KIRKLAND LAKE
THE RIGHT ENVIRONMENT

Annual Summary Report to Council

The Kirkland Lake Water Treatment Plant
Drinking Water System # 220000308
Reporting Period January 1, 2009 to December 31, 2009

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Introduction

As of June 2003, municipalities throughout Ontario have been required to comply with Ontario Regulation 170/03 made under the Safe Drinking Water Act (SDWA 2002). 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 specified drinking water testing for microbiological parameters, chemical parameters, use of licensed laboratories, treatment requirements, and reporting requirements.

The Annual Summary Report for Council is one requirement under Regulation 170/03. The 2009 Annual Summary Report for the Town of Kirkland Lake Water Treatment Plant has been submitted to the MOE and is available at Physical Services, Town Hall, KLWTP, and on the TKL website.

The required components of this Annual Summary Report for Council can be summarized as follows:

- Council must receive the Annual Summary Report no later than March 31 for the previous calendar year.
- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows and daily instantaneous peak flow rates
- A comparison of the above summary to the rated capacity and flow rates approved in the systems approval
- Any additional data and other information that could provide insight to Council on the Drinking Water System.

In addition, this report contains Raw Water information as well as a summary of in-plant testing results. Internal testing of certain parameters on the Raw water, Treated Water, and locations throughout the treatment process act as plant performance indicators, and are necessary for quality control, trend monitoring, chemical addition adjustments, and historical data.

Figure 2 on next page shows a summary of internal testing results.

Figure 2 - Internal Testing Results

PARAMETER	SOURCE	JAN	FEB	MAR	APR	MAY	JUN
pH	RAW	6.78	6.76	6.72	6.68	6.96	7.04
pH	CLARIFIER	6.14	6.10	6.13	6.17	5.86	5.83
pH	TREATED	6.97	7.03	6.97	6.95	7.33	7.36
TURBIDITY (NTU)	RAW	1.22	1.32	1.67	1.38	1.19	0.74
TURBIDITY (NTU)	CLARIFIER	0.24	0.29	0.27	0.23	0.22	0.10
TURBIDITY (NTU)	FILTER	0.03	0.04	0.06	0.04	0.03	0.02
TURBIDITY (NTU)	TREATED	0.13	0.13	0.15	0.14	0.09	0.10
TEMP. (Deg C)	RAW	6.3	6.9	7.0	6.5	9.4	15.4
TEMP. (Deg C)	TREATED	8.6	8.8	8.3	8.7	8.5	17.8
COLOUR (PCU)	RAW	31	34	34	34	33	26
COLOUR (PCU)	TREATED	6	8	5	6	3	3
TOT. CHLORINE	*pre-treat*	0.24	0.08	0.11	0.17	0.09	0.08
TOT. CHLORINE	*clearwell*	2.02	2.10	2.10	2.02	1.95	1.99
FREE CHLORINE	TREATED	1.06	1.17	1.31	1.29	1.49	1.33
ALUMINUM (mg/L)	TREATED	0.010	0.009	0.011	0.009	0.011	0.006

PARAMETER	SOURCE	JUL	AUG	SEP	OCT	NOV	DEC
pH	RAW	7.05	7.15	7.15	7.13	7.11	6.97
pH	CLARIFIER	6.02	6.10	6.26	6.18	6.10	6.24
pH	TREATED	7.33	7.37	7.22	7.17	7.20	7.11
TURBIDITY (NTU)	RAW	1.01	0.97	1.18	0.91	0.73	0.65
TURBIDITY (NTU)	CLARIFIER	0.10	0.10	0.10	0.14	0.17	0.23
TURBIDITY (NTU)	FILTER	0.02	0.02	0.02	0.03	0.03	0.03
TURBIDITY (NTU)	TREATED	0.03	0.05	0.04	0.06	0.06	0.06
TEMP. (Deg C)	RAW	18.5	21.3	19.1	11.3	6.7	4.8
TEMP. (Deg C)	TREATED	21.3	23.2	21.0	13.4	8.7	7.2
COLOUR (PCU)	RAW	30	29	30	26	24	27
COLOUR (PCU)	TREATED	2	2	2	2	1	3
TOT. CHLORINE	*pre-treat*	0.12	0.13	0.11	0.10	0.11	0.14
TOT. CHLORINE	*clearwell*	2.00	2.01	2.03	1.98	1.99	1.95
FREE CHLORINE	TREATED	1.43	1.42	1.42	1.52	1.55	1.51
ALUMINUM (mg/L)	TREATED	0.003	0.002	0.001	0.005	0.003	0.005

