Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Kirkland Lake Drinking Water System

2020 ANNUAL/SUMMARY REPORT

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

Revised June 26, 2021

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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 31st 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 2020 Annual/Summary Report.

Kirkland Lake Drinking Water System

Section 11

2020 Annual Report

Section 11 - ANNUAL REPORT

1.0 INTRODUCTION

Drinking-Water System Name:	**Kirkland Lake Drinking Water System**
Drinking-Water System No.:	220000308
Drinking-Water System Owner:	The Corporation of Town of Kirkland Lake
Drinking-Water System Category:	Large Municipal, Residential System
Period being reported:	January 1, 2020 to December 31, 2020

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

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 2020 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:

- Notice on the Town's website
- Notice on the Town's Facebook page
- Notice at 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^3/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 L. J. Sherratt 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 L. J. Sherratt 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 raw water is continuously monitored by a 12" magnetic flow meter and 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. At this point, the treated water is continuously monitored for pH, free chlorine residual, flow and pressure before being pumped by four high lift pumps to 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^3. 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 through 2740 residential service connections. 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^3 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 – Coagulant aid
- 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:

- The SCADA computer which operators the entire water treatment plant continues to have serious issues. In case of data loss, OCWA was able to set up a temporary system using two OCWA outpost panels which allows results of selected parameters to be trended and recorded.
- Replaced GA recirculating valves from all five low lift pumps with air release valves and replaced the original swing check valves with silent check valves,

- Replaced the existing 18 inch orifice plate venture type treated flow meter was replaced with an 18 inch Endress+Houser electromagnetic flow meter,
- Sodium Bulk tanks emptied, cleaned and leaks repaired,
- Installed a chemical flow meter on the alum line which is programmed to alarm,
- Repaired multiple leaks in the sodium chlorite discharge piping,
- Replaced flow meter on chlorine dioxide system,
- Repaired Filter #3 underdrain; total of 7 breakthrough points repaired,
- Repaired leaking backwash return pump assembly; bolts tightened and gaskets fabricated,
- Replaced drain valves on all four filters, and installed rotork actuator on Filter #4 drain valve,
- Repaired caustic metering pumps; quick connects and compression fittings replaced on both pumps,
- Installed sump pump for filter outlet trough,
- Installed a Grain Auger on the soda ash system to lift the dry chemical up to the mixing tank to reduce the injury to workers.
- Removed filter room floor. The parging layer on the floor was cracked and lifting presenting a trip hazard.
- Completed construction to link chemical storage room and chemical mixing room,
- Installed new chemical storage tanks for sodium hydroxide - piping and transfer of chemical to be completed in 2021 to coincide with SCADA project,
- Installed a dehumidifier PLC – required to control the humidity levels within the treatment building. OCWA IT developed this software drastically reducing the cost of repairs.

Distribution Work includes:

- Chaput Hughes Standpipe - Installed a chart recorder to record free chlorine residual readings in case of SCADA failure
- Chaput Hughes Standpipe - Installed an outside chemical fill line
- Swastika Control Building - Replaced exhaust fan

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, five (5) adverse water quality incidents were reported to the Ministry's Spills Action Centre in 2020.

Date	*AWQI No.*	*Details*
January 21, 2020	149675	A loss of pressure incident due to a watermain break/repair (Category 2) at 1 Station Road. Main was isolated to conduct repair. The local Health Unit issued a boil water advisory (BWA) for the affected area. Approximately 6 houses were affected. The Town performed the repairs. Corrective Action: Flow was maintained until an air gap was created. All materials were disinfected. Repair was completed and the pressure was restored on January 21st at 2240 hours. The area was flushed and bacteriological samples were collected (upstream, downstream and at site) on January 22nd and 23rd. Sample results indicated no total coliforms or *E.coli.* The BWA was lifted on January 24th, 2020 at 1249 hours. Notifications and reports completed as required.
March 2, 2020	149675	Loss of coagulant. Operator switched alum chemical tanks between 12:00 – 12:30 pm and found the alum pump air locked at 3:00 pm. The settled turbidity alarmed soon after. Corrective Actions: Operator bled off the air from the line, stopped the low lifts and began draining all 3 clarifiers to waste tank. Manually backwashed filter 1 as it was the worst and locked out upon restarting the plant. Monitored settled turbidity and filter turbidities and pH until normal operations resumed. CT (primary disinfection) was met as per SCADA trends. Incidents resolved on March 2, 2020. Notifications and reports completed as required.
March 2020	149820	In order to meet the 95% turbidity performance standard, the turbidity must be <=0.3 NTU for at least 95% of the time each month for each filter to meet CT removal credits. The percentage for filter No. 3 was 90.7%. (average percentage of all filters = 97.5%). A loss of coagulant incident on March 2nd resulted in several high turbidity results above 0.3 NTU causing Filter No. 3 to fail the 95% turbidity standard. Corrective Actions: The filter taken off-line on March 2nd and remained off-line until repairs to the undrain system were complete and the filter was put back into service on May 11th. Notifications and reports completed as required.
July 14, 2020	150667	Twenty-eight (28) total coliforms were detected in a drinking water sample collected at the 4-46 Popular Avenue. The sample was collected on July 13th at 1250 hours. The free chlorine residual was 0.37 mg/L. Corrective Action: Resamples were collected upstream, downstream and at the site of the adverse result on July 14th. Re-sample results indicated zero total coliforms and *E.coli*. Pipes were flushed at each site as per the health Units instructions. Incident resolved on July 20th. Notifications and reports completed as required.

Date	*AWQI No.*	*Details*
October 6, 2020	152514	A treated water sample collected on October 5th exceeded the allowable sodium standard (20 mg/L), having a result of 20.2 mg/L. Corrective Action: A re-sample was collected on October 9th with a result of 22.8 mg/L. MOH - Public Health Inspector was notified of the re-sample result on October 19, 2020. Notifications and reports completed as required.

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 *E.coli* Results *(min to max)*	# of HPC Samples	Range of HPC Results *(min to max)*
Raw (Gull Lake)	52	< 2 to > 400/NDOGT(N)	0 to 280/ NDOGT(N)	0	N/A
Treated (POE)	52	0 to 0	0 to 0	52	< 10 to 180
Distribution	260	0 to 28*	0 to 0	104	< 10 to 110

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
NDOGN = No Data, Overgrown with Non-Target
"<" denotes less than the laboratory's method detection limit
">" denotes greater than the laboratory's method detection limit.

Notes:

1. 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 must be tested for HPC bacteria.

2. July 14 – Twenty-eight (28) total coliforms were detected in a drinking water sample collected in the distribution system at 46 Popular Avenue in Kirkland Lake. Resamples collected and results acceptable (AWQI No. 150667).

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
Turbidity (Filter 1)	8760	0.00 to 2.19*	NTU	1.0 *(for >15 minutes)*
Turbidity (Filter 2)	8760	0.00 to 3.47*	NTU	
Turbidity (Filter 3)	8760	0.00 to 4.99*	NTU	
Turbidity (Filter 4)	8760	0.00 to 3.34*	NTU	
Free Chlorine (POE)	8760	0.0.60** to 4.08	mg/L	CT

Notes:

1. For continuous monitors, 8760 is used as the number of samples.
2. * If the filter effluent turbidity reaches 0.8 NTU, the filter will automatically shut down.

