12	36.9	100
2013 Average	**28.4**	100
2014 Average	**22.4**	100
2015 Average	**24.8**	100
2016 Average	**26.1**	100

Organic Parameters

Organic parameters are sampled every three (3) years in treated water from common well discharge in accordance with Schedules 13 and 24 of O. Reg. 170/03. These parameters include various acids, pesticides, herbicides, PCBs, volatile organics, and other organic chemicals. With respect to the Pickle Lake DWS, sampling for organic parameters was conducted on April 8, 2014. Organic parameter

sampling results are provided in **Table 9**. All results were below the associated Ontario Drinking Water Quality Standards.

TABLE 9: ORGANIC SAMPLING RESULTS

Parameter (Treated Water)	Result (µg/L)	ODWQS (µg/L)	Parameter (Treated Water)	Result (µg/L)	ODWQS (µg/L)
Alachlor		5	Diquat		70
Aldicarb		9	Diuron		150
Aldrin + Dieldrin		0.7	Glyphosate		280
Atrazine + N-dealkylated metabolites		5	Heptachlor + Heptachlor Epoxide		3
Azinphos-methyl		20	Lindane		4
Bendiocarb		40	Malathion		190
Benzene		5	Methoxychlor		900
Benzo(a)pyrene		0.01	Metolachlor		50
Bromoxynil		5	Metribuzin		80
Carbaryl		90	Monochlorobenzene		80
Carbofuran		90	Paraquat		10
Carbon Tetrachloride		5	Parathion		50
Chlordane (Total)		7	Pentachlorophenol		60
Chlorpyrifos		90	Phorate		2
Cyanazine		10	Picloram		190
Diazinon		20	Polychlorinated Biphenyls (PCBs)		3
Dicamba		120	Prometryne		1
1,2-Dichlorobenzene		200	Simazine		10
1,4-Dichlorobenzene		5	Temephos		280
DDT + metabolites		30	Terbufos		1
1,2-Dichloroethane		5	Tetrachloroethylene		30
1,1-Dichloroethylene		14	2,3,4,6-Tetrachlorophenol		100
Dichloromethane		50	Triallate		230
2,4 -Dichlorophenol		900	Trichloroethylene		5
2,4-Dichlorophenoxy acetic acid		100	2,4,6-Trichlorophenol		5
Diclofop-methyl		9	2,4,5-Trichlorophenoxy acetic acid		280
Dimethoate		20	Trifluralin		45
Dinoseb		10	Vinyl Chloride		2

Flows

2016 Flows

Throughout the reporting period, the Pickle Lake DWS supplied 164,135 m^3 of treated water to consumers. On an average day in 2016, 450 m^3 of treated water was supplied to the community. The average daily flow in 2016 represents 13% of the combined rated capacity of the Pickle Lake DWS (3,369.6m^3/day). The maximum daily flow in 2016 was 1150 m^3/day, which represents 34% of the combined rated capacity of the Pickle Lake DWS.

Table 10 and **Figure 1** provide a flow summary and capacity assessment for each relevant location. The reader is asked to consult **Appendix A** for a complete summary of 2016 flow data.

TABLE 10: 2016 Flow Summary:

Location	Rated Capacity[1] (m^3/day)	Total Annual Treated Water Flow (m^3/year)	Average Treated Water Daily Flow (m^3/day)	Maximum Treated Water Daily Flow (m^3/day)	Capacity Assessment (Average Flows)	Capacity Assessment (Maximum Flows)
Well 1	1987.2	91,122	250	943	13%	47%
Well 2	1382.4	72,793	199	1150	14%	83%
All Wells	3369.6	164,135	450	1150	13%	34%

Flow Comparisons

There has been a significant increase in the amount of treated water supplied in recent years when compared to historic flows. In 2013, the Pickle Lake DWS produced 81,060 m^3 of treated water. By comparison, in 2016 the Pickle Lake DWS produced 164,135m^3 of treated water. This represents a 102% increase in the amount of water supplied.

Figure 2 provides a breakdown of annual total treated water volumes by well in 2015. The reader is asked to consult **Appendix A** for a summary of historical flow data.

Chemical Consumptions

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of water treatment chemicals used by the system during the period covered by the report. **Table 11** summarizes total chemical consumptions for each treatment chemical used at the Pickle Lake DWS. All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

TABLE 11: CHEMICAL CONSUMPTIONS 2016:

Chemical Used	Liters Used
sodium hypochlorite 12%	**2630.8**

Compliance

The Township of Pickle Lake employs an operational strategy that is committed to achieving the following goals:

1) Providing a safe and reliable supply of drinking water to the community of Pickle Lake;
2) Meeting or exceeding all applicable legislative and regulatory requirements;
3) Maintaining and continually improving the operation and maintenance of the system; and,
4) Maintaining and operating the Pickle Lake Drinking Water System in a responsible manner in accordance with documented quality management system policies and procedures.

