



**Ontario Clean Water Agency**  
**Agence Ontarienne Des Eaux**

Kirkland Lake Drinking Water System

# 2019 ANNUAL/SUMMARY REPORT

Prepared by the Ontario Clean Water Agency  
on behalf of the Town of Kirkland Lake

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## INTRODUCTION

Municipalities throughout Ontario have been required to comply with Ontario Regulation 170/03 made under the *Safe Drinking Water Act* (SDWA) since June 2003. The Act was enacted following recommendations made by Commissioner O'Conner after the Walkerton Inquiry. The Act's purpose is to protect human health through the control and regulation of drinking water systems. O. Reg. 170/03 regulates drinking water testing, use of licensed laboratories, treatment requirements and reporting requirements.

Section 11 of Regulation 170/03 requires the owner to produce an Annual Report. This report must include the following:

1. Description of system & chemical(s) used
2. Summary of any adverse water quality reports and corrective actions
3. Summary of all required testing
4. Description of any major expenses incurred to install, repair or replace equipment

This annual report must be completed by February 28th of each year.

Schedule 22 of the regulation also requires a Summary Report which must be presented & accepted by Council by March 31<sup>st</sup> of each year for the preceding calendar year.

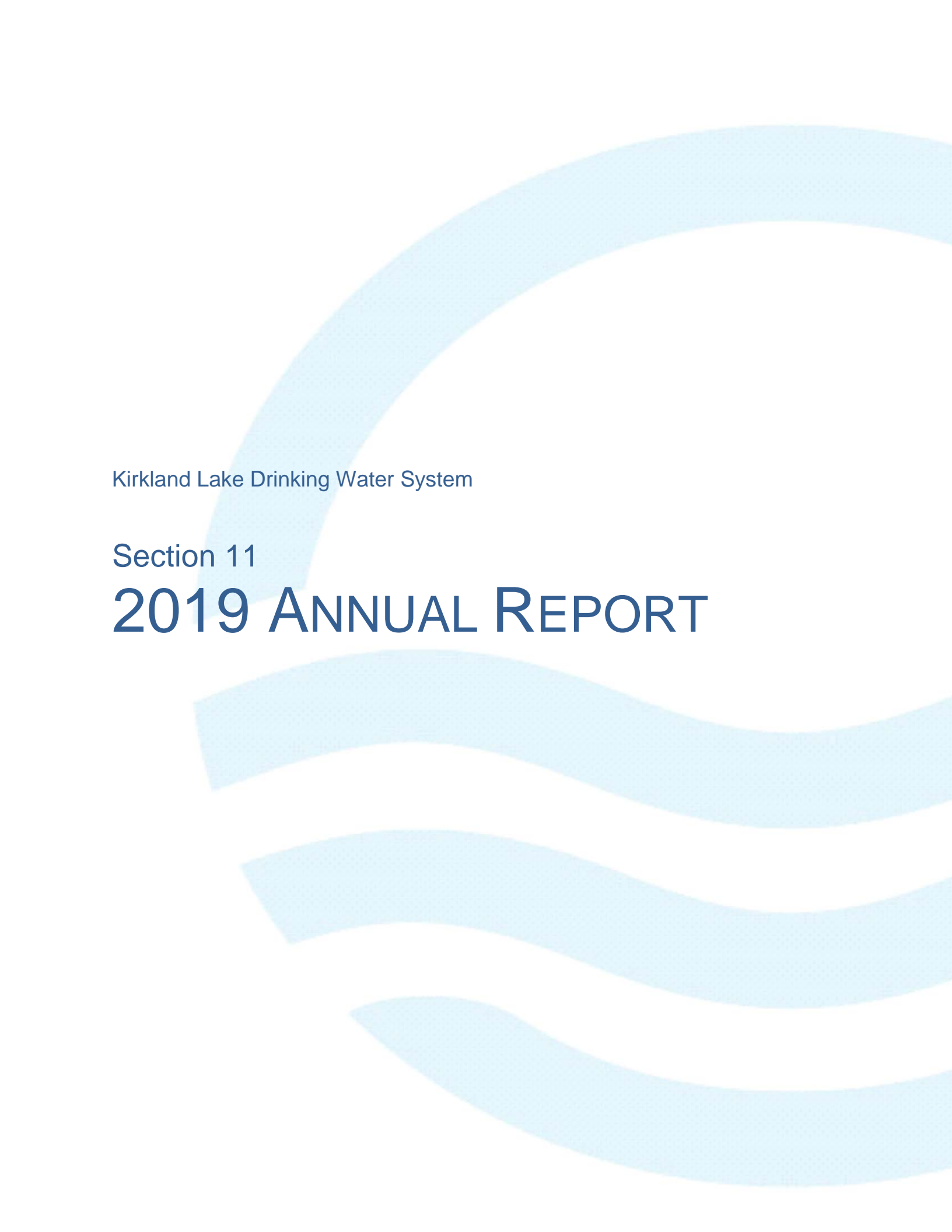
The report must list the requirements of the Act, its regulations, the system's Drinking Water Works Permit (DWWP), Municipal Drinking Water Licence (MDWL), Certificate of Approval (if applicable), and any regulatory requirements the system failed to meet during the reporting period. The report must also specify the duration of the failure, and for each failure referred to, describe the measures that were taken to correct the failure.

The *Safe Drinking Water Act* (2002) and the drinking water regulations can be viewed at the following website: <http://www.e-laws.gov.on.ca>.

To enable the Owner to assess the rated capacity of their system to meet existing and future planned water uses, the following information is also required in the report.

1. A summary of the quantities and flow rates of water supplied during the reporting period, including the monthly average and the maximum daily flows,
2. A comparison of the summary to the rated capacity and flow rates approved in the systems approval, drinking water works permit or municipal drinking water licence or a written agreement if the system is receiving all its water from another system under an agreement.

The reports have been prepared by the Ontario Clean Water Agency (OCWA) on behalf of the Owner and presented to council as the 2019 Annual/Summary Report.



Kirkland Lake Drinking Water System

Section 11

# 2019 ANNUAL REPORT



## Section 11 - ANNUAL REPORT

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### 1.0 INTRODUCTION

<b>Drinking-Water System Name:</b>	Kirkland Lake Drinking Water System
<b>Drinking-Water System No.:</b>	220000308
<b>Drinking-Water System Owner:</b>	The Corporation of Town of Kirkland Lake
<b>Drinking-Water System Category:</b>	Large Municipal, Residential System
<b>Period being reported:</b>	January 1, 2019 to December 31, 2019

**Does your Drinking Water System serve more than 10,000 people?** No

**Is your annual report available to the public at no charge on a web site on the Internet?** Yes  
at <http://www.kirklandlake.ca/>

**Location where the report required under O. Reg. 170/03 Schedule 22 will be available for inspection.**

Town of Kirkland Lake, Department of Physical Services  
1 Dunfield Road,  
Kirkland Lake ON P2N 3P4

Town of Kirkland Lake Municipal Office  
3 Kirkland Street,  
Kirkland Lake ON P2N 3P4

#### ***Drinking Water Systems that receive drinking water from the Kirkland Lake Drinking Water System***

The Kirkland Lake Drinking Water System provides all drinking water to the communities of Kirkland Lake, Chaput Hughes and Swastika.

#### ***The Annual Report was not provided to any other Drinking Water System Owners.***

The Ontario Clean Water Agency prepared the 2019 Annual/Summary Report on behalf of the Town of Kirkland Lake and provided a copy to the system owner. The Kirkland Lake Drinking Water System is a stand-alone system that does not receive water from or send water to another system.

#### ***Notification to system users that the Annual Report is available for viewing is accomplished through:***

- The Town of Kirkland Lake social media and website
- The Town of Kirkland Lake Municipal Office



## 2.0 DESCRIPTION OF THE DRINKING WATER SYSTEM (DWS# 220000308)

The Kirkland Lake Drinking Water System is owned by the Corporation of the Town of Kirkland Lake and consists of a Class 3 conventional design water treatment plant (Lionel Sherratt water treatment plant) and a Class 2 water distribution system. The Ontario Clean Water Agency (OCWA) is the accredited operating authority and is designated as the Overall Responsible Operator for both the water treatment and water distribution facilities.

The Kirkland Lake Drinking Water System has an approved rated capacity of 22,500 m<sup>3</sup>/day and provides a potable water supply to the Town of Kirkland Lake which includes the communities of Chaput Hughes and Swastika.

### ***Raw Water Supply***

The Kirkland Lake water plant draws raw water from Gull Lake through a 146 m long, 710 mm diameter intake pipe. The pipe terminates in an intake chamber located approximately 10 m from the lake shoreline. A 750 mm diameter, 17 m long pipe connects the intake chamber and the water plant.

A traveling water screen is installed immediately inside the plant. The screen removes large floating debris from the water prior to treatment. The provision for a manual screen immediately downstream from the traveling screen offers back up screening in the event the traveling screen is out of service. Following the screening, the raw water can be disinfected (pre-chlorination) prior to entering the wet well of the Low Lift Pumping Station. The raw water is also injected with soda ash, usually during the winter months to stabilize the water and aid in the coagulation and flocculation process which reduces the amount of iron and manganese passing through the system and into the distribution system. Soda ash is injected prior to the mechanical bar screen and operates pace-to-flow.

A chlorine dioxide pilot trial began at the Kirkland Lake water treatment plant in January 2018 to help reduce the amount of iron and manganese in the finished water leaving the plant. The process was permanently implemented in January 2019. Chlorine dioxide is injected into the bottom of the raw water wet well following the mechanical screens. It is flow paced to the raw water flow meter which is located on the common raw water header. Chlorine dioxide is generated and stored on site using a vendor supplied package generator system. The generator uses chlorine gas, which already exists on-site and 25% sodium chlorite solution which is stored in two (2) 1500 US gallon bulk tanks as feed chemicals which are drawn under partial vacuum into the generator. The generator is called to start on a low level signal in the day tank. The generator also uses a finished water supply line and a finished water booster pump to boost water pressure to a minimum of 60 psi. Upon fault condition, the generator will shut down.



## **Water Treatment**

### **1. Coagulation / Flocculation / Sedimentation**

The Low Lift Pumping Station (LLPS), equipped with five pumps, transfers water from the wet well (where water level corresponds to the water level in the lake) to the treatment processes. The water flows by gravity through the treatment processes.

The first step of water treatment is coagulation; a process of destabilization and initial aggregation of colloidal and finely divided suspended matter by the addition of a floc-forming chemical. Raw water enters the treatment stage through an inlet chamber. Just prior to entering the chamber, a chemical coagulant, aluminum sulfate (alum), is injected into raw water and is rapidly agitated with a flash mixer.

The mixture then overflows into three (3) contact compartments – one per pre-treatment unit. In the compartments, the mixing weirs gently turn the mixture in order to promote coagulation.

Just prior to leaving the mixing chambers, a flocculant, FloPam – an inorganic polymer, is added.

Flocculation in water treatment is an agglomeration of colloidal and finely divided suspended matter after coagulation by gentle agitation by either mechanical or hydraulic means, sometimes with an aid of chemical flocculant.

The mixture enters the bottom distribution piping of each Degremont Ultra-Pulsator clarifier via vacuum chambers. The vacuum in the chambers is created by the vacuum pumps, one per chamber. The purpose of the vacuum chambers is to create gentle movement of the sludge blanket in the clarifier for both flocculation and sludge removal.

Sedimentation is the process of subsidence and deposition of suspended matter, carried by water or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid to below the point at which it can transport the suspended material or floc.

The flow is distributed equally over the full area of the clarifiers through the distribution pipes in the bottom of the unit. The flow percolates through the sludge blanket. Upon exiting the sludge blanket, the water flows through a plate settler and then the tube settler. Clarified water is gathered by the collection pipes at the top of the units and transferred to channels that lead to the filters.