    1. March 2 - high turbidity occurred on filter No. 3 due to loss of coagulant when an alum pump airlocked. Filter shut down. Incident reported as improperly disinfected water directed to users (AWQI No. 146675).
    2. May 9, & 25 - high turbidity occurred on Filter No. 4. Filter shutdown. No reportable exceedances occurred.
    3. Turbidities above 1.0 NTU were recorded on all four filters in July, August and September. The filters automatically shut down when the filter effluent turbidity reaches 0.8 NTU. No reportable exceedances occurred.
    4. November 16 - a turbidity above 1.0 NTU was recorded for Filter No. 3. The filter shut down as programmed during this high turbidity event. No reportable exceedance occurred.
    5. December 31 - high turbidities above 1 NTU occurred on all four filters due to plugged polymer feed lines. The filters automatically shut down as programmed. When resolving the issue, high turbid water from Filter No. 3 was directed to the distribution system for more than 15 minutes resulting in an adverse water quality incident (AWQI). Turbidity exceedances occur when two (2) readings are above 1 NTU for 15 minutes or more in a 24 hour period.

3. ** 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 2020.

    1. Feb. 23 & 24 - Treated water free chlorine residual less than 0.8 mg/L (0.72 & 0.76 mg/L). CT met as per SCADA report.
    2. April 29 & 30 - Treated water FCR less than 0.8 mg/L (0.67 & 0.60 mg/L). CT met as per SCADA report.

Summary of Chlorine Residual Data in the Distribution System

Parameter	# of Samples	Range of Results *(min to max)*	Unit of Measure	Standard
Free Chlorine Residual	419	0.05 to 1.72	mg/L	0.05
Free Chlorine (Chaput Hughes Standpipe)	8760	0.08 to 5.01	mg/L	0.05
Free Chlorine (Swastika Booster Station)	8760	0.06 to 5.05	mg/L	0.05

Notes:

1. 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.

2 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 13	< 0.05	< 0.05	mg/L	No
April 14	0.07	< 0.05	mg/L	No
July 13	< 0.05	< 0.05	mg/L	No
October 6	< 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 every quarter)*

Date of Sample	Result Value	Unit of Measure	Quarter Average	Running Annual Average	Exceedance
January 13	42.6	ug/L	41.2	56.0	No
January 15*	47.6	ug/L			
February 10*	33.4	ug/L			
April 14	57.0	ug/L	57		
July 13	72.2	ug/L	72.2		
October 6	53.7	ug/L	53.7		

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

Note:

* THM samples are collected and tested quarterly as required under section 13-6 of Schedule 13, under O. Reg. 170/03. Additional monthly sampling was done as part of the chlorine dioxide pilot trial until February 5, 2020 when a new Municipal Drinking Water License was issued and the monthly sampling was no longer a requirement. All results are used to calculate the running annual average (RAA) for THMs.

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

Date of Sample	Result Value	Unit of Measure	Quarter Average	Running Average	Exceedance
January 13	33	ug/L	29.3	28.8	No
January 15*	30	ug/L			
February 10*	25	ug/L			
April 14	28	ug/L	28		
July 13	48	ug/L	48		
October 6	10	ug/L	10		

Maximum Allowable Concentration (MAC) for Total Haloacetic Acids = 80 ug/L (Four Quarter Running Average)

Note:

* HAA samples are collected and tested quarterly as required under section 13-6 of Schedule 13, under O. Reg. 170/03. Additional monthly sampling was done as part of the chlorine dioxide pilot trial until February 5, 2020 when a new Municipal Drinking Water License was issued and the monthly sampling was no longer a requirement. All results are used to calculate the running annual average (RAA) for HAAs.

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 ug/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 lead, alkalinity and pH testing were carried out on March 16th and September 14th of 2020. 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 (ug/L) *(min to max)*
March 16	3	6.82 to 6.91	5.4 to 6.6	43 to 44	< 0.1 to 0.9
September 14	3	6.79 to 7.05	13.3 to 15.4	29 to 30	0.3 to 1.3

Note: Next lead sampling scheduled for 2023

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	< 1.0	ug/L	10	No	No
Barium	35.0	ug/L	1000	No	No
Boron	< 2.0	ug/L	5000	No	No
Cadmium	< 0.1	ug/L	5	No	No
Chromium	< 1.0	ug/L	50	No	No
Mercury	< 0.1	ug/L	1	No	No
Selenium	< 0.2	ug/L	50	No	No
Uranium	< 1.0	ug/L	20	No	No

Note: Sample required every 12 months (sample date = *October 6, 2020)*

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	< 0.275	ug/L	5	No	No
Atrazine + N-dealkylated metobolites	< 0.5	ug/L	5	No	No
Azinphos-methyl	< 0.206	ug/L	20	No	No
Benzene	< 0.1	ug/L	1	No	No

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

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Benzo(a)pyrene	< 0.01	ug/L	0.01	No	No
Bromoxynil	< 0.101	ug/L	5	No	No
Carbaryl	< 1.0	ug/L	90	No	No
Carbofuran	< 2.0	ug/L	90	No	No
Carbon Tetrachloride	< 0.2	ug/L	2	No	No
Chlorpyrifos	< 0.206	ug/L	90	No	No
Diazinon	< 0.206	ug/L	20	No	No
Dicamba	< 0.088	ug/L	120	No	No
1,2-Dichlorobenzene	< 0.3	ug/L	200	No	No
1,4-Dichlorobenzene	< 0.3	ug/L	5	No	No
1,2-Dichloroethane	< 0.3	ug/L	5	No	No
1,1-Dichloroethylene (vinylidene chloride)	< 0.3	ug/L	14	No	No
Dichloromethane	< 1.0	ug/L	50	No	No
2-4 Dichlorophenol	< 0.2	ug/L	900	No	No
2,4-Dichlorophenoxy acetic acid (2,4-D)	< 0.377	ug/L	100	No	No
Diclofop-methyl	< 0.126	ug/L	9	No	No
Dimethoate	< 0.206	ug/L	20	No	No
Diquat	< 0.2	ug/L	70	No	No
Diuron	< 6.0	ug/L	150	No	No
Glyphosate	< 20.0	ug/L	280	No	No
Malathion	< 0.206	ug/L	190	No	No
Metolachlor	< 0.138	ug/L	50	No	No
Metribuzin	< 0.138	ug/L	80	No	No
Monochlorobenzene	< 0.5	ug/L	80	No	No
Paraquat	< 0.2	ug/L	10	No	No
Polychlorinated Biphenyls (PCB)	< 0.06	ug/L	3	No	No
Pentachlorophenol	< 0.3	ug/L	60	No	No
Phorate	< 0.138	ug/L	2	No	No
Picloram	< 0.088	ug/L	190	No	No
Prometryne	< 0.069	ug/L	1	No	No
Simazine	< 0.206	ug/L	10	No	No
Terbufos	< 0.138	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	< 0.138	ug/L	230	No	No
Trichloroethylene	< 0.2	ug/L	5	No	No
2,4,6-Trichlorophenol	< 0.2	ug/L	5	No	No
2-methyl-4-chlorophenoxyacetic acid (MCPA)	< 6.29	ug/L	100	No	No
Trifluralin	< 0.138	ug/L	45	No	No

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

Parameter	Result Value	Unit of Measure	Standard	MAC Exceedance	½ MAC Exceedance
Vinyl Chloride	< 0.1	ug/L	1	No	No

Note: Sample required every 12 months (sample date = *October 6, 2020)*

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 6, 2020	1	20.2	mg/L	20	Yes
October 9, 2020 (resample)	1	22.8	mg/L	20	Yes

Note: Sample required every 60 months. Next sampling scheduled for October 2025

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 adverse sodium result was reported to SAC and the Timiskaming Health Unit on October 9, 2020 as required under Schedule 16 of O. Reg. 170/03 (AWQI# 15214).

Most Recent Fluoride Data Sampled at the Water Treatment Plant

Date of Sample	No. of Samples	Result Value	Unit of Measure	Standard	Exceedance
October 6, 2020	1	< 0.05	mg/L	1.5	No

Note: Sample required every 60 months. Next sampling scheduled for October 2025

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

1. 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. 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 chlorine dioxide system which oxidizes iron and manganese was installed at the Kirkland Lake drinking water system which has significantly improved the aesthetic quality of the water by reducing these high levels.

