



SYDENHAM WATER TREATMENT PLANT

2024 ANNUAL REPORT

Drinking Water System Number: 260069290
Drinking Water System Owner: Township of South Frontenac
Drinking Water System Category: Large Municipal Residential

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1 EXECUTIVE SUMMARY

Utilities Kingston is proud to present this annual report on drinking water quality. This report has been prepared in accordance with Section 11 of Ontario Regulation 170/03. Regulation 170/03 sets requirements for public waterworks with regard to sampling and testing, levels of treatment, licensing of staff, and notification of authorities and the public about water quality. Free copies of this report and the Report prepared in accordance to Schedule 22 of Ontario Regulation 170/03, are available by public request at the South Frontenac Township Offices, at our water plant locations, and at <http://www.utilitieskingston.com> or <https://www.southfrontenac.net>. Notices of availability are generally made through our website and media releases on social media platforms. More information on the Drinking Water Regulations can be found on [Ministry of the Environment, Conservation and Parks](#) (MECP) website. For further information about this report or any questions regarding accessibility, contact Robert Cooney by email at rcooney@utilitieskingston.com, or call 613-546-1181 Ext 2291.

2 PLANT DESCRIPTION AND TREATMENT PROCESS

2.1 RAW WATER SOURCE

The source of water treated by this plant is Sydenham Lake. The intake is located 128 m east of the treatment plant, at approximately 6 m of water depth.

2.2 ZEBRA MUSSEL CONTROL

Pre-chlorination takes place at the mouth of the intake. This protects the intake from becoming encrusted with zebra mussels, which would restrict the flow of water through the intake.

2.3 SCREENING

Two stationary screens located in the low lift pumping well remove any large debris such as weeds, fish, etc.

2.4 LOW LIFT PUMPS

Three low lift pumps lift the water from lake level to the main treatment building. The pumps are submersible pumps each with a capacity of 7.8 L/sec which pump the water into the main building for treatment.

2.5 CHEMICAL FEED SYSTEM

XL1900, Poly Aluminum Chloride (PACl), is added to the water as it enters the process building just prior to passing through the in-line mixer. The particles in the water will collide with the PACl particles as the water flows in a spiral motion through the mixer, and then join together to form larger particles called floc.

2.6 FILTERS

Three pressure filtration tanks containing a ceramic filtration media remove the floc formed from the addition of PACl and the particles present in the water. Water flows through the filters into two baffled clean water reservoirs called clear wells.

2.7 BACKWASH

Filters are washed to remove the particulates they have collected over the previous 24 hours. Clean water from the clear well is pumped backwards through the filter, and the filter is agitated by air scouring the filter media to break up any large particles.

2.8 PROCESS WASTE MANAGEMENT

Effluent water from the backwash process is directed to a backwash storage tank for further settling. The supernatant (the clear water at the top of the tank after settling) is directed back to Sydenham Lake and the settled sludge is mechanically removed and sent for further treatment.

2.9 GRANULAR ACTIVATED CARBON CONTACTORS

During periods of high dissolved organic content in the source water, filter effluent water is directed to two pressure filtration tanks containing granular activated carbon (GAC). The GAC contactors assist in the removal of dissolved organics which react with chlorine to produce chlorination by-products. The GAC contactors are periodically backwashed to remove the particulates they have collected.

2.10 PRIMARY DISINFECTION

Primary disinfection of the filtered water is achieved via Ultraviolet (UV) light and free chlorine residual. Two UV reactors (duty/standby) each using 12 low pressure high output lamps provide the UV light disinfection. Free chlorine disinfection follows the UV process with the use of two chemical metering pumps (duty/standby) which provide sodium hypochlorite to an application point downstream of the UV reactors at the entrance to the detention piping.

2.11 SECONDARY DISINFECTION

Secondary disinfection is the maintenance of a disinfectant residual throughout the distribution system which is achieved with chloramines. Following the free chlorine disinfection process, ammonium sulphate is added with the use of two chemical metering pumps (duty/standby), at an approximate rate of 3.5:1 ratio (chlorine/ammonia), to react with the free chlorine residual to form chloramines. The application dosages of sodium hypochlorite and ammonium sulphate is adjusted to produce a sufficient in plant combined chlorine residual to ensure that minimum residuals are maintained in the distribution system.