The following sections will summarize incidents of adverse water quality and noncompliance that occurred during the reporting period. The Township of Pickle Lake is committed to employing timely and effective corrective actions to prevent recurrence of all identified incidents of adverse water quality and noncompliance.

Incidents of Adverse Water Quality

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this Annual Report must summarize any reports made to the Ministry under subsection 18(1) (Duty to report adverse test results) of *the Act* or section 16-4 (Duty to report other observations) of Schedule 16 of O. Reg. 170/03. Additionally, this Annual Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report.

Reporting & Corrective Actions: None

Both pre-contact chamber and end of contact chamber continuous chlorine analyzers, monitor chlorine and alarm to the PLC, which will signal to call through the Verbatim auto-dialer which calls out to an operator's pager three times, after a 120 second delay. If no one is reached at the pager number, the auto-dialer will call the operators cell phone three times. If no one responds, the alarm will call the ORO assigned. Once an alarm is received, operators can call the auto-dialer from their cell phone and determine the reason for the alarm. A review of logbook entries indicated that operator response time was approximately 20 minutes. The actions that were taken by operators were also recorded in the logbook.

Incidents of Non-compliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must list any requirements of *the Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report (i.e. an incident of non-compliance). Additionally, this Annual Report must specify the duration of the failure and the measures that were taken to correct the failure.

NON-COMPLIANCE WITH REGULATORY REQUIREMENTS AND ACTIONS REQUIRED:

This section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues. Further details pertaining to these items can be found in the body of the inspection report.

1 The operations and maintenance manuals did not meet the requirements of the Drinking Water Works Permit and Municipal Drinking Water Licence issued under Part V of the SDWA. The re-issued Municipal Drinking Water Works License (295-101), issued on March 2, 2016, Schedule B, condition 16.2.8 to 16.2.10 require the following in the Operations and Maintenance Manual: 16.2.8 An inspection schedule for all wells associated with the drinking water system, including all production wells, standby wells, test wells and monitoring wells; 16.2.9 Well inspection and maintenance procedures for the entire well structure of each well including all above and below grade well components; and 16.2.10 Remedial action plans for situations where an inspection indicates non-compliance with respect to regulatory requirements and/or risk to raw well water quality.

Though the production wells were last inspected below ground and status report developed on October 3, 2014 by well contractor, the above procedures required in the MDWP were not included in the Operations and Maintenance Manual. The owner of the Pickle Lake DWS is required to update the Operations and Maintenance Manual to address the requirements of the DWWP in regard to Schedule B, conditions 16.2.8 to 16.2.10 and provide a copy of the update to the undersigned Officer by September 30, 2016.

Action(s) Required:

The owner of the Pickle Lake DWS is required to update the Operations and Maintenance Manual to address the requirements of the DWWP in regard to Schedule B, conditions 16.2.8 to 16.2.10 and provide a copy of the update to the undersigned Officer by September 30, 2016.

Appendix A – Flow Data:

Table A1: 2016 Flows – All Wells

Month	Well # 1 Monthly Flow (m^3)	Well # 2 Monthly Flow (m^3)	Combined Wells Total Monthly Flow (m^3)	Combined Wells Average Daily Flow (m^3/day)	Average Daily Flow (Imp. Gal/Day)	Maximum Daily Flow (m^3/day)
January	8,700	903	9,603	310	68,150	468
February	471	8780	9,251	319	71,400	594
March	11,221	95	11,536	370	81,400	559
April	1,749	10,316	12,065	401	88,244	770
May	15,514	1,386	16,900	545	119,900	787
June	77	16,431	16,508	550	121,000	1150
July	17,090	2,757	19,847	640	140,850	943
August	8,882	6,405	15,287	493	108,488	916
September	10,405	3,077	13,482	449	98,868	606
October	2,304	10,391	12,695	410	90,094	669
November	12,115	498	12,613	420	92,495	609
December	2,594	11,754	14,348	463	101,825	638
Total	91,122	72,793	164,135	—	—	—
Average	7,594	6,066	13,678	448	98,560	726

Permit to Take Water Requirements:

	PTTW # 0386-A27PHJ	
Location	Max. Rate (L/min)	Max Rate (L/day)
Well 1	1,380	1,987,200
Well 2	960	1,382,400
Combined	----	3,369,600

TABLE A2: HISTORICAL FLOWS

Year	Historical Average Flow Records (m^3)	
	Total Annual Flow (m^3)	Average Daily Flow (m^3)
2016	164,135	450
2015	157,597	432
2014	129,035	354
2013	81,060	222
2012	72,484	199
2011	93,665	257
2010	86,704	238

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