The following laboratory parameters were tested during and after the trial of the system until a new Municipal Drinking Water License (MDWL) was issued in February of 2020 after which only quarterly sampling of the treated water for chlorate and chlorite was required.

- Hardness, dissolved oxygen, total solids, total dissolved solids in the raw, treated, and distribution water.
- Iron and manganese were tested for both the raw and treated water.
- Chlorate, chlorite, THMs, and HAAs were 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.

In-house testing of the following parameters also continued until the issuance of the new MDWL: iron, manganese, chlorine dioxide residual, pH, temperature, and alkalinity was done at multiple locations in the plant. These locations included Incoming Raw, Pre-Clarifier, Post Clarifier, Post Filter, and Finished Water. The in-house results are found in Appendix D.

2. Legal Instrument: Schedule C, Section 4.0 Additional Sampling, Testing and Monitoring: Municipal Drinking Water Licence No. 214-101 (issue 4)

Summary of Chlorate & Chlorite Data *(sampled from the final treated water every quarter)*

Date of Sample	Chlorate Result Value	Chlorite Result Value	Unit of Measure	Exceedance
January 15	0.14	0.47	mg/L	No
February 11	0.18	0.53	mg/L	No
April 14	0.10	0.26	mg/L	No
July 13	< 0.01	< 0.01	mg/L	No
October 6	0.04	0.08	mg/L	No

Maximum Allowable Concentration (MAC) for Chlorate = 1 mg/L
MAC for Chlorite = 1 mg/L

Note:

Chlorate and chlorite samples are collected and tested quarterly as required under section 4.0 (4.1) of the system's Municipal Drinking Water License (MDWL) 214-101 (issue 4). Additional monthly sampling was done as part of the chlorine dioxide pilot trial until February 5, 2020 when a new MDWL was issued and the monthly sampling was no longer a requirement.

Kirkland Lake Drinking Water System

Schedule 22

2020 SUMMARY REPORT

FOR MUNICIPALITIES

Schedule 22 - SUMMARY REPORTS FOR MUNICIPALITIES

1.0 INTRODUCTION

Drinking-Water System Name:	**Kirkland Lake Drinking Water System**
Municipal Drinking Water Licence (MDWL) No.:	214-101-2 (issued April 13, 2016) 214-101-4 (issued February 5, 2020)
Drinking Water Work Permit (DWWP) No.:	214-201-3 (issued May 5, 2017) 214-201-4 (issued February 5, 2020
Permit to Take Water (PTTW) No.:	5882-APGJY8 (issued July 25, 2017)
Period being reported:	January 1, 2020 to December 31, 2020

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.

It should also be mentioned that, five (5) adverse water quality incidents occurred during the reporting period and were reported to the Ministry's Spills Action Center. Refer to Section 5.0 – *Details on Notices of Adverse Test Results and Other Problems Reported to & Submitted to the Spills Actions Center* on page 7 of this report for details.

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 2020 reporting period, including total monthly volumes, average monthly volumes, maximum monthly volumes, and maximum flow rates.

Raw Water

2020 - 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^3)	337244	332148	345993	329391	318624	322780	332805	339005	325388	330173	331239	343571	3988361
Average Volume (m^3/d)	10879	11453	11161	10980	10278	10759	10736	10936	10846	10651	11041	11083	10900
Maximum Volume (m^3/d)	12430	14693	12546	14693	13172	12665	12204	15305	11869	11927	11863	12867	15305
PTTW - Maximum Allowable Volume (m^3/day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
Maximum Flow Rate (L/min)	15234	13050	12912	12996	13144	13148	13296	13089	12978	13008	13088	13085	15234
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

2020 - Monthly Summary of Treated Water Supplied to the Distribution System

Regulated Municipal Drinking Water Licence (MDWL) #214-101 - Issue 4, dated February 5, 2020

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year to Date
Total Volume (m^3)	316046	287782	303739	290621	270412	270547	278091	279016	256310	279509	273936	280955	3386964
Average Volume (m^3/d)	10195	9924	9798	9687	8723	9018	8971	9001	8544	9016	9131	9063	9256
Maximum Volume (m^3/d)	11537	12995	11000	12884	11158	10839	10201	13092	9212	10168	9584	10632	13092
MDWL/C of A - Rated Capacity (m^3/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^3/day. The Kirkland Lake DWS complied with this limit having a recorded maximum volume of 13,092 m^3/day on August 26th when the standpipe was being filled after annual maintenance was completed. This represents 58.2% 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: 2020 - Comparison of Treated Water Flows to the Rated Capacity

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Flow (m^3/day)	10195	9924	9798	9687	8723	9018	8971	9001	8544	9016	9131	9063
Maximum Flow (m^3/day)	11537	12995	11000	12884	11158	10839	10201	13092	9212	10168	9584	10632
MDWL - Rated Capacity	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500
% Rated Capacity	51	58	49	57	50	48	45	58	41	45	43	47