* results are monthly averages

Review

The 2009 calendar year proved to be successful with the Kirkland Lake Water Treatment Plant. The MOE performed two inspections in 2009; one detailed inspection in January, and one focused inspection in December. Both inspections proved us to be 100% compliant with all applicable legislation.

No major breakdowns occurred in 2009, with plant availability at a perfect 100%. Critical spare parts are now a part of our inventory, making repairs safe and efficient. The CPU's are also now equipped with instantaneous battery back-up systems to protect against "brown" power.

New regulations have come into play regarding lead testing. Our lead testing program in 2008 showed no exceedences of MOE lead standards. Due to our successful results and our population being less than 50,000, we are exempt from further lead sampling as part of that program.

This past summer, many lab jar-tests were conducted on water chemical clarification. Alum (coagulant) and Activated Silica (coagulant aid) concentrations were tested to achieve maximum disinfection by-product (DBP) precursor removal. The resulting chemical optimization has reduced the formation of DBP precursors. Further testing will take place on "winter" water.

Updates

Kirkland Lake's Drinking Water Quality Management System (DWQMS) was submitted to MOE in December 2009 as required. The program requires municipalities to develop and maintain management systems to ensure consistent water quality now and into the future. The accreditation process is now underway with internal and external audits taking place.

A new Magna-Drive Variable Speed pumping system was installed in early 2009. This variable speed drive allows for a smoother change in water pressure differentials, ensures longer pump life, and reduces power consumption at the pump. More importantly, the drive allows the Chaput standpipe to cycle more frequently, thereby keeping distribution water fresh.

Treatment System Overview:

The Kirkland Lake Water Treatment Plant is a Class 3 water treatment plant, which draws raw water from Gull Lake. The process flow schematic for the Water Treatment Plant is shown in Fig. 1 at the end of the document.

Raw water is drawn into the plant via an intake structure approximately 3m deep and 75 m from shore. Water is then pumped to treatment area via 25 Hp low lift vertical turbine pumps. Each pump typically produces 85 L/s, and the number of pumps required depends on water treatment plant demand.

The treatment process involves the following stages:

- Coagulation process utilizing aluminum sulfate (alum) - electrochemical preparation of particulates for removal
- Flocculation process utilizing activated silica - particulates combined into settleable sludge
- Sedimentation process utilizing "Degremont Ultra-Pulsator" clarifiers - solids removal through settling
- Filtration process utilizing dual media filters (anthracite coal and silica sand) - filter residual solids
- pH adjustment process utilizing sodium hydroxide - restores treated water to neutral pH
- Disinfection process - destroy pathogenic microorganisms
- Removal – larger microorganisms removed through filtration
- Inactivation – chemical disinfection through the use of chlorine
- Fluoridation process utilizing fluorosilicic acid – helps prevents dental cavities
- Sludge disposal process - discharged to sanitary sewage system for subsequent treatment

Treated water is distributed to the piping system and the Chaput Hughes stand pipe by (2) 125 Hp and (2) 200 Hp vertical turbine high lift pumps. Under normal operating conditions, one 125 Hp pump is utilized. As pressure drops in the system, or the Chaput Tower requires filling, one 200 Hp pump is used. Water pressure is maintained between 60 and 70 psi.