### **2. Filtration**

Filtration is the process of passing a liquid through a filtering medium (consisting of granular material, sand and anthracite) for the removal of suspended or colloidal matter. There are four (4) dual media filters at the plant. Each filter is approximately 6.4 m x 4.3 m x 3m deep and rated to operate at a maximum rise rate of 9.0 m/hr or a maximum flow rate of 65.0



L/sec. The filter media consists of 450 mm of anthracite underlain by a 300 mm layer of silica sand. A concrete underdrain slab outfitted with strainer nozzles supports the filter media. During normal operation, the water flows into the filter from the filter channel via an inlet sluice gate and travels through the media in a downward pattern. The filtered water is collected in the underdrain area and transported by pipes to the clearwell, located under the ground slab of the plant. The flow through each filter is measured by individual flow meters and is controlled by dedicated filter control valves. A headloss indicator monitors the filter media condition. The filtrate quality is continuously monitored by individual turbidimeters, and a particle analyzer.

### **3. Disinfection (Chlorination)**

Filtered water is disinfected following filtration. Chlorine solution is diffused into the water stream in the clearwell of the treatment building. The diffuser and a series of baffles promote complete mixing of chlorine with water. The chlorine solution is prepared on-site by mixing chlorine gas with water. A chlorinator controls the chlorine gas feed rate. There are two (2) chlorinators installed at the plant; one serves as a duty pre-chlorinator while the second is a duty post-chlorinator. Chlorine gas is mixed with water in the ejectors and is sent to diffusers as a chlorine solution. SCADA monitors the chlorinators which will generate alarms upon high and low vacuum levels or abnormal chlorine levels. Each chlorinator is rated to supply 67.0 kg per day of chlorine gas which, based on the plant rated capacity, equals to the maximum chlorine feed rate of up to 3.0 mg/L (3.0 ppm or parts per million) at each location. The gas is withdrawn at any given time from only one of the two one tonne cylinders that are located on the monitored weigh scale. The chlorine feed system will switch automatically to another cylinder when pressure in the duty cylinder drops below the pre-set value. If both cylinders approach low levels, SCADA will alarm the operator.

### **4. pH Adjustment**

The pH adjustment process uses 40% sodium hydroxide (NaOH) to restore treated water to a neutral pH. Two metering pumps (1 duty and 1 standby) feed the NaOH to the clearwell of the treatment building at the point of exit to the pumping building. Four high lift pumps are used to direct treated water into the distribution system.

### ***Process Waste Residuals Management***

Filter backwash water and withdrawn sludge from the sedimentation tanks are directed to two wastewater tanks. The capacity of each tank is approximately 900 m<sup>3</sup>. Wastewater is discharged to the sanitary sewer system.

### ***Emergency Power***

The plant has a standby power generator rated at 300 kW and equipped with an automatic transfer switch, underground and in-plant fuel storage tanks.



### ***Distribution System and Elevated Storage Tank***

The Kirkland Lake Drinking Water System is classified as a Large Municipal Residential Drinking Water System and provides water to approximately 9000 residents. Distribution piping typically ranges in size from 150 mm to 250 mm, and may consist of cast iron, ductile iron, or PVC, depending on the location and date of installation. Typical system pressure ranges from 55 P.S.I. to 70 P.S.I. The standpipe provides for storage for approximately 7,115 m<sup>3</sup> of water, helps stabilize water pressure in the distribution system and provides extra water in the case of an emergency. To ensure optimum chlorine residual in the distribution system there are two chlorine booster stations, one at the Chaput Hughes Water Control Building/Standpipe and the other at the Swastika Water Control Building.

### **3.0 LIST OF WATER CHEMICALS USED OVER THE REPORTING PERIOD**

The following chemicals were used in the treatment process at the Kirkland Lake Water Treatment Plant.

- Aluminum Sulphate (Alum) - Coagulation/Flocculation
- Sodium Carbonate (Soda Ash) - pH Adjustment/oxidation of iron and manganese
- FloPam FO 4240 PWG - flocculant
- Sodium Hydroxide – pH adjustment
- Chlorine Gas – primary disinfection
- Chlorine Dioxide (Sodium Chlorite and Chlorine Gas) – oxidation of iron and manganese
- Sodium Hypochlorite – booster chlorination at the Chaput Hughes standpipe and Swastika booster station.

All treatment chemicals meet AWWA and NSF/ANSI standards.

### **4.0 SIGNIFICANT EXPENSES INCURRED IN THE DRINKING WATER SYSTEM**

OCWA is committed to maintaining the assets of the drinking water system and maintains a program of scheduled inspection and maintenance activities using a computerized Work Management System (WMS).

Significant expenses incurred in the drinking water system include:

- Replaced 1 - 205 L drum for sodium chlorite with 2 - 1500 US gallon (5680 L) bulk storage tanks. One tank is equipped with a milltronics level indicator. The tanks are located in a lowered area 8 feet below floor level outside the chlorine dioxide room of the Kirkland Lake water treatment plant.



- Replaced 2 existing diaphragm type alum pumps and associated piping with 2 Watson Marlow peristaltic pumps.
- Installed a pH meter in the flash mix tank to monitor the pH from clarifier #2.
- Replaced two (2) actuators on the chlorine dioxide system.
- Replaced auto dialer (Raco Verbatim) with Mobile 911 which is a virtual machine connected to all operators mobile devices through an application that will alert operators of any alarms via text messaging.
- Installed plant heaters
- Distribution Work includes:
  - Completed assessment of tower chamber and roof
  - Completed standpipe swing check valve assessment and repair

## 5.0 DETAILS ON NOTICES OF ADVERSE TEST RESULTS AND OTHER PROBLEMS REPORTED TO & SUBMITTED TO THE SPILLS ACTION CENTER

Based on information kept on record by OCWA, the Kirkland Lake Drinking Water System was in full compliance in 2019 with no adverse water quality incidents reported to the Ministry's Spills Action Centre.

## 6.0 MICROBIOLOGICAL TESTING PERFORMED DURING THE REPORTING PERIOD

### *Summary of Microbiological Data*

Sample Type	# of Samples	Range of Total Coliform Results (min to max)	Range of <i>E.coli</i> Results (min to max)	# of HPC Samples	Range of HPC Results (min to max)
Raw (Gull Lake)	53	0 to 324	0 to 22	0	N/A
Treated (POE)	53	0 to 0	0 to 0	53	<10 to >2000
Distribution	265	0 to 0	0 to 0	107	<10 to 260

Maximum Allowable Concentration (MAC) for *E. coli* = 0 Counts/100 mL

MAC for Total Coliforms = 0 Counts/100 mL

NDOGT = No Data, Overgrown with Target

NDUI = No data, unknown interference

INT = Interferences are evident on plate and therefore bacterial colonies cannot be properly counted (interferences can be anything that inhibit the proper growth and formation of target colonies)

**Note:** One microbiological sample is collected and tested each week from the raw and treated water supply. A total of five microbiological samples are collected and tested each week from the Kirkland Lake distribution system which includes one sample from the community of Swastika. At least 25% of the distribution samples are tested for HPC bacteria.

Refer to [Appendix A](#) for a monthly summary of microbiological test results.



## 7.0 OPERATIONAL TESTING PERFORMED DURING THE REPORTING PERIOD

### *Continuous Monitoring in the Treatment Process*

Parameter	# of Samples	Range of Results (min to max)	Unit of Measure	Standard
<b>Turbidity</b> (Filter 1)	8760	0.02 to 0.95	NTU	1.0 (for >15 minutes)
<b>Turbidity</b> (Filter 2)	8760	0.03 to 1.94 <sup>Note2</sup>	NTU	
<b>Turbidity</b> (Filter 3)	8760	0.00 to 2.36 <sup>Note2</sup>	NTU	
<b>Turbidity</b> (Filter 4)	8760	0.00 to 4.75 <sup>Note2</sup>	NTU	
<b>Free Chlorine</b> (POE)	8760	0.18 <sup>Note3</sup> to 2.95	mg/L	CT

#### Notes:

- For continuous monitors, 8760 is used as the number of samples.
- If the filter effluent turbidity reaches 0.8 NTU, the filter will automatically shut down.  
 February 23 - high turbidity on filter No. 4 due to backwash pump failure. Filter shutdown.  
 March 27 - high turbidity on filter No. 2, 3 and 4 due to clarifier carry over. Filter shutdown  
 March 29 - high turbidity on filter No. 3 and 4 due to clarifier carry over. Filter shutdown  
 May 21 - high turbidity on filter No. 3 & 4 due to clarifier carryover. Filters shutdown and backwashes performed to reduce turbidity levels.  
 July 2 - high turbidity on filter No. 4 which lasted approximately 10 minutes. Turbidity exceedances occur when two (2) readings are above 1 NTU for 15 minutes or more in a 24 hour period.
- CT is the concentration of chlorine in the water times the time of contact that the chlorine has with the water. It is used to demonstrate the level of disinfection treatment in the water. CT calculations are performed by the plant's SCADA system and are monitored daily to ensure primary disinfection is achieved. CT was met in 2019.  
 May 3 – Low free chlorine residual of 0.18 mg/L due to analyzer issues. CT calculated and passed.  
 June 17, 18, 22 - Low free chlorine residuals (0.43, 0.68, 0.58 mg/L). CT passed  
 July 24 - Low free chlorine residuals (0.74 mg/L). CT passed  
 August 18 & 22 - Low free chlorine residuals (0.67, 0.70 mg/L). CT passed  
 September 13 & 25 - Low free chlorine residuals (0.71, 0.68 mg/L). CT passed

### *Summary of Chlorine Residual Data in the Distribution System*

Parameter	# of Samples	Range of Results (min to max)	Unit of Measure	Standard
<b>Free Chlorine Residual</b>	418	0.09 to 1.73	mg/L	0.05
<b>Free Chlorine</b> (Chaput Hughes Standpipe)	8760	0.08 to 5.05	mg/L	0.05
<b>Free Chlorine</b> (Swastika Booster Station)	8760	0.08 to 5.01	mg/L	0.05

#### Notes:

- A total of eight operational checks for chlorine residual in the distribution system were collected each week. Five (5) samples were tested one day and three (3) on a second day. The sample sets are collected at least 48-hours apart and samples collected on the same day are from different locations.
- Free chlorine residuals are also continuously monitored in the distribution system at the Chaput Hughes standpipe and the Swastika booster station.

Refer to [Appendix B](#) for a monthly summary of the above chemical test results.

**Summary of Nitrate & Nitrite Data** (sampled at the plant's point of entry into the distribution every quarter)

Date of Sample	Nitrate Result Value	Nitrite Result Value	Unit of Measure	Exceedance
January 8	< 0.02	< 0.008	mg/L	No
April 1	< 0.05	< 0.05	mg/L	No
July 11	< 0.05	< 0.05	mg/L	No
October 9	< 0.05	< 0.05	mg/L	No

Maximum Allowable Concentration (MAC) for Nitrate = 10 mg/L

MAC for Nitrite = 1 mg/L

**Summary of Total Trihalomethane Data** (sampled in the distribution system)

Date of Sample	Result Value	Unit of Measure	Quarter Average	Running Annual Average	Exceedance
January 8*	38.6	ug/L	39.6	52.2	No
January 24	41.9	ug/L			
February 28	48	ug/L			
March 28	30	ug/L			
April 1*	33.7	ug/L	45.6		
April 29	28.3	ug/L			
May 28	48.7	ug/L			
June 27	71.5	ug/L			
July 11*	64.3	ug/L	68.5		
July 24	67.4	ug/L			
August 21	98.4	ug/L			
September 25	44	ug/L			
October 9*	60.5	ug/L	55.2		
December 2	49.9	ug/L			
December 17	55.1	ug/L			

Maximum Allowable Concentration (MAC) for Total Trihalomethanes = 100 ug/L (Running Annual Average)

**Note:**

\* THM samples are collected and tested quarterly as required under section 13-6 of Schedule 13, under O. Reg. 170/03. Additional sampling was done as part of the chlorine dioxide pilot trial and continues to be tested until a new Municipal Drinking Water License with specific sampling requirements is issued. All results are used to calculate the running annual average (RAA) for THMs.