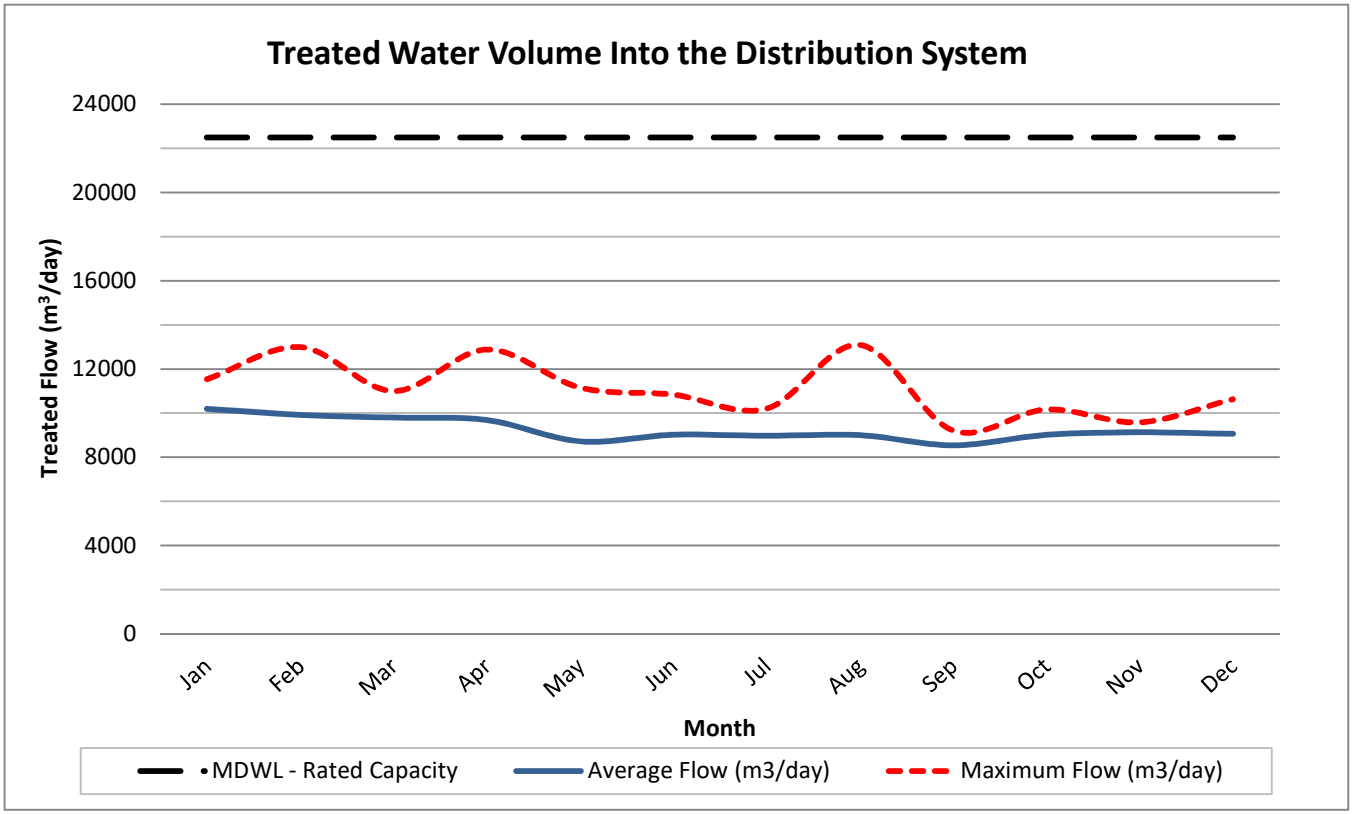
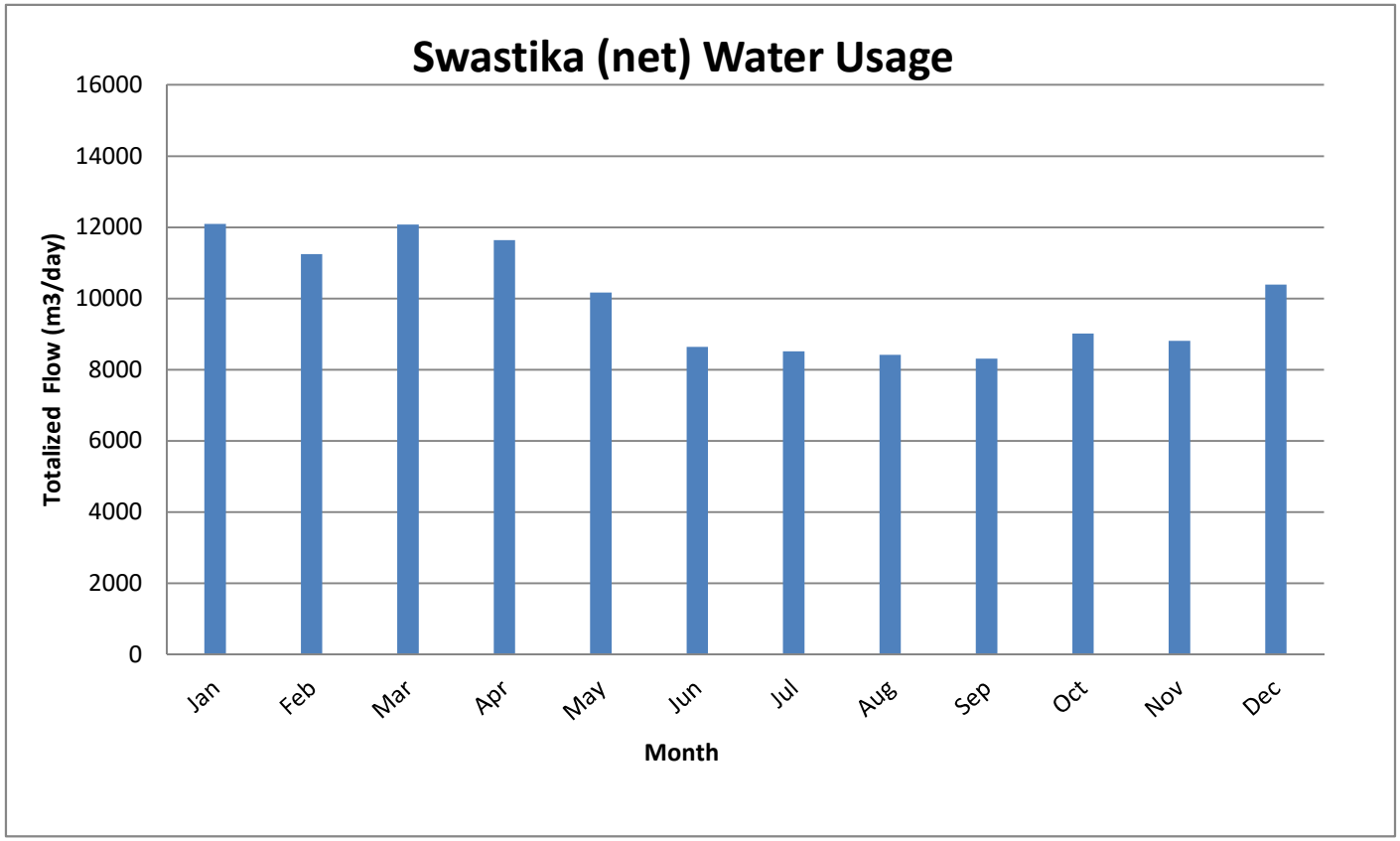


Figure 2: 2020 - Town of Swastika (net) Water Usage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Totalized Flow (m3/day)	12095	11249	12080	11640	10169	8641	8518	8414	8307	9014	8811	10388
WTP Discharge (m3/d)	316046	287782	303739	290621	270412	270547	278091	279016	256310	279509	273936	280955
Swastika Usage (%)	3.83	3.91	3.98	4.01	3.76	3.19	3.06	3.02	3.24	3.22	3.22	3.70



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^3/day	
Average Daily Flow for 2020	9256 m^3/day	41.1 % of the rated capacity
Maximum Daily Flow for 2020	13,092 m^3/day	58.2 % of the rated capacity
Total Treated Water Produced in 20120	3,386,964 m^3	

Historical Flows

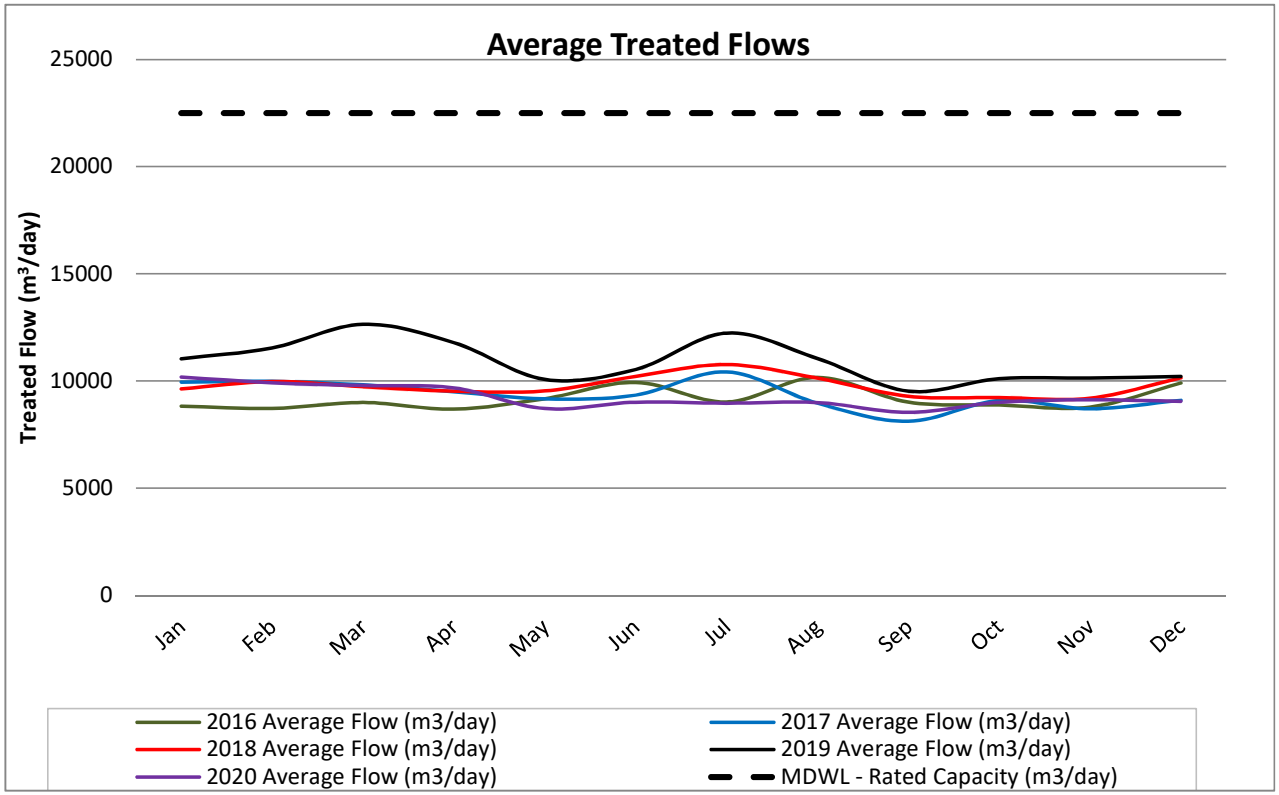
Kirkland Lake (Lionel Sherratt) Water Treatment Plant – Historical Flow Comparison