2.12 CLEAR WELLS

Two baffled clear wells, each with a volume of 115 m³, provide storage of filtered water and allow for a sufficient amount of chlorine contact time with the water to ensure proper disinfection.

2.13 HIGH LIFT PUMPS

Three high lift pumps move treated water from the clear wells into the distribution system.

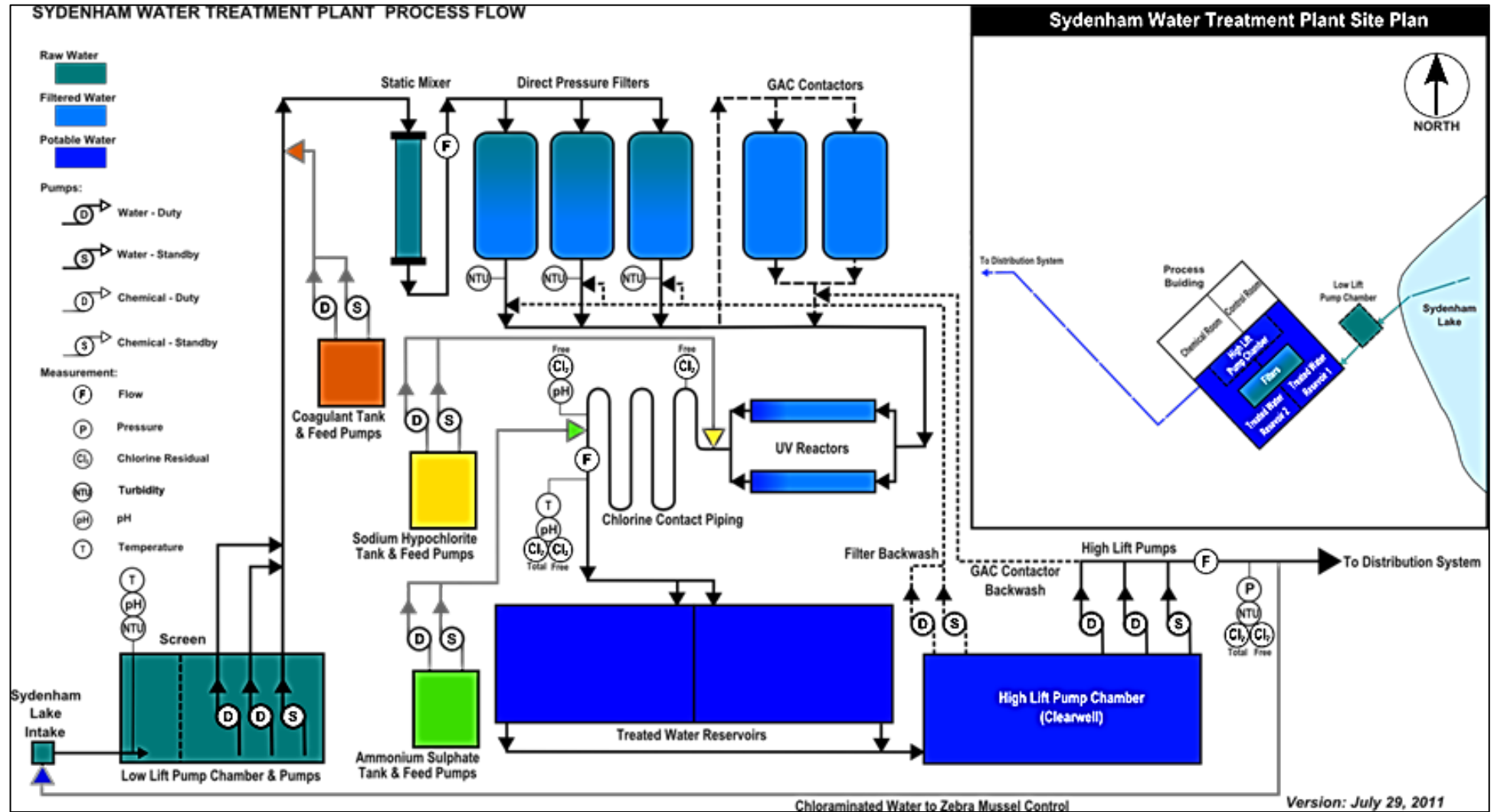
2.14 STANDBY EQUIPMENT

A 130 kilowatt (kW) standby diesel generator provides electricity to the water plant during power interruptions. The generator and standby equipment are tested regularly to ensure proper operation when required.