Another important aspect of the Town's water system is the potable water storage tank (standpipe) at Chaput Hughes. It provides storage for approximately 7,115 m^3 of water, to help regulate water pressure in the distribution system, and provide extra water in the case of an emergency. To ensure optimum chlorine residual in the distribution system there are booster chlorinators at the standpipe and Swastika Valve Chamber.

Compliance Information:

This section has been prepared to give Council a synopsis of the Drinking Water System and to evaluate the ability of the process to meet the standards and guidelines set out in legislation. The regulatory testing, sampling, and monitoring is quite complex, and the data handled by the operations staff is extensive. Adverse Water Quality Results must have documented Corrective Actions submitted to the MOE Spills Action Center and the local Health Unit within specific timelines. This data has also been included for your review.

The Kirkland Lake Water Treatment Plant is operated in accordance with several Provincial Regulations. The following is a summary of those Regulations:

- Use of Accredited Laboratories: Analytical tests to monitor water quality are conducted at laboratories that are audited by the Canadian Association for Environmental Analytical Laboratories (CAEAL). The Standards Council of Canada (SCC), whom ensures the laboratories use acceptable protocols and test methods, also accredits them. The accreditation process also requires the laboratory to provide evidence and assurances of the proficiency of the analysts performing the tests.

- Operation by Licensed Operators: Operations and maintenance personnel at the Kirkland Lake Water Treatment Plant are licensed under the Safe Drinking Water Act, 2002. This mandatory requirement ensures that operators have met academic and experience requirements, as well as passed the examination for the class level of license they hold. Currently, we employ three Class II operators and one Class III operator, Eric Nielson, acting as ORO (Overall Responsible Operator)

- Sampling and Analytical Requirements: Sampling and analysis of the various water quality parameters are mandated in the Drinking-Water Systems Regulation 170/03. Information on these sampling and analytical requirements, is included in this report or at the Work's Department Offices at 1 Dunfield Road in Kirkland Lake.

- Adherence to Ministry Guidelines and Procedures: The Ministry of the Environment and the Ministry of Health developed guidelines and procedures to ensure operational excellence and the protection of public health. Operation staffs are adhering to these guidelines and procedures and the ministries perform regular audits of the plant.

Water Source:

Kirkland Lake draws its water from Gull Lake on the eastern border of the town. Gull Lake is characteristic of most Northern Ontario lakes classified as eutrophic in nature with relatively high color content. Gull Lake is spring-fed with one naturally occurring outlet at the Physical Services garage. Gull Lake's volume can be supplemented by pumping water from nearby McTavish Lake. In 2009 we did not have to supplement Gull Lake. Leisure and recreational activity is limited in an attempt to ensure the cleanliness and safety of the water source.

If there are any questions you may have regarding Gull Lake as a water source, please contact the Town Work's Department.

Raw Water Contaminants:

Some parameters may be present in surface source water before we treat it. The following is a description of the various groups of parameters.

Microbiological parameters such as bacteria may come from sewage plants, livestock operations, septic systems and wildlife. Microbiological quality is the most important aspect of drinking water quality because of its association with dangerous water-borne diseases that can strike quickly.

Inorganic parameters such as salts and metals can be naturally occurring or a result of urban storm runoff, industrial or domestic wastewater discharge, mining or agriculture.

Organic parameters can be naturally occurring, but most organics of concern are synthetic. They originate from industrial discharges, urban storm runoff and other sources. Included in this group are pesticides that originate from both rural and urban areas. Some organics may originate from treatment of drinking water (for example, chlorination byproducts such as trihalomethanes).

Terms and Definitions:

The following are terms that you will find useful when reading the summary of analytical results.

MAC
Maximum Acceptable Concentration. This is a health-related Ontario drinking water standard established for contaminants that have known or suspected adverse health effects when above a certain concentration. The length of time the MAC can be exceeded without injury to health will depend on the nature and concentration of the parameter.