Year	Maximum Treated Flow (m^3/d)	Average Daily Treated Flow (m^3/d)	Average Day % of Rated Capacity (22,500 m^3/d)
2020	**13,092**	**9256**	**41.1%**
2019	15,485	10,916	48.5%
2018	14,506	9789	43.5%
2017	13,021	9355	41.6%
2016	13,580	9184	40.9%

Figure 3 compares the average treated water flows from 2016 to 2020.

Figure 3 - Historical Water Usage Trends (2016 to 2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016 Average Flow (m^3/day)	8831	8726	9005	8696	9182	9944	9028	10179	9023	8891	8790	9912
2017 Average Flow (m^3/day)	9958	9994	9826	9511	9174	9347	10431	8974	8126	9097	8715	9108
2018 Average Flow (m^3/day)	9642	9981	9743	9533	9545	10222	10774	10141	9298	9236	9204	10153
2019 Average Flow (m^3/day)	11042	11550	12653	11799	10081	10544	12244	11059	9535	10113	10147	10225
2020 Average Flow (m^3/day)	10195	9923	9798	9687	8723	9018	8971	9001	8544	9016	9131	9063
MDWL - Rated Capacity (m^3/day)	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500	22500



CONCLUSION

The water quality data collected in 2020 demonstrates that the Kirkland Lake drinking water system provided good quality drinking water to its users. Five adverse water quality incidents (one during to a watermain repair, two due to filter process issues, one bacteriological exceedance and one high sodium result) occurred in 2020 and were immediately reported, responded to and addressed.

The Kirkland Lake Drinking Water System was able to operate in accordance with the terms and conditions of the Permit to Take Water 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

KIRKLAND LAKE DRINKING WATER SYSTEM
2020 SUMMARY OF MICROBIOLOGICAL TEST RESULTS

Facility Works Number: 220000308
Facility Owner: Municipality: Town of Kirkland Lake
Facility Classification: Class 3 Water Treatment

RAW WATER	01/2020	02/2020	03/2020	04/2020	05/2020	06/2020	07/2020	08/2020	09/2020	10/2020	11/2020	12/2020	Total	Avg	Max	Min
Gull Lake / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max Lab	22	< 150	> 400	< 222	252	< 5/NDOGT(N)	4/NDOGT(N)	14/NDOGT	162	160	66	22			> 400	
Mean Lab	14	< 53.5	> 155	< 58.5	99	< 3	4	< 8.25	50.5	99.25	28.2	15.5		54.848		
Min Lab	6	< 2	28	< 4	12	< 2	4	< 2	8	24	8	8				< 2
Gull Lake / E. Coli: EC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max Lab	< 2	< 2	< 2	< 2	< 5	< 10/NDOGT(N	280/NDOGT(N)	< 5/NDOGT	28	10	< 2	< 2			280	
Mean Lab	< 2	< 2	< 1.6	< 2	< 2.75	< 5.667	141	< 3.25	< 9.75	5.75	< 2	< 2		< 9.255		
Min Lab	< 2	< 2	< 0	< 2	< 2	< 2	2	< 2	< 2	2	< 2	< 2				0

TREATED WATER	01/2020	02/2020	03/2020	04/2020	05/2020	06/2020	07/2020	08/2020	09/2020	10/2020	11/2020	12/2020	Total	Avg	Max	Min
Treated Water (POE) / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max Lab	< 10	< 10	< 180	< 10	< 10	< 10	< 10	< 50	< 40	< 50	< 70	< 30			180	
Mean Lab	< 10	< 10	< 44	< 10	< 10	< 10	< 10	< 16.667	< 17.5	< 20	< 36	< 17.5		< 18.302		
Min Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10				< 10

DISTRIBUTION WATER	01/2020	02/2020	03/2020	04/2020	05/2020	06/2020	07/2020	08/2020	09/2020	10/2020	11/2020	12/2020	Total	Avg	Max	Min
KL-3 / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	1	3	1	2	3	1	2	2	1	1	2	21			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	2	1	2	1	2	2	1	2	2	1	19			
Max Lab	< 10	110	< 10	< 10	< 10	10	< 10	20	10	< 100	< 100	< 10			110	
Mean Lab	< 10	< 60	< 10	< 10	< 10	10	< 10	< 15	10	< 55	< 55	< 10		< 25.263		
Min Lab	< 10	< 10	< 10	< 10	< 10	10	< 10	< 10	10	< 10	< 10	< 10				< 10
KL-5 / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	4	4	5	4	4	5	4	5	4	4	5	4	52			
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	2	3	2	2	1	2	1	2	1	2	1	1	20			
Max Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	30	40	< 10	< 10			40	
Mean Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	30	25	< 10	< 10		< 12.5		
Min Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	30	10	< 10	< 10				< 10
KL-6 / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max Lab	0	0	0	0	0	0	28	0	0	0	0	0			28	
Mean Lab	0	0	0	0	0	0	7	0	0	0	0	0		0.538		
Min Lab	0	0	0	0	0	0	0	0	0	0	0	0				0
KL-6 / E. Coli - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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-6 / HPC - cfu/mL																
Count Lab	2	1	1	2	2	2	2	3	2	2	4	2	25			
Max Lab	< 10	< 10	< 10	< 10	< 20	< 10	< 60	20	60	60	< 30	< 20			60	
Mean Lab	< 10	< 10	< 10	< 10	< 15	< 10	< 35	< 13.333	< 35	40	< 15	< 15		< 18.4		
Min Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	20	< 10	< 10				< 10
KL-7 / Total Coliform: TC - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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-7 / E. Coli - cfu/100mL																
Count Lab	4	4	5	4	4	5	4	5	4	4	5	4	52			
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-7 / HPC - cfu/mL																
Count Lab	1	1	2	2	1	2	2	1	2	1	2	2	19			
Max Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	20	< 20			20	
Mean Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	20	< 15		< 11.579		
Min Lab	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	20	< 10				< 10

NOTES:
* NDOGT = No Data, Overgrown with Target
NDOGN = No Data, Overgrown with Non-Target

** One adverse water quality incident (detection of total coliforms) occurred in 2020:
July 14 – Twenty-eight (28) total coliforms were detected in a drinking water sample collected in the distribution system at 46 Popular Avenue in Kirkland Lake. Resamples collected and results acceptable (AWQI No. 150667).