2.15 ELEVATED TANK

The elevated tank has a storage capacity of 1019 m³ and provides pressure to the distribution system.

Figure 1 – Sydenham Water Treatment Plant Process Flow Diagram



3 DISTRIBUTION SYSTEM

There are approximately 7154 m of water mains and 43 fire hydrants in the system. Once all connections to the distribution system have been completed, the drinking water system will supply water to 288 services.

4 MONETARY EXPENSES

Under Section 11 of Ontario Regulation 170/03, a description of any major expenses incurred during this reporting period must be included in the annual report.

4.1 MAJOR EXPENSES:

- Continued replacement of distribution system sample hydrants and one sample hydrant was installed at a new location.
- Completed the 5-year, system-wide hydrant flow testing program.
- Major facility SCADA/PLC upgrades were completed.
- Safety upgrades were completed for chemical drum handling equipment.
- The bulk water filling station was commissioned.
- The UV reference probe was calibrated.

5 NOTIFICATIONS

Under Ontario Regulation 170/03, notifications were required for any instances where a sample result indicated that a parameter used to measure water quality exceeded a Maximum Acceptable Concentration (MAC). Once a notification is received from a laboratory or an observation of any other indicator of adverse water quality is made by operations personnel, corrective action as dictated by the regulations is initiated in an effort to confirm the initial result. If confirmed, further action may be recommended by the Medical Officer of Health. If not confirmed, sampling will typically return to the normal schedule, or depending on the parameter, Utilities Kingston may choose to increase the sampling frequency to monitor the parameter more closely for a period of time.

5.1 EVENTS REQUIRING NOTIFICATIONS:

There were no events within the Sydenham Water Treatment Plant that required notification during this reporting period.

6 GLOSSARY

TCU – True Colour Units

mg – Milligram

N/A – Not Applicable

N/D – Non-Detectable

NTU – Nephelometric Turbidity Units - A measure of the amount of particles in water.

mg/L – Milligrams per litre. This is a measure of the concentration of a parameter in water, also called parts per million.

µg/L – Micrograms per litre, also called parts per billion.

ng/L – Nanograms per litre, also called parts per trillion.

Parameter – A substance that we sample and analyze for in the water.

AO – Aesthetic Objective. AOs are not health related, but may affect the taste, odour, colour, or clarity of the water

DOCUMENT:

Sydenham Water Treatment Plant Annual Report

OG – Operational guideline. Set to ensure efficient treatment and distribution of water.

MAC – Maximum Acceptable Concentration. This is a health-related drinking water standard established for contaminants having 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

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7 WATER QUALITY TEST RESULTS

Table 1 - Microbiological Testing

(Performed Under Regulation 170/03)

| Type | MAC (E. Coli & Total Coliforms) | Number of Samples | Range of E. Coli Results (Min - Max) | Range of Total Coliform Results (Min - Max) | Number of HPC Samples | Range of HPC Results (Min - Max) |
|---------------------|---------------------------------|-------------------|--------------------------------------|---|-----------------------|----------------------------------|
| Raw | N/A | 53 | 0 - 7 | 0 - >200 | N/A | N/A |
| Treated | 0 | 53 | 0 | 0 | 53 | Under 10 - 230 |
| Distribution System | 1 | 113 | 0 | 0 - 1 | 75 | Under 10 - 490 |