IMAC
Interim Maximum Acceptable Concentration. This is a health-related Ontario drinking water standard established for contaminants when there are insufficient toxicological data to establish a MAC with reasonable certainty, or when it is not practical to establish a MAC at the desired level.

Parameter
This is a substance in the water for which we sample and analyze.

CFU
Colony Forming Units. This is a unit of measure for bacterial colonies in water.

Membrane Filtration (MF)
A method for counting bacteria in water. A measured volume of water is filtered through a sterilized membrane, which is then transferred to the surface of an appropriate agar medium and incubated. Upon incubation, retained bacteria give rise to visible colonies on the membrane surface.

mg/L
Milligrams per litre. This is a measure of the concentration of a parameter in water, sometimes called parts per million (ppm).

ug/L
Micrograms per litre. This is a measure of the concentration of a parameter in water, sometimes called parts per billion (ppb).

m^3
Cubic Meter. This is a measure of the volume of water (equal to 1000 Litres).

Coliform bacteria
A group of commonly found bacteria. Their presence in a water sample may be indicative of inadequate filtration / disinfection.

Total Coliforms
Indicates possible presence of fecal contamination

E. Coli bacteria
Is a sub-group of coliforms bacteria. They reside in the digestive tracts of warm-blooded animals. Their presence is a definite indicator of fecal contamination.

Heterotrophic Plate Count *(HPC)*
Indicates bacterial activity that may contribute to the deterioration of water quality.

Raw Water
Surface or ground water available as a source for drinking water that has not undergone treatment.

Summary Analytical Test Results:

Microbiological Parameters	MAC or IMAC	Number of Samples	Number of Detectable Results	Sampling Date	Range	Exceedence?
For Plant Treated and Distribution Samples						
Total Coliforms (CFU/100 ml)	*	364	0	Jan 1 to Dec. 31	NA	NO
E. Coli (CFU/100 ml)	*	364	0	Jan 1 to Dec. 31	N/A	NO
Heterotrophic Plate Count (CFU/1 ml)	N/A	364	36	Jan 1 to Dec. 31	0-270	

Microbiological Parameters	MAC or IMAC	Number of Samples	Number of Detectable Results	Sampling Date	Range**	Exceedence?
Turbidity – Plant Treated (NTU)	1.0	Continuous monitoring	Continuous monitoring	Jan 1 to Dec 31	0.00 - 0.05	NO
Turbidity indicates presence of particulates in water due to treatment process difficulties.						
Free Chlorine – Plant Treated (mg/L)	4.0	Continuous monitoring	Continuous monitoring	Jan 1 to Dec 31	0.90 – 1.65	NO
Free Chlorine - Distribution System (mg/L)	4.0	Continuous monitoring	Continuous monitoring	Jan 1 to Dec 31	0.57 – 1.79	NO

To maintain microbiological quality in the system, the optimal minimal level of free chlorine is >0.20 mg/l. A possibility of an adverse water quality occurs when the free chlorine residual in the distribution system is less than 0.05 mg/L.

Inorganic Parameters	MAC or IMAC	Number of Samples	Number of Detectable Results	Sampling Date	Range**	Exceedence?
Fluoride Plant Treated (mg/L)	N/A (revoked)	Continuous monitoring	Continuous monitoring	Jan 1 to Dec 31	0.44 – 0.84	
Fluoride Distribution Performed by Plant Staff (mg/L)	N/A (revoked)	312	312	Jan 1 to Dec 31	0.16 – 0.93	
Sodium	20	1	1	Feb 20, 2008	30.7	Yes***
Nitrite - Plant Treated (mg/L)	1.0	4	0	Quarterly	<0.05	NO
Nitrate - Plant Treated (mg/L)	10	4	0	Quarterly	<0.1	NO