APPENDIX B

Monthly Summary of Operational Data

KIRKLAND LAKE DRINKING WATER SYSTEM
2020 SUMMARY OF OPERATIONAL RESULTS

Facility Works Number: 220000308
Facility Owner: Municipality: Town of Kirkland Lake
Facility Classification: Class 3 Water Treatment

FILTERED WATER	01/2020	02/2020	03/2020	04/2020	05/2020	06/2020	07/2020	08/2020	09/2020	10/2020	11/2020	12/2020	Total	Avg	Max	Min
Filter 1 / Turbidity (1 NTU) - NTU																
Max OL	0.41	0.14	0.87	0.18	0.199	0.179	0.643	0.83	2.186	0.694	0.359	1.676			2.186	
Mean OL	0.055	0.035	0.038	0.042	0.067	0.067	0.088	0.089	0.078	0.065	0.082	0.069		0.065		
Min OL	0.03	0.02	0.02	0.03	0.045	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00
Filter 2 / Turbidity (1.0 NTU) - NTU																
Max OL	0.325	0.18	0.58	0.2	0.256	0.162	0.668	3.471	0.249	0.154	0.82	1.33			3.471	
Mean OL	0.068	0.048	0.06	0.047	0.051	0.052	0.076	0.069	0.063	0.056	0.062	0.059		0.059		
Min OL	0.03	0.03	0.03	0.00	0.033	0.036	0.038	0.05	0.00	0.042	0.002	0.00				0.00
Filter 3 / Turbidity (1.0 NTU) - NTU																
Max OL	0.45	0.25	1.28	Filter 3 Offline	0.247	0.23	1.48	0.508	0.361	0.183	4.999	1.327			4.999	
Mean OL	0.095	0.111	0.195		0.064	0.064	0.086	0.08	0.072	0.064	0.076	0.07		0.089		
Min OL	0.01	0.06	0.14		0.045	0.048	0.05	0.061	0.00	0.00	0.05	0.045				0.00
Filter 4 / Turbidity (1.0 NTU) - NTU																
Max OL	0.46	0.16	0.73	0.21	3.337	0.252	1.88	0.651	2.781	0.402	0.748	1.259			3.337	
Mean OL	0.082	0.054	0.055	0.054	0.055	0.052	0.081	0.067	0.071	0.065	0.068	0.051		0.063		
Min OL	0.04	0.04	0.03	0.03	0.005	0.00	0.036	0.05	0.00	0.00	0.027	0.00				0.00

TREATED WATER	01/2020	02/2020	03/2020	04/2020	05/2020	06/2020	07/2020	08/2020	09/2020	10/2020	11/2020	12/2020	Total	Avg	Max	Min
Treated Water (POE) / Cl Residual: Free (0.80 mg/L) - mg/L																
Max OL	1.74	2.089	1.73	4.076	2.827	2.309	1.586	2.068	2.412	1.943	2.276	1.999			4.076	
Mean OL	1.31	1.51	1.346	1.317	1.418	1.375	1.139	1.219	1.264	1.395	1.408	1.331		1.336		
Min OL	0.85	0.72	0.86	0.60	0.898	0.925	0.802	0.84	0.815	1.018	0.944	0.94				0.60
KL-3 / Cl Residual: Free - mg/L																
Count IH	9	8	9	9	8	9	9	9	8	9	9	9	105			
Max IH	1.19	1.4	1.21	1.32	1.22	1.03	0.8	0.84	0.74	1.35	1.59	1.25			1.59	
Mean IH	0.97	1.275	1.012	1.024	1.069	0.868	0.548	0.654	0.579	1.079	1.137	0.844		0.92		
Min IH	0.75	1.12	0.54	0.67	0.96	0.69	0.11	0.32	0.4	0.57	0.58	0.13				0.11
KL-4 / Cl Residual: Free - mg/L																
Count IH	9	8	9	9	8	9	9	9	8	9	9	9	105			
Max IH	1.2	1.41	1.28	1.22	1.14	1.22	0.99	1.08	1.36	1.33	1.58	1.72			1.72	
Mean IH	0.878	1.183	0.99	1.001	0.976	0.906	0.677	0.466	0.873	1.083	1.223	1.119		0.946		
Min IH	0.7	0.95	0.64	0.51	0.78	0.53	0.1	0.05	0.57	0.54	0.71	0.65				0.05
KL-5 / Cl Residual: Free - mg/L																
Count IH	9	8	9	9	8	9	9	9	8	9	9	9	105			
Max IH	1.19	1.31	1.27	1.14	1.51	1.06	0.74	1.13	1.07	1.67	1.3	1.16			1.67	
Mean IH	0.91	1.141	0.991	1.029	1.075	0.856	0.502	0.549	0.705	1.003	1.144	0.854		0.894		
Min IH	0.61	0.99	0.72	0.91	0.73	0.6	0.19	0.11	0.09	0.23	0.96	0.15				0.09
KL-6 / Cl Residual: Free - mg/L																
Count IH	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max IH	0.94	1.25	1.2	1.25	1.32	1.47	0.54	0.96	1.29	1.26	1.26	1.19			1.47	
Mean IH	0.838	1.058	0.936	1.07	1.043	1.088	0.398	0.57	0.885	0.915	1.026	0.933		0.897		
Min IH	0.76	0.92	0.53	0.84	0.82	0.64	0.17	0.27	0.35	0.51	0.76	0.48				0.17
KL-7 / Cl Residual: Free - mg/L																
Count IH	4	4	5	4	4	5	4	5	4	4	5	4	52			
Max IH	1.01	1.47	1.16	1.08	1.19	1.34	0.78	0.87	1.11	1.11	1.42	1.49			1.49	
Mean IH	0.875	1.243	0.998	0.865	1.1	1.004	0.62	0.602	0.978	0.955	0.896	1.108		0.932		
Min IH	0.79	1.09	0.9	0.76	0.94	0.8	0.37	0.07	0.71	0.77	0.46	0.87				0.07
Swastika Booster Station / Cl Residual: Free (0.05 mg/L) - mg/L																
Max OL	1.52	1.79	1.6	2.25	1.97	1.74	3.98	1.973	4.12	5.01	2.96	1.8			5.01	
Mean OL	1.002	1.291	1.067	1.094	1.315	1.156	1.099		0.997	1.205	1.33	1.264		1.165		
Min OL	0.42	0.73	0.32	0.28	0.63	0.63	0.11	0.423	0.34	0.08	0.57	0.59				0.08
Chaput Hughes Standpipe / Cl Residual: Free (0.05 mg/L) - mg/L																
Max OL	3.48	3.99	2.741	2.63	4.23	5.04	1.87	5.05	2.83	3.49	5.04	3.24			5.05	
Mean OL	1.365	1.542	1.367	1.429	1.197	1.024	0.74		0.808	1.038	1.175	1.243		1.175		
Min OL	0.58	0.81	0.72	0.71	0.62	0.26	0.06	0.06	0.16	0.46	0.61	0.66				0.06

NOTES:

* April - No turbidity data for Filter No. 3; off-line. Back on-line May 11th.

** Turbidity exceedances

1. March 2 - high turbidity occurred on filter No. 3 due to loss of coagulant when an alum pump airlocked. Filter shut down. Incident reported as improperly disinfected water directed to users (AWQI No. 146675).
2. May 9, & 25 - high turbidity occurred on Filter No. 4. Filter shutdown. No reportable exceedances occurred.
3. Turbidities above 1.0 NTU were recorded on all four filters in July, August and September. The filters automatically shut down if the filter effluent turbidity reaches 0.8 NTU. The system shutdown during all high turbidity events. No reportable exceedances occurred.
4. November 16 - a turbidity above 1.0 NTU was recorded for Filter No. 3. The filter shutdown as programmed during this high turbidity event. No reportable exceedance occurred.
5. December 31 - high turbidities above 1 NTU occurred on all four filters due to plugged polymer feed lines. The filters automatically shut down as programmed. When resolving the issue, high turbid water from Filter No. 3 was directed to the distribution system for more than 15 minutes resulting in an adverse water quality incident (AWQI). 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 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.
Feb. 23 & 24 - Treated water free chlorine residual less than 0.8 mg/L (0.72 & 0.76 mg/L). CT met as per SCADA report.
April 29 & 30 - Treated water FCR less than 0.8 mg/L (0.67 & 0.60 mg/L). CT met as per SCADA report.