Note: Total Coliforms are an indicator of adverse water quality if detected

Table 2 - Operational Testing

(Performed under Schedule 7, 8, or 9 of Regulation 170/03)

| Parameter | MAC | Number of Samples | Range of Results (min - max) | Parameter Description |
|---|---------------------------|-------------------|------------------------------|--|
| Raw Water Turbidity (NTU) | N/A | Continuous | 0.242 - 2.98 | Turbidity is a measure of particles in water |
| Treated Water Turbidity (NTU) | N/A | Continuous | 0.063 - 0.212 | Turbidity is a measure of particles in water |
| Treated Combined Chlorine Residual (mg/L) | See Parameter Description | Continuous | 1.23 - 2.21 | Recommended level of at least 1.00 mg/L in distribution system to maintain microbiological quality. 0.25 mg/L minimum. |
| Distribution System Chloramines Residual (mg/L) | See Parameter Description | Continuous | 0.93 - 2.87 | Recommended level of at least 1.00 mg/L combined chlorine in distribution system to maintain microbiological quality. 0.25 mg/L combined chlorine minimum. |

Note: Turbidity range determined through in house lab testing

Table 3 - Filter Operational Testing

| Parameter | MAC | Number of Samples | Range of Results (min - max) | Results Average |
|------------------------------------|-------------------------|-------------------|------------------------------|-----------------|
| Filter #1 Effluent Turbidity (NTU) | 1.0 for over 15 minutes | Continuous | 0.05 - 1.86 | 0.09 |
| Filter #2 Effluent Turbidity (NTU) | 1.0 for over 15 minutes | Continuous | 0.04 - 2.00 | 0.09 |
| Filter #3 Effluent Turbidity (NTU) | 1.0 for over 15 minutes | Continuous | 0.01 - 0.41 | 0.1 |

Table 4 – Backwash Wastewater Effluent Testing and Sampling

| Parameter | MAC | Number of Samples | Results Average | Parameter Description |
|-------------------------------|-----|-------------------|-----------------|--|
| Total Suspended Solids (mg/L) | 15 | 12 | 7 | A measure of the particulates collected in the filtration process. |

Note: Testing and sampling in accordance with the requirements of the Municipal Drinking Water License

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Table 5 - Raw Water Testing

(Analyzed by Accredited Laboratories)

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|--------------------|-----|-------------------|---------------------------|----------------------------|--|
| Microcystin (µg/L) | 1.5 | 22 | Under 0.15 - 0.21 | No | Naturally occurring (released from blooms of blue-green algae) |

Table 6 - Treated Water Schedule 23 Inorganic Parameters

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|-----------------|-------|-------------------|---------------------------|----------------------------|---|
| Antimony (mg/L) | 0.006 | 1 | 0.0001 | No | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder |
| Arsenic (mg/L) | 0.025 | 1 | 0.0002 | No | Naturally occurring in surface waters / mine drainage |
| Barium (mg/L) | 1 | 1 | 0.05 | No | Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes. |
| Boron (mg/L) | 5 | 1 | 0.026 | No | Erosion of natural deposits, industrial waste effluents. |
| Cadmium (mg/L) | 0.005 | 1 | Under 0.000015 | No | Industrial discharge |
| Chromium (mg/L) | 0.05 | 1 | Under 0.001 | No | Industrial residues |
| Mercury (mg/L) | 0.001 | 1 | Under 0.00002 | No | Erosion of natural deposits, industrial discharges. |
| Selenium (mg/L) | 0.01 | 1 | Under 0.001 | No | Discharge from refineries, mines, chemical manufacture |
| Uranium (mg/L) | 0.02 | 1 | Under 0.00005 | No | Erosion of natural deposits. |

Table 7 - Treated Water Schedule 24 Inorganic Parameters

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|---|------|-------------------|---------------------------|----------------------------|---|
| Alachlor (µg/L) | 5 | 1 | Under 0.3 | No | Agricultural herbicide |
| Atrazine + N-Dealkylated Metabolites (µg/L) | 5 | 1 | Under 0.5 | No | Agricultural herbicide |
| Azinphos-methyl (µg/L) | 20 | 1 | Under 1 | No | Insecticide |
| Benzene (µg/L) | 5 | 1 | Under 0.5 | No | Discharge from plastics manufacturing, leaking fuel tanks |
| Benzo(a)pyrene (µg/L) | 0.01 | 1 | Under 0.006 | No | Formed from the incomplete burning of organic matter. |
| Bromoxynil (µg/L) | 5 | 1 | Under 0.5 | No | Agricultural herbicide |
| Carbaryl (µg/L) | 90 | 1 | Under 3 | No | Agricultural/Forestry/ Household insecticide |
| Carbofuran (µg/L) | 90 | 1 | Under 1 | No | Agricultural insecticide |