**Haloacetic Acid (HAAs) Sampling and Testing Required under Schedule 13-6.1**

New sampling requirements for Haloacetic Acids (HAAs) came into effect on January 1<sup>st</sup>, 2017. At least one distribution sample must be taken in each calendar quarter, from a point in the drinking water system's distribution system, or plumbing that is likely to have an elevated potential for



the formation of HAAs. In 2019, additional HAA samples were collected in the distribution system and tested as part of the chlorine dioxide pilot trial which continues until a new Municipal Drinking Water License with specific sampling requirements is issued. Results marked with an asterisk were collected as required under section 13-6.1 of Schedule 13, under Ontario Regulation 170/03.

Over the past three years, samples were collected near the plant, in the middle of the distribution system and at the end of the distribution system as per guidance provided in a Ministry's letter "HAA Concerns" dated May 9, 2018. The sample location with the highest concentration of HAAs is the Archer Drive sewage pumping station (8 Archer Dr.) in the middle of the system.

The maximum allowable concentration (MAC) of 80 ug/L is effective January 1<sup>st</sup>, 2020 and is based on a running annual average of quarterly results (similar to THMs). It should be mentioned that all results were used to calculate the running annual average for HAAs. Results that exceed the MAC must be reported as an adverse water quality incident (AWQI) starting January 1<sup>st</sup>, 2020. HAA results for 2019 are summarized below.

**Summary of Total Haloacetic Acid Data** *(sampled in the distribution system)*

Date of Sample	Result Value	Unit of Measure	Quarter Average	Running Average	Exceedance
January 8*	63	ug/L	46.8	37.6	N/A
January 24	34	ug/L			
February 28	56	ug/L			
March 28	34	ug/L			
April 1*	45	ug/L	34		
April 29	29	ug/L			
May 28	17	ug/L			
June 27	45	ug/L			
July 12*	55	ug/L	47		
July 24	48	ug/L			
August 21	53	ug/L			
September 25	32	ug/L			
October 9*	22	ug/L	22.7		
December 2	24	ug/L			
December 17	22	ug/L			

\* HAA samples are collected and tested quarterly as required under section 13-6.1 of Schedule 13, under O. Reg. 170/03.

**Summary of Most Recent Lead Data**

*(applicable to the following drinking water systems; large municipal residential systems, small, municipal residential systems, and non-municipal year-round residential systems)*



The Kirkland Lake Drinking Water System was eligible to follow the “Exemption from Plumbing Sampling” as described in section 15.1-5(9) and 15.1-5(10) of Schedule 15.1 of Ontario Regulation 170/03. The exemption applies to a drinking water system if, in two consecutive periods at reduced sampling, not more than 10% of all samples from plumbing exceed the maximum allowable concentration (MAC) of 10 µg/L for lead. As such, the system was required to test for total alkalinity and pH in three distribution sample collected during the periods of December 15 to April 15 (winter period) and June 15 to October 15 (summer period). This testing is required in every 12-month period with lead testing in every third 12-month period.

Two rounds of alkalinity and pH testing were carried out on March 28<sup>th</sup> and September 24<sup>th</sup> of 2019. Results are summarized in the table below.

**Summary of Lead Data** (sampled in the distribution system)

Date of Sample	# of Samples	Field pH (min to max)	Field Temperature (°C) (min to max)	Alkalinity (mg/L) (min to max)	Lead (µg/L) (min to max)
March 28	3	7.06 to 7.12	4.9 to 5.2	38 to 39	N/A
September 24	3	7.61 to 7.70	14 to 15	28 to 28	N/A

**Note:** Next lead sampling scheduled for 2020

**Most Recent Schedule 23 Inorganic Data Tested at the Water Treatment Plant**

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Antimony	< 0.5	ug/L	6	No	No
Arsenic	< 1	ug/L	10	No	No
Barium	28	ug/L	1000	No	No
Boron	2	ug/L	5000	No	No
Cadmium	< 0.1	ug/L	5	No	No
Chromium	1	ug/L	50	No	No
Mercury	< 0.1	ug/L	1	No	No
Selenium	< 0.5	ug/L	50	No	No
Uranium	< 1	ug/L	20	No	No

**Note:** Sample required every 12 months (sample date = October 9, 2019)

**Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant**

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Alachlor	< 0.223	ug/L	5	No	No
Atrazine + N-dealkylated metabolites	< 0.5	ug/L	5	No	No
Azinphos-methyl	< 0.168	ug/L	20	No	No
Benzene	< 0.1	ug/L	1	No	No
Benzo(a)pyrene	< 0.009	ug/L	0.01	No	No
Bromoxynil	< 0.492	ug/L	5	No	No
Carbaryl	< 2	ug/L	90	No	No

**Most Recent Schedule 24 Organic Data Tested at the Water Treatment Plant**

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	
Carbofuran	< 3	ug/L	90	No	No
Carbon Tetrachloride	< 0.2	ug/L	2	No	No
Chlorpyrifos	< 0.168	ug/L	90	No	No
Diazinon	< 0.168	ug/L	20	No	No
Dicamba	< 0.08	ug/L	120	No	No
1,2-Dichlorobenzene	< 0.2	ug/L	200	No	No
1,4-Dichlorobenzene	< 0.3	ug/L	5	No	No
1,2-Dichloroethane	< 0.2	ug/L	5	No	No
1,1-Dichloroethylene (vinylidene chloride)	< 0.3	ug/L	14	No	No
Dichloromethane	< 1	ug/L	50	No	No
2-4 Dichlorophenol	< 0.2	ug/L	900	No	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	< 0.343	ug/L	100	No	No
Diclofop-methyl	< 0.114	ug/L	9	No	No
Dimethoate	< 0.168	ug/L	20	No	No
Diquat	< 0.2	ug/L	70	No	No
Diuron	< 9	ug/L	150	No	No
Glyphosate	< 20	ug/L	280	No	No
MCPA	< 5.72	ug/L	100	No	No
Malathion	< 0.168	ug/L	190	No	No
Metolachlor	< 0.112	ug/L	50	No	No
Metribuzin	< 0.112	ug/L	80	No	No
Monochlorobenzene	< 0.5	ug/L	80	No	No
Paraquat	< 0.2	ug/L	10	No	No
Pentachlorophenol	< 0.3	ug/L	60	No	No
Phorate	< 0.112	ug/L	2	No	No
Picloram	< 0.08	ug/L	190	No	No
Polychlorinated Biphenyls (PCB)	< 0.06	ug/L	3	No	No
Prometryne	< 0.0558	ug/L	1	No	No
Simazine	< 0.168	ug/L	10	No	No
Terbufos	< 0.112	ug/L	1	No	No
Tetrachloroethylene	< 0.3	ug/L	10	No	No
2,3,4,6-Tetrachlorophenol	< 0.2	ug/L	100	No	No
Triallate	< 0.112	ug/L	230	No	No
Trichloroethylene	< 0.3	ug/L	5	No	No
2,4,6-Trichlorophenol	< 0.2	ug/L	5	No	No
Trifluralin	< 0.112	ug/L	45	No	No
Vinyl Chloride	< 0.1	ug/L	1	No	No

Note: Sample required every 12 months (sample date = October 9, 2019)

***Inorganic or Organic Test Results that Exceeded Half the Standard Prescribed in Schedule 2 of the Ontario Drinking Water Quality Standards.***

No inorganic or organic parameter(s) listed in Schedule 23 and 24 of Ontario Regulation 170/03 exceeded half the standard found in Schedule 2 of the Ontario Drinking Water Standard (O. Reg. 169/03) during the reporting period.

***Most Recent Sodium Data Sampled at the Water Treatment Plant***

Date of Sample	No. of Samples	Result Value	Unit of Measure	Standard	Exceedance
October 5, 2015	1	25.9	mg/L	20	Yes

**Note:** Sample required every 60 months. Next sampling scheduled for October 2020

The aesthetic objective for sodium in drinking water is 200 mg/L at which it can be detected by a salty taste. It is required that the local Medical Officer of Health be notified when the concentration exceeds 20 mg/L so that persons on sodium restricted diets can be notified by their physicians. Sodium exceedances are only reported every five years. The last reported exceedance occurred in February 2012 (AWQI# 105146).

***Most Recent Fluoride Data Sampled at the Water Treatment Plant***

Date of Sample	No. of Samples	Result Value	Unit of Measure	Standard	Exceedance
October 5, 2015	1	< 0.1	mg/L	1.5	No

**Note:** Sample required every 60 months. Next sampling scheduled for October 2020

***Additional Testing Performed in Accordance with an Approval, Order or Legal Instrument***

Legal Instrument: Schedule C, Issue 4 to DWWP 214-201: Authorization to Alter the Drinking Water System

The Town of Kirkland Lake has historically experienced a high number of discoloured water complaints from residents during the winter months. There is growing public concern over the quality of drinking water in the Town. The suspected cause of the discoloured water is high levels of iron and manganese in the raw water source (Gull Lake) while the lake is frozen during the winter months. Both the iron and manganese concentrations within the lake vary seasonally reaching a peak during the cold winter months.

A pilot trial of soda ash for pH adjustment and chlorine dioxide for the oxidation of iron and manganese was implemented for the Kirkland Lake drinking water system on January 11, 2018 and ended in May 2018.



The process has significantly improved the aesthetic quality of the water by removing iron well below the aesthetic objective (0.3 mg/L) and increasing the removal rate of manganese by a factor of 5.

Parameters tested during and after the trial in 2019 were hardness, dissolved oxygen, total solids, total dissolved solids in the raw, treated, and distribution water. Iron and manganese was tested for both the raw and treated water. Chlorate, chlorite, THMs, and HAAs was tested in the treated and distribution water. These samples were sent to an accredited laboratory for testing and the results can be found in the [Appendix C](#). It should be noted that at no time during the reporting period did the values exceed MAC limits of over 1mg/L for chlorate and chlorite, over 100 ug/L for THMs, and over 80 ug/L for HAA.

In-house testing of the iron, manganese, chlorine dioxide residual, pH, temperature, and alkalinity was done at multiple locations in the plant. These locations include Incoming Raw, Pre-Clarifier, Post Clarifier, Post Filter, and Finished Water. This in-house results are found in [Appendix D](#).



Kirkland Lake Drinking Water System

Schedule 22

# 2019 SUMMARY REPORT

## FOR MUNICIPALITIES



## Schedule 22 - SUMMARY REPORTS FOR MUNICIPALITIES

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### 1.0 INTRODUCTION

<b>Drinking-Water System Name:</b>	<b>Kirkland Lake Drinking Water System</b>
<b>Municipal Drinking Water Licence (MDWL) No.:</b>	214-101-2 (issued April 13, 2016)
<b>Drinking Water Work Permit (DWWP) No.:</b>	214-201-3 (issued May 5, 2017)
<b>Permit to Take Water (PTTW) No.:</b>	5882-APGJY8 (issued July 25, 2017)
<b>Period being reported:</b>	January 1, 2019 to December 31, 2019

### 2.0 REQUIREMENTS THE SYSTEM FAILED TO MEET

According to information kept on record by OCWA, the Kirkland Lake Drinking Water System has complied with all the requirements set out in the system's MDWL, its DWWP, the Act and its Regulations.

### 3.0 SUMMARY OF FLOWS AND COMPARISON TO REGULATORY LIMITS

#### ***Flow Monitoring***

MDWL No. 214-101 requires the owner to install a sufficient number of flow measuring devices to permit the continuous measurement and recording of:

- the flow rate and daily volume of treated water that flows from the treatment subsystem  
the distribution system (treated water flow from the high lift pump facilities), and
- the flow rate and daily volume of water that flows into the treatment subsystem (raw water flow from the low lift pump facilities).

The flow monitoring equipment identified in the MDWL is present and operating as required. These flow meters are calibrated on an annual basis as specified in the manufacturers' instructions.

#### ***Water Usage***

The following water usage tables summarize the quantities and flow rates of water taken and produced during the 2019 reporting period, including total monthly volumes, average monthly volumes, maximum monthly volumes, and maximum flow rates.