APPENDIX C

Chlorine Dioxide Trial - Laboratory Data

CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 392062

WORK ORDER RESULTS

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	1/15/2020 9:33 AM		1/15/2020 9:27 AM		1/15/2020 9:15 AM			
Lab ID	1510403		1510404		1510405			
General Chemistry	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Chlorate			0.14	0.01	0.14	0.01	mg/L	1
Chlorite			0.47	0.01	0.51	0.01	mg/L	1
Total Hardness (as CaCO3) (Calc.)	26.6	0.1	26.1	0.1	26.2	0.1	mg/L	~

Sample Description	Treated water (POE)			
Sample Date	1/15/2020 9:27 AM			
Lab ID	1510404			
Haloacetic Acids	Result	MDL	Units	Criteria: O.Reg. 170
2,3-Dibromopropionic acid (Surr.)	92.9	N/A	% Rec	~
Bromoacetic acid	<3	3	ug/L	~
Bromochloroacetic Acid	<3	3	ug/L	~
Chloroacetic acid	<4	4	ug/L	~
Dibromoacetic acid	<3	3	ug/L	~
Dichloroacetic acid	18	3	ug/L	~
Haloacetic acids (Total) (Calc.)	32	8	ug/L	80
Trichloroacetic acid	14	3	ug/L	~

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	1/15/2020 9:33 AM		1/15/2020 9:27 AM		1/15/2020 9:15 AM			
Lab ID	1510403		1510404		1510405			
Solids	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Total Dissolved Solids	90	20	110	20	110	20	mg/L	~
Total Solids (Calc.)	90	20	110	20	110	20	mg/L	~

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 392062

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	1/15/2020 9:33 AM		1/15/2020 9:27 AM		1/15/2020 9:15 AM			
Lab ID	1510403		1510404		1510405			
Solids	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Total Suspended Solids	<1	1	<1	1	<1	1	mg/L	~

Sample Description	Treated water (POE)			
Sample Date	1/15/2020 9:27 AM			
Lab ID	1510404			
THMs	Result	MDL	Units	Criteria: O.Reg. 170
Bromodichloromethane	<0.3	0.3	ug/L	~
Bromoform	<0.3	0.3	ug/L	~
Chloroform	17.4	0.3	ug/L	~
Dibromochloromethane	<0.3	0.3	ug/L	~
Toluene-d8 (Surr.)	96.2	N/A	% Rec	~
Total THMs (Calc.)	17.4	0.5	ug/L	100

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 392062

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

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MDL: Method detection limit or minimum reporting limit.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 392064

WORK ORDER RESULTS

Sample Description	Town Office (1 Dunfield)			
Sample Date	1/15/2020 9:55 AM			
Lab ID	1510409			
Haloacetic Acids	Result	MDL	Units	Criteria: O.Reg. 170
2,3-Dibromopropionic acid (Surr.)	84.1	N/A	% Rec	~
Bromoacetic acid	<3	3	ug/L	~
Bromochloroacetic Acid	<3	3	ug/L	~
Chloroacetic acid	<4	4	ug/L	~
Dibromoacetic acid	<3	3	ug/L	~
Dichloroacetic acid	17	3	ug/L	~
Haloacetic acids (Total) (Calc.)	30	8	ug/L	80
Trichloroacetic acid	13	3	ug/L	~

Sample Description	Testmark Labs (1470 Government Rd.)			
Sample Date	1/15/2020 10:18 AM			
Lab ID	1510408			
THMs	Result	MDL	Units	Criteria: O.Reg. 170
Bromodichloromethane	1.1	0.3	ug/L	~
Bromoform	<0.3	0.3	ug/L	~
Chloroform	46.5	0.3	ug/L	~
Dibromochloromethane	<0.3	0.3	ug/L	~
Toluene-d8 (Surr.)	95.8	N/A	% Rec	~
Total THMs (Calc.)	47.6	0.5	ug/L	100

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 392064

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

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MDL: Method detection limit or minimum reporting limit.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

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Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 393626

WORK ORDER RESULTS

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	2/11/2020 8:48 AM		2/11/2020 8:40 AM		2/11/2020 8:25 AM			
Lab ID	1515397		1515398		1515399			
General Chemistry	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Chlorate			0.18	0.01	0.24	0.01	mg/L	1
Chlorite			0.53	0.01	0.55	0.01	mg/L	1
Total Hardness (as CaCO3) (Calc.)	36.0	0.1	36.1	0.1	35.8	0.1	mg/L	~

Sample Description	Treated water (POE)			
Sample Date	2/11/2020 8:40 AM			
Lab ID	1515398			
Haloacetic Acids	Result	MDL	Units	Criteria: O.Reg. 170
2,3-Dibromopropionic acid (Surr.)	79.4	N/A	% Rec	~
Bromoacetic acid	<3	3	ug/L	~
Bromochloroacetic Acid	<3	3	ug/L	~
Chloroacetic acid	<4	4	ug/L	~
Dibromoacetic acid	<3	3	ug/L	~
Dichloroacetic acid	11	3	ug/L	~
Haloacetic acids (Total) (Calc.)	17	8	ug/L	80
Trichloroacetic acid	6	3	ug/L	~

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	2/11/2020 8:48 AM		2/11/2020 8:40 AM		2/11/2020 8:25 AM			
Lab ID	1515397		1515398		1515399			
Solids	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Total Dissolved Solids	70	20	130	20	160	20	mg/L	~
Total Solids (Calc.)	73	20	130	20	160	20	mg/L	~

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 393626

Sample Description	Raw water wet well		Treated water (POE)		Kirkland Lake WWTP (600 Archer Drive)			
Sample Date	2/11/2020 8:48 AM		2/11/2020 8:40 AM		2/11/2020 8:25 AM			
Lab ID	1515397		1515398		1515399			
Solids	Result	MDL	Result	MDL	Result	MDL	Units	Criteria: O.Reg. 170
Total Suspended Solids	3	1	<1	1	<1	1	mg/L	~

Sample Description	Treated water (POE)			
Sample Date	2/11/2020 8:40 AM			
Lab ID	1515398			
THMs	Result	MDL	Units	Criteria: O.Reg. 170
Bromodichloromethane	0.6	0.3	ug/L	~
Bromoform	<0.3	0.3	ug/L	~
Chloroform	26.0	0.3	ug/L	~
Dibromochloromethane	<0.3	0.3	ug/L	~
Toluene-d8 (Surr.)	99.7	N/A	% Rec	~
Total THMs (Calc.)	26.6	0.5	ug/L	100

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 393626

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

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MDL: Method detection limit or minimum reporting limit.

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Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 393534

WORK ORDER RESULTS

Sample Description	1 Dunfield Road
Sample Date	2/10/2020 12:00 PM
Lab ID	1515054

Haloacetic Acids	Result	MDL	Units	Criteria: O.Reg. 170
2,3-Dibromopropionic acid (Surr.)	94.9	N/A	% Rec	~
Bromoacetic acid	<3	3	ug/L	~
Bromochloroacetic Acid	<3	3	ug/L	~
Chloroacetic acid	<4	4	ug/L	~
Dibromoacetic acid	<3	3	ug/L	~
Dichloroacetic acid	15	3	ug/L	~
Haloacetic acids (Total) (Calc.)	25	8	ug/L	80
Trichloroacetic acid	10	3	ug/L	~

Sample Description	Testmark Labs (1470 Government Rd.)
Sample Date	2/10/2020 2:05 PM
Lab ID	1515053

THMs	Result	MDL	Units	Criteria: O.Reg. 170
Bromodichloromethane	0.9 [0.8]	0.3	ug/L	~
Bromoform	<0.3 [<0.3]	0.3	ug/L	~
Chloroform	32.5 [31.4]	0.3	ug/L	~
Dibromochloromethane	<0.3 [<0.3]	0.3	ug/L	~
Toluene-d8 (Surr.)	98.9 [100]	N/A	% Rec	~
Total THMs (Calc.)	33.4 [32.2]	0.5	ug/L	100

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CERTIFICATE OF ANALYSIS

OCWA - Kirkland Lake - Kirkland Lake WTP

Work Order Number: 393534

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

[ ]: Results for laboratory replicates are shown in square brackets immediately below the associated sample result for ease of comparison.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Exceedences: HIGHLIGHTED CELLS INDICATE THAT THE RESULT EXCEEDS A REGULATORY LIMIT. CALCULATED UNCERTAINTY ESTIMATIONS ARE NOT APPLIED FOR DETERMINING SAMPLE EXCEEDANCES.