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| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|---|------------|--------------------------|----------------------------------|-----------------------------------|---|
| Carbon Tetrachloride (µg/L) | 5 | 1 | Under 0.2 | No | Discharge from chemical and industrial activities |
| Chlorpyrifos (µg/L) | 90 | 1 | Under 0.5 | No | Agricultural/ Household insecticide |
| Diazinon (µg/L) | 20 | 1 | Under 1 | No | Agricultural/ Livestock Operation/ Residential insecticide |
| Dicamba (µg/L) | 120 | 1 | 1 | No | Agricultural herbicide |
| 1,2-Dichlorobenzene (µg/L) | 200 | 1 | Under 0.5 | No | Discharge from industrial chemical factories |
| 1,4-Dichlorobenzene (µg/L) | 5 | 1 | Under 0.5 | No | Discharge from industrial chemical factories |
| 1,2-Dichloroethane (µg/L) | 5 | 1 | Under 0.5 | No | Discharge from industrial chemical factories |
| 1,1-Dichloroethylene (µg/L) | 14 | 1 | Under 0.5 | No | Discharge from industrial chemical factories |
| Dichloromethane (µg/L) | 50 | 1 | Under 5 | No | Discharge from pharmaceutical and chemical factories |
| 2,4-Dichlorophenol (µg/L) | 900 | 1 | Under 0.2 | No | Industrial contamination/ reaction with chlorine |
| 2,4-Dichlorophenoxy Acetic Acid (µg/L) | 100 | 1 | Under 1 | No | Agricultural/ Residential herbicide |
| Diclofop-methyl (µg/L) | 9 | 1 | Under 0.9 | No | Agricultural herbicide |
| Dimethoate (µg/L) | 20 | 1 | Under 1 | No | Agricultural/ Livestock Operation/ Forestry insecticide |
| Diquat (µg/L) | 70 | 1 | Under 5 | No | Agricultural/ Aquatic herbicide |
| Diuron (µg/L) | 150 | 1 | Under 5 | No | Agricultural/ Industrial/ herbicide |
| Glyphosate (µg/L) | 280 | 1 | Under 25 | No | Agricultural/Forestry/ Household herbicide |
| Malathion (µg/L) | 190 | 1 | Under 5 | No | Fruit & Vegetable / pest control insecticide |
| 2-methyl-4-chlorophenoxy-acetic Acid (µg/L) | 100 | 1 | Under 10 | No | Leaching and/or runoff from agricultural and other uses |
| Metolachlor (µg/L) | 50 | 1 | Under 3 | No | Agricultural herbicide |
| Metribuzin (µg/L) | 80 | 1 | Under 3 | No | Agricultural herbicide |
| Monochlorobenzene (µg/L) | 80 | 1 | Under 0.5 | No | Discharge from industrial and agricultural chemical factories and dry-cleaning facilities |
| Paraquat (µg/L) | 10 | 1 | Under 1 | No | Agricultural/ Aquatic herbicide |
| Pentachlorophenol (µg/L) | 60 | 1 | Under 0.2 | No | Pesticide/ wood preservative residue |
| Phorate (µg/L) | 2 | 1 | Under 0.3 | No | Agricultural insecticide |
| Picloram (µg/L) | 190 | 1 | Under 5 | No | Industrial herbicide |