**Daily average for continuous monitoring equipments
***Exceedence notification is once every 5 years (Sodium)

Volatile Organics	MAC or IMAC	Number of Samples	Number of Detectable Results	Sampling Date	Range	Exceedence?
Trihalomethanes – Distribution (ug/L)	100	4	4	Quarterly	23 – 73.2	NO
				average	47.3	

* THM MAC is based on a running annual average of the four most recent quarterly samples. The average for 2009 was **47.3 ppb**

On February 19, 2009 the Plant Treated Water was sampled and analyzed for all Organic parameters listed in Schedule 24 of the Ontario Drinking Water Standards. There were no exceedences.

On February 19, 2009 the Plant Treated Water was sampled and analyzed for all Pesticides and PCB parameters listed in Table D of the ODWS. There were no exceedences.

Notable Events

There were no major operational problems encountered in 2009.

Treatment Plant Specifications

Operating Authority	Corporation of the Town of Kirkland Lake
Address	1 Dunfield Road, Kirkland Lake, ON, P2N 3P4
Contacts	Eric Nielson (ORO) – 705-642-6625
	Mark Williams - 567-9365 extension 231

General Plant Information:

Plant Classification	Class 3 Water Treatment
Total Design Capacity	22 500 m^3/day (or 260 litres/second)
Average Daily Flow for this reporting period	8207 m^3/day
Maximum Daily Flow for this reporting period	12429 m^3/day
Total Treated water for this reporting period	2,993,330 m^3

Treatment Process

Coagulation Chemical	Aluminum Sulfate (alum)
Coagulation Aid	Activated Silica (AS-AL)
Sedimentation	Degremont ultra-Pulsator clarifiers
Filtration	Dual Media - anthracite over silica sand
pH Adjustment	Sodium Hydroxide (Caustic soda)
Disinfection Method	Chlorine Gas
Fluoridation Chemical	Hydrofluosilicic acid
Waste Disposal	Sanitary Sewer System

Compliance with Terms and Conditions of the Certificate of Approval

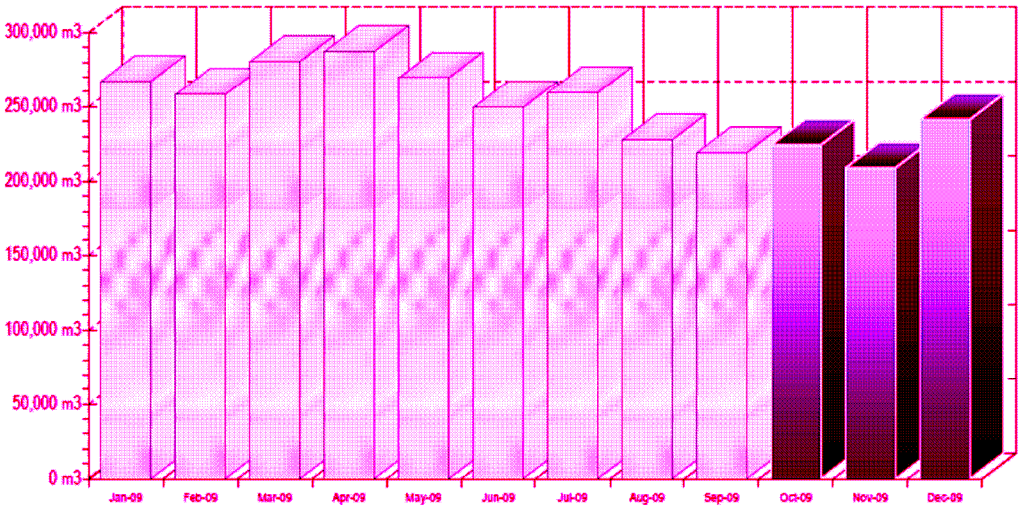
The Kirkland Lake Water Treatment Plant operated during the reporting period in accordance with the Terms and Conditions of Certificates of Approval # 6444-7PYRER. All conditions under this Certificate of Approval have been met.