## Raw Water

### 2019 - Monthly Summary of Water Takings from the Source (Gull Lake)

Regulated by by Permit to Take Water (PTTW) #5882-APGJY8 (issued July 25, 2017)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m <sup>3</sup> )	360263	339315	412108	375625	335893	335979	409418	376087	309377	333595	320714	335824	4244198
Average Volume (m <sup>3</sup> /d)	11621	12118	13294	12521	10835	11199	13207	12132	10313	10761	10690	10833	11627
Maximum Volume (m <sup>3</sup> /d)	13072	15250	15457	15410	12566	13600	16483	17191	11320	13543	12144	13038	17191
PTTW - Maximum Allowable Volume (m <sup>3</sup> /day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
Maximum Flow Rate (L/min)	9120	12990	12966	13122	13356	13350	13554	15552	13122	13050	13020	14646	15552
PTTW - Maximum Allowable Flow Rate (L/min)	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625	15625

The system's Permit to Take Water allows the Municipality to withdraw a maximum volume of 22,500 cubic meters from Gull Lake each day. A review of the raw water flow data indicates that the system did not exceed the maximum allowable volume or maximum flow rate during the reporting period.

## Treated Water

### 2019 - Monthly Summary of Treated Water Supplied to the Distribution System

Regulated Municipal Drinking Water Licence (MDWL) #214-101 - Issue 2, dated April 13, 2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m <sup>3</sup> )	342287	323386	392247	353960	312513	316332	379549	342826	286041	313517	304423	316976	3984057
Average Volume (m <sup>3</sup> /d)	11042	11550	12653	11799	10081	10544	12244	11059	9535	10113	10147	10225	10916
Maximum Volume (m <sup>3</sup> /d)	12645	14174	14898	14198	11647	13245	15321	15485	10742	12433	11456	11861	15485
MDWL/C of A - Rated Capacity (m <sup>3</sup> /day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500

Schedule C, Section 1.0 (1.1) of MDWL No. 214-101 states that the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed 22,500 m<sup>3</sup>/day. The Kirkland Lake DWS complied with this limit having a recorded maximum volume of 15,485 m<sup>3</sup>/day in August which represents 68.8% of the rated capacity.

Figure 1 compares the average and maximum flow rates into the distribution system to the rated capacity of the system identified in the MDWL.

Figure 2 provides water usage information for the community of Swastika.

**Figure 1: 2019 - Monthly Volume of Treated Water into the Distribution System**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Average Flow (m<sup>3</sup>/day)</i>	11042	11550	12653	11799	10081	10544	12244	11059	9535	10113	10147	10225
<i>Maximum Flow (m<sup>3</sup>/day)</i>	12645	14174	14898	14198	11647	13245	15321	15485	10742	12433	11456	11861
<i>MDWL - Rated Capacity</i>	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
<i>% Rated Capacity</i>	56	63	66	63	52	59	68	69	48	55	51	53

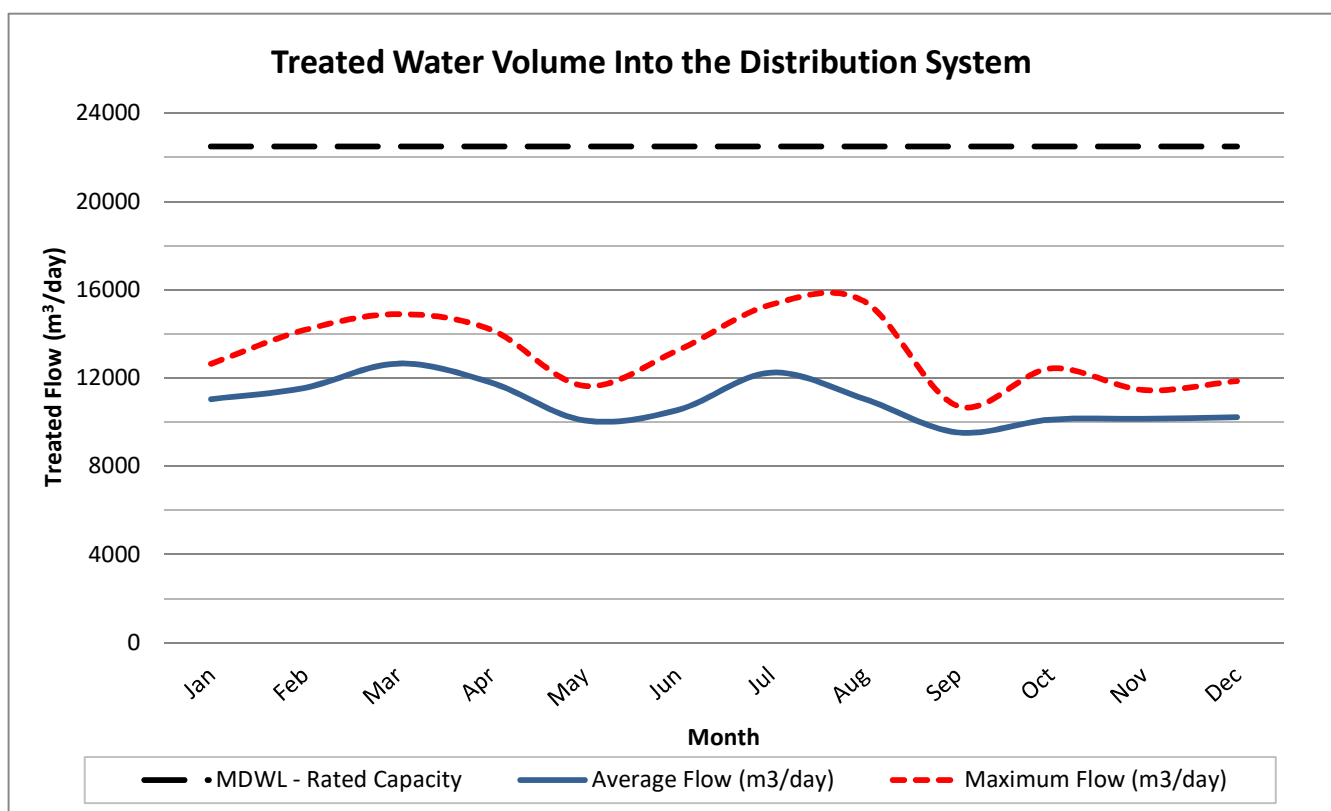
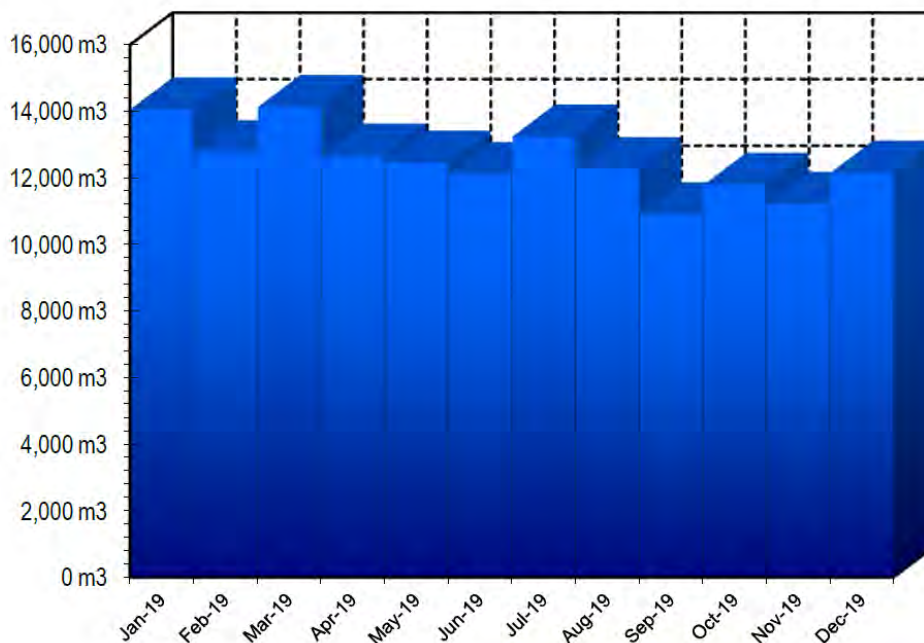




Figure 2 – Swastika Water Usage

Swastika mag. meter (into Town)					
Mth	WTP discharge	Swastika's USAGE (%)	metered volume	HIGHEST DAY	AVERAGE DAY
Jan-19	342,286 m3	4.10%	14,049 m3	471.1 m3	453 m3
Feb-19	323,386 m3	3.95%	12,771 m3	481.8 m3	456 m3
Mar-19	392,244 m3	3.60%	14,131 m3	472.9 m3	456 m3
Apr-19	353,960 m3	3.58%	12,663 m3	455.2 m3	422 m3
May-19	312,511 m3	3.98%	12,453 m3	752.1 m3	402 m3
Jun-19	316,334 m3	3.83%	12,111 m3	451.4 m3	404 m3
Jul-19	379,550 m3	3.49%	13,241 m3	503.0 m3	427 m3
Aug-19	342,824 m3	3.58%	12,256 m3	466.8 m3	395 m3
Sep-19	286,044 m3	3.81%	10,898 m3	387.3 m3	363 m3
Oct-19	313,517 m3	3.76%	11,785 m3	751.5 m3	380 m3
Nov-19	304,421 m3	3.69%	11,218 m3	421.8 m3	374 m3
Dec-19	316,971 m3	3.84%	12,157 m3	421.9 m3	392 m3
<b>Annual Total</b>	3,984,049 m3	3.76%	<b>149,732 m3</b>		
Maximum month	392,244 m3	4.10%	14,131 m3	752.1 m3	
	March-19	Jan-19	March-19	29-May-19	
Minimum month	286,044 m3		10,898 m3		
	September-19		September-19		
Average month	332,004 m3		12,478 m3		
Average day for the year				410 m3	

### Town of Swastika (net) WATER USAGE





### ***Summary of System Performance***

The following information is provided to enable the Owner to assess the capability of the system to meet existing and future water usage needs.

Rated Capacity of the Plant (MDWL)	22,500 m <sup>3</sup> /day	
Average Daily Flow for 2019	10,916 m <sup>3</sup> /day	48.5 % of the rated capacity
Maximum Daily Flow for 2019	15,485 m <sup>3</sup> /day	68.8 % of the rated capacity
Total Treated Water Produced in 2019	3,894,057 m <sup>3</sup>	

### **CONCLUSION**

The Kirkland Lake Drinking Water System operated well in 2019 complying with the regulatory requirements of the Safe Drinking Water Act and its Regulations and met the terms and conditions outlined in its site specific drinking water works permit and municipal drinking water licence having no incidents of non-compliance during the reporting period.

The system was able to operate within the water taking limits of the permit and in accordance with the rated capacity of the licence while meeting the community's demand for water use.