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| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|----------------------------------|-----|-------------------|---------------------------|----------------------------|---|
| Polychlorinated Biphenyls (µg/L) | 3 | 1 | Under 0.05 | No | Residue from various industrial uses |
| Prometryne (µg/L) | 1 | 1 | Under 0.1 | No | Agricultural herbicide |
| Simazine (µg/L) | 10 | 1 | Under 0.5 | No | Agricultural herbicide or its residue |
| Terbufos (µg/L) | 1 | 1 | Under 0.5 | No | Agricultural insecticide |
| Tetrachloroethylene (µg/L) | 30 | 1 | Under 0.5 | No | Leaching from PVC pipes; discharge from factories, dry cleaners, and auto shops (metal degreaser) |
| 2,3,4,6-Tetrachlorophenol (µg/L) | 100 | 1 | Under 0.2 | No | Wood preservative |
| Triallate (µg/L) | 230 | 1 | Under 10 | No | Agricultural herbicide |
| Trichloroethylene (µg/L) | 5 | 1 | Under 0.5 | No | Discharge from metal degreasing sites and other factories |
| 2,4,6-Trichlorophenol (µg/L) | 5 | 1 | Under 0.2 | No | Pesticide manufacturing |
| Trifluralin (µg/L) | 45 | 1 | Under 0.5 | No | Agricultural herbicide |
| Vinyl Chloride (µg/L) | 2 | 1 | Under 0.2 | No | Leaching from PVC pipes; discharge from plastics factories |

Table 8 - Other Regulatory Treated Water Parameters

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|-----------------|-----|-------------------|---------------------------|----------------------------|---|
| Fluoride (mg/L) | 1.5 | 1 | Under 0.1 | 1 | Naturally occurring. |
| Nitrite (mg/L) | 1 | 4 | Under 0.05 - 0.08 | 4 | A natural component of water at this level. |
| Nitrate (mg/L) | 10 | 4 | 0.07 - 0.55 | 4 | Runoff from fertilizer use, erosion of natural deposits |
| Sodium (mg/L) | 20 | 1 | 11.2 | 1 | Occurs naturally in the earth's crust. Notification is required every 60 months if greater than 20 mg/L |

Table 9 - Treated Water Testing

(Analyzed by Accredited Laboratories)

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|--------------------|-----|-------------------|---------------------------|----------------------------|--|
| Microcystin (µg/L) | 1.5 | 9 | Under 0.15 | No | Naturally occurring (released from blooms of blue-green algae) |

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Table 10 - Regulatory Distribution Water Testing

(Analyzed by Accredited Laboratories)

| Parameter | MAC | Number of Samples | Results Range (min - max) | MAC Exceedance (Yes or No) | Parameter Description |
|-------------------------------------|--------------------|-------------------|---------------------------|----------------------------|---|
| Alkalinity CaCO ₃ (mg/L) | N/A | 9 | 117 - 128 | N/A | A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate. |
| Total Haloacetic Acids (mg/L) | 0.08 (Annual avg.) | 4 | 0.0116 - 0.027 | No | By-product of drinking water disinfection with chlorine. Based on a running annual average |
| pH | 6.5–8.5 OG | 9 | 7.17 - 8.01 | N/A | An indicator of the acidity of water. |
| Total Trihalomethanes (µg/L) | 100 (Annual avg.) | 4 | 26 - 43 | No | By-product of chlorination. * The MAC for THMs of 100 µg/L is based on a running annual average. |
| Lead (mg/L) | 0.01 | 8 | 0.00004 - 0.00062 | No | Internal corrosion of household plumbing, erosion of natural deposits. |

Table 11 - Raw Water Testing

(Analyzed by In House Laboratory)

| Parameter | MAC | Number of Samples | Average Results | MAC Exceedance (Yes or No) | Parameter Description |
|----------------------|-----|-------------------|-----------------|----------------------------|--|
| UV Transmittance (%) | N/A | 128 | 78.2 | N/A | A measure of the percentage of transmittance of UV light |

Table 12 - Treated Water Testing

(Analyzed by In House Laboratory)

| Parameter | MAC | Number of Samples | Average Results | MAC Exceedance (Yes or No) | Parameter Description |
|------------------------|--------|-------------------|-----------------|----------------------------|---|
| Aluminum (mg/L) | 0.1 OG | 131 | 0.03 | N/A | May be naturally present or a residual from the coagulation process. There is no MAC for this parameter. It is an Operational Guideline (OG). |
| Free Ammonia (mg/L) | N/A | 116 | 0.27 | N/A | Residual from the addition of Ammonium Sulphate for the secondary disinfection process |
| Monochloramines (mg/L) | 3 | 118 | 1.83 | No | Chloramines are produced when ammonia is added to chlorinated water during the disinfection process. |
| UV Transmittance (%) | N/A | 128 | 86.1 | N/A | UV transmittance is a measure of the percentage of transmittance of UV light |