Town of Kirkland Lake
Water Treatment Plant

from January '09 to December '09 12 month annual

Annual / 4th Quarter Report 2009

Plant water production



Mth	plant discharge	average day's pumpage	highest day's pumpage	raw water intake	average day's pumpage	highest day's pumpage
Jan-09	267,357 m3	8,624 m3	10,112 m3	273,008 m3	8,807 m3	10,394 m3
Feb-09	258,060 m3	9,216 m3	11,526 m3	263,156 m3	9,398 m3	11,846 m3
Mar-09	280,564 m3	9,050 m3	11,832 m3	285,580 m3	9,212 m3	12,000 m3
Apr-09	287,181 m3	9,573 m3	12,429 m3	293,676 m3	9,789 m3	12,729 m3
May-09	269,583 m3	8,696 m3	11,689 m3	274,715 m3	8,862 m3	12,059 m3
Jun-09	249,449 m3	8,315 m3	11,042 m3	254,331 m3	8,478 m3	10,977 m3
Jul-09	259,601 m3	8,374 m3	10,395 m3	265,312 m3	8,655 m3	10,951 m3
Aug-09	227,539 m3	7,340 m3	8,848 m3	233,656 m3	7,537 m3	9,160 m3
Sep-09	219,133 m3	7,304 m3	9,595 m3	223,762 m3	7,459 m3	9,847 m3
Oct-09	224,343 m3	7,237 m3	11,083 m3	229,456 m3	7,402 m3	11,822 m3
Nov-09	209,145 m3	6,971 m3	8,151 m3	212,894 m3	7,096 m3	8,332 m3
Dec-09	241,376 m3	7,786 m3	11,416 m3	241,923 m3	7,804 m3	11,486 m3
Annual Total	2,993,330 m3			3,054,474 m3		
Maximum month	287,181 m3 Apr-09		12,429 m3 29-Apr-09	293,676 m3 Apr-09		12,729 m3 29-Apr-09
Minimum month	209,145 m3 November-09			212,894 m3 November-09		
Average month	249,444 m3			254,539 m3		
Average day for the year		8,207 m3			8,375 m3	

NOTE: *Discrepancy this year between plant discharge and raw water orfice flow meters (subtracting wastewater) was -2.61%*

The chart above shows the monthly water production as well as peak daily flow. The highest peak intake flow rate for the year occurred on June 21st, with a flow rate of 228.3 L/s, below the maximum allowed of 260 L/s.

Continuous Improvement and Calibration to the Works

The following improvements occurred at the water plant in 2009:

Tower inspection:

In October 2009 the Chaput Hughes Water Tower was drained and inspected. The lower interior lining of the tank was found to be in good order, however there is some wearing of the inner liner near the top of the tank. Surface ice build-up is suspected to be the cause. Tank professionals will be utilized in the summer to repair the worn surfaces. There was very little residue on the bottom of the tank.

Flow meters and pressure gauge inspection:

In September 2009 all flow meters and pressure transmitters at the KLWTP were calibrated and adjusted as required. The annual calibration check was performed by DES Systems.

Preventative Maintenance Program:

In October 2006, an initial preventative maintenance program was developed for the KLWTP. PM programs are essential in preventing unexpected downtime, improving equipment efficiency, reducing costly equipment repairs, and reducing call-out time due to unexpected equipment failure. The program is continually growing. In 2009, the number of call-outs were further reduced, and plant availability was 100%.

Adverse Water Quality Occurrence

On April 3rd, a count of one coliform bacteria at a residence was reported by the lab. Ministry guidelines call for a total coliform count of Non-Detectable. Resampling on April 4th showed a result of Non-detect. Local Ministry of Health was informed as well as local Ministry of Environment officials.

Figure 1. Kirkland Lake Water Treatment Plant Flow Schematic