# **APPENDIX A**

## Monthly Summary of Microbiological Test Results

Facility Works Number:	220000308
Facility Classification:	Class 3 Water Treatment
Total Design Capacity:	22500.0 m3/day

RAW WATER		01/2019		02/2019		03/2019		04/2019		05/2019		06/2019		07/2019		08/2019		09/2019		10/2019		11/2019		12/2019		Total		Avg		Max		Min	
Gull Lake / Total Coliform: TC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab		<	2		46		36		32		90		12		6		10		212		324		270		20						324		
Mean Lab		<	1.6		16.5		12		14		68		6.667		4		5.25		99.2		190.5		212		14.4			<		52.62			
Min Lab		<	0		4		2		8		54		2		2		2		8		98		130		8								0
Gull Lake / E. Coli: EC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab		<	2	<	2	<	2	<	2	<	2	<	2	<	2	<	5		22	<	2	<	2	<	2						22		
Mean Lab		<	1.6	<	2	<	1.5	<	2	<	2	<	2	<	2	<	2.75		7.6	<	2	<	2	<	2			<		2.54			
Min Lab		<	0	<	2	<	0	<	2	<	2	<	2	<	2	<	2		2	<	2	<	2	<	2								0
TREATED WATER		01/2019		02/2019		03/2019		04/2019		05/2019		06/2019		07/2019		08/2019		09/2019		10/2019		11/2019		12/2019		Total		Avg		Max		Min	
Treated Water (POE) / Total Coliform: TC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
Treated Water (POE) / E. Coli: EC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
Treated Water (POE) / HPC - cfu/mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	20	>	2000	<	10	<	10	<	10				>		2000		
Mean Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	12.5	>	416	<	10	<	10	<	10			?		48.491			
Min Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	>	10	<	10	<	10	<	10							<	10
DISTRIBUTION WATER		01/2019		02/2019		03/2019		04/2019		05/2019		06/2019		07/2019		08/2019		09/2019		10/2019		11/2019		12/2019		Total		Avg		Max		Min	
KL-3 / Total Coliform: TC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-3 / E. Coli - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-3 / HPC - cfu/mL																																	
Count Lab			2		2		1		2		2		2		2		2		2		2		1		2		22						
Max Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10						10		
Mean Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10			<		10			
Min Lab		<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10							<	10
KL-4 / Total Coliform: TC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-4 / E. Coli - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-4 / HPC - cfu/mL																																	
Count Lab			1		2		1		1		0		2		2		2		2		1		2		2		18						
Max Lab		<	10	<	10	<	10	<	10			<	10	<	10		20		80	<	10	<	10	<	10						80		
Mean Lab		<	10	<	10	<	10	<	10			<	10	<	10	<	15		45	<	10	<	10	<	10			<		14.444			
Min Lab		<	10	<	10	<	10	<	10			<	10	<	10	<	10		10	<	10	<	10	<	10							<	10
KL-5 / Total Coliform: TC - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-5 / E. Coli - cfu/100mL																																	
Count Lab			5		4		4		5		4		4		5		4		5		4		4		5		53						
Max Lab			0		0		0		0		0		0		0		0		0		0		0		0						0		
Mean Lab			0		0		0		0		0		0		0		0		0		0		0		0					0			
Min Lab			0		0		0		0		0		0		0		0		0		0		0		0								0
KL-5 / HPC - cfu/mL																																	
Count Lab																																	



# **APPENDIX B**

## Monthly Summary of Operational Data

**KIRKLAND LAKE DRINKING WATER SYSTEM  
2019 SUMMARY OF OPERATIONAL RESULTS**

Facility Works Number: 220000308  
Facility Classification: Class 3 Water Treatment  
Total Design Capacity: 22500.0 m3/day

<b>FILTERED WATER</b>	01/2019	02/2019	03/2019	04/2019	05/2019	06/2019	07/2019	08/2019	09/2019	10/2019	11/2019	12/2019	Total	Avg	Max	Min
<b>Filter 1 / Turbidity (1 NTU) - NTU</b>																
Max OL	0.37	0.07	0.95	0.08	0.1	0.66	0.18	0.2	0.13	0.14	0.12	0.45			0.95	
Mean OL	0.025	0.029	0.028	0.03	0.034	0.051	0.051	0.063	0.049	0.046	0.042	0.061		0.042		
Min OL	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03				0.02
<b>Filter 2 / Turbidity (1.0 NTU) - NTU</b>																
Max OL	0.11	0.52	1.94*	0.09	0.28	0.53	0.22	0.19	0.15	0.13	0.12	0.49			1.94	
Mean OL	0.031	0.038	0.039	0.04	0.046	0.058	0.058	0.064	0.055	0.051	0.049	0.074		0.05		
Min OL	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04				0.03
<b>Filter 3 / Turbidity (1.0 NTU) - NTU</b>																
Max OL	0.11	0.11	2.36*	0.1	1.26*	0.47	0.33	0.21	0.26	0.17	0.15	0.35			2.36	
Mean OL	0.038	0.033	0.034	0.037	0.042	0.061	0.059	0.071	0.058	0.055	0.057	0.091		0.053		
Min OL	0.02	0	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.05				0.00
<b>Filter 4 / Turbidity (1.0 NTU) - NTU</b>																
Max OL	0.09	2.13*	1.98*	0.11	4.67*	0.31	4.75*	0.44	0.14	0.214	0.26	0.46			4.75	
Mean OL	0.032	0.034	0.037	0.039	0.051	0.057	0.063	0.072	0.054	0.049	0.052	0.085		0.052		
Min OL	0.02	0	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.03	0.04				0.00
<b>TREATED WATER</b>	01/2019	02/2019	03/2019	04/2019	05/2019	06/2019	07/2019	08/2019	09/2019	10/2019	11/2019	12/2019	Total	Avg	Max	Min
<b>Treated Water (POE) / Cl Residual: Free (0.80 mg/L) - mg/L</b>																
Max OL	1.74	1.79	2.95	1.77	1.97	2.29	2.03	2	1.84	1.89	1.98	1.66			2.95	
Mean OL	1.464	1.461	1.375	1.48	1.416	1.416	1.348	1.294	1.326	1.432	1.442	1.302		1.396		
Min OL	1.14	1.00	0.92	0.82	0.16**	0.43**	0.74**	0.67**	0.68**	1.07	1.08	0.93				0.18
<b>DISTRIBUTION WATER</b>	01/2019	02/2019	03/2019	04/2019	05/2019	06/2019	07/2019	08/2019	09/2019	10/2019	11/2019	12/2019	Total	Avg	Max	Min
<b>KL-3 / Cl Residual: Free - mg/L</b>																
Count IH	10	8	8	9	9	8	9	9	9	9	8	9	105			
Total IH	10.4	9.02	9.63	9.83	10.57	7.73	6.52	7.58	8.7	9.03	8.92	8.7	106.63			
Max IH	1.37	1.44	1.52	1.26	1.71	1.61	1.04	1.17	1.39	1.32	1.73	1.19			1.73	
Mean IH	1.04	1.128	1.204	1.092	1.174	0.966	0.724	0.842	0.967	1.003	1.115	0.967		1.016		
Min IH	0.73	0.82	0.92	0.99	0.83	0.67	0.44	0.56	0.72	0.46	0.67	0.7				0.44
<b>KL-4 / Cl Residual: Free - mg/L</b>																
Count IH	10	8	8	9	9	8	9	9	9	9	8	9	105			
Total IH	10.83	8.54	10.02	10.55	8.96	7.29	6.41	6.21	7.23	9.13	8.32	7.96	101.45			
Max IH	1.21	1.25	1.39	1.33	1.26	1.09	1.07	0.97	1.26	1.37	1.29	1.2			1.39	
Mean IH	1.083	1.068	1.253	1.172	0.996	0.911	0.712	0.69	0.803	1.014	1.04	0.884		0.966		
Min IH	0.86	0.79	0.93	1.02	0.75	0.83	0.46	0.56	0.35	0.6	0.85	0.53				0.35
<b>KL-5 / Cl Residual: Free - mg/L</b>																
Count IH	10	8	8	9	9	8	9	9	9	9	8	9	105			
Total IH	11.18	9.75	10.17	10.84	9.2	7.44	6.98	6.87	7.7	9.42	8.03	8.13	105.71			
Max IH	1.22	1.41	1.41	1.3	1.22	1.06	1.01	0.94	1.05	1.26	1.49	1.17			1.49	
Mean IH	1.118	1.219	1.271	1.204	1.022	0.93	0.776	0.763	0.856	1.047	1.004	0.903		1.007		
Min IH	0.9	1.07	1.19	1.11	0.79	0.81	0.62	0.49	0.75	0.7	0.55	0.55				0.49
<b>KL-6 / Cl Residual: Free - mg/L</b>																
Count IH	5	4	4	5	4	4	5	4	5	4	4	5	53			
Total IH	5.51	3.8	4.86	5.7	4.38	4.63	3.09	2.69	4.57	4.23	4.6	4.79	52.85			
Max IH	1.26	1.1	1.47	1.34	1.38	1.33	0.79	1.1	1.34	1.09	1.44	1.17			1.47	
Mean IH	1.102	0.95	1.215	1.14	1.095	1.158	0.618	0.673	0.914	1.058	1.15	0.958		0.997		
Min IH	0.96	0.81	0.92	1.02	0.93	1.04	0.44	0.09	0.61	1.02	0.93	0.7				0.09
<b>KL-7 / Cl Residual: Free - mg/L</b>																
Count IH	5	4	4	5	4	4	5	4	5	4	4	5	53			
Total IH	7.17	5.28	5.48	6.68	5.64	5.03	4.39	2.62	5.59	4.08	3.58	4.56	60.1			
Max IH	1.57	1.43	1.46	1.6	1.65	1.72	1.09	0.87	1.38	1.13	1.07	1.26			1.72	
Mean IH	1.434	1.32	1.37	1.336	1.41	1.257	0.878	0.655	1.118	1.02	0.895	0.912		1.134		
Min IH	1.33	1.22	1.27	1.15	1.11	0.98	0.57	0.42	0.91	0.82	0.54	0.75				0.42
<b>Chaput Hughes Standpipe / Cl Residual: Free (0.05 mg/L) - mg/L</b>																
Max OL	2.73	4.91	4.87	4.34	3.93	5.04	3.75	4.15	5.05	5.04	2.83	2.93			5.05	
Mean OL	1.499	1.469	1.482	1.443	1.29	1.245	1.101	0.984	1.177	1.255	1.558	1.425		1.327		
Min OL	0.67	0.66	0.61	0.61	0.51	0.31	0.11	0.08	0.346	0.56	0.76	0.42				0.08
<b>Swastika Booster Station / Cl Residual: Free (0.05 mg/L) - mg/L</b>																
Max OL	2.09	1.88	1.85	1.92	2.02	2.11	1.77	5.01	2.2	1.97	1.97	2.19			5.01	
Mean OL	1.526	1.473	1.423	1.445	1.353	1.293	1.024	0.945	1.251	1.26	1.273	1.087		1.279		
Min OL	1.13	1.09	1.04	1.11	0.76	0.63	0.64	0.08	0.2	0.69	0.73	0.46				0.08

**NOTES:**

\* Turbidity exceedances

February 23 - high turbidity on filter No. 4 due to backwash pump failure. Filter shutdown.

March 27 - high turbidity on filter No. 2, 3 and 4 due to clarifier carry over. Filter shutdown

March 29 - high turbidity on filter No. 3 and 4 due to clarifier carry over. Filter shutdown

May 21 - high turbidity on filter No. 3 & 4 due to clarifier carryover. Filters shutdown and backwashes performed to reduce turbidity levels.

July 27 - high turbidity on filter No. 4 which lasted approximately 10 minutes. Turbidity exceedances occur when two (2) readings are above 1 NTU for 15 minutes or more in a 24 hour period.

\*\* Low treated water chlorine incidents

CT is the concentration of chlorine in the water times the time of contact that the chlorine has with the water. It is used to demonstrate the level of disinfection treatment in the water. CT calculations are reviewed using the plant's SCADA system if the free chlorine residual level drops below 0.80 mg/L to ensure primary disinfection is achieved.

May 3 - Free chlorine residual of 0.18 mg/L due to analyzer issues. CT calculated and passed.