Benzo(b)fluoranthene: Results for benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

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APPENDIX D

Chlorine Dioxide Trial – In-house Daily Data

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-Jan-20																						
2-Jan-20																						
3-Jan-20	0.02	0.005	34.2	6.99	6.6	0.02	0.002	0.23	6.96	0	0	6.6	0	0.027	0.06	6.71	0	0	32.4	0.13	7.12	5.3
4-Jan-20																						
5-Jan-20																						
6-Jan-20	0.02	0.003	23.6	6.68	5.1	0.02	0.005	0.36	7.08	0	0	6.85	0	0.055	0	6.57	0	0	36.5	0.13	7.18	5.3
7-Jan-20																						
8-Jan-20																						
9-Jan-20	0.02	0.018	32.8	6.78	4.9	0.02	0.018	0.31	6.65	0	0	6.58	0	0.028	0.07	6.48	0	0	34.5	0.1	7.09	5.2
10-Jan-20																						
11-Jan-20																						
12-Jan-20																						
13-Jan-20	0	0.006	24.3	6.97	5.9	0	0.001	0.27	6.94	0	0	6.67	0	0.038	0.08	6.35	0	0	36.5	0.41	7.07	5
14-Jan-20																						
15-Jan-20																						
16-Jan-20	0.03	0.013	24	6.85	5.7	0	0.015	0.38	6.17	0.02	0.001	6.11	0	0.005	0.06	6.31	0.03	0	38.2	0.19	7.01	5.4
17-Jan-20																						
18-Jan-20																						
19-Jan-20																						
20-Jan-20	0.05	0	16.7	6.83	4.9	0.05	0.011	0.13	7.06	0.02	0.014	6.41	0.01	0.002	0.08	6.46	0.01	0	36.7	0.1	7	5.3
21-Jan-20																						
22-Jan-20																						
23-Jan-20	0.03	0.01	23.4	6.54	5.8	0.03	0.022	0.09	7.01	0.01	0.012	6.47	0	0.033	0.08	6.4	0	0	37.3	0.18	7.05	5.2
24-Jan-20																						
25-Jan-20																						
26-Jan-20																						
27-Jan-20	0.03	0.01	31.5	7.1	6.85	0.03	0.013	0.39	6.72	0.03	0.003	6.6	0.01	0.046	0.05	6.49	0	0.04	36.3	0.16	7.13	5.3
28-Jan-20																						
29-Jan-20																						
30-Jan-20	0.03	0.015	32.5	6.84	6.82	0.03	0.027	0.37	6.57	0.01	0.01	6.32	0	0.075	0.24	6.34	0.03	0.003	41.9	0.24	7.24	5.5
31-Jan-20																						
month Avg.	**0.03**	**0.01**	**27.00**	**6.84**	**0.03**	**0.02**	**0.01**	**0.28**	**6.80**	**0.01**	**0.03**	**6.51**	**0.00**	**0.03**	**0.08**	**0.03**	**0.01**	**0.00**	**36.70**	**0.18**	**7.10**	**5.28**
month Min	**0.00**	**0.00**	**16.70**	**6.54**	**4.90**	**0.00**	**0.00**	**0.09**	**6.17**	**0.00**	**0.00**	**6.11**	**0.00**	**0.00**	**0.00**	**6.31**	**0.00**	**0.00**	**32.40**	**0.10**	**7.00**	**5.00**
month Max	**0.05**	**0.02**	**34.20**	**7.10**	**6.85**	**0.05**	**0.03**	**0.39**	**7.08**	**0.03**	**0.01**	**6.85**	**0.01**	**0.08**	**0.24**	**6.71**	**0.03**	**0.04**	**41.90**	**0.41**	**7.24**	**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-Feb-20																						
2-Feb-20																						
3-Feb-20	0.03	0.003	32.3	7.12	6.2	0.05	0.028	0.4	6.87	0.01	0	6.63	0.01	0.036	0.07	6.48	0	0	22.2	0.11	7.2	5.7
4-Feb-20																						
5-Feb-20																						
6-Feb-20	0.05	0.017	25.6	7.13	5	0.05	0.014	0.49	6.77	0.01	0.002	6.49	0.01	0.036	0.08	6.48	0	0	43.1	0.26	7.35	5.7
7-Feb-20																						
8-Feb-20																						
9-Feb-20																						
10-Feb-20	0.05	0.011	33.4	7.02	6.7	0.04	0.007	0.37	6.88	0.02	0.002	6.64	0.02	0.031	0.09	6.53	0.01	0.006	28.6	0.19	7.06	5.6
11-Feb-20																						
12-Feb-20																						
13-Feb-20	0.05	0.007	28.7	6.91	5.1	0.05	0.013	0.42	6.86	0	0	6.64	0.01	0.021	0.09	6.72	0	0	36.4	0.07	6.9	5.2
14-Feb-20																						
15-Feb-20																						
16-Feb-20																						
17-Feb-20																						
18-Feb-20	0.005	0.021	32.3	6.7	10.3	0.05	0.019	0.43	6.53	0	0	6.49	0	0.042	0.05	6.35	0.01	0	43	0.06	7.37	5.5
19-Feb-20																						
20-Feb-20																						
21-Feb-20	0.04	0.006	33.2	7.15	5.4	0.04	0.006	0.35	6.59	0.01	0.002	6.59	0	0.026	0.07	6.76	0.01	0	31.8	0.19	7.23	5.2
22-Feb-20																						
23-Feb-20																						
24-Feb-20	0.04	0.018	32.4	6.64	10.4	0.03	0.013	0.09	6.46	0	0	6.8	0	0.031	0.13	6.68	0	0.006	40.1	0.18	7.01	5.7
25-Feb-20																						
26-Feb-20	0.04	0.02	64.5	6.95	5.2	0.05	0.013	0.39	6.67	0	0.002	6.65	0	0.052	0.06	6.44	0	0.006	40.6	0.18	6.87	5.7
27-Feb-20																						
28-Feb-20																						
month Avg.	**0.04**	**0.01**	**35.30**	**6.95**	**0.03**	**0.05**	**0.01**	**0.37**	**6.70**	**0.01**	**0.03**	**6.62**	**0.01**	**0.03**	**0.08**	**0.03**	**0.00**	**0.00**	**35.73**	**0.16**	**7.12**	**5.54**
month Min	**0.01**	**0.00**	**25.60**	**6.64**	**5.00**	**0.03**	**0.01**	**0.09**	**6.46**	**0.00**	**0.00**	**6.49**	**0.00**	**0.02**	**0.05**	**6.35**	**0.00**	**0.00**	**22.20**	**0.06**	**6.87**	**5.20**
month Max	**0.05**	**0.02**	**64.50**	**7.15**	**10.40**	**0.05**	**0.03**	**0.49**	**6.88**	**0.02**	**0.00**	**6.80**	**0.02**	**0.05**	**0.13**	**6.76**	**0.01**	**0.01**	**43.10**	**0.26**	**7.37**	**5.70**