June 17, 18, 22 - Low free chlorine residuals (0.43, 0.68, 0.58 mg/L). CT passed

July 24 - Low free chlorine residuals (0.74 mg/L). CT passed

August 18 & 22 - Low free chlorine residuals (0.67, 0.70 mg/L). CT passed

September 13 & 25 - Low free chlorine residuals (0.71, 0.68 mg/L). CT passed



# **APPENDIX C**

Chlorine Dioxide Trial - Laboratory Data

Kirkland Lake DWS - Chlorine Dioxide Trial Laboratory Test Results  
Trial Period - January 2018 to May 2018

Date	RAW WATER						FINISHED WATER										DISTRIBUTION WATER							
	Hardness	DO	TS	TDS	Fe (ug/L)	Mn (ug/L)	Chlorate	Chlorite	THM (ug/L)	HAA (ug/L)	Hardness	DO	TS	TDS	Fe (ug/L)	Mn (ug/L)	Chlorate	Chlorite	THM (ug/L)	HAA (ug/L)	Hardness	DO	TS	TDS
08-Jan-19					150	106									28	16			38.6	63				
24-Jan-19	37.1	8	200	180			0.13	0.36	24.9	37	37.4	8.7	230	130			0.12	0.39	41.9	34	37.5	9	210	150
04-Feb-19					208	123									35	42								
28-Feb-19	36.8	7.2	80	120			0.11	0.35	27.6	38	36.8	9.1	80	190			0.11	0.29	48	56	37.5	9.4	260	160
04-Mar-19					193	100									37	60								
28-Mar-19	37.7	6.1	120	140			0.14	0.47	16.8	28	37.8	9	40	160			0.15	0.45	30	34	37	8.3	170	130
01-Apr-19					282	20			33.7	45					63	37								
29-Apr-19	41.9	7	100	210			0.15	0.44	18.4	27	43.1	8.6	110	110			0.14	0.4	28.3	29	43.1	8.8	130	130
06-May-19					318	139									42	25								
29-May-19		9.2	50	40			0.12	0.26	29.7	17	29.2	3.8	80	90			0.12	0.29	48.7	17	29	9.2	90	80
03-Jun-19					205	46									66	15								
27-Jun-19	29.2	8.6	90	90			0.1	0.07	22.4	30	30.4	7	90	90			0.06	0.13	71.5	45	30.1	9.1	80	80
02-Jul-19					101	34									27	18								
24-Jul-19	27.3	6.6	70	70			0.04	0.05	33.8	47	27.4	7.5	120	120			0.03	<0.01	67.4	48	29.6	7.4	121	120
06-Aug-19					85	22									27	5								
21-Aug-19	28.9	7.4	90	90			0.05	0.08	62.2	63	29.9	7.3	70	70			0.04	0.06	98.4	53	27.6	6.8	100	100
03-Sep-19					110	28									36	2								
25-Sep-19	32.1	7.3	101	100			0.05	0.05	23.4	39	32	7.7	130	130			0.05	0.08	44	32	31.7	7.7	160	160
07-Oct-19					100	13									49	9								
09-Oct-19																			60.5	22				
30-Oct-19	28.2	9.33	80	80			0.03	0.05	27.1	23	28	9.7	110	110			0.03	0.06			28.9	9.66	110	110
04-Nov-19					86	8									50	1								
25-Nov-19	28.9	*	110	110			0.03	0.08	32.3	21	30.8	*	100	100			0.03	0.05	Samples not collected		30.4	*	110	110
02-Dec-19																			49.9	24				
12-Dec-19					72	25									36	51								
17-Dec-19	43.8	*	100	100			0.12	0.32	33.2	24	39.2	*	70	71			0.09	0.26	55.1	22	40	*	70	70
MIN	27.3	6.1	50	40	72	8	0.03	0.05	16.8	17	27.4	3.8	40	70	27	1	0.03	0.05	28.3	17	27.6	6.8	70	70
MAX	43.8	9.33	200	210	318	139	0.15	0.47	62.2	63	43.1	9.7	230	190	66	60	0.15	0.45	98.4	63	43.1	9.66	260	160
MEAN	33.8	7.67	99.3	110.8	159.2	55.3	0.1	0.2	29.7	33.8	33.5	7.8	102.5	114.3	41.3	23.4	0.1	0.2	52.5	36.8	33.5	8.5	134.3	116.7

Notes: All results are in mg/L unless indicated

DO tested done in-house on October 31st. Lab not licensed to test for DO and stopped by the Ministry. Too late in October to ship to another lab. Spoke with local MECP Inspector J. Recoskie on Oct. 31st and she approved in-house testing in October.

\* DO testing stopped in November as per email from Janet Recoski (MECP Water Inspector) dated November 8, 2019



# **APPENDIX D**

Chlorine Dioxide Trial – In-house Daily Data

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKALINITY	Dioxide Residual	Ph	TEMP
1-Jan-19	0.12	0.126	38.5	6.78	5.1	0.11	0.117	0.11	6.86	0	0.034	6.78	0	0.031	0.18	6.35	0	0.027	37.3	0.22	7.22	4.9
2-Jan-19																						
3-Jan-19		0.024	37.2	6.61	5.1		0.099	0.14	6.81		0.017	6.5		0.007	0.11	6.38		0.009	36.2	0.31	7.29	4.9
4-Jan-19																						
5-Jan-19																						
6-Jan-19																						
7-Jan-19		0.026	38.1	6.96	5.1		0.114	0.17	7.16		0.024	6.88		0.02	0.09	6.36		0.025	35.7	0.1	6.99	5
8-Jan-19																						
9-Jan-19		0.096	35.2	6.86	5.4		0.118	0.19	7.08		0.034	7.02		0.049	0.04	6.76		0.038	31.2	0.17	7.04	5.1
10-Jan-19																						
11-Jan-19																						
12-Jan-19																						
13-Jan-19		0.111	34.3	7.21	5.1		0.12	0.22	6.98		0.029	7.09		0.028	0.04	6.8		0.033	30.1	0.17	6.98	5
14-Jan-19																						
15-Jan-19																						
16-Jan-19																						
17-Jan-19		0.094	37.8	6.81	5.2		0.127	0.21	6.92		0.015	6.87		0.01	0.02	6.95		0.013	39.5	0.31	7.36	4.9
18-Jan-19																						
19-Jan-19		0.033	37.5	6.82	5.1		0.122	0.25	6.96		0.026	6.8		0.021	0.03	6.63		0.028	42.1	0.11	6.98	4.8
20-Jan-19																						
21-Jan-19																						
22-Jan-19		0.083	37.2	6.87	5.2		0.105	0.25	7.03		0.027	6.96		0.023	0.09	6.81		0.021	36.8	0.19	7.13	4.9
23-Jan-19																						
24-Jan-19																						
25-Jan-19																						
26-Jan-19																						
27-Jan-19		0.039	37	6.91	5.2		0.115	0.22	7.08		0.014	6.86		0.012	0.1	6.62		0.012	35.5	0.13	7.37	4.9
28-Jan-19																						
29-Jan-19																						
30-Jan-19		0.011	40.2	6.7	4.9		0.022	0.28	6.84		0.017	6.81		0.015	0.09	6.64		0.011	41.2	0.17	7.06	4.9
31-Jan-19																						
month Avg	0.12	0.06	37.30	6.85	0.03	0.11	0.11	0.20	6.97	0.00	0.03	6.86	0.00	0.02	0.08	0.03	0.00	0.02	36.56	0.19	7.14	4.93
month Min	0.12	0.01	34.30	6.61	4.90	0.11	0.02	0.11	6.81	0.00	0.01	6.50	0.00	0.01	0.02	6.35	0.00	0.01	30.10	0.10	6.98	4.80
month Max	0.12	0.13	40.20	7.21	5.40	0.11	0.13	0.28	7.16	0.00	0.03	7.09	0.00	0.05	0.18	6.95	0.00	0.04	42.10	0.31	7.37	5.10

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP
1-Feb-19																						
2-Feb-19																						
3-Feb-19																						
4-Feb-19																						
5-Feb-19		0.056	31.7	6.97	5		0.118	0.64	6.28		0.017	6.4		0.014	0.14	6.05		0.027	36.2	0.13	7.36	5
6-Feb-19																						
7-Feb-19		0.045	35.7	6.91	5.3		0.119	0.33	6.41		0.086	6.52		0.072	0.09	6.11		0.046	36.7	0.18	7.34	5
8-Feb-19	0.23	0.133	34.2	7.08	5	0.2	0.14	0.41	6.61		0.069	6.52		0.062	0.06	6.35		0.05	36.7	0.4	7.3	5.1
9-Feb-19																						
10-Feb-19																						
11-Feb-19	0.18	0.06	29.1	6.97	5.3	0.21	0.122	0.28	6.52	0.03	0.039	6.25	0.02	0.041	0.05	6.15		0.052	35.9	0.25	7.26	5.3
12-Feb-19																						
13-Feb-19																						
14-Feb-19	0.12	0.117	36.4	6.86	5.6	0.14	0.122	0.41	7.01		0.043	6.59		0.036	0.06	6.65		0.033	37	0.24	7.26	5.2
15-Feb-19																						
16-Feb-19																						
17-Feb-19																						
18-Feb-19																						
19-Feb-19	0.18	0.113	35.9	7.25	5.5	0.19	0.122	0.37	6.99		0.03	6.33	0.01	0.02	0.14	6.2		0.018	37.1	0.13	7.27	5.2
20-Feb-19																						
21-Feb-19																						
22-Feb-19																						
23-Feb-19																						
24-Feb-19																						
25-Feb-19																						
26-Feb-19																						
27-Feb-19																						
28-Feb-19																						
month Avg.	0.18	0.09	33.83	7.01	0.03	0.19	0.12	0.41	6.64	0.03	0.03	6.44	0.02	0.04	0.09	0.03	#DIV/0!	0.04	36.60	0.22	7.30	5.13
month Min	0.12	0.05	29.10	6.86	5.00	0.14	0.12	0.28	6.28	0.03	0.02	6.25	0.01	0.01	0.05	6.05	0.00	0.02	35.90	0.13	7.26	5.00
month Max	0.23	0.13	36.40	7.25	5.60	0.21	0.14	0.64	7.01	0.03	0.09	6.59	0.02	0.07	0.14	6.65	0.00	0.05	37.10	0.40	7.36	5.30

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP
1-Mar-19	0.17	0.125	36.2	7.14	6	0.17	0.134	0.33	6.85		0.064	6.63		0.062	0.27	6.34	0.01	0.061	37	0.31	7.15	5.5
2-Mar-19																						
3-Mar-19																						
4-Mar-19																						
5-Mar-19	0.13	0.125	36.6	7.2	6.4	0.14	0.123	0.3	6.89		0.077	6.46		0.08	0.12	6.33		0.077	39.3	0.12	7.45	5.2
6-Mar-19																						
7-Mar-19																						
8-Mar-19																						
9-Mar-19																						
10-Mar-19																						
11-Mar-19																						
12-Mar-19																						
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27-Mar-19																						
28-Mar-19																						
29-Mar-19																						
30-Mar-19																						
31-Mar-19																						
month Avg.	0.15	0.13	36.40	7.17	0.03	0.16	0.13	0.32	6.87	#DIV/0!	0.03	6.55	#DIV/0!	0.07	0.20	0.03	0.01	0.07	38.15	0.22	7.30	5.35
month Min	0.13	0.13	36.20	7.14	6.00	0.14	0.12	0.30	6.85	0.00	0.06	6.46	0.00	0.06	0.12	6.33	0.01	0.06	37.00	0.12	7.15	5.20
month Max	0.17	0.13	36.60	7.20	6.40	0.17	0.13	0.33	6.89	0.00	0.08	6.63	0.00	0.08	0.27	6.34	0.01	0.08	39.30	0.31	7.45	5.50

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER						
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP	
1-Apr-19																							
2-Apr-19	0.24	0.128	28.8	7	6	0.25	0.147	0.36	6.6	0.01	0.061	6.36	0	0.058	0.13	6.23	0.02	0.092	39.1	0.14	7.3	7	
3-Apr-19																							
4-Apr-19	0.26	0.075	34	7.07	6.9	0.27	0.158	0.38	6.72	0.01	0.029	6.53	0.1	0.128	0.19	6.52	0.02	0.014	40.2	0.11	7.31	4.9	
5-Apr-19																							
6-Apr-19																							
7-Apr-19																							
8-Apr-19																							
9-Apr-19	0.18	0.037	35	7.01	6.7	0.25	0.142	0.4	6.94	0	0.013	6.38	0	0.013	0.28	6.26	0	0.024	37.1	0.19	7.45	5	
10-Apr-19																							
11-Apr-19																							
12-Apr-19	0.28	0.146	35.5	7.03	6.8	0.25	0.155	0.56	7.1	0	0.027	6.49	0	0.014	0.1	6.29	0	0.01	37.7	0.2	7.33	5	
13-Apr-19																							
14-Apr-19																							
15-Apr-19																							
16-Apr-19	0.33	0.133	38.2	7.04	6	0.35	0.184	0.45	7.04	0	0.053	6.52	0	0.05	0.27	6.3	0	0.048	40	0.14	7.27	5	
17-Apr-19																							
18-Apr-19																							
19-Apr-19																							
20-Apr-19																							
21-Apr-19																							
22-Apr-19																							
23-Apr-19																							
24-Apr-19	0.25	0.149	40	7.11	6	0.25	0.161	0.48	6.95	0	0.032	6.39	0	0.032	0.18	6.39	0	0.042	40.7	0.35	7.26	5.5	
25-Apr-19																							
26-Apr-19																							
27-Apr-19																							
28-Apr-19																							
29-Apr-19																							
30-Apr-19																							
month Avg.	0.26	0.11	35.25	7.04	6.03	0.27	0.16	0.44	6.89	0.00	0.03	6.45	0.02	0.05	0.19	0.03	0.01	0.04	39.13	0.19	7.32	5.40	
month Min	0.18	0.04	28.80	7.00	6.00	0.25	0.14	0.36	6.60	0.00	0.01	6.36	0.00	0.01	0.10	6.23	0.00	0.01	37.10	0.11	7.26	4.90	
month Max	0.33	0.15	40.00	7.11	6.90	0.35	0.18	0.56	7.10	0.01	0.06	6.53	0.10	0.13	0.28	6.52	0.02	0.09	40.70	0.35	7.45	7.00	

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP
1-May-19	0.3	0.148	43.1	7.08	6	0.34	0.16	0.62	6.87	0	0.04	6.58	0	0.026	0.34	6.35	0	0.043	41.8	0.61	7.25	5
2-May-19																						
3-May-19																						
4-May-19																						
5-May-19	0.23	0.117	41.5	7.02	6	0.25	0.109	0.48	6.84	0	0.029	6.47	0	0.025	0.16	6.43	0.01	0.025	41	0.2	7.37	5.6
6-May-19																						
7-May-19																						
8-May-19																						
9-May-19	0.08	0.042	34	7.03	6	0.08	0.04	0.25	7.11	0	0.006	6.55	0	0.01	0.15	6.33	0	0.007	41	0.32	7.4	4.4
10-May-19																						
11-May-19																						
12-May-19																						
13-May-19	0.07	0.023		7.1	6								0.02	0.014	0.18		0	0.011		0.25	7.46	4.5
14-May-19																						
15-May-19																						
16-May-19																						
17-May-19	0.16	0.053	24.5	6.6	11	0.16	0.054	0.12	6.7	0	0.03	6.27	0	0.026	0.06	6.25	0	0.022	26.5	0.19	7.28	9
18-May-19																						
19-May-19																						
20-May-19																						
21-May-19																						
22-May-19																						
23-May-19																						
24-May-19																						
25-May-19																						
26-May-19																						
27-May-19																						
28-May-19	0.16	0.056	25	6.91	10	0.13	0.055	0.25	6.91	0	0.025	6.28	0	0.031	0.13	6.06	0	0.032	26.8	0.12	7.46	10
29-May-19																						
30-May-19																						
31-May-19																						
month Avg.	0.17	0.07	33.62	6.96	0.03	0.19	0.08	0.34	6.89	0.00	0.03	6.43	0.00	0.02	0.17	0.03	0.00	0.02	35.42	0.28	7.37	6.42
month Min	0.07	0.02	24.50	6.60	6.00	0.08	0.04	0.12	6.70	0.00	0.01	6.27	0.00	0.01	0.06	6.06	0.00	0.01	26.50	0.12	7.25	4.40
month Max	0.30	0.15	43.10	7.10	11.00	0.34	0.16	0.62	7.11	0.00	0.04	6.58	0.02	0.03	0.34	6.43	0.01	0.04	41.80	0.61	7.46	10.00

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER						
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP	
1-Jun-19																							
2-Jun-19																							
3-Jun-19																		0.02					
4-Jun-19	0.16	0.038	22.5	6.92	12	0.15	0.042	0	7.38	0.01	0.027	7.02	0	0.025	0.08	6.32	0.01	0.032	20	0.16	7.62	11.3	
5-Jun-19																							
6-Jun-19	0.1	0.025	18	7.02	13	0.13	0.034	0.17	6.44	0	0.012	6.44	0	0.016	0.14	6.01	0	0.018	26	0.09	7.27	12.1	
7-Jun-19																							
8-Jun-19																							
9-Jun-19																							
10-Jun-19	0.08	0.021	28	6.91	13	0.09	0.032	0.12	6.24	0	0.016	6.25	0	0.005	0.21	6.1	0	0.013	26	0.22	7.19	12.6	
11-Jun-19																							
12-Jun-19																							
13-Jun-19	0.06	0.029	25	6.96	13	0.08	0.025	0.17	6.82	0	0.011	6.4	0	0.012	0.07	6.16	0	0.009	28	0.18	7.55	12.4	
14-Jun-19																							
15-Jun-19																							
16-Jun-19																							
17-Jun-19																							
18-Jun-19																							
19-Jun-19	0.11	0.035	26	7.07	16	0.13	0.03	0.06	6.48	0.04	0.013	6.44	0	0.019	0.03	6.14	0.01	0.016	26.5	0.06	7.54	14.3	
20-Jun-19																							
21-Jun-19																							
22-Jun-19																							
23-Jun-19																							
24-Jun-19	0.08	0.012	21.5	7.09	16	0.08	0.014	0.24	7.1	0.01	0.007	6.55	0	0	0.13	6.35	0	0.012	27	0.11	7.54	14.6	
25-Jun-19																							
26-Jun-19																							
27-Jun-19	0.13	0.033	27.5	6.95	16	0.13	0.04	0.1	6.84	0.02	0.014	6.35	0.02	0.018	0.01	6.21	0.01	0.005	26.5	0.08	7.42	15.1	
28-Jun-19																							
29-Jun-19																							
30-Jun-19																							
month Avg.	0.10	0.03	24.07	6.99	0.03	0.11	0.03	0.12	6.76	0.01	0.03	6.49	0.00	0.01	0.10	0.03	0.00	0.02	25.71	0.13	7.45	13.20	
month Min	0.06	0.01	18.00	6.91	12.00	0.08	0.01	0.00	6.24	0.00	0.01	6.25	0.00	0.00	0.01	6.01	0.00	0.01	20.00	0.06	7.19	11.30	
month Max	0.16	0.04	28.00	7.09	16.00	0.15	0.04	0.24	7.38	0.04	0.03	7.02	0.02	0.03	0.21	6.35	0.01	0.03	28.00	0.22	7.62	15.10	

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKALINITY	Dioxide Residual	Ph	TEMP
1-Jul-19																						
2-Jul-19	0.14	0.047	26.5	7.03	16	0.12	0.041	0.04	7.01	0.01	0.033	6.34	0.01	0.032	0.05	6.14	0	0.033	28	0.1	7.38	16
3-Jul-19																						
4-Jul-19																						
5-Jul-19																						
6-Jul-19																						
7-Jul-19																						
8-Jul-19																						
9-Jul-19	0.09	0.034	28.3	6.89	17	0.08	0.038	0.07	6.89	0	0.023	6.3	0.02	0.038	0.04	6.01	0	0.026	28	0.09	7.26	16.8
10-Jul-19																						
11-Jul-19	0.11	0.077	23.3	6.63	17	0.11	0.071	0.05	6.57	0	0.021	6.29	0	0.023	0.04	6.34	0	0.022	30.3	0.05	7.03	16.8
12-Jul-19																						
13-Jul-19																						
14-Jul-19																						
15-Jul-19	0.12	0.086	30	6.51	17	0.15	0.085	0.16	6.77	0	0.037	6.4	0.03	0.043	0.02	6.11	0	0.014	31	0.08	7.2	17.5
16-Jul-19																						
17-Jul-19																						
18-Jul-19																						
19-Jul-19																						
20-Jul-19																						
21-Jul-19																						
22-Jul-19																						
23-Jul-19	0.25	0.309	22	6.73	22.3	0.09	0.051	0.1	6.82	0.02	0.007	6.57	0.02	0.033	0.18	6.46	0	0.015	28.2	0.08	7.2	21
24-Jul-19																						
25-Jul-19																						
26-Jul-19																						
27-Jul-19																						
28-Jul-19																						
29-Jul-19																						
30-Jul-19	0.24	0.188	18	6.85	22.3	0.1	0.043	0.17	6.85	0	0.003	6.99	0	0.006	0.01	6.02	0.01	0.006	26	0.12	7.3	21.7
31-Jul-19																						
month Avg.	0.16	0.12	24.68	6.77	0.03	0.11	0.05	0.10	6.82	0.01	0.03	6.48	0.01	0.03	0.06	0.03	0.00	0.02	28.58	0.09	7.23	18.30
month Min	0.09	0.03	18.00	6.51	16.00	0.08	0.04	0.04	6.57	0.00	0.00	6.29	0.00	0.01	0.01	6.01	0.00	0.01	26.00	0.05	7.03	16.00
month Max	0.25	0.31	30.00	7.03	22.30	0.15	0.09	0.17	7.01	0.02	0.04	6.99	0.03	0.04	0.18	6.46	0.01	0.03	31.00	0.12	7.38	21.70

Date	RAW WATER					Pre - CLARIFIER				Post- CLARIFIER			POST FILTER				FINISHED WATER						
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP	
1-Aug-19	0.1	0.07	29	6.95	22.7	0.08	0.03	0.06	6.91	0.01	0.012	6.52	0.01	0.004	0.14	7.03	0.01	0.008	28.3	0.08	7.44	22.2	
2-Aug-19																							
3-Aug-19																							
4-Aug-19																							
5-Aug-19																							
6-Aug-19	0.06	0.039	29.8	7.23	21.7	0.04	0.032	0.09	7.29	0	0.003	6.44	0	0.002	0.06	6.35	0	0	27	0.01	7.66	20.7	
7-Aug-19																							
8-Aug-19																							
9-Aug-19																							
10-Aug-19																							
11-Aug-19	0.13	0.094	26	7.17	21.3	0.08	0.039	0.16	6.98	0	0.003	6.56	0	0	0.12	6.12	0.01	0.008	25.5	0.1	7.31	20.9	
12-Aug-19																							
13-Aug-19																							
14-Aug-19																							
15-Aug-19																							
16-Aug-19	0.16	0.143	30.6	7	19.5	0.12	0.11	0.08	7.08	0	0.041	6.69	0	0.029	0.01	6.67	0	0.025	29	0.09	7.84	20.7	
17-Aug-19																							
18-Aug-19																							
19-Aug-19																							
20-Aug-19																							
21-Aug-19	0.81	0.115	30.5	7.2	21.6	0.07	0.046		7.17	0	0.001	7.23	0.01	0		6.53	0	0	27.1		7.48	21.5	
22-Aug-19																							
23-Aug-19																							
24-Aug-19																							
25-Aug-19																							
26-Aug-19	0.14	0.064	30.5	7.28	20.5	0.13	0.043	0.12	7.22	0.01	0	6.25	0.02	0.001	0.02	6.09	0.01	0	25.6	0.06	7.25	20	
27-Aug-19																							
28-Aug-19																							
29-Aug-19																							
30-Aug-19																							
31-Aug-19	0.11	0.041	30.4	7.35	20.5	0.11	0.036	0.08	7.27	0.02	0.007	6.64	0	0.007	0.02	6.28	0	0.001	25	0	7.25	20.2	
month Avg.	0.22	0.08	29.54	7.17	0.03	0.09	0.05	0.10	7.13	0.01	0.03	6.62	0.01	0.01	0.06	0.03	0.00	0.01	26.79	0.06	7.46	20.89	
month Min	0.06	0.04	26.00	6.95	19.50	0.04	0.03	0.06	6.91	0.00	0.00	6.25	0.00	0.00	0.01	6.09	0.00	0.00	25.00	0.00	7.25	20.00	
month Max	0.81	0.14	30.60	7.35	22.70	0.13	0.11	0.16	7.29	0.02	0.04	7.23	0.02	0.03	0.14	7.03	0.01	0.03	29.00	0.10	7.84	22.20	

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP
1-Sep-19																						
2-Sep-19																						
3-Sep-19	0.18	0.111	30.6	7.28	19	0.14	0.062	0.13	7.46	0	0.021	6.71	0.01	0.021	0.1	6.27	0	0.017	26.6	0.18	7.34	18.8
4-Sep-19																						
5-Sep-19																						
6-Sep-19	0.22	0.113	31.1	7.14	18	0.12	0.037	0.06	7.38	0.01	0.005	6.72	0.02	0.008	0	6.45	0	0.001	27.1	0.02	7.32	17.4
7-Sep-19																						
8-Sep-19																						
9-Sep-19	0.35	0.188	31.7	6.84	16.5	0.13	0.04	0.06	7.29	0.02	0.005	6.62	0.01	0.014	0	6.47	0	0.004	26.8	0.37	7.25	16.5
10-Sep-19																						
11-Sep-19																						
12-Sep-19	0.16	0.059	29.7	7.27	15.5	0.13	0.034	0.06	7.28	0.01	0.013	6.79	0.02	0.016	0.02	6.53	0	0.015	26.8	0.02	7.38	15.5
13-Sep-19																						
14-Sep-19																						
15-Sep-19																						
16-Sep-19	0.21	0.075	24	7.29	15.5	0.14	0.033	0.06	7.34	0.01	0.016	6.86	0	0.017	0.02	6.49	0	0.011	26.1	0.03	7.28	15.5
17-Sep-19																						
18-Sep-19																						
19-Sep-19	0.08	0.03	25.2	6.9	15.5	0.14	0.034	0	7.14	0.01	0.005	6.48	0.01	0.012	0.03	6.2	0	0.011	25.8	0.01	7.14	15.1
20-Sep-19																						
21-Sep-19																						
22-Sep-19																						
23-Sep-19	0.35	0.086	22.1	7.04	17	0.16	0.038	0.09	7.06	0.01	0.01	6.66	0.01	0.013	0.02	6.27	0	0.004	26.4	0	7.27	15.8
24-Sep-19																						
25-Sep-19																						
26-Sep-19	0.13	0.027	18.3	7.16	16.5	0.11	0.035	0.17	7.19	0.02	0.003	6.63	0.02	0.007	0.07	6.33	0.02	0.009	26.7	0.08	7.26	15.6
27-Sep-19																						
28-Sep-19																						
29-Sep-19																						
30-Sep-19																						
month Avg.	0.21	0.09	26.59	7.12	0.03	0.13	0.04	0.08	7.27	0.01	0.03	6.68	0.01	0.01	0.03	0.03	0.00	0.01	26.54	0.09	7.28	16.28
month Min	0.08	0.03	18.30	6.84	15.50	0.11	0.03	0.00	7.06	0.00	0.00	6.48	0.00	0.01	0.00	6.20	0.00	0.00	25.80	0.00	7.14	15.10
month Max	0.35	0.19	31.70	7.29	19.00	0.16	0.06	0.17	7.46	0.02	0.02	6.86	0.02	0.02	0.10	6.53	0.02	0.02	27.10	0.37	7.38	18.80

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER					
	IRON	MANGANESE	AKLALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKLALINITY	Dioxide Residual	Ph	TEMP
1-Oct-19	0.19	0.068	29.5	6.91	15	0.16	0.045	0.11	7.16	0.03	0.004	6.6	0.02	0.02	0.03	6.69	0	0	25.1	0.06	7.1	14.9
2-Oct-19																						
3-Oct-19	0.09	0.047	22.5	6.95	14.2	0.11	0.027	0.08	6.73	0.03	0	6.26	0.02	0.02	0.02	6.41	0	0.008	25.8	0.08	6.72	13.9
4-Oct-19																						
5-Oct-19																						
6-Oct-19																						
7-Oct-19	0.14	0.119	26.7	6.9	13	0.03	0.022	0.13	7.17	0	0.007	6.69	0	0.016	0.08	6.67	0	0.003	27	0.03	7.38	12
8-Oct-19																						
9-Oct-19																						
10-Oct-19	0.1	0.028	31	7.1	13	0.08	0.02	0.08	7.5	0	0	6.66	0	0	0.06	6.29	0	0	27	0.04	7.22	11.9
11-Oct-19																						
12-Oct-19																						
13-Oct-19																						
14-Oct-19																						
15-Oct-19	0.11	0.023	28.3	7.22	11.5	0.09	0.026	0.08	7.19	0	0.013	6.6	0.01	0.009	0.05	6.34	0	0.005	27.1	0.03	7.35	10.9
16-Oct-19																						
17-Oct-19	0.11	0.041	28	7	10.2	0.13	0.042	0.04	7.11	0.01	0.01	6.35	0.01	0.011	0.08	6.25	0.01	0.012	27.6	0.08	7.18	9.9
18-Oct-19																						
19-Oct-19																						
20-Oct-19																						
21-Oct-19	0.06	0.031	29.7	7.4	10	0.06	0.028	0.06	7.12	0	0.014	6.21	0	0.017	0.06	6.11	0	0.017	26.5	0	7.3	9.4
22-Oct-19																						
23-Oct-19	0.07	0.018	24.9	6.76	10	0.06	0.004	0.09	7.15	0	0	6.17	0	0	0.12	6.05	0	0	25.8	0.04	7.39	9.2
24-Oct-19																						
25-Oct-19																						
26-Oct-19																						
27-Oct-19																						
28-Oct-19	0.06	0.02	29	7.11	9.1	0.06	0.017	0.05	6.99	0	0.13	6.29	0	0.018	0.03	6.02	0	0.007	26.5	0.08	7.37	8.4
29-Oct-19																						
30-Oct-19	0.07	0.01	25.7	7.11	9	0.05	0.017	0.12	7.26	0	0.005	6.45	0.01	0.006	0.07	6.43	0	0.003	26.6	0.05	7.35	8.3
31-Oct-19																						
month Avg.	0.10	0.04	27.53	7.05	0.03	0.08	0.02	0.08	7.14	0.01	0.03	6.43	0.01	0.01	0.06	0.03	0.00	0.01	26.50	0.05	7.24	10.88
month Min	0.06	0.01	22.50	6.76	9.00	0.03	0.00	0.04	6.73	0.00	0.00	6.17	0.00	0.00	0.02	6.02	0.00	0.00	25.10	0.00	6.72	8.30
month Max	0.19	0.12	31.00	7.40	15.00	0.16	0.05	0.13	7.50	0.03	0.13	6.69	0.02	0.02	0.12	6.69	0.01	0.02	27.60	0.08	7.39	14.90

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER						
	IRON	MANGANESE	AKALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKALINITY	Dioxide Residual	Ph	TEMP	
1-Nov-19																							
2-Nov-19																							
3-Nov-19																							
4-Nov-19	0.04	0.024	14	7.26	5	0.03	0.008	0.06	7.34	0	0.001	6.38	0	0	0.02	6.25	0	0.002	28	0.09	7.36	5.8	
5-Nov-19																							
6-Nov-19																							
7-Nov-19	0.03	0.018	29.7	7.19	5	0.07	0.019	0.08	7.33	0.04	0.014	6.28	0	0.013	0.08	6.15	0.01	0.005	19.8	0.23	7.33	4.7	
8-Nov-19																							
9-Nov-19																							
10-Nov-19																							
11-Nov-19																							
12-Nov-19	0.03	0.012	30.9	7.32	3.3	0.03	0.011	0.14	7.17	0.01	0.015	6.45	0	0.015	0.06	6.18	0	0.04	7.4	0.08	7.28	3.4	
13-Nov-19																							
14-Nov-19	0.08	0.012	28.5	7.29	5	0.04	0.018	0.13	7.2	0	0.012	6.23	0	0.004	0.06	6.27	0	0.009	27.5	0.09	7.41	3.3	
15-Nov-19																							
16-Nov-19																							
17-Nov-19																							
18-Nov-19																							
19-Nov-19	0.06	0.03	26.5	7.05	5	0.02	0.028	0.07	7.29	0	0.025	6.67	0.02	0.028	0.05	6.22	0.01	0.011	29.2	0.11	7.33	4.1	
20-Nov-19																							
21-Nov-19	0.05	0.016	29.9	7.25	5	0.05	0.019	0.17	7.16	0.01	0.007	6.45	0.01	0.009	0.12	6.26	0.01	0.005	27.6	0.05	7.3	4.4	
22-Nov-19																							
23-Nov-19																							
24-Nov-19																							
25-Nov-19	0.04	0.022	31.4	7.27	5	0.03	0.019	0.23	7.16	0	0.013	6.47	0	0.007	0.11	6.28	0	0.005	27.2	0.19	7.37	3.7	
26-Nov-19																							
27-Nov-19																							
28-Nov-19	0.02	0.017	25	7.14	5	0.02	0.016	0.19	7.05	0	0.002	6.33	0	0.002	0.16	6.22	0	0	27	0.1	7.25	4	
29-Nov-19																							
30-Nov-19																							
month Avg.	0.04	0.02	26.99	7.22	0.03	0.04	0.02	0.13	7.21	0.01	0.03	6.41	0.00	0.01	0.08	0.03	0.00	0.01	24.21	0.12	7.33	4.18	
month Min	0.02	0.01	14.00	7.05	3.30	0.02	0.01	0.06	7.05	0.00	0.00	6.23	0.00	0.00	0.02	6.15	0.00	0.00	7.40	0.05	7.25	3.30	
month Max	0.08	0.03	31.40	7.32	5.00	0.07	0.03	0.23	7.34	0.04	0.03	6.67	0.02	0.03	0.16	6.28	0.01	0.04	29.20	0.23	7.41	5.80	

Date	RAW WATER					Pre-CLARIFIER				Post-CLARIFIER			POST FILTER				FINISHED WATER						
	IRON	MANGANESE	AKALINITY	Ph	TEMP	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	Ph	IRON	MANGANESE	Dioxide Residual	Ph	IRON	MANGANESE	AKALINITY	Dioxide Residual	Ph	TEMP	
1-Dec-19																							
2-Dec-19	0.05	0.029	26.8	7.15	5	0.04	0.027	0.2	7.05	0	0.033	6.45	0	0.03	0.09	6.33	0	0.005	27.2	0.09	7.35	4.2	
3-Dec-19																							
4-Dec-19																							
5-Dec-19	0.06	0.021	27.1	6.88	5	0.04	0.012	0.29	7.05	0	0.008	6.47	0	0.012	0.13	6.35	0	0.01	27.6	0.07	7.41	4.6	
6-Dec-19																							
7-Dec-19																							
8-Dec-19																							
9-Dec-19	0.09	0.077	26.5	6.97	5	0.09	0.085	0.23	7	0	0.052	6.4	0	0.048	0.16	6.31	0	0.059	34	0.17	7.34	5	
10-Dec-19																							
11-Dec-19																							
12-Dec-19																							
13-Dec-19																							
14-Dec-19																							
15-Dec-19																							
16-Dec-19	0.11	0.06	33	7	5	0.1	0.102	0.17	6.9	0.01	0.044	6.46	0	0.059	0.04	6.46	0	0.052	31	0.15	7.19	4.7	
17-Dec-19																							
18-Dec-19																							
19-Dec-19																							
20-Dec-19																							
21-Dec-19																							
22-Dec-19																							
23-Dec-19	0.06	0.017	26.7	6.77	4.5	0.04	0.029	0.28	6.31	0.02	0.009	6.63	0.01	0.051	0.05	6.29	0.01	0.09	38.4	0.11	7.31	4.3	
24-Dec-19																							
25-Dec-19																							
26-Dec-19																							
27-Dec-19	0.03	0.007	22.2	6.89	3.3	0.04	0.013	0.3	7.02	0.01	0	6.71	0.01	0.163	0.1	6.56	0	0	38.7	0.26	7.29	5.2	
28-Dec-19																							
29-Dec-19																							
30-Dec-19	0.05	0.022	25.7	6.87	5.6	0.05	0.03	0.29	6.65	0.01	0.014	6.38	0.02	0.058	0.14	6.44	0.01	0.012	38.5	0.16	7.33	5.3	
31-Dec-19																							
month Avg.	0.06	0.03	26.86	6.93	0.03	0.06	0.04	0.25	6.85	0.01	0.03	6.50	0.01	0.06	0.10	0.03	0.00	0.03	33.63	0.14	7.32	4.76	
month Min	0.03	0.01	22.20	6.77	3.30	0.04	0.01	0.17	6.31	0.00	0.00	6.38	0.00	0.01	0.04	6.29	0.00	0.00	27.20	0.07	7.19	4.20	
month Max	0.11	0.08	33.00	7.15	5.60	0.10	0.10	0.30	7.05	0.02	0.05	6.71	0.02	0.16	0.16	6.56	0.01	0.09	38.70	0.26	7.41	